League of Arab States

Arab Organization for
Agricultural Development

Arab Program For The Sustainability Of Food Security

2022

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Preface

Since the beginning of 2020, world countries have witnessed serious transformations in various aspects of life caused by the shock of COVID-19 pandemic, which profound impacts were not limited to health conditions, but moved beyond to hit various economic, social and political aspects of life.

From the perspective of food security, one of the most prominent lessons learned from the COVID-19 pandemic was that all countries can be exposed to grave and mounting risks due to the consequences associated with such pandemic, other pandemics, or the widespread of natural, political and economic disasters that could result in disruptions, or stumbling, of the food supply chains at the world level, hence, difficulties in obtaining food products from external sources. Therefore, world countries became alerted to the necessity of maximizing self-sufficiency in providing such products, as well as building up buffer stocks of food products by all the various possible means.

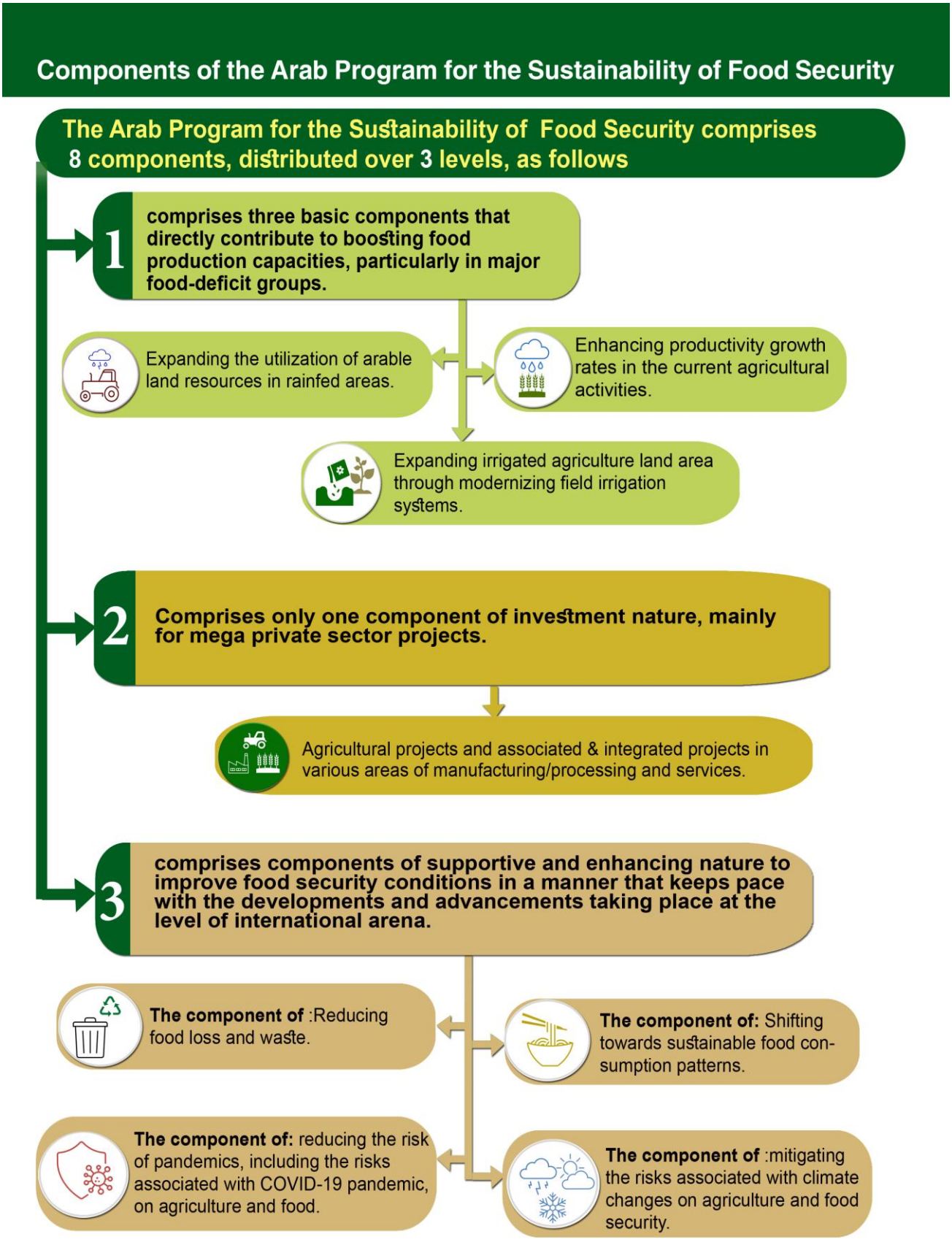
At the level of the Arab World, which is one of the regions heavily dependent on food imports, it was not only the COVID-19 pandemic, or similar pandemics, that threatened Arab food security, rather, it was the crises in water resources that have been aggravating year over year, combined with population growth that recorded the world's highest in terms of rate and pace, which hampered agricultural development efforts exerted over nearly half a century, and are no longer considered sufficient to confront the situation.

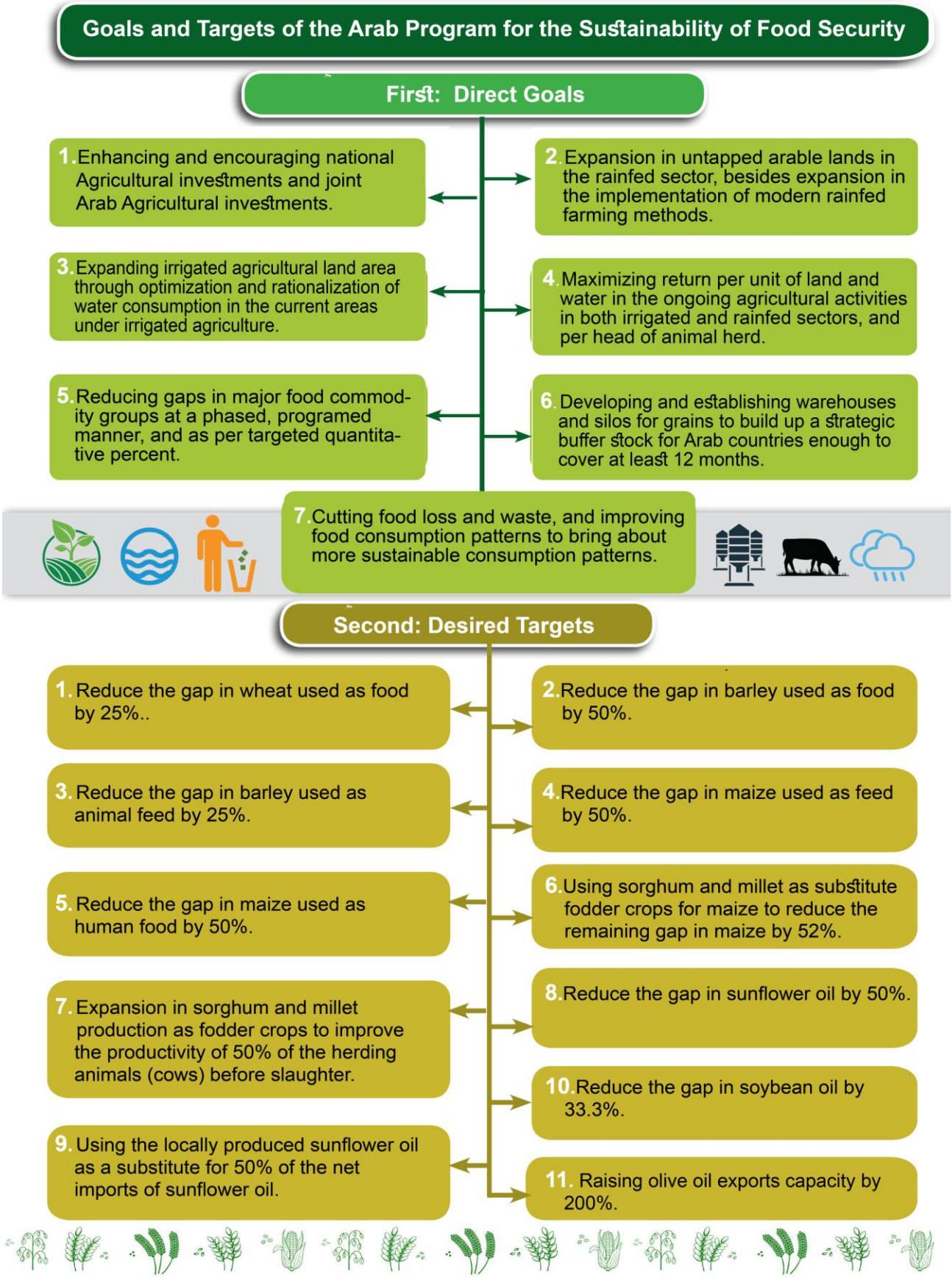
In this context, the Arab Organization for Agricultural Development, by virtue of its role and responsibility in the field of agricultural development and food security, not only raised alarm about the imminent food disasters now threatening the Arab world, but has also stepped forward and launched an initiative to achieve Arab food security during the second half of the pandemic year (2020). This initiative has further been supported by developing a program to sustain Arab food security that keeps in line with the ongoing global and local developments and advancement, as a substitute, or alternative, for the emergency program being implemented since (2011).

Through this initiative and associated program, the Arab Organization for Agricultural Development has been keen to present a new, more ambitious vision to boost Arab countries' capabilities and capacities to achieve self-sufficiency in agricultural production, in order to meet the growing demand for food, through maximizing the efficiency of utilizing available agricultural resources, and seeking to overcome the current situation by optimizing the utilization of untapped available resources, and investing in all that can be benefited from of such resources in such a

way that guarantees they are rightfully merged into the circle of optimal agricultural utilization to ensure they are properly employed, in terms of production and services, using sophisticated and modern systems and methods.

The current document presents the "Arab Program for The Sustainability of Food Security", including importance; justifications; objectives; main and subsidiary technical components; as well as projected outcomes. It also presents the program implementation requirements, including financing measures; institutional, organizational and coordination aspects; as well as Monitoring and Evaluation mechanisms and indicators. It is worth mentioning that the program combines the development and investment approaches, gives weight to comparative and specialized advantages in utilizing available agricultural resources, and opens broad prospects for cooperation and economic integration in the field of sustainable food security through the Joint Arab Action System.


Components of the Arab Program for the Sustainability of Food Security
The Arab Program for the Sustainability of Food Security comprises 8 components, distributed over 3 levels, as follows
1
comprises three basic components that directly contribute to boosting food production capacities, particularly in major food-deficit groups.
Expanding the utilization of arable land resources in rainfed areas.
Enhancing productivity growth rates in the current agricultural activities.
Expanding irrigated agriculture land area through modernizing field irrigation systems.
2
Comprises only one component of investment nature, mainly for mega private sector projects.
Agricultural projects and associated & integrated projects in various areas of manufacturing/processing and services.
3
comprises components of supportive and enhancing nature to improve food security conditions in a manner that keeps pace with the developments and advancements taking place at the level of international arena.
The component of :Reducing food loss and waste.
The component of: Shifting towards sustainable food consumption patterns.
The component of: reducing the risk of pandemics, including the risks associated with COVID-19 pandemic, on agriculture and food.
The component of :mitigating the risks associated with climate changes on agriculture and food security.


Goals and Targets of the Arab Program for the Sustainability of Food Security
First: Direct Goals
1. Enhancing and encouraging national Agricultural investments and joint Arab Agricultural investments.
2. Expansion in untapped arable lands in the rainfed sector, besides expansion in the implementation of modern rainfed farming methods.
3. Expanding irrigated agricultural land area through optimization and rationalization of water consumption in the current areas under irrigated agriculture.
4. Maximizing return per unit of land and water in the ongoing agricultural activities in both irrigated and rainfed sectors, and per head of animal herd.
5. Reducing gaps in major food commodity groups at a phased, programed manner, and as per targeted quantitative percent.
6. Developing and establishing warehouses and silos for grains to build up a strategic buffer stock for Arab countries enough to cover at least 12 months.
7. Cutting food loss and waste, and improving food consumption patterns to bring about more sustainable consumption patterns.
Second: Desired Targets
1. Reduce the gap in wheat used as food by 25%..
2. Reduce the gap in barley used as food by 50%.
3. Reduce the gap in barley used as animal feed by 25%.
4. Reduce the gap in maize used as feed by 50%.
5. Reduce the gap in maize used as human food by 50%.
6. Using sorghum and millet as substitute fodder crops for maize to reduce the remaining gap in maize by 52%.
7. Expansion in sorghum and millet production as fodder crops to improve the productivity of 50% of the herding animals (cows) before slaughter.
8. Reduce the gap in sunflower oil by 50%.
9. Using the locally produced sunflower oil as a substitute for 50% of the net imports of sunflower oil.
10. Reduce the gap in soybean oil by 33.3%.
11. Raising olive oil exports capacity by 200%.

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Executive Summary

Introduction

1. In the framework of the ongoing global and regional developments, all what has the outbreak of Covid-19 pandemic revealed, and what would the occurrence of similar pandemics cause; in addition to repercussions associated with natural, political or economic disasters, such as the high probabilities of interruptions or failures in international food supply chains, which cause difficulties in obtaining food products through imports, world countries have been keen to work towards maximizing self-sufficiency ratios to provide their own food needs, and to build up strategic buffer stocks. At the level of the Arab world, which is one of the regions heavily dependent on food imports, it was not only the Covid-19 pandemic that threatened its food security, but the issue became more critical and dangerous with the aggravating problem of Arab water resources, and the weak capabilities to reduce the widening food gaps due to the growing increase in population, which has been growing at rates that are considered the highest at the world level.
2. Based on that and the necessity to keep pace with the guidelines of the Sustainable Development Goals (2030) and associated commitments, the Arab Organization for Agricultural Development (AOAD) realized that it is imperative to present its initiative to achieve Arab food security, and to support it with a new, advanced program for the sustainability of Arab food security that holds an adequate extent of ambition, and daring to break into non-traditional areas of development to enhance the joint and integrated capabilities of Arab countries, organizations and entities to achieve a reasonable degree of self-sufficiency in providing food requirements. At the same time, it seeks to maximize efficiency of the currently utilized agricultural, water and land resources, and to maximize the utilization of untapped resources to manage them effectively.

Economic and Agricultural Conditions in the Arab World

3. Comparing evolutions of main economic and agricultural variables in the Arab world between the two periods (1996-1998) and (2016-2018) indicates that Arab world's population is still increasing at rates that are probably the highest at the level of the world (around 2.3%), resulting in increasing Arab population from 275 to 414 million, approximately. Also, a significant decline in the percent of rural population has been observed due to the growing increase in internal migrations towards urban areas. In addition, the ratio of agricultural labor force to total labor force declined from 33% to 23%. It also seems that interest in investment and development in the agricultural sector has remained limited and modest relative to interest in the overall economic development activities, where the rate of increase in Arab Agricultural Product amounted to 70.7% as compared to 333% at the macroeconomic level, during the same period.

4. Slow growth in agricultural and food production, combined with the growing increase in population, resulted in higher food imports bill during the aforementioned period, where it soared from US$ 21up to US$92 billion due to the widening food gap, the volume of which jumped from 49.3 to a high of 101.2 million tons. Also, percentages of the food gap in all food groups have been increasing, from 42% up to 61% in cereals, from 55% up to 59% in edible oils and fats, from 67% up to 70% in sugar, and from 16% up to 27% in red and white meats.

Arab and International Developments and Advancements

5. During the last decade (2010-2019), a number of significant developments and advancements took place on the Arab and international arenas, posing direct and indirect impacts on the state of Arab food security. One of the most prominent developments was the intensification and aggravation of the water scarcity issue at the level of the Arab world, as reflected by indicators such as evolution of per capita share of available water resources that has been declining year-over-year until reaching some 575 cubic meters in recent years. Level of water stress at the level of the Arab world also increased, recording an average of 136%. Such situation was accompanied by escalation of the problems and disputes over common water resources coming from outside the borders of the Arab world.
6. The volume of aggregate demand for food at the level of the Arab World has been following a year-over-year increasing trend, driven by the large increases in population, coupled with aggravations in the resources and production problems. Arab world's population is expected to reach some 797 million by 2050, based on conservative estimates, which is 92% higher than the current situation. This percent (92%) represents the minimum increase in demand for food in 2050, which is a significantly higher rate compared with the increase in global demand for food in 2050, expected to reach 60%, according to estimates of the Food and Agriculture Organization of the United Nations (FAO).
7. At the beginning of 2020, Covid-19 pandemic outburst in the framework of unanticipated changing global variables, to put world countries face to face with new threats and fears regarding food security. It has become possible that international food supply chains stop at any time, or falter, and that food-surplus countries, as well as other countries, impose restrictions on exports of their food surpluses, and tend to monopolize their produce to secure their own food requirements and build up buffer stocks in anticipation of similar crises.
8. In 2015, the Global Agenda for Sustainable Development, with the underlying seventeen goals, was launched. It became one of the most important global developments as it constitutes commitment of countries, and represents an international guide to development plans and strategies around the world. Some of the 17 goals are directly related to agricultural development, food production and

food security, as the case of the goal of ending hunger, providing food security and improved nutrition, and promoting sustainable agriculture (Goal 2); as well as ensuring sustainable consumption and production patterns (Goal 12); taking urgent actions to address climate change and associated impacts (Goal 13). Goal 12 also includes directing world countries towards reducing food loss and waste along various stages of the food supply chains, especially the post-harvest stage.

From the Emergency Program to the Arab Program for the Sustainability of Food Security

9. The soaring of world food prices in early 2008 was one of the major reasons that prompted the establishment and issuance of the Emergency Program for Arab Food Security at that time. However, the rise in world food prices during that period was not the first of its kind, and of course it will not be the last, as this rise is considered one of the factors of a cyclical and accidental nature. However, developments and advancements during the decade that followed the launching of the emergency program represented the major factors and considerations for designing, and the launching of, a program for the sustainability of Arab food security. Such changing variables would not have been comprehended by the emergency program, or taken into consideration, either in its goals, or the components thereof. Hence, it was necessary to reconsider the emergency program, and work towards developing and changing the program in such a manner that takes into account recent developments and advancements, and the problems and challenges of fundamental nature and chronic impacts that have occurred in recent years. That is what exactly has been taken into account within the framework of the current "Arab Program For the Sustainability of Food Security".

10. The ten-year period that elapsed since launching the Emergency Program for Arab Food Security was first launched resulted in important lessons that were learned and taken into account while developing and designing the current sustainable program, so as to be more realistic and competent in terms of implementing the underlying components, and achieving the quantitative and qualitative goals as per the specified Monitoring and Evaluating performance indicators. The program is characterized by fulfilling the highest degree of alignment with the national development trends, and maximizing the utilization of benefits associated with the relative differences between Arab countries. It is consistent and in line with the international sustainable development trends, emphasizing the activation of shared solidarity and responsibility principles among countries, as well as between countries and various relevant development and financiers and institutions.

11. The program also stressed the importance that the Arab Organization for Agricultural Development pursue implementation of its annual work plans by focusing on priorities of the Arab region agreed upon by all local, regional and international stakeholders, including, but not limited to, tackling the problem of food loss and waste; control of transboundary animal diseases that constitute a serious limitation to intra-trade in livestock; implementing adaptation programs and the programs targeting the development and transformation of the prevailing agricultural and food systems in order to accelerate achieving Arab food security and sustainable production systems, especially for small-scale producers and family farming; in addition to implementing human and institutional capacity building programs to support transformation and adaptation of the dominant agricultural and food systems.

Program Importance and Justifications

12. Various developments and advancements that have taken place in the Arab and international arenas over the last decade have been of outstanding importance in pushing the need to formulate a sustainable Arab food security program that takes into account keeping pace with; responding to various developments and advancements; seriously and unprecedentedly deals with the Arab region's vulnerable state regarding water resource and the hazards/risks such situations can bring about in the future. It also takes into account lessons learned from the Covid-19 pandemic and similar pandemics, disasters or crises, either natural, political or economic, in order to keep pace with the programs, plans and strategies that qualify Arab countries to be self-reliant in terms of achieving self-sufficiency in food requirements.

13. However, the other aspect that underscores the importance and justification of this sustainable program is the gloomy picture of the future vision of what Arab food security conditions can look like if the situation continues as is. Specifically, if the increase in population, and hence in food requirements, continues at the same pace and rate of growth, while at the same time agricultural development conditions and food production developments continue along the lines of their stereotypical pace since the 1970s and 1980s.

14. In the future prospects on food security, and in accordance with the current stereotypical developments, the food gap rises from 101 million tons in the current situation to about 131 million tons in 2030, and further to about 190 million tons in 2050. As for the food gap in the grain group, it rises from (79) to (103), then up to 152 million tons. For sugar, the food gap rises from (8.6) to (11.1), then up to (16.5) million tons, while for the oilseed group it rises from (3.5) to (4.5), then up to 6.7 million tons. In regards to the meat group, the food gap rises from (3.8) to (4.1), then up to 6.1 million tons.

Program Philosophy and Broad Orientations

15. This program is based on a set of considerations and visions, the contents of which represent the program's philosophy towards dealing with the issue of sustainability of Arab food security. One of the main features of the program' philosophy is that it combines both the development and investment approaches to improve the goals sought. The program involves an unprecedented breakthrough for the development and upgrading of the rainfed agriculture sector to transform it into a modern economic sector that is actively involved in meeting the requirements of sustainable food production and consumption. The program is also based on an effective partnership between the public and private sectors, and on a phased and substantive graduation. It is also based on the principle of complementarity, inclusiveness of roles and contributions by countries, together with maximizing the utilization of countries' comparative and specialized advantages wherever they exist, as well as on the principle of complementarity, shared responsibility and solidarity among various development activities, financiers and regional and international donors.

Program Goals

16. The program is based on a set of direct goals associated with the defined timeframe of execution (ten years), and a set of broad indirect goals, some of which are to be achieved over the program's timeframe, and beyond. Some of the direct goals include expanding the utilization of untapped arable lands of the rainfed sector in Arab countries; developing and the modernization of agriculture systems in the current and targeted expansions in the rainfed sector; maximizing return per unit of land and water in the currently existing agricultural activities in both irrigated and rainfed sectors; and expanding the irrigated cropped area by investing the amount of water saved through modernizations applied to field irrigation systems. Needless to say, all such goals pour into the goal that aims to reduce deficit in major food commodity groups.

17. The overall desired indirect targets include pumping sufficient investments in the following: the agricultural sector in general, and in the rainfed sector in particular; enhancing the interlinked and integrated processing and service activities; improving the agricultural infrastructure and utilities; establishing agricultural settlements and reducing urban migration; creating employment opportunities for the youth (both sexes), either in the direct agricultural activities, or various

associated processing, services and marketing activities; improving the standards of living and reducing poverty in rural agricultural communities; developing and improving the performance efficiency of food supply chains and enhancing interconnectedness between their different stages; supporting Arab countries' efforts to fulfill their commitments towards achieving global sustainable development goals, in particular with regard to promoting sustainable agricultural food production and improving the conditions of Arab food security.

Program Timeframe/Term

18. The program's timeframe extends over ten years (2021-2030) and two phases, the first of which covers the period (2021-2025), while the second covers the period (2026-2030). The actual start of each program component varies based on its nature and the extent to which it needs preparedness and pre-configuration. From a sustainable perspective, this 10-year program represents the first phase of the sustainable and sustained program that extends beyond the deadline until 2030, then takes off to other relevant and follow-up phases that aim to achieve the principle of sustainability.

Program Components

19. The current "Arab Program for The Sustainability of Food Security" comprises eight components, distributed over three levels.

The First Level includes the basic components that directly contribute to increasing food production capacities, particularly in major food-deficit groups, as follows:

- **Component I:** Expanding the utilization of untapped arable land resources in rainfed areas.
- **Component II:** Boosting productivity growth rates in the current agricultural activities.
- **Component III:** Expanding irrigated agriculture land areas through modernizing field irrigation systems.

The Second Level comprises only one component of investment nature, mainly for mega private sector projects, including agricultural projects, and associated and integrated projects in various areas of processing and services, which is the fourth component of agricultural and food-processing investment projects.

The Third Level includes four components of a supportive and enhancing nature to improve the state of food security, in line with the developments and advancements taking place in the international arena. Details are as follows:

- **Component V:** Reducing food loss and waste.
- **Component VI:** Shifting towards sustainable food consumption patterns.
- **Component VII:** Reducing the risks of pandemics, including those associated with COVID-19 pandemic, on agriculture and food.
- **Component VIII:** Mitigating the risks associated with climate changes on agriculture and food security.

20. The first component targets increasing rainfed agricultural sector's land area, already used in cultivating basic food-gap crops, through expanding the utilization of untapped arable land resources, estimated at 161 million hectares distributed over Arab countries, with significant concentration in a limited number of countries (about five), thus creating a modern rainfed sector. The program decided on the set of principles and criteria for expansions in this sector, based on which the categories of countries with comparative advantages, prospects and basic criteria for expansion have been classified into 3 categories, the first of which includes Sudan, Morocco, Algeria, Somalia and Yemen.

    Given the novelty of this development approach, and the possible need for restructuring and reformulation of strategies, policies, plans and programs, both at the regional and joint Arab levels, to eliminate or reduce constrains on arable land use in Category I countries, and other countries under Categories II and III, the program has adopted two main principles for expansion, the first is the preparation for implementation, and second is the gradualism f staged expansion. The program devoted the first phase (five years) for preparation activities. Of course, preparation is a process that continues throughout phase II, as gradualism of staged expansion is cumulative, and is implemented at rates commensurate with the requirements deemed necessary and essential before actual land utilization is initiated during phase II.

21. Through gradual expansion in the utilization of untapped arable land, the first component aims to achieve eleven targets during the program term, all of which are geared towards improving the conditions of the food and feed gaps and/or surplus in grain and oilseed crops, and meat, as follows:

    - Reducing the gap in wheat used as food by 25%.
    - Reducing the gap in barley used as food by 50%.
    - Reducing the gap in barley used as animal feed by 25%.
    - Reducing the gap in maize used as feed by 50%.
    - Reducing the gap in maize used as human food by 50%.
    - Using sorghum and millet as substitute fodder crops for maize to reduce the remaining gap in maize by 52%.
    - Expanding sorghum and millet production as fodder crops to improve the productivity of 50% of the herding animals (cows) before slaughter.
    - Reducing the gap in sunflower oil by 50%.
    - Using the locally produced sunflower oil as a substitute for 50% of the net imports of sunflower oil.
    - Reducing the gap in soybean oil by 33.3%.
    - Raising the capacity of olive oil exports by 200%.

22. Based on the determinants and requirements for horizontal expansion in arable lands, and vertical expansion through improved productivity levels, and based on the gradualism approach proposed by the program, utilization rates of such lands have been very modest, where it did not exceed 14% of the total arable land area over ten years. Cumulative expansion in areas at the level of eligible countries under the three categories is estimated to reach 22.1 million hectares by 2030, as shown in the following Table (area in 1000 hectares).

Year	Cereals Group							Oilseeds Group				Cumulative increase in Expansion Areas
	Wheat used as Food	Barley		Maize		Sorghum & Millet		Sunflower		Soybean	Olives (1)	
		Food	Feed	Food	Feed	Feed as a substitute for Maize	Finishing Ration	Sunflower Oil	As a Substitute for Maize Oil			
2026	965	125	535	400	925	1930	78.2	480	90	370	1020	6918.2
2027	1835	235	1010	765	1760	3260	151.5	890	165	715	1020	11806.5
2028	2600	335	1440	1090	2500	3550	211.1	1130	230	1175	1020	15281.1
2029	3300	420	1780	1375	3160	4400	267.1	1535	285	1680	1020	19222.1
2030	3915	500	2160	1630	3750	4525	316.7	1780	330	2175	1020	22101.7

(1) Beginning of expansion in the total area proposed for expanding olive cultivation as a permanent crop is 2023.

23. The component that focuses on boosting productivity growth rates of the existing crops aims to achieve the best possible levels of productivity per hectare of major food-deficit crops (cereals, oilseeds, sugar crops). The targeted annual growth rates are: 2.5% for irrigated crops, 7.5% for cereal crops grown in rainfed areas, and 10% for oilseed crops grown in rainfed areas. Such rates combine ambition and realism in the light of achievements realized in many countries. Achieving the goals of this component requires an integrated set of measures, procedures and action pillars that work together to achieve the outcomes expected by 2030, i.e., increasing production of grain crops by 57%, oilseeds by 110%, and sugar crops by 28%.

24. The component that focuses on expanding irrigated agriculture through modernizing field irrigation systems comprises two concurrent goals; the first is to modernize field irrigation systems at an annual rate of 2.5% of irrigated agricultural lands that are still irrigated applying surface irrigation system (flood irrigation). This goal is expected to result in modernizing field irrigation systems over an area estimated at 1.83 million hectares by 2030, saving around 9.1 billion cubic meters of water. Such saved amount of water can be used to achieve the second goal of cultivating additional areas under irrigated agriculture, estimated to reach 864 thousand hectares, approximately, by 2030, which will mainly be utilized in cultivating sugar crops to increase refined sugar production by 7.7 million tons, by 2030.

25. The fourth component is devoted to agricultural and food processing investment projects. Through this component, many investment projects are to be established in various fields of agricultural production and associated processing, manufacturing and services. Such projects include: integrated agro-industrial parks; improved seed production projects; production of soil fertilizers and nutrients, processing of agricultural products, especially sugar and oils; manufacturing of equipment and supplies required for modern irrigation systems, as well as farm machinery and equipment; intensive fish farming projects; commercial livestock breeding and fattening projects in pastoral areas, and associated projects, for the production of processed meat products, and various areas of preparation, processing and marketing related to integrated food supply chains. Overall, such projects are expected to result in important outcomes in terms of improving the state food security conditions at the level of the Arab region, and in terms of improving macroeconomic indicators at the level of the countries where these projects are implemented, in addition to improving the living standards at the level of the local population in the areas they serve, as well as reviving and developing these areas in general.

26. The component that focuses on reducing food loss and waste is designed to keep pace with the global trends and initiatives to increase food availability by reducing loss and waste rates. These ratios, estimated by international institutions, account for 30% of the total amount of food production. The component aims to reduce loss and waste in major deficit commodities, as well as in the commodity groups that suffer high deficit rates, such as vegetables, fruit, fish, meat and dairy products. Achieving this goal requires applying a package of appropriate technical, organizational and institutional policies and procedures. If this is correctly done, the expected outcomes would be saving around 11.6 million tons of food at the level of the Arab region, thus providing adequate food for some 15.4 million people. This amount of saved food is approximately equivalent to 3 million hectares of agricultural land, and around 8.2 billion cubic meters of water.

27. The component that focuses on shifting towards sustainable food consumption patterns seeks to keep pace with contemporary global trends to achieve environmental sanitation; conserve resources and improve food patterns, to keep in line with supporting human health and safety standards and measures. Given the importance of this approach, it was set as one of the 17 Global Sustainable Development Goals. Despite the multiple development pillars for achieving sustainable consumption dietary patterns, the goals this component seeks to achieve focus on two main issues, the **first** of which is increasing white meat and fish consumption while reducing red meat consumption to keep in line with the World Health Organization's recommendations that per capita consumption of red meat should not exceed 5.5 kg per year. Cutting 1 kilogram of per capita red meat consumption across the Arab world, and substituting it by an equivalent amount of poultry meat, is expected to save an amount of water estimated at 5 billion cubic meters. This amount can be further increased to some 17.5 billion cubic meters if the targeted reduction is further pushed to 25% of the current average per capita consumption of red meat, estimated at 14 kg at the level of the Arab region, as well as realizing positive impacts on the environment and the health of the population in general. The **second** goal focuses on reducing cane sugar consumption and substituting the reduced amount with beet sugar. It is worth mentioning that each 1 kilogram of substituted cane sugar at the level of the Arab region results in saving an amount of water estimated at half a billion cubic meters per year.

28. Under level three, the program devotes a component that focuses on interventions and measures that aim to reduce the risks and threats posed by the COVID-19 pandemic on agriculture and food security, and adapt with the associated implications through designing a package of precautionary measures that establish a future institutional methodology and structure to address the recurrence of such a

pandemic, or outbreaks of similar epidemics and disasters with direct effects, taking into account common country and Arab perspectives, as well as the global perspective. The proposed interventions contribute to supporting the program's implementation and contribute to improving the state of sustainable Arab food security during the outbreak of such pandemics and disasters. Perhaps the most important of such interventions and measures is strengthening Arab cooperation in the field of supply chains; strengthening international cooperation to sustain international trade in food to enable the building of decentralized national buffer stocks of food; providing protection and support for smallholder farmers and small and medium-scale rural enterprises; guarantee stability of food supply; protecting the food needs of the vulnerable rural poor, small farmers and producers; and guaranteeing that formal external needs of commodity imports, especially agricultural and food commodities, are covered.

29. The program presents some proposals to support countries efforts to mitigate the risks associated with climate changes, with a special focus on the agriculture and food security sector, both within the framework of the Paris Climate Accords and Sustainable Development Goals (SDGs). Such proposals include a range of direct and indirect interventions by both the Governments and the private sector, covering areas like broader application of climate-friendly farming practices, including expansion in forest plantations, promoting and expanding the use of renewable energy sources in support of the World Bank Group's initiative "Sustainable Energy Initiative". They also cover other fields/areas like the institutional development of climate information systems, in addition to providing support and guidance for conducting agricultural research in the field of adapting to climate change.

30. There is a need to provide support for innovation units, agribusiness incubators and partnerships at the level of the Organization and countries. Perhaps the most important elements of focus are to stimulate investors' participation in transforming innovations into projects that serve the agricultural sector; to support new business projects that aim to transform the ideas of clean and modern technology, conservation agriculture (CA) and good agricultural practices (GAP) into opportunities for economic growth; as well as attracting and mobilizing financial resources from various sources to finance activities targeting the mitigation of negative impacts associated with climate changes on agricultural production in the foreseeable future, in a way that contributes to supporting and promoting sustainable food security in terms of production and consumption.

Program Implementation Requirements

31. Financial measures required to provide funds needed for implementing the program focus on three main pillars:

    First Pillar: To mobilize countries' own financial resources from multiple sources, and reconsider the way they are allocated so that the agricultural sector receives a share equivalent to, or commensurate with its contribution to GDP, whether in relation to capital composition, developmental inflows or total credit.

    Second Pillar: To devote the largest share of internal and external financial and investment inflows from all potential sources, either Arabic, regional or international, to serve the issues of sustainable food security, and to achieve the highest degree of coordination among Arab countries to maximize the share devoted to agricultural sector's development from such inflows, the details of which are explained hereinafter:

    - Loans and development aids from external Arab, regional or international sources, whether direct from countries; or through the Arab Coordination Group; or regional and international development institutions and funds.
    - Grants from the same external sources mentioned above.
    - Technical assistance from the same sources mentioned above, as well as from Arab, regional and international development organizations, centers and entities engaged in agricultural and food development issues.

    Third Pillar: Enhancing local and joint Arab private sector's contributions to implementing the program's investment components, and the country level or joint ventures arising thereof, besides facilitating the sector's access to concessional finance from all possible sources to maximize its contributions.

32. Primary responsibility for securing the required funds from various sources, multiple patterns and methods, lies on countries. This principle is one of the lessons learned from the Arab Emergency Program for Food Security. The alternative sustainable program conceptualizes funding coordination mechanisms to regulate the flow of financial resources available through such sources. It also identifies the policies and specific actions that support national credit and financing capacities to meet agricultural sector’s needs in the countries of implementation, and creates a development investment climate at the macro level, as well as the farm level, whether from the governmental public side, or the private sector's side, where the program considerably relies upon their contribution in implementing the projects, either national or joint ventures.

33. The program gives considerable weight and importance to the Arab Coordination Group as an Arab source that is more likely to contribute to providing development assistance, whether in the form of loans, grants, subsidies, or technical consultations, or granting facilities and credit benefits that give preferential priorities to activities and projects implemented under, or arising from the program as per the specified measures. This is done through requests submitted by individual countries to implement national components, or joint work in case of investment components, including joint agricultural, manufacturing, processing and service projects. The program emphasizes the importance of treating its components as a funding agenda to be agreed upon by countries in accordance with the mechanisms mutually agreed upon by member countries, institutions and funds of the Coordination Group. The Program suggests that it might be appropriate to have a leadership initiative to adopt a "special account for sustainable Arab food security", thus giving impetus and support to secure a stable source of funding for the program's projects. Such account could be hosted by one of the funds affiliated to the Arab Coordination Group.

34. Implementation of different aspects requires a broad base of partner institutions, whose functions and responsibilities vary. However, under all situations and at all levels, countries of implementation constitute the basis, and parties involved are dealt with within the framework of coordination and cooperation, and through countries' competencies, determined according to their specificity and the principle of national sovereignty, with relevant parties or partners acting as supportive/catalytic elements. Given the multiplicity of measures and procedures for the financial, institutional and organizational aspects of implementation, the program involves a proposal regarding the coordination system to be adopted for organizing the roles and functions, which covers the program fields; implementation of associated components at the country level; financing arrangements; providing aid, technical consultations and grants; and the preparation and implementation of joint ventures. The system also identified key actors involved in implementation, or directly/indirectly related to implementation; focal points; proposed coordination mechanisms; as well as the tools and means to assist such mechanisms at the level of each field of work, taking into account interlinkages, overlaps and multilateralism of competencies and functions.

35. Key areas of regulatory procedures for executing the program's components include the issuance of legislation regarding the acquisition of untapped arable lands targeted for expansion activities; the issuance of promulgated laws regarding the settlement of agricultural labor and craftsmen in new agricultural

communities; apply an Arab rules of origin to the program's exportable outputs; introducing new guidance, indicative or binding policies, as needed, in lending farmers and pastoralists of the rainfed sector; insurance and social solidarity against the risks and instability of rainfed agriculture; granting incentives and concessions for the private sector to invest in expansion areas and subsidiary projects; specific plans and programs supporting implementation in various areas of agricultural production, service, extension & research activity, agricultural organizations, education & training institutions; as well as in the fields of informatics, climate protection, pest control, agricultural and health quarantine, veterinary care, etc; farmers' organizations role in value chains; private sector's role in building strategic buffer stocks; and structuring the response and mitigation measures to address repercussions of the pathological pandemics, epidemics and climate changes.

Expected Cumulative Outcomes of the Program

36. The program provides a clear presentation of the projected outcomes under each of its components. On the one hand, some of the projected cumulative outcomes are direct, reflected in the form of improved productivities and self-sufficiency rates, which collectively constitute the program's central and main goal. In this regard, the program's outcomes are expected to result in increasing self-sufficiency rates in main food groups by 2030 as follows: from the current situation of 41.9% in cereal crops to 70.3%; from 31.9% in vegetable oils to 71.8%; and from 30.25% in sugar to 74.43%, etc. On the other hand, many indirect, or general, outcomes are expected, namely, creating new employment opportunities; improving the living standards of farmers; creating new agricultural communities/settlements; enhancing agricultural sector's contribution to Gross Domestic Product (GDP), and other outcomes.

Monitoring and Evaluation Mechanism and Indicators

37. One of the important topics the program was keen to include and clarify in particular is the mechanism and indicators for continuous monitoring of the program's achievements, and the evaluation of its performance. This is consistent with what has come to be required and emphasized by international institutions and organizations in any project or program, not only to ensure transparency, governance and accountability, but also to ensure better levels of success in implementing the program and realizing its goals, and to protect the program's activities and components against faltering, or encountering disruptions in terms of complementarity and coordination between them. In addition, monitoring and

evaluation mechanisms and indicators are considered effective in identifying and problems and finding urgent and critical solutions to address them, besides ensuring unfavorable environment to any form of corruption or bureaucracy. In this regard, the Arab Organization for Agricultural Development (AOAD) has been selected to assume the central role in the monitoring and evaluation mechanism, with the help of affiliated units in each Arab country. AOAD and affiliated units will be responsible for collecting the data required for M&E indicators, analyzing them, and issuing periodic reports regarding the achieved results. In this regard, the Program was keen to develop a set of proposed indicators specific to each component, both quantitative and qualitative, which can be used, built on, and developed according to what is seen required in practice.

Arab Program For The Sustainability Of Food Security

1. Background

The Arab Organization for Agricultural Development (AOAD), in accordance with its mandated tasks and competencies, has been following up and keeping abreast of relevant global developments and advancement taking place, and associated impacts on agriculture and food security in Arab countries, whether commissioned by its legislative councils, or through self-initiatives in favor of member countries. Therefore, in support of the Joint Arab Action procession, and based on Arab leaders' persistent concerns regarding the issues of Arab agricultural development, a decree was issued during the Algeria Summit in 2005, by virtue of which the Arab Organization for Agricultural Development (AOAD) was assigned to prepare a strategy for sustainable Arab agricultural development for the two decades 2005-2025, which AOAD did prepare and was later approved by the Riyadh Summit in 2007.

Only one year later, the world witnessed a food crisis that received great attention at various levels. At the level of the Arab region, in mid-2008, the General Assembly of the Arab Organization for Agricultural Development issued the "Riyadh Declaration to Consolidate Arab Cooperation to face World Food Crises", which involved a commitment to launch the initiative "The Emergency Program for Arab Food Security" that aimed to boost and stabilize food production in the Arab world. Accordingly, AOAD's general administration, in coordination with the General Secretariat of the League of Arab States, prepared the program, which was launched by virtue of a decree issued by the economic, development and social summit held in Kuwait in early 2009. The program's implementation timeframe covered the period 2010-2030, over three phases, the last of which started in 2020.

However, the pace of events accelerated regionally and globally, casting shadows over the constituent and the march of sustainable Arab agricultural development, where the situation of Arab food security continued to deteriorate. Therefore, at the end of 2019, The Arab Organization for Agricultural Development took the initiative to harmonize its strategy for sustainable Arab agricultural development for the two decades 2005-2025 to keep pace with the global goals the 2030 sustainable development agenda, as well as other contemporary issues. Only a few months later the world was shocked by the Covid-19 pandemic, which inflicted heavy losses in various sectors of various economies at the world level, unprecedented in contemporary history.

In view of this situation, efforts were devoted to adapt to repercussions of the pandemic, both nationally and globally, and everyone, each in his/her field and specialization, started to reconsider the strategies and policies, amend plans and programs, and establish approaches and interventions that contribute to adaptation and harmonization efforts. In this context, and out of commitment to its responsibilities and leading role as an organization that is specialized in Arab food security issues, the General Administration of the Arab Organization for Agricultural Development has taken the initiative for accelerating the achievement of Arab food security by adjusting (modifying) the Emergency Program for Arab Food Security to keep pace with all the new constituents and obligations, and deal with the threats and risks posed by all incidents that occurred during the last decade after the launching of the Emergency Program.

Pursuant to this initiative, the desired adaptation can be achieved through the "Arab Program for The Sustainability of Food Security", which is the alternative program contained within in the initiative. After submitting the initiative of the General Administration of the Arab Organization for Agricultural Development to the Economic and Social Council of the League of Arab States in its 106th regular session held during September 2020, the Council issued Resolution No. (2280), in which the fourth paragraph stated: "4. Taking note of the Arab Organization for Agricultural Development's initiative to achieve sustainable Arab food security in light of the current challenges amplified by the Covid-19 pandemic, based on the Emergency Program for Arab Food Security, and requests to proceed with presentation to legislative bodies of the organization in preparation for presentation to the Economic and Social Council to take what it deems appropriate".

Accordingly, the General Administration of the Arab Organization for Agricultural Development prepared the "Arab Program for Sustainable Food Security" in the framework of this initiative. Upon completion, the program was presented to the Organization's General Assembly that issued Resolution No. (5/36 J/2020) stipulating the following: "1. Approval of The Arab Program for The Sustainability of Food Security as an alternative program for the Emergency Program for Arab Food Security; 2. Assigning AOAD's General Administration to carry out the formal procedures towards ratification of the program by the Economic and Social Council of the League of Arab States and the Arab Summit.

2. General Economic and Agricultural Conditions in the Arab World

This part provides a brief presentation of the main indicators reflecting the general and agricultural conditions at the level of the Arab world, considering that such conditions constitute the economic, social and demographic base on which the future vision of any strategies, programs or plans for agricultural development, and for improving the conditions of Arab food security, are based, among which, of course, is the current Program for Sustainable Arab Food Security.

2.1. Population

Two decades ago, specifically during the period (1996-1998), Arab world's population was nearly 275.5 million. This number rose to a high of 413.8 million during the period (2016-2018), indicating a high growth rate for Arab population, estimated at 2.63% during the first ten years of this period. This rate then declined to around 2.26% during the second ten years. If it continues to decline during the coming years until reaching 2%, the expected population will reach some 535 million by 2030, and will further rise to some 797 million by 2050, which is 92% higher than the current situation. Needless to say, this is the percent by which demand for food will increase, at least, in 2050.

It is worth noting that distribution of the Arab world's population tends to be relatively concentrated, where 44% of the population is concentrated in only three countries (Egypt, Sudan and Algeria). This percent increases to reach 84% by adding another four countries, namely Saudi Arabia, Iraq, Morocco and Yemen, whereas the rest of the 16% is distributed over the remaining 15 countries.

Generally speaking, Arab population is divided into four categories according to the Human Development Index (HDI). This index is a static composite index that measures the economic, health and educational conditions of the population. According to HDI, about 69% of the Arab world's population falls into the third category (medium human development conditions) and the fourth category (low human development conditions). Only 13.1% of this population belongs to the very high category, while 18.3% belong to the high category. No doubt, having an ambitious program that aims to achieving agricultural development and improving the state of food security will have positive impacts on improving human development conditions of the population, especially since agricultural and rural areas in various Arab countries include the vast majority population categories who suffer low living conditions.

2.2.1. Rural population

Rural population in the Arab world averaged 173.4 million over the period (2016-2018). This figure represents around 40% of the Arab world's total population. However, the percent of rural population varies greatly among countries, where it rises to reach half the population, or more, like in Egypt, Syria, Sudan, Somalia, Yemen, and Comoros; while drops to less than 20% in countries like the UAE, Bahrain, Saudi Arabia, Sultanate of Oman, Qatar, Kuwait and Lebanon; and ranges between 20%-50% in the rest of countries. It is noticeable that growth rate of the rural population is significantly lower than that of the whole population, where it reached around 1.4% during the last two decades, which can be attributed to the

increasing trend of migration to cities and urban areas, a trend that is expected to continue during the coming years and decades. Associated indirect impacts include increased demand for food at rates that may exceed the rates of population growth due to improved income levels, and urban consumers' behavior.

2.3. Agricultural Labor Force

Labor force in the agricultural sector refers to human capacities involved in the food production process, thus in determining the state of food security. The numbers and ratios of the agricultural labor force to total labor force also reflect the relative importance of the agricultural sector as compared to the rest of economic sectors. At the level of the Arab world, and based on the situation during the period (2016-2018), there exist approximately 28.8 million agricultural workers, accounting for 23% of the total labor force. During the period (1996-1998), this percent was 33%, which indicates a markedly relative decline in the agricultural labor force, and that the agricultural sector is no longer an attractive field of work as it used to be in the past. Between the two mentioned periods, the number of total labor force was increasing at an annual rate of 2.7%, while agricultural labor force was increasing at an annual rate of only 1%.

At the level of Arab countries, the ratio of the agricultural labor force to total labor force varies, reflecting the relative importance of the agricultural sector in each country. For instance, the ratio rises to reach a high of 84% in Somalia and 79% in Djibouti, while significantly declines to reach less than 5% in Saudi Arabia, the UAE, Bahrain, Qatar, Lebanon and Libya. In other cases, the ratio ranges from 5% to less than 20%, like in Jordan, Oman, Iraq, Palestine, Kuwait and Mauritania, while ranges from 20% to 50% in other countries.

2.4. Gross Value of Agricultural Production and Domestic Product

Between the two periods (1996-1998) and (2016-2018), gross value of agricultural production at the level of the Arab world rose from $77.8 billion to $132.8 billion, up by 70.7%. This percent is much lower than the increase in Gross Domestic Product (GDP) during the same period, estimated at 333.2%. Such large difference indicates that the rate of increase gross agricultural production appears to be slow and modest as compared to the rate of increase in GDP. This also affirms the fact that agricultural production's contribution to GDP amounted to 13.33% during the first period (1996-1998), after which it declined significantly to 5.25% during the second period (2016-2018).

These indicators clearly reflect the limited and modest care the agricultural sector receives at the level of the Arab world in terms of development and share of public and private investment allocations compared to other economic sectors. This is the main reason behind the serious issues the Arab world has been witnessing, starting from the escalating food deficit, the widening food gap in main food groups, and the large increases in food imports bill, as inferred from evolutions in the Arab food trade balance.

2.5. Arab Food Trade Balance

Over the last two decades, particularly between the period (1996-1998) and the period (2016-2018), Arab food imports value continued to rise, from some $20.7 billion to a high of $91.8 billion. This large increase is mostly due to the continuous increase in food imports volume between the two periods, where it rose from 55.8 million tons to 120 million tons. It can also be attributed to the remarkable and fast increases in the average value per unit of imported food products, which rose from $370.2 to $766.4 per ton, approximately. Consequently, food imports bill increased as a result of the double effect of the increase in imports volume plus the increase in average value per imported unit.

Despite the improve in Arab food exports value, which increased from US$4.7 billion per year during the first period to US$15.9 billion per year during the second period, food imports value has been following an increasing trend at rates higher than the exports rates, resulting in escalated deficit in the value of food trade balance that soared from $15.9 to US$67.9 billion. While food imports value accounted for 79.3% of the agricultural imports value during the first period, it increased to 84.7% during the second period. Thus, the burden food imports poses on total agricultural imports has been increasing from period to another at the expense of non-food agricultural imports, including tools, supplies and machinery required for the process of agricultural production, and for agricultural development and modernization in general.

2.6. Agricultural Land and Water Resources

First and foremost, it is important to distinguish between available resources and utilized resources. In regard to available resources, data issued by the Arab Organization for Agricultural Development (AOAD) indicate the availability of vast undeveloped arable land areas at the level of the Arab world, estimated at some 155 million hectares. Such areas represent an available resource that can be utilized relying on rainwater as the main source of irrigation. Data also indicate that rainfall

rates in a number of Arab countries allow for significant potentials for expansions in rainfed agriculture. There are five countries where rainfall rate exceeds 400 mm/year, and six other countries where it ranges between 200-400 mm/year. In fact, rainfed agriculture in most Arab countries did not receive the appropriate, or the required, attention for realizing optimal economic utilization based on modern and advanced methods of rainfed farming systems that have achieved tangible successes in many other countries. Such methods and systems can help achieve a qualitative leap in the field of rainfed agriculture's contribution to improving food production thus the state of food security in the Arab world.

As for the utilized agricultural land and water resources, main features characterizing their conditions can be presented as follows:

- Total area under irrigated agricultural accounts for only 25% of the total cultivated areas in the Arab world. Despite this fact, they represent the main source of food production. In the wake of the successive global food crises during the seventies and eighties of the last century, and the growing increase in population thus demand for food, area under irrigated agriculture was expanded until reaching a maximum of 14.5 million hectares during the period 2003-2005. Since then, this area did not witness any significant increase, as the issue of water resources has been aggravating until becoming a major determinant that prevents the possibility of achieving further expansion in irrigated agriculture.
- Total area under rainfed agriculture accounts for 75% of the total cultivated land area in the Arab world, where it reached a total of 38 million hectares at the beginning of the current millennium. Such area has increased in recent years (2016-2018) to almost 42 million hectares. However, this increase may not necessarily mean a developmental tendency towards increasing rainfed agriculture’s area due to the fact that it is subject to significant fluctuations year-over-year, or from period to another, based on rainfall fluctuations rates. Largely, rainfed agriculture in the Arab world is considered traditional, if not primitive, based on data collected regarding the productivity levels of various crops. Such levels are considered very low compared to productivity realized by some world countries that have achieved remarkable developments in rainfed farming methods and systems.
- It is not an exaggeration to say that most of the rainfed agriculture in the Arab world, with being subject to vast fluctuations and high levels of risks under the current conditions, belongs to marginalized agriculture more than representing an agricultural system to which considerations and criteria of financial feasibility and Economic efficiency apply.

- In irrigated agriculture, measuring production efficiency focuses on estimating return per unit of land area (ha), while no attention is given to estimating return per unit of water (cubic meter). Based on this criterion, irrigated agriculture in the Arab world is considered of limited efficiency to a significant degree, where efficiency of field irrigation systems prevalent in the vast majority of areas (about 70%) is estimated at 50%. Such areas, estimated at 10.5 million hectares, still apply surface irrigation system (flood irrigation). Hence, there is an urgent need to developing field irrigation systems in irrigated agriculture, not only to increase the rate of return per unit of water, but also to save large amounts of irrigation water that can be invested in horizontal expansions by cultivating additional new areas under irrigated agriculture.

2.7. Livestock

The number of livestock in the Arab world amounted to 350 million heads as average of the period (2016-2018). This number is 8% lower than that recorded ten years ago (2006-2008) when the estimated number was 380 million heads. As for composition, the majority of livestock is sheep and goats (about 78.4%), while the number of large livestock animals is estimated at 55 million heads of cows, 18.3 million heads of camels, and 3.7 million heads of buffaloes.

Livestock distribution over the Arab world is characterized by a remarkable spatial concentration. The vast majority of cows (around 70%) are concentrated in Sudan, while nearly 90% of the buffaloes is concentrated in Egypt, and around 80% of the camels is concentrated in Somalia, Sudan and Mauritania. In regards to sheep and goats, concentration is relatively low, where nearly 80% of each is concentrated in seven countries.

Generally speaking, it can be said that no proper systems of breeding, or care, that can help achieve the proper rates of production efficiency are provided for the vast majority of livestock in the Arab world, especially in countries where livestock depend on natural pastures, where the owners of such livestock pay more attention to the number they hold, while pay less attention to their production efficiency.

Starting from this era, it can be said that great opportunities exist for increasing the production of animal food products by devoting more attention to developing both the breeding and care systems, and applying modern methods, both technically and administratively, in various stages of the supply chains of animal food products.

2.8. Food Production, Supply and Self-sufficiency Rate

During the twenty years that elapsed between the two periods (96-1998) and (2016-2018), Arab world's population increased by 61%. When compared to the increase in food production during the same period, it can be noted that production of some food groups increased at higher rates than the rate of increase in population, such as tubers, white meat, fish, eggs and sugar crops, whereas the rate of increase in vegetable production was close to the rate of increase in population. This is the positive side of the performance of food production sector. The negative side implies signs of much concern, especially in regards to basic food commodity groups. Of the Cereals production increased at a low rate of 10.5%, legumes production increased by 5%, while red meat production increased by 46.1%. The situation gets worse for the cereals group, especially in regards to wheat and maize, where consumption of both crops tends to increase at rates exceeding the rate of increase in population, specifically, 73.9% for wheat and 108.7% for maize. If the focus is on comparing the rates of increase in production and consumption during the same period, it becomes clear that there are increasing, noticeable imbalances in most food groups, including grains, tubers, legumes, oils and fats, red meat, and eggs, which consumption has been increasing at rates higher than the rates of increase in production. By and large, different food groups suffer gaps that vary in percent. One the one hand, the gap rises to critical and dangerous limits (more than 50%) in the groups of cereal crops (61%), sugar crops (70%) and oils and fats (58.7%). On the other hand, the gap is considered high, but less serious, in the groups of legumes (45.1%), white meat (33.7%) and red meat (18.6%). When analyzing evolution of self-sufficiency rates between the two mentioned periods, it becomes obvious that such rates tend to improve in some food groups, namely vegetables, fruits, fish, milk and dairy products. However, they showed declines for other groups, namely grains, tubers, legumes, oils and fats, red meat, white meat and eggs. Finally, self-sufficiency rates appeared relatively stable, or slightly better, for the group of sugar crops.

This brief presentation regarding the state of production, supply, consumption and self-sufficiency rates of various food groups, and the relationship between them, clearly reveals that the groups of cereal crops, oilseed crops, sugar crops, and to some extent white meat, rank on top of the groups with critical situation from the perspective of food security, followed by the groups of red meat, legumes and eggs. The state of food security for other food groups remains subject to future developments in the relationship between the rates of increase in their production and consumption, minding that demand is driven by increase in population, as well as other economic and social factors and considerations.

Table 2: Evolution of Population and Agricultural Lands in the Arab World

Attribute	Unit	Average of the Period 1996-1998	Average of the Period 2006-2008	Average of the Period 2016-2018
Total population	**Million**	257.5	333.5	413.8
Rural population		132.4	148.4	173.4
Total labor force		72.2	104.3	125.1
Agricultural labor force		23.8	28.6	28.8
Agricultural area	**Million Ha**	66.9	71.2	73.9
Per capita share	**Ha**	0.26	0.21	0.18
Rainfed area	**Million Ha**	37.9	37.6	42.1
Irrigated area		13.3	14.0	14.8
Forest area		93.7	93.4	38.9
Pasture area		349.5	519.6	374.7

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Table 3: Evolution of Animal Wealth and Animal Production

Type/Product	Unit	Average of the Period 1996-1998	Average of the Period 2006-2008	Average of the Period 2016-2018
Cows	Number in Million Heads	17.7	62.6	55.0
Buffaloes		3.1	4.4	3.7
Sheep		146.8	183.3	182.7
Goats		82.8	113.8	91.4
Camels		11.9	15.7	16.6
Total Number		262.3	379.8	349.4
Red meat	Production in Million Tons	3.2	4.5	4.7
White meat		1.8	2.7	4.5
Total meat		5.0	7.2	9.2
Milk		17.8	24.6	27.8
Eggs		0.8	1.4	2.1
Fish		2.6	3.7	5.1

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Table 4: Evolution of Gross Domestic Product of Agriculture and Foreign Trade in Food at the Level of the Arab World

Attribute	Unit	Annual Average of the Period 1996-1998	Annual Average of the Period 2006-2008	Annual Average of the Period 2016-2018
Gross Domestic Product of Agriculture	US$ Billion	77.81	91.27	132.82
Share in GDP	%	13.33	5.76	5.25
Food Imports	US$ Billion	20.66	43.73	91.81
Share in Total Agricultural Imports	%	79.29	82.22	84.73
Food Exports	US$ Billion	4.71	11.59	23.91
Share in Total Agricultural Exports	%	69.31	76.27	88.01
Food Trade Balance	US$ Billion	-15.95	-32.14	67.90-

Source: Calculated based on data collected from the" Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Table 5: Evolution of Production, Supply, and Self-sufficiency Ratios in Food Groups the Level of the Arab World

Food Group	Average of the Period 1996-1998			Average of the Period 2016-2018			% Increase between the Two Periods	
	Production (Million Tons)	Supply (Million Tons)	Self-sufficiency (%)	Production (Million Tons)	Supply (Million Tons)	Self-Sufficiency (%)	In Production	In Consumption
Total Grains	45.86	78.30	58.39	50.66	129.81	39.03	10.5	65.8
Wheat and flour	20.59	38.25	53.63	24.63	66.51	37.02	19.6	73.9
Maize	7.00	13.80	50.86	8.09	28.80	28.33	15.6	108.7
Rice	5.31	7.23	73.52	5.38	10.49	51.52	1.3	45.1
Barley	6.52	12.25	51.67	5.42	16.61	32.24	-16.8	35.6
Roots and Tubers	7.15	7.14	100.04	14.92	14.87	96.17	99.9	108.3
Legumes group	1.39	1.86	75.23	1.46	2.69	54.86	5.0	44.6
Total Vegetables	35.40	35.85	98.74	57.36	56.40	102.07	62.0	57.3
Total Fruits	25.14	26.07	96.46	34.63	33.63	103.15	37.7	29.0
Sugar (Refined)	2.28	7.02	32.75	5.86	14.43	30.25	157.0	105.6
Total Oils and Fats	1.63	3.59	45.31	2.62	6.69	41.28	60.7	86.4
Total Meat	4.99	5.93	84.14	9.23	12.61	73.19	85.0	112.6
Red Meat	3.23	3.72	86.83	4.72	5.80	81.38	46.1	55.9
White Meat	1.76	2.22	79.28	4.51	6.81	66.23	257.5	206.8
Fish	2.43	2.34	104.15	5.38	4.85	110.95	121.2	107.3
Eggs	0.84	0.87	96.61	2.15	2.51	86.02	155.9	188.5
Milk & Dairy Products	17.80	25.28	70.41	28.05	30.67	92.21	57.6	21.3

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

3. Arab and International Developments and Advancements

It is possible to capture a set of developments and advancements that took place during the last decade (2010-2019), both at the Arab and international arenas, which are mutually linked in one way or another, to some degree, with the state of Arab food security. Hence, it is essential to take such variables into consideration when developing programs, policies and projects to improve the state of food security, whether at level of the Arab world, or at the level of individual countries. Perhaps among the most important developments and advancements that should be taken into consideration in the framework of this program are the following:

3.1. Aggravation of the Water Problem

As previously mentioned, aggravation in the scarcity of water resources in the Arab world is at the forefront of key issues that have profound impacts on the state of Arab food security, as it has been deteriorating year-over-year. According to the report issued by the Arab Water Council in 2019, average per capita share of fresh water in the Arab world has declined to reach around 575 m3 in recent years, which is below the water poverty limit (1000 m^3) by 42.55%. Based on that, the majority of Arab countries (17 countries) fall below the water poverty line.

Water problem in the Arab world has many dimensions. On the one hand, dependency on water resources coming from outside the borders is as high as 64%. Such resources became subject to problems and conflicts that threaten their decline. On the other hand, water stress has been increasing year-over-year, as the rate of withdrawals from available fresh water has been increasing until reaching about 136% at the level of the Arab world, indicating intensive withdrawals from the non-renewable groundwater resources.

Based on water statistics database (AQUASTAT), published by the Food and Agriculture Organization of the United Nations, the rate of water stress in some countries exceeds one thousand percent, like Kuwait (2603%), Saudi Arabia (1242%), and Libya (1072%), while exceeds one hundred percent in some other countries like Jordan (151%), Bahrain (206%), Syria (109%), Yemen (228%), Egypt (160%), and Oman (106%), and is almost very close to the critical limit of water stress, 100%, in Iraq (93%), Tunisia (94%), and Algeria (88%).

As for rainwater resources (green water), they are considered relatively limited in whole, as rainfall in the Arab region is estimated at 2.1% of the total global precipitation on land. Hence, about 90% of the Arab lands are classified as arid or semi-arid lands. According to AOAD's Report on the State of Food Security in the Arab World, issued in 2017, there are only five Arab countries where average

rainfall is slightly above 400 mm/year, namely Lebanon, Palestine, Morocco, Algeria, and Somalia. This rate ranges between 200-400 mm/year in six countries, including Tunisia, Jordan, Sudan, Iraq, Yemen, and Mauritania; while ranges between 100-200 mm/year in four countries, including Saudi Arabia, Libya, Oman, and Djibouti; and is less than 100 mm/year in five countries, including UAE, Bahrain, Kuwait, Qatar, and Egypt.

Problems related to rainwater resources can be summarized in that the vast majority of such resources is not directly utilized in agricultural irrigation. Rainfall is also characterized by relatively wide fluctuations in terms of rates that vary from year to year, thus cropped areas that depend on rainfed irrigation fluctuate accordingly. On the other hand, within the one season, such precipitation is characterized by a temporal pattern that is not sufficiently compatible with the needs of cultivated crops during different stages of growth, causing negative impacts, to a large extent, on productivity levels, and on the percent of harvested areas relative to cultivated areas. In addition to problems associated with water rainwater resources, estimates indicate that climatic changes will lead to a 20% reduction in precipitation rates during the next few decades.

3.2. Significant Increase in Demand for Food Associated with the High Rate of Population Growth

By and large, population growth rate in the Arab world is considered of the highest rates at the world level. Between 1998 and 2008, the rate was around 2.4%, and then slightly declined to 2.2% between 2008 and 2018 compared to 1.1% at the world level. In case population growth rate in the Arab world declines to 2%, Arab population is expected to reach some 535 million by 2030, and 797 million by 2050, up by 92% compared to the current situation. This percent matches the minimum percent of increase in demand for food, ignoring other factors influencing demand such as: urbanization levels, income, and food awareness. This percentage is nearly 150% (i.e., one and a half times) compared with the increase in global demand for food for the same year (2050), estimated at 60% by the Food and Agriculture Organization. It is therefore clear that the Arab world needs more ambitious programs and policies for food security, and more determined and serious efforts compared to the global situation.

3.3. Impacts of Covid-19 Pandemic on Agriculture and Food Security

During the year of outbreak (2020), Covid-19 pandemic severely hit the global economy, adding to the deterioration and fragility it has already been suffering during the previous few years. In April 2020, more than 80 countries around the world closed workplaces and imposed widespread travel restrictions.

Moreover, around 150 countries closed all schools and imposed cancellations of gatherings and events. Mandatory lockdown and social distancing imposed on producers and consumers resulted in significant negative impacts on economic activities and trade around the world. Needless to say, sharp recessions have negative repercussions on production, investment rates, unemployment rates, and global trade. Such negative economic repercussions are expected to be much severe on the average emerging markets and developing economies, where potential GDP is likely to decline by almost 8%, while for energy-exporting countries the decline is likely reach 11%[(1)].

Direct negative repercussions of Covid-19 pandemic on agriculture and food security include:

1. Disruption of food supply chains at the international, regional and domestic levels.
2. Farmers were exposed to market losses due to the fact that a large percent of them were neither able to harvest their crops, nor able to grow crops during the new season.
3. Some governments halted food exports and imposed restrictions on food imports, resulting in increased tensions at the level of international trade, and fluctuations in the prices of food commodities.
4. Children enrolled in school feeding programs were deprived from the benefits they used to get from such programs.
5. More suffering of poor families who depend on food subsidies.
6. Difficulty of delivering agricultural production inputs and supplies to farmers' fields in due time.

[(1)] World Bank Blogs - COVID-19 Pandemic Will Leave Lasting Economic Scars Around the World, Dana Vorisek, Senior Economist, Prospects Group of the Equitable Growth, Finance and Institutions Global Practice, June 2020.

In June 2020, Executive Director of the World Food Program issued a report in which he indicated that, in the framework of the Covid-19 pandemic, estimates reveal that nearly 270 million people around the world will face a state of food insecurity before the end of the year [2].

It is worth noting that the United Nations held a Food Systems Summit in 2021 as an occasion to organize international efforts aiming to confront challenges imposed by the Covid-19 pandemic on agriculture and food security, and to identify the necessary implementation measures through partnerships between governments, regional banks, food agencies, the private sector and international organizations in order to help both farmers and consumers.

3.4. Announcing the Global Sustainable Development Goals 2030 and Launching of the Fourth Agricultural Revolution (Agric.4.0)

During the seventieth session of the United Nations General Assembly (25-27 September, 2015), the United Nations Summit was held and attended by heads of state, leaders and heads of the governments of 193 countries. The UN General Assembly adopted the 2030 Development Agenda titled "Transforming our world: the 2030 Agenda for Sustainable Development". The agenda outlines the 17 Sustainable Development Goals targeted to be achieved by 2030. Such agenda represents a commitment and a guide for development plans and strategies of the world countries that participated in this summit, where the announcement of these goals involved that "All countries and all stakeholders, acting in collaborative partnership, will implement this plan".

The set of global sustainable development goals consists of 17 goals and 169 associated targets, mainly related to various fields of sustainable development economic, social and environmental dimensions. Agricultural development and food security received focus in a number of the 17 global sustainable development goals and associated targets, the most important of which are the following:

1. Goal 2: “to end hunger”, achieve food security and improved nutrition and promote sustainable agriculture".
2. Goal 12: “Ensure sustainable consumption and production patterns”.
3. Goal 13: “Take urgent action to address climate change and its impacts.”

[2] Website of the World Food Program

4. Goal 14: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."
5. Goal 15: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". In the year following the launch of global sustainable development goals, the Fourth Industrial Revolution was announced during the forty-sixth session of the World Economic Forum held in Davos-Switzerland in 2016, which raised the slogan "Reaping profits from global innovation", based on which the fourth agricultural revolution (Agric.4.0) was launched. The fourth agricultural revolution invests in various outputs of revolutions in digital economy and artificial intelligence to bring about a qualitative shift in agricultural production systems and productivity levels. Many countries, especially developed countries, have already started using applications associated with the 4th agricultural revolution in various areas, including the use of modern technologies in what is nowadays called: precision agriculture, smart agriculture, electronic agriculture, and other fields where modern inventions and innovations are applied. The term "Fourth Industrial Revolution" appeared at the World Economic Forum in Davos - Switzerland, in 2016, and it foreshadowed a new technological revolution that would fundamentally change the way we live, work and relate to each other, and that the size, scope and complexities of the transformation will be different from what humanity has to witness before.

Annex (1) includes a brief presentation of the goals related to agricultural development and food security within the framework of aforementioned goals.

3.5. Increased Global Attention to the Issue of Food Loss and Waste [(3)]

One of the significant global developments, especially during the last decade, is the increased attention to the issue of food loss and waste, and how to cut the percent food loss and waste and transform it into an additional stock to increase food supply, thus contribute to enhancing global food security, especially that it helps in increasing food supply without the need for additional agricultural resources. FAO reports indicate that roughly one-third of global food produced for human consumption is either lost or wasted from the farm to the fork.

(3) This part is based on the following sources:

1. Micheal Blakeny; ."Food loss and food waste, causes and solution", Edward Elger publishing limited ,2019 .
2. FAO, Global initiative on food loss and waste Reduction, Rome, 2015.
3. FAO, Regional Strategic Framework for Food Loss and Waste Reduction in the Near East and North Africa Region, Cairo 2015.

Given the importance this issue represents, target 12.3 under goal 12 of the global SDGs calls for directing world countries towards responsible consumption and production for "cutting in half per capita global food waste at the retail and consumer level, and reducing food losses along production and supply chains (including post-harvest losses) by 2030.

The Food and Agriculture Organization (FAO), supported by other United Nations organizations, including the World Food Program (WFP), the International Fund for Agricultural Development (IFAD), the United Nations Environment Program (UNEP), and under the direct supervision of "the United Nations Secretariat on Hunger Elimination Challenges", devoted great attention to the issue of food loss and waste, where it launched the global initiative "Zero loss or waste of food". In this context, FAO estimates indicate that it is possible to reduce, or cut in half food loss and waste, which will reduce the need to increase global food production in 2050 from the previously projected 60% to 25% instead.

If the main advantage of reducing food loss and waste is that it contributes to increasing food supply without the need for extra agricultural resources, then the issue becomes more important and appropriate for conditions in the Arab world that is currently facing severe problems related to the scarcity of agricultural resources, especially water.

3.6. Accelerated Pace of Attention for the Impacts of Climate Changes

In May 1992, the United Nations drafted a version of the Framework Convention on Climate Change (UNFCCC)[4] . It was signed by 154 states at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro (June 1992). The agreement focused on the commitment of member countries to reduce greenhouse gas emissions. This commitment was later renewed at the Kyoto Summit (1997).

In fact, climate change has multiple effects and dimensions on both the environmental and economic aspects. It involves a range of risks to agricultural production and food security. The scope of such risks expands to threatening productivity of agricultural crops; increasing and the expansion of drought domain; increasing crops' water rations or requirements; deteriorating soil fertility due to the rise in groundwater level; providing suitable conditions for the growth and spread of weeds, insects and

[4] This part depended on the following sources:
1. United Nation Framework Convention on Climate Change.
2. FAO, the Stat of Food and Agriculture, Climate Change, Agriculture and Food Security, Roma, 2016.

plant diseases; and posing negative impacts on animal and fish production. Climate changes also cause disruption in cropping patterns; the agricultural map; and areas allocated for various crops. Overall, this is reflected in the form of negative impacts on the state of agricultural production and food security.

The beginning of climate change is no longer a possibility; rather, it became a reality. In this regard, the following should be taken into consideration:

- The severity of negative impacts associated with climate change is likely to increase over years, and will extend to dominate all countries and regions after 2030, albeit in varying degrees.
- The categories that are most likely to be exposed to such impacts are those who mainly depend on agriculture for their livelihood and income, especially small producers in developing countries.

A study conducted by the Climate Change Information Center in Egypt showed that, by 2050, productivity of most agricultural crops will decline at rates ranging from 11% to 18% for cereal crops, while will reach 27% for oil crops and 24.5% for sugar cane. Also, the rise in temperatures will increase heat stress on livestock, leading to lower milk production and increased possibility of infections with diseases, in addition to facing shortages in fodder supply due to increased competition between humans and livestock over agricultural land and water resources.

The previously referred to FAO report concludes that "if interventions that make agriculture more sustainable and productively resilient are not taken now, the effects of climate change will lead to serious concessions on food production in countries and regions that already suffer from food insecurity." The Paris Agreement, adopted at the Paris climate conference (COP21) in December 2015, is considered a new beginning for international efforts to stabilize climate conditions before it is too late, where it stresses the importance of protecting food security in the framework of universal response to climate changes, especially in countries that mainly depend on the agricultural sector, by contributing to the adaptation and mitigation of climate change effects on agriculture and food security.

3.7. The Broadening Scope and Acuteness of Security and Political Conflicts

During the last decade, security and political conflicts have broadened and intensified, either within, or between countries. The Arab region has also been subject to a number of such conflicts that later escalated into the so-called Arab Spring of 2011, leading to very bad impacts and repercussions on the state of Agricultural

development and food security at the level of the Arab region. On the one hand, such conflicts led to disruption and the impediment of some agricultural and food production capacities and capabilities; and faltering of the efforts devoted to agricultural development activities and associated projects due to low investment allotments. On the other hand, they led to expansion in the areas and number of people suffering from poverty and food insecurity in the Arab region. The World Food Program's report issued in 2020 indicate that the number of people suffering from food insecurity in the countries of conflict and security imbalances in the Arab world is estimated at 46 million, and that more than half of them are severely food insecure [(5)].

4. From the Emergency Program to the Arab Program for the Sustainability of Food Security

4.1. Importance and Conditions for Transformation

No doubt, preparation of the Emergency Program for Arab food Security was carried in the light of certain international circumstances mainly represented in the dramatic increase in international food prices during the first three months of 2008. Accordingly, the program was launched based on emergency conditions, and situations of periodic and accidental nature. It did not primarily stem from the reality of the chronic problems and challenges that agricultural development and food security conditions have been encountering in the Arab world, or from the reality of the "non-traditional" opportunities available for such development.

In addition, the ten years that have elapsed from the emergency program's life have witnessed global developments that the program did not cover, either in terms of objectives or components. Among the key developments and advancements was the launch of the global sustainable development agenda, subsequent commitments, pillars and directions, including, but not limited to, devoting attention to the issues of: reducing food loss and waste, shifting towards sustainable consumption patterns, and mitigating the impacts of climate changes. Of course, none of these issues, or other issues, was covered by the emergency program.

The issue that remains the most critical is the aggravating water resources crisis in the Arab world, the severity of which is escalating year-over-year. In regards to confronting this crisis, the emergency program focused on modernizing field irrigation systems in irrigated plantations, besides developing water transmission and distribution systems serving such areas. As for the aspect related to maximizing the

[(5)] Website of the World Food Program on the Internet, different reports published during the first half of 2020.

utilization of rains in the field of agriculture, which still entails great opportunities for expansion in rainfed agriculture, especially in some countries, and regions within countries with rainfall rates that allow stable, or semi-stable cultivations, the emergency program did not address despite the fact that expanding the cultivation of additional new areas based on rainwater still entails great potential and opportunities, especially if it is accompanied with developments in the farming patterns, water harvesting systems, besides expansion in supplementary irrigation systems. Hence, available rainfed agricultural area, besides the prospects for large expansions in this type of agriculture, could become an important tributary for increasing agricultural production, especially of basic food commodities, and a fundamental support for improving food security conditions in the Arab world. This is exactly what the components of the sustainable program devoted attention to.

On the other hand, impacts of the global Covid-19 pandemic cannot be overlooked. While this pandemic had no analogues that could have been taken into account in the emergency program, it has become one of the components of the sustainable program in terms of associated repercussions on agriculture and food security, and the ways to confront and mitigate them. In light of such considerations, it was necessary to reconsider, build upon, and develop the emergency program in a manner that embraces the latest developments and advancements that have occurred, besides building upon successes achieved by national initiatives, plans and strategies, which constituted real breakthroughs in the field of agricultural development and food security, including, but not limited to, the Green Morocco Plan in Morocco, the Agricultural and Rural Economic Renewal Program in Algeria, the King Abd-Allah Initiative for Agricultural Investment Abroad, the Sudan Initiative for food security, and other initiatives.

4.2. Lessons Learned

Generally speaking, it can be said that the emergency program has kept pace with data regarding the period during which it was prepared and implemented. There are many evidences indicating positive impacts of the emergency program on agricultural development paths and improving the state of food security, which have been reported in some periodic follow-up reports that were received by the Arab Organization for Agricultural Development from concerned countries. Perhaps one of the most important advantages of such a program is that it provides lessons that can be benefited from in correcting the paths to pursue sustainable agricultural development efforts, which never stop, but vary in terms of formulation, methodology and mechanism, in order to achieve the principle of keeping pace. In this regard, a number of lessons have be drawn, the most important of which are:

1. The necessity to set key performance indicators, either quantitative or qualitative, as they could help isolate, or measure, the program's impact on achieved outcomes that contribute to the development process at the national and Arab levels. This also helps in monitoring the achievement of direct goals in due time, place, goods and services.
2. The need for accurate and consistent identification of the program term based on references that correspond to limited deadlines for national, regional or global development strategies, programs or agendas. This may contribute to achieving common goals, or achieving consistency with the local and joint efforts and designated goals and targets. Perhaps the third phase of the emergency program confirms this principle, as it became useless in light of the changing variables that made it necessary to revisit the viability of continuation of the program for another ten years with the same goals and components.
3. Benefiting from the new directions of national development, and successful Arab and international experiences and models when deciding on development interventions and approaches included in the regional and joint development programs, especially those that have proven success, or have promising future prospects under similar or identical local conditions.
4. Emphasizing the importance of adopting the principle of joint or shared responsibility in achieving the targeted goals and providing the necessary requirements to create an enabling, undisrupted environment for technical, institutional, organizational and financial success. Of course, the responsibility is directly distributed between concerned participant parties, or between relevant parties, each according to the role, advantages and capabilities it possesses, based on the principle of "integration of roles".
5. With special emphasis on the principle of solidarity, financial aspects are the responsibility of the beneficiary countries in the first place, and it is them who decide on the measures to receive finance based on their designated priorities, especially that development financial institutions and funds of various levels and scope of work deal more closely with the beneficiary countries, or their private sector through official channels in such countries. As for the projects and programs of a common nature, it should be within the framework of special protocols or memoranda of understanding. Perhaps the absence of this concept in the emergency program contributed to the shortcomings encountered in management, and/or falling short of fully benefiting from the discretionary

budgets that were set for the program, in addition to weak commitment to apply the decisions that were issued by legislative bodies at their highest levels regarding the contribution of these institutions and funds to providing the required financing for this program.

6. Achieving balance between comprehensiveness and focus requires more scrutiny and differentiation when preparing such programs. This is because there are interventions of a comprehensive nature in which all Arab countries must participate, whether in terms of burdens or benefits, to achieve the goals of joint Arab action. There are also interventions that require comparative or specialized advantages, national or regional. The nature of such interventions may turn into a comprehensive nature if they are directed towards achieving common Arab goals. Such scrutiny gives impetus to collective Arab participation, thus provides the required factors of success for the program under preparation, especially as it deals with issues of a sustainable nature across times and generations.
7. The significance of integration and clarity of the program's elements so that it does not need other framework documents after being approved by the higher legislative bodies. This includes, but is not limited to, the preparatory stages and the requirements thereof at the country level; specific programs, policies and legislation supporting the program; preliminary stages or deadlines for interventions or new activities for beneficiary countries; procedures and actions to be carried out before starting to implement the main components according to the underlying specific targets; in addition to other criteria that should be taken into account as much as possible in this program.
8. The need to adopt an effective and practical Monitoring and Evaluation (M&E) mechanism within the framework of the program, and to be agreed upon, either upon approval of the programs, or at a later stage in the framework of the Joint Arab Action, until it becomes binding. This lesson requires that the program include M&E indicators, and a specific proposal for the mechanism. Upon the start of implementation, some countries may consider editing, or making fundamental amendment that are collectively agreed upon. In this case, the body entrusted with supervising the monitoring process coordinates the regular procedures for receiving the approval of relevant Legislative Councils, the General Assembly and the Executive Council of the Arab Organization for Agricultural Development, as the formal agency in charge of Arab food security.

9. It is necessary that the Arab Organization for Agricultural Development pursue implementation of its annual work plans by focusing on priorities of the Arab region agreed upon by all local, regional and international stakeholders, including, but not limited to, addressing the problem of food loss and waste; controlling transboundary animal diseases that constitute a serious limitation to intra-trade in livestock; implementing adaptation programs and the programs targeting the development and transformation of the prevailing agricultural and food systems in order to accelerate achieving Arab food security and sustainable production systems, especially for small-scale producers and family farming; in addition to implementing human and institutional capacity building programs to support transformation and adaptation of the dominant agricultural and food systems.

Such learned lessons had clear reflections on the philosophy, objectives, components and mechanisms of the current alternative sustainable program.

5. Elements and Components of the Sustainable Program

5.1. Importance and Justifications

During the last decade (2010-2019), a number of important developments took place at the level of the Arab and international arenas, which casted direct and indirect repercussions on the situation of Arab food security. In sum, such developments call for the need that Arab countries be well and deeply aware of their nature, hence revisit and correct the path of agricultural development and food security to align with the new conditions they impose, and the implications and variables they entail.

One of the most important and prominent developments at the level of the Arab world is that the water resource crisis is no longer a potential danger, rather, it has become a lived reality, the severity and negative impacts of which are increasing on daily basis. What aggravates the seriousness of this crisis is that it is of a complex and multidimensional nature. On the one hand, the severity of water scarcity is rising due to the continuous increase in imbalance between limited water resources and the growing increase in population, which led to continuous decline in average per capita share of available water resources.

On the other hand, the problems and disputes over common water resources coming from outside the borders of the Arab World are escalating, posing threats of declines in the amount of available water, as well as the entry of water resources into the circle of political conflicts.

Climate changes add another dimension to the Arab water resources' crisis, as the impacts associated with such changes include anticipated annual decline in precipitation rates in the Arab region where irrigation in three quarters of the agricultural lands depends on rainfall.

Accordingly, water scarcity has become, in the present reality, and to a greater extent in the future, the major determinant facing Arab agriculture and Arab food security, which necessarily requires a new vision to deal with the problem of limited water resources and to maximize the efficiency of their uses in agriculture.

One of the most important incidents on the international scene is the outbreak of Covid-19 pandemic and the very important facts it revealed. One of the most prominent of these facts -with regard to Arab food security as the case in any region of the world- is that it is possible to have sufficient financial resources and capabilities to import food, but it may not be possible to obtain it, not only because of the problems related to interruption or disruption of the international food supply chains, but also because food-surplus countries are turning to halt food exports to other countries in the framework of being more precautious and keen to build buffer stocks to meet the conditions of uncertainty in the light of this pandemic, similar pandemics or problems in international relations.

Consequently, when designing their economic and development plans and strategies, countries have become keener to achieve the highest possible level of self-reliance in securing their food requirements, an attitude that is considered of the key lessons learned from the Covid-19 pandemic.

In the context of all such global developments and advancements, the situation revealed the need for a political will, both at the level of the Arab world in general, and individual Arab countries in particular, strongly capable of promoting the adoption and implementation of the strategies and plans targeting the achievement of agricultural development and improved state of food security, and in the same time is characterized by an appropriate level of ambition to induce a qualitative shift that surpasses the traditional patterns these strategies and plans have been following in recent decades.

From this perspective, and in the context of various developments and advancements, the importance of introducing the current program "The Arab Program for the Sustainability of Food Security" emanates, as it adopts a developed and unprecedented vision that is characterized by realism and not devoid of an unexaggerated amount of ambition.

To confirm and deepen the significance of shifting towards a new and advanced vision of Arab food security that differs from the traditional forms that prevailed during the past decades, we can take a look at what the future of Arab food security might look like in case agricultural development conditions and attentions devoted to food security continue at the same pace and patterns that prevailed during the last three decades.

While acknowledging that efforts have been exerted, the overall performance of such efforts did not result in a significant improvement that can be commended, or significant positive results that can be referred to with regard to the state of Arab food security. Timeseries analysis applied to measure evolutions of main indicators related to food security reveals food gaps that have been widening, and may continue to widen, in addition to food imports quantities that have been increasing, and may continue to increase.

In the late 1990s (1996-1998) the volume of Arab food imports reached some 55.8 million tons. This amount rose to almost 119.8 million tons during recent years (2016-2018), up by 114%. As for the value of imports, it rose from US$ 16.9 billion to a high of US$ 55.5 billion, up by 228%.

During the period between the nineties of the last century and recent years, total Arab gap in various food commodities and groups has magnified from 49.3 to 101.2 million tons, up by 205%.

Based on the aforementioned general indicators, if the state of food security is actually deteriorating, then the worst is what this implication indicate for the outlook of such situation in case Arab agricultural development and attentions devoted to the issue of Arab food security continue at the same pace and under the same prevailing conditions. This necessarily calls for the adoption of new approaches and serious interventions, reinforced by a conscious and real political will that deals with the issue of Arab agricultural development and Arab food security as strategic issues related to Arab national security, otherwise the cost will be huge and the impacts will be dire if things in this regard continue as is.

The following tables and figures depict some of the indicators regarding current evolution and projections regarding the total gaps in food at the level of the Arab world, and the gaps in basic food commodity groups.

Production, Consumption and Gap of Total Food Groups over the Periods (1996-1998), (2006-2008), (2016-2018), and Projections for 2030 and 2050

(Mil Tons)

Total Food Groups			
Period/Year	**Production**	**Consumption**	**Gap**
Average of the Period (1996-1998)	144.91	194.25	49.34
Average of the Period (2006-2008)	184.11	260.86	76.75
Average of the Period (2016-2018)	210.38	311.56	101.18
Projected for 2030	272.02	402.85	130.83
Projected for 2050	404.35	598.82	194.47

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Production, Consumption and Gap of Total Grains over the Periods (1996-1998), (2006-2008), (2016-2018), and Projections for 2030 and 2050

(Mil Tons)

Total Food Groups			
Period/Year	**Production**	**Consumption**	**Gap**
Average of the Period (1996-1998)	45.86	78.30	32.44
Average of the Period (2006-2008)	52.02	105.68	53.66
Average of the Period (2016-2018)	50.66	129.96	79.30
Projected for 2030	65.51	168.04	102.53
Projected for 2050	97.38	249.78	152.41

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Production, Consumption and Gap of Total Sugar over the Periods (1996-1998), (2006-2008), (2016-2018), and Projections for 2030 and 2050

(Mil Tons)

Total Food Groups			
Period/Year	**Production**	**Consumption**	**Gap**
Average of the Period (1996-1998)	2.28	7.02	4.74
Average of the Period (2006-2008)	2.90	10.21	7.31
Average of the Period (2016-2018)	5.87	14.43	8.56
Projected for 2030	7.59	18.65	11.07
Projected for 2050	11.28	27.73	16.45

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Production, Consumption and Gap of Total Meat over the Periods (1996-1998), (2006-2008), (2016-2018), and Projections for 2030 and 2050

(Mil Tons)

Total Food Groups			
Period/Year	**Production**	**Consumption**	**Gap**
Average of the Period (1996-1998)	4.99	5.93	0.94
Average of the Period (2006-2008)	7.20	8.97	1.77
Average of the Period (2016-2018)	9.48	12.66	3.18
Projected for 2030	12.26	16.37	4.11
Projected for 2050	18.23	24.34	6.11

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

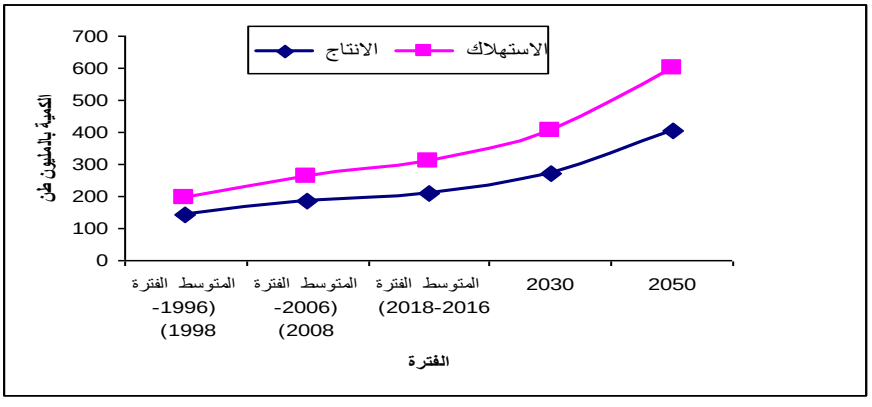
Production, Consumption and Gap of Total Edible Oils over the Periods (1996-1998), (2006-2008), (2016-2018), and Projections for 2030 and 2050

(Mil Tons)

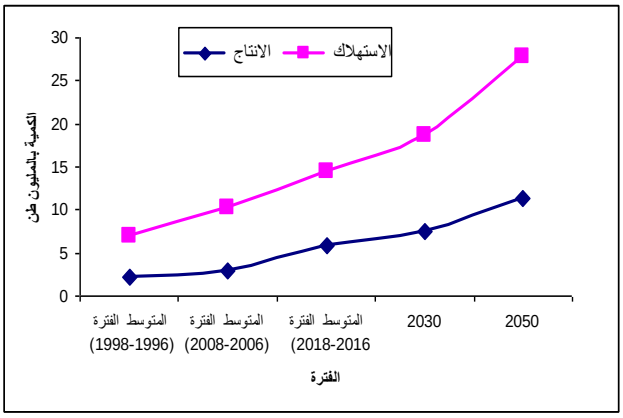
Total Food Groups			
Period/Year	**Production**	**Consumption**	**Gap**
Average of the Period (1996-1998)	1.63	3.59	1.97
Average of the Period (2006-2008)	1.66	5.03	3.37
Average of the Period (2016-2018)	2.62	6.07	3.45
Projected for 2030	3.39	7.85	4.47
Projected for 2050	5.03	11.67	6.64

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

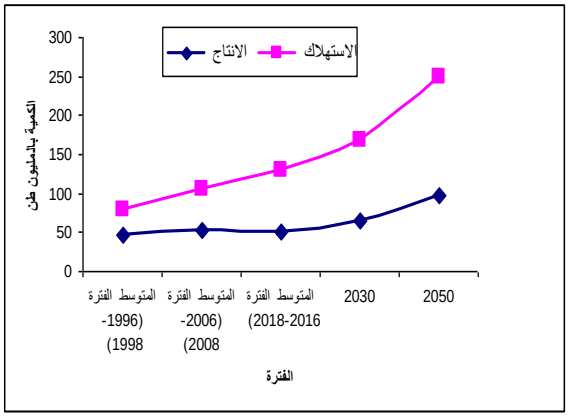
Evolution of Production, Consumption and Gap of Total Food Groups over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



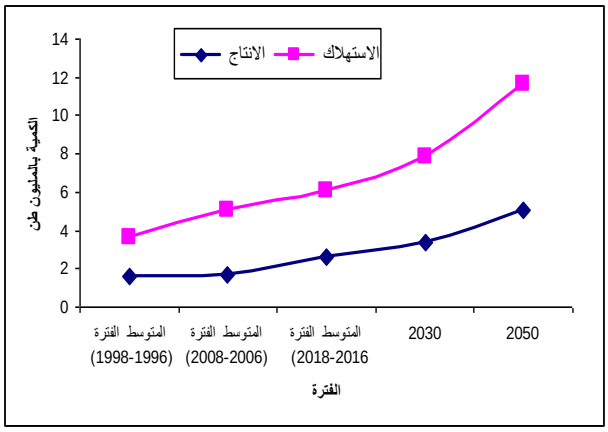
Evolution of Production, Consumption and Gap of Total Sugar over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



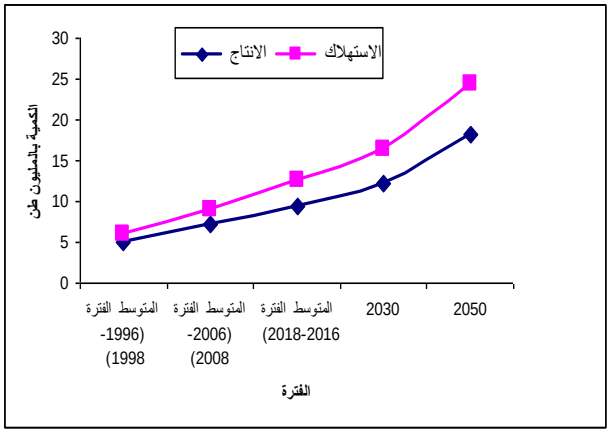
Evolution of Production, Consumption and Gap of Total Grains over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



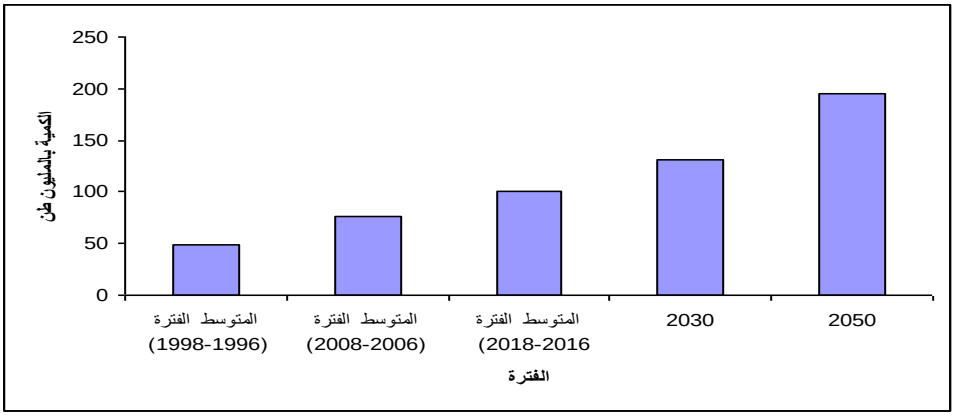
Evolution of Production, Consumption and Gap of Total Edible Oils over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



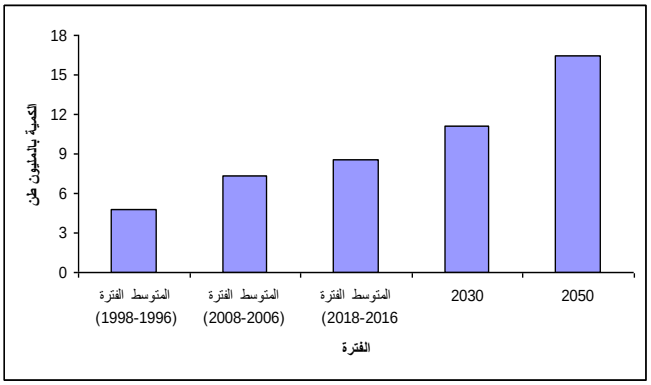
Evolution of Production, Consumption and Gap of Total Meat over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



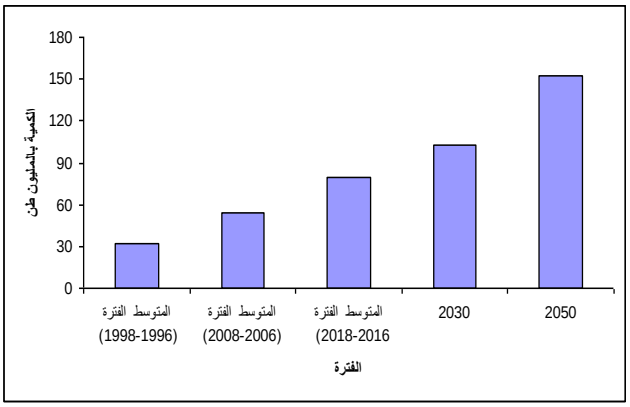
Evolution of the Gap in Total Food Groups over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



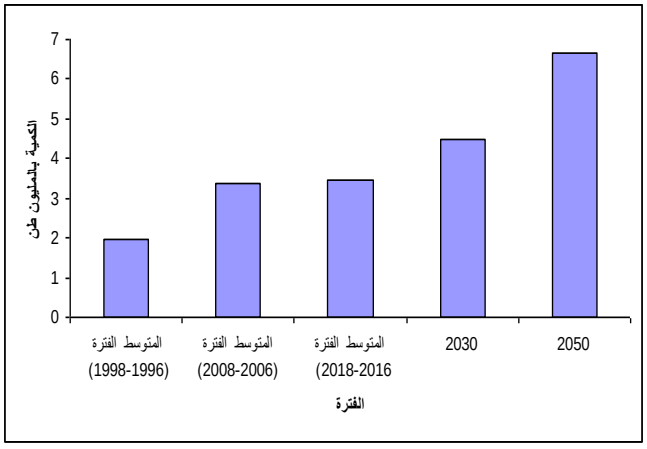
Evolution of the Gap in Total Sugar over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



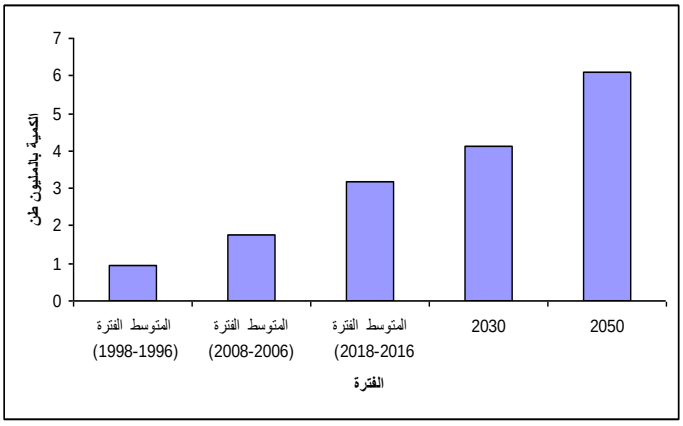
Evolution of the Gap in Total Grains over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



Evolution of the Gap in Total Edible Oils over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



Evolution of the Gap in Total Meat over the Periods (1996-1998), (2006-2008), (2016-2018), in Mil Tons



5.2. Program's Philosophy and Broad Orientations

The program is based on a set of concepts, considerations, visions and approaches, all of which represent the program's philosophy in dealing with the issue of sustainability of Arab food security. Main elements include:

1. Merging the development and investment approaches to improve the targeted objectives.
2. Adopting an unprecedented breakthrough for the development and upgrading of the rainfed agriculture sector to transform it into a modern economic sector that is actively involved in meeting the requirements of sustainable food production and consumption along with the future-developed irrigated sector.
3. Strengthening partnership between the public and private sectors in achieving development goals, overall investment goals and development projects' goals.
4. Achieving a phased and integrative planning, implementation, and defining short and long-term goals.
5. Devoting attention to achieving inclusiveness at the level of the roles and contributions to be made by participant countries, as well as benefiting from countries' comparative and specialized advantages, wherever they exist, when employing resources, distributing burdens and benefits, based on an integrative Arab perspective
6. Implementing joint responsibility between various concerned parties and authorities, including countries at all governmental, public and private levels, and the system of joint Arab Action at all the legislative, technical, developmental and financing levels, either national, Arab or regional.
7. Achieving maximum benefit from the frameworks of bilateral and multilateral Arab agreements and protocols related to the economic, financial, commercial, investment, logistical and institutional aspects, etc**.**
8. Expanding the scope of partnership and deepening the concept of coordination to enhance Arab/international/regional cooperation, in a manner that ensures effective participation of regional and international development, finance and donor agencies, institutions and bodies.
9. Building on the successes achieved by national initiatives and strategies, and pursuing the implementation of AOAD's annual work plans by focusing on priorities of the Arab region, the most important of which are programs related to food loss and waste; transboundary animal diseases; adaptation and transformation of agricultural and food systems; and human and institutional capacity building programs that support the transformation and adaptation process.

5.3. Program Goals

The proposed program aims to achieve a set of direct goals during the specified timeframe, and a set of indirect goals in the long term, as follows:

First: Direct Goals

Direct goals comprise a set of specific objectives for each of the main and subsidiary components of the program, expressed in amounts and/or time-programed quantitative percentages, as follows:

1. Expanding the utilization of untapped arable lands of the rainfed sector, besides developing the sector by expanding the implementation of modern rainfed farming methods to transform it into a productive economic sector that is more stable, profitable and investment-attractive.
2. Expanding irrigated agricultural land area through maximizing water use efficiency in the current areas under irrigated agriculture based on specific areas of untapped arable land resources in the targeted countries.
3. Maximizing return per unit of land and water in both the irrigated and rainfed sectors, and per unit of animal herd.
4. Reducing deficits in major food commodity groups at a phased, programed manner and as per the targeted quantitative percentages.

Second: Indirect Goals

Indirect goals comprise the overall development goals at the level of the Arab sectors and economies, as follows:

1. Pumping more investments in the infrastructure serving the agricultural sector, especially in the rainfed sector.
2. Establishing agricultural settlements to reduce internal migration of labor to non-agricultural sectors in urban areas.
3. Improving the standards of living and general welfare levels for labor in the agricultural sector, especially in rural communities.
4. Creating agricultural and non-agricultural employment opportunities for the youth (both sexes) in rural areas.
5. Developing and improving the performance efficiency of food supply chains, as well as enhancing interconnectedness between their different stages inside and outside Arab countries, either inside or in-between them.

6. Supporting Arab countries' efforts to fulfill their commitments towards achieving Global Sustainable Development Goals (SDGs), particularly with regard to improving the state of Arab food security.

5.4. Program's Timeframe/Term

Based on the program's nature, areas of work, keenness to keep in line with the Global Sustainable Development Goals to some degree, the proposed timeframe for implementing the program components extends over ten years covering the period 2021-2030, divided over two phases, as follows:

- **Phase I (2021-2025)**

During this phase, work will be directed towards preparation to initiate implementation through resources and efforts mobilization, including inventory procedures, surveys, field studies, pre-feasibility & investment studies, and market studies. This phase also focuses on pursuing the adoption of easy and guaranteed interventions that lead to instantaneous results and maximum return to narrowing the current food gap, relying on successes achieved by the Emergency Program for Arab food security and national agricultural development programs and strategies; in addition to continue devoting special consideration to issues of priority in the Arab region in AOAD's annual work plans, such as food loss and waste; transboundary epidemics; adaptation & transformation of agricultural systems; and training and capacity building programs, both human and institutional.

- **Phase II (2026-2030)**

Phase II is the phase during which implementation of various components of the sustainable program will be initiated, the preparations for which have been completed under phase I, while implementation of the other programs referred to under phase I will continue.

It is worth noting that the sustainability nature of this program imposes itself on some of the components in that its objectives can continue beyond the specified program term. This is reflected in the specific quantitative goals of the program components that refer to the phased and gradual implementation over continuous timeframes to reach the final goals of achieving sustainability. In line with the principle of sustainability, the timeframe for implementing the majority of the program components is extended for longer periods exceeding ten years, i.e. 2030. Of course, dividing the program timeframe into two phases enables an interim evaluation to correct the path and achieve the monitoring objectives to improve performance levels in realizing the specific quantitative and qualitative goals and objectives, especially that the program includes specific indicators that serve this purpose.

5.5. Program Components

The program comprises a group of components that synergize together from an integrative holistic perspective to achieve the specific quantitative and qualitative goals and objectives. Three levels can be distinguished based on the nature of work areas and interventions in their activities, as follows:

a. First Level

The first level comprises the program's basic components. Such components are of an agricultural/economic/social developmental nature that directly contribute to increasing Arab agricultural production capacities, whether national, joint or regional, especially in food-deficit commodities, leading to curbing the food gaps and/or increasing, or improving, surpluses in a manner that contributes to the sustainability of food security in the short-run and across generations while conserving natural resources, and increases the value added of agricultural product. This level comprises three main components, as follows:

- **Component 1:** Expanding the utilization of arable land resources in rainfed areas.
- **Component II:** Boosting productivity growth rates in the current agricultural activities.
- **Component III:** Expanding irrigated agriculture through modernizing field irrigation systems.

b. Second Level

The second level comprises components of an investment nature related to mega projects, primarily executed by the private sector, either regional, or within the framework of Arab partnership through benefiting from the Joint Arab action. On the one hand, such projects contribute to securing, or providing, the requirements to achieve the components targeted under the first level. On the other hand, they are based on raising the value added of the program's outputs and outcomes in general. This level comprises only one component, that is:

- The component of investment projects in the fields of agriculture, food, processing & manufacturing, storage and services.

c. Third Level

The third level comprises components of a supportive and enhancing nature to improve the state of sustainable Arab food security, in addition to components of a comprehensive nature, the effectiveness of which increases with the joint or collective contribution of all Arab countries, and supports them fulfill commitments

towards the 2030 global sustainable development goals agenda. There are four components that fall under this level:

- The component of reducing food loss and waste.
- The component of shifting towards sustainable food consumption patterns.
- The component of reducing the risk of pandemics, including those associated with COVID-19 pandemic, on agriculture and food.
- The component of mitigating the risks associated with climate changes on agriculture and food security.

5.5.1. Expanding the Utilization of Rainfed Arable Land Resources:

5.5.1.1. Features of the Current Utilization Pattern of Arab Agricultural Land Resources

The following describes the features of the current utilization of agricultural land resources available for Arab countries over the course of nearly half a century[6(1)]:

- Limited irrigated agriculture that ranges from 10 to 15 million hectares. These areas are distributed, in a semi-stable pattern, between permanent and seasonal crops, as shown in Table (1) in the annex.
- Seasonal rainfed agriculture prevails in areas more than double the irrigated areas. However, it is subject to fluctuations mainly related to rainfall. Assuming that it is classified as a traditional rainfed agriculture that has not undergone modernization or technical developments, fluctuations in rainfed areas during the medium term are often limited in a narrow range.
- Prevalence of the phenomenon of abandoned (uncultivated) areas, even though they are classified as utilized areas. Such category of areas exists in most Arab countries, and constitutes a significant annual percent.
- Total size of arable land areas at the level of the Arab world, including rainfed arable lands, some irrigated areas, and untapped fallow lands, is huge. Whatever the situation regarding the current utilization of such lands, they are considered a virgin national wealth that needs an Arab agenda to maximize the benefits thereof through directing efforts towards raising the utilization percent in favor of

[6](1) First statistics on land use at the level of Arab countries, Arab Agricultural Statistics Yearbook, Arab Organization for Agricultural Development, 1973-1980.

achieving Arab agriculture development thus food security, and to mobilize the resources necessary to achieve this target.

In the light of what proceeded, it is possible to extract a set of indicators on the patterns of land use at the level of the Arab world, revealed by averages of the period 2015-2017, as presented in Table (6). The most important of these indicators are:

1. The vast areas of arable land that has not yet been utilized in agricultural production, amounts to some 161 million hectares(1), or 69.4% of the total arable area in the Arab world, estimated at 232 million hectares as average of the period 2015-2017.
2. Actual utilized areas, whether rainfed or irrigated, represent nearly one-quarter of the total arable land area. This area is estimated at 55 million hectares as average of the period 2015-2017.
3. Irrigated agriculture represents only 6.3%, on average, of the total arable land area, and around 20% of the lands classified as utilized of this total area, estimated at 14 million hectares on average.

Table (6): Current Utilization Patterns of Arable Lands at the Level of the Arab world over the Period 2015-2017

Attributes	2015	2016	2017	Average of the Period 2017-2015
1. Total Cultivated Area under Rainfed Agriculture (Permanent And Seasonal)	44.84	35.38	41.63	40.62
2. Total Cultivated Area under Irrigated Agriculture (Permanent and Seasonal)	14.03	13.88	14.90	14.27
3. Some of Total Actually Utilized Arable Land Areas (1)	58.87	49.26	56.53	54.89
4. Total Utilized Agricultural Land Area	74.17	65.76	72.86	70.93
5. Total Unutilized Agricultural Land Area (2)	156.52	166.45	159.90	160.96
6. Total Arable Land Area	230.69	232.45	232.76	231.89

Source: Calculated using data in Table (1) in the Annex

(1) Rainfed agriculture (permanent and seasonal) occupies nearly three quarters of the actually utilized land areas, estimated at 41 million hectares as average of the mentioned period.

The following Table summarizes the relative importance of current utilization patterns of arable lands in the Arab world, and utilized areas, as averages of the period 2015-2017:

Attributes	Relative Importance (%)
• Percentage of Actually Utilized Land Area/Total Arable Land Area	23.67
• Percentage of Utilized Arable Land Area/Total Arable Land Area	30.59
• Percentage of Unutilized Arable Land Area/Total Arable Land Area	69.41
• Percentage of Land Area under Rainfed Agriculture/Total Utilized Agricultural Land Area	57.26
• Percentage of Land Area under Irrigated Agriculture/Total Utilized Agricultural Land Area	20.12
• Percentage of Land Area/Total Utilized Agricultural Land Area	22.61
• Percentage of Actually Utilized Land Area/Total Utilized Agricultural Land Area	77.39
• Percentage of Rainfed Land Area/Total Actually Utilized Agricultural Land Area	74.00
• Percentage of Irrigated Land Area/Total Actually Utilized Agricultural Land Area	26.00

5.5.1.2. Pillars and Prospects for Horizontal Expansion in Rainfed Agriculture

a. National Concentration of Rainfed Agriculture

As previously mentioned, the limited area under irrigated agriculture in the Arab region is attributed to limited renewable water resources. Rainfed agriculture covers about three quarters of the actually utilized lands. Also, rainfed agricultural patterns in the Arab world is characterized by spatial concentration, where agricultural climate and environmental conditions, as well as experiences aquired, impose such a concentration, resulting in the currently prevailing utilization patterns under which seasonal crops outweigh permanent crops in terms of spread; where total areas under seasonal crops is six times that under permanent crops, as shown in table (1) in the annex. The following table presents the categories of countries classified by degree of concentration in rainfed agricultural areas, either under permanent or seasonal crops, as averages for the period 2015-2017:

Categories of Focus	Permanent Rainfed Crops		Seasonal Rainfed Crops		Total Rainfed Agriculture	
	Country	%	Country	%	Country	%
First Category (Greater than one Mil ha)	Tunisia	40.98	Sudan	54.30	Sudan	47.00
	Syria	15.77	Morocco	16.10	Morocco	15.85
	Morocco	14.23	Algeria	10.50	Algeria	10.45
	Algeria	10.13			Tunisia	9.25
					Syria	7.43
					Somalia	2.49
Total		**81.11**		**80.90**		**92.47**
Second Category (Greater than 500 thousand ha)	Libya	6.40	Syria	6.14	Iraq	2.12
	Yemen	4.18	Tunisia	4.32	Libya	1.57
	Egypt	1.83	Somalia	2.79	Yemen	1.38
	Palestine	1.55	Iraq	2.45		
	Lebanon	1.33				
Total		**15.29**		**15.70**		**5.07**
Third Category (Less than 100 thousand ha)	Mauritania	0.92	Yemen	0.95	Mauritania	0.70
	Jordan	0.68	Libya	0.82	Egypt	0.41
	Somalia	0.59	Mauritania	0.67	Jordan	0.38
	Sudan	0.03	Jordan	0.33	Palestine	0.30
			Saudi Arabia	0.20	Lebanon	0.30
			Egypt	0.19	Saudi Arabia	0.17
			Lebanon	0.14		
			Palestine	0.11		
Total		**2.22**		**3.41**		**2.26**

Source: Calculated using data in Table (1) in the Annex

Contrary to the national level, spatial concentration varies when classified according to type of cultivated crops, permanent or seasonal. As for the permanent crops, Tunisia ranks first (around 2.24 million hectares), followed by Syria (around 862 thousand hectares), Morocco (around 666 thousand hectares), and Algeria (around 553,000 hectares). As for Libya, rainfed cropped areas declined during the last two years to 140,000 hectares. The list also includes Yemen, Egypt, Palestine and Lebanon, as shown in Table (1) in the annex. It should be noted that countries belonging to the first and second categories account for more than 96% of the permanent rainfed agriculture.

As for the areas under crops grown during the rainy season (monsoon crops), Sudan ranked first with a total area estimated at more than 22 million hectares in 2015, and not less than 15 million hectares, as shown in the mentioned table. Morocco ranked second with an average area estimated at 5.7 million hectares; followed by Algeria, with a total area of no less than 3.6 million hectares; Syria, with an average area of 2.2 million hectares; Tunisia, with an average of 1.5 million hectares; then Somalia, with an average of 980,000 hectares. Iraq and Libya witnessed significant declines in the areas under crops grown during the rainy season. As for the rest countries, data in the table above indicate that areas under crops grown during the rainy season are relatively modest.

Of course, such concentration and distribution typology of rainfed agricultural areas is among the main factors determining the countries with comparative advantages in this pattern of agriculture, based on which they have opportunities for horizontal expansion in cultivating food-deficit crops that are most suitable for their conditions.

b. Rainfed Agricultural Crops in the Arab Region

The list of seasonal crops grown during the rainy season in the Arab region includes the group of cereal crops, whether food or feed, such as wheat, barley, maize, sorghum and millet; and the group of oilseeds, including yellow maize, peanuts, sesame and sunflower, in addition to olives. There are recent trends towards growing soybeans under rainfed agriculture, in addition to some legumes/pluses.

A degree of specialization, or a level of comparative advantage, can be observed in the production of some of these crops, which might be attributed to climate and environmental conditions other than rain. Of course, this represents a reflection of countries' experiences in producing crops under rainfed farming systems. Productivity per hectare also reflects the level of technology applied under these systems, indicating that such systems still need to be developed and modernized [(1)] [7].

[7] (1) Refer to productivities in the base period, on which improve in crop productivities in the rainfed sector under the second component of this program are based, which are also the same productivities the first component will rely on when estimating the required expansion areas to achieve the proposed goals.

Investigating the cropping patterns that have been prevailing over decades reveal that Arab countries in the eastern and western regions are generally characterized by producing olives, as well as food and feed grain crops. As for countries in the central region, especially Sudan and the rest of African Arab countries, they enjoy comparative advantages in producing sorghum and millet, mainly used as food grains, the areas of which can be expanded in other Arab countries for feed uses. They are also characterized by producing oilseeds, especially peanuts and sesame.

c. Spatial Concentration of Untapped Arable Land Resources

Studying untapped arable lands distribution reveals that it is highly concentrated, where almost 86% of such areas are located in only four countries, including Sudan, Somalia, Saudi Arabia and Algeria. The following table presents the categories of untapped arable land areas and their distribution over Arab countries, expressed as average of the period 2015-2017, and listed in descending order:

Category	Area Limit/Country	Country	Total Area (Mil ha)	Relative Importance
First Category	Greater than 10 Mil ha	Sudan, Somalia, Saudi Arabia, Algeria	138.564	86.08
Second Category	Greater than one Mil ha	Iraq, Morocco, Mauritania, Egypt, Yemen	20.239	12.57
Third Category	Greater than 100 thousand ha	Jordan, Lebanon, Tunisia, Syria, Libya, Palestine	2.038	1.28
Fourth Category	Less than 100 thousand ha	Sultanate of Oman, Qatar, Comoros, UAE, Kuwait, Bahrain, Djibouti	0.114	0.07
Gross Total			160.955	100.0

Source: Calculated based on data in Table (2) in the Annex

This concentration is almost identical to what features rainfed agriculture, which gives high prospects for maximizing the utilization of such untapped resources at the national level, in line with the program's orientation towards expanding the rainfed sector in countries with comparative advantages in agricultural resources.

d. Measures and Criteria for Expanding the Use of Arable Lands under the Rainfed Sector

Horizontal expansion is one of the main pillars for increasing Arab production capacities of food and agricultural commodities to improve the state of Arab food security, especially in food-deficit commodities. Such untapped arable lands represent a natural resource that can help raise the capabilities of horizontal expansion in the Arab world. Of course, there exist some factors that govern countries' capabilities of fully benefiting from this land as a production resource. These factors are mainly represented in the availability of sufficient irrigation water for crop cultivation, appropriateness of climate conditions for the crops to be produced, the prevalent level of technology, as well as the adopted field management systems.

It has already been pointed out that the main features that qualify this program to be an alternative to the emergency program is that it primarily aims at shifting towards a new perspective of the future agricultural pattern in the Arab region to confront the problem of water stress, the consequences of which are branching and foretell crises with negative and destructive impacts and repercussions on Arab agriculture. This perspective is based on creating a favorable climate, devoting efforts and mobilizing capacities towards creating a modern rainfed agricultural sector that adopts the latest technologies to accommodate these huge areas within the production and services system, either permanent or seasonal; plant, animal or poultry, which will be explained later in the document.

As for the natural and environmental determinants, especially climate conditions, they represent the cornerstone for using arable land resources available in the aforementioned countries. At the forefront of these conditions are precipitation rates, annual rainfall quantities, rainy seasons and rainfall distribution within countries as the main source of irrigation, either direct or supplemental, through technical interventions like the constructions of reservoirs, dams, and modern irrigation methods and equipment. Through these interventions, the benefit can be achieved, whether for the existing developed rainfed sector, or the newly developed sector in the new utilized lands, i.e., lands added from the currently untapped arable land areas.

The elements of this system represent the foundations and criteria for employing land resources available for utilization, in terms of sufficiency and efficiency, and the ability to reconcile and harmonize through future national policies, strategies and agendas to benefit from them.

From what proceeded, it can be said that the system of expanding the utilization of the land resources under consideration stands on the following pillars:

- Sufficiency of the untapped arable land areas available in each country.
- Sufficiency of annual precipitation rates in concerned country.
- Sufficiency of annual average precipitations in concerned country.
- Appropriateness of rainfall distribution over agricultural seasons, and between regions inside the country.
- Sufficiency of rainfall rate in terms of temporal and spatial concentration.
- Appropriateness of the rainfed cropping pattern in countries.

Table (3) in the Annex presents data regarding untapped arable land areas, precipitation rates, annual rainfall quantities and seasons; whereas Table (4) in the Annex presents data regarding the minimum and maximum annual precipitation rates over targeted Arab countries with promising prospects for expansions under this main component of the program.

e. Food-deficit Crops Suitable for Cultivation in Promising Rainfed Expansion Areas

Based on the criteria defined above, countries with capabilities and comparative advantages, i.e., with promising prospects, to achieve the targeted expansion can be divided into the following categories:

First Category: This category includes the countries that have been classified as first-category countries due to satisfying each of the criteria mentioned above, thus are considered the most qualified, or appropriate, for expanding investment in untapped arable lands, as they scored the highest average precipitation rates (above 300 mm/year) and amount of annual rainfall. At the same time, they have vast areas for expansions; they are highest in terms of relative importance of the rainfed agricultural pattern at the level of the Arab region; and they are experienced in cultivating the crops targeted to reduce food deficit.

Second Category: This is the category of countries with average precipitation rates of more than 200 mm/year, and the areas of untapped arable lands are relatively limited. They either have comparative advantages, or a high degree of specialization, in the production of a particular crop, and of course they have quantities of rain water, the benefit of which can be maximized proportional to the annual precipitation rates.

Third Category: This is the category of countries in which average precipitation rates exceed 200 mm/year in specific areas, and possess vast land potentials, or lands considered suitable for promising expansions, besides having distinguished experiences in producing some of the basic food and feed crops.

Based on the categories of countries classified by comparative advantages, promising crops that can be grown under rainfed conditions in each country are distributed as follows:

Categories	Country	Proposed Crops in Range of the Cropping Structure for Expansion
First Category: "More than 300 mm of precipitation; large areas"	Morocco	Wheat, Barley, Maize, Olives, Sunflower
	Algeria	Wheat ,Barley ,Olives ,Peanuts
	Somalia	Sorghum & Millet ,Peanuts ,Sesame , Maize
	Sudan	Sorghum & Millet, Peanuts, Sesame, Sunflower
	Yemen	Sorghum & Millet, Sesame, Wheat, Barley, Maize
Second Category: "More than 200 mm of precipitation; limited areas"	Jordan	Olives, Barley, Wheat
	Tunisia	Olives, Wheat, Barley, Sunflower
	Syria	Barley, Olives, Wheat, Sesame ,Sunflower
	Iraq	Maize, Wheat, Barley, Sunflower
	Mauritania	Sorghum & Millet
Third Category "More than 200 mm of precipitation in very limited areas[8(1)]"	Egypt	Wheat, Barley, Olives
	Saudi Arabia	Barley, Olives
	Libya	Barley, Olives
	Palestine	Olives

[8] (1) Except fof Saudi Arabia where vast areas exist. Egypt too has relatively large areas.

5.5.1.3. Justifications

The program aims to devote a major component for expanding the rainfed sector through utilizing available arable land resources to boost future Arab production capacities of basic food-deficit commodities, which can be justified by the following reasons:

- Aggravation of the water problem dimensions, including low per capita share of water; higher frequency of external threats as a result of increased dependency ratio(1) [9]; increased water stress(2), which is one of the indicators included in the Sustainable Development Agenda (2-4-6); low water use efficiency in field irrigation systems; neglecting to take full advantage of long-term average annual precipitation volume (3) in modernizing the rainfed sector at the level of the Arab world; in addition to other indicators mentioned in Tables (5) and (6) in the Annex.
- Failure of cropped areas, either currently or historically utilized, whether under rainfed or irrigated agriculture, to meet the entire population's needs of main food commodities, which resulted in increased deterioration in the state of food insecurity, as well as increased imports dependency ratio to provide such commodities for the population.
- The currently dominant cropping pattern in Arab agriculture, which reflects consumer demand and preferences, does not allow the adoption of policies to replace, or expand production of food-deficit crops at the expense of seasonal surplus crops.
- Evidence of successful experiences, and availability of international expertise and models in different fields of rainfed agriculture development and expansion, and modernization of technologies applicable in the context of environmental and climate conditions that are similar, or identical to, those prevalent in Arab countries where rainfed agriculture is currently concentrated.
- Productivity rates per hectare reached maximum levels, or levels close to those realized from crops under irrigated agriculture, which might be an indication for exhausting vertical development efforts in the irrigated agricultural sector in the foreseeable future.

(1) [9] Dependency Ratio (2) Water Stress
(3) Long-term average annual precipitation in volume (10^9 m^3/year)

In all cases, reality of agriculture and food security in the Arab world indicates that irrigated agriculture, alone, has become incapable, whether in terms of spatial importance or total production, to reach those productivity levels that address the aggravating deficit in basic food commodities, or even in combination with the production levels achieved from the currently existing rainfed sector that is still primitive even after the developments and modernization applied.

5.5.1.4. Determinants and Expansion Schedule

Perhaps one of the main pillars the program focuses on to achieve the targeted sustainability is self-reliance in producing the largest possible amount of basic food commodities through activating Arab integration and cooperation. Available data and statistics on arable land resources in Arab countries confirm that what Arab countries have been utilizing out of these resources, since starting to devote attention to collect and publish statistics regarding such resources, does not exceed one-quarter. The current program provides an unprecedented vision for dealing with the issue of food security, not only through expanding the utilization of such arable lands, but also through bringing about this expansion in the rainfed sector by exerting efforts to eliminate the existing determinants and providing whatever physical, human or technical requirements needed. This vision has not become an option, despite the challenges and complications that can be deduced from the delay in dealing with this issue for decades, or since the wake of modern agricultural development thought, whether horizontal or vertical.

Given the novelty of this trend, the program allows time for the implementation of this model in developing arable land resources to become productive within the framework of two main principles, both of which comprise a package of policies and procedures of national and Arab nature, these are:

First: Preparation: The launch of this component requires a period of time, during which countries mobilize the necessary resources and efforts to initiate implementation, including inventory procedures, surveys, field studies, pre-feasibility and investment studies, market and supply chains studies for all of the targeted products, as well as other prerequisite areas of work. The program estimates that such preparation may need five years on average, i.e., during the first phase of the program, in order to get the areas proposed by the program prepare.

During this period, an agreement is also made regarding the distribution of burdens and returns among implementing countries, in coordination with each other within the framework of the Joint Arab Action System, especially since the majority of Arab countries where such resources are concentrated may need financial and/or human

support, whether from inside or outside the Arab world, to achieve the desired goals. It is also suggested that most of the program's outputs be injected into inter-Arab trade.

Second: Gradualism or Gradation: The targeted horizontal expansion that is based on applying advanced technological packages suitable for modern rainfed farming imposes the adoption of gradualism in expansion, especially that the areas to be utilized to achieve production booms require scheduled programming in the medium and long-term, given their magnitude and country-specific concentration. And since the timeframe for the Sustainability Program is ten years over two phases, it is proposed to start actual implementation during the second phase, immediately after completion of the preparation operations, starting from year six, at rates commensurate with the capabilities of concerned countries in order to achieve the targeted annual increases.

Accordingly, this stage can be viewed as the beginning of expansions, so that communication takes place, either within the framework of the same sustainable program, or other future frameworks that will gradually carry on with the utilization of arable land resources in light of the results and successes achieved at the level of crops and/or areas where such resources are available, given that the process of possible expansion in suitable rainfed land areas has an extended time horizon.

5.5.1.5. Main Goals

Immediate main goals of the first component include:

a. Increasing the agricultural area actually utilized in the production of seasonal and/or permanent crops, especially those in which the food gap is widening, through expanding the utilization of currently untapped arable land resources in various countries, in accordance with the factors available for land use, leading to the creation of a new rainfed sector that is effectively able to contribute to the sustainability of Arab food security from an integrative perspective.

b. Contributing to the spread of extensive mechanized farming systems that apply the latest methods and technologies of conservation agriculture, which contributes to the preservation of agricultural and environmental resources in both the developed and growing rainfed sector through this component.

c. Creating a long-term Arab agenda for the sustainability of food security, in terms of production and consumption, that promotes achieving self-sufficiency based on a time-programed quantitative growth rates, at a pace that ensures balance between growth rates in population and consumer needs on the one side, and

growth in the rates of both domestic production and substitution of imports from food-deficit commodities on the other side.

Needless to say, in the light of the abovementioned targets, this component will contribute to achieving the specified indirect program goals at various levels.

5.5.1.6. Subsidiary Components and Targets

The second major component comprises two sub-components, one of which is concerned with the group of cereal crops, while the other is concerned with the group of oilseed crops. Targets associated with each component contribute to achieving the direct goals of the main component, hence the program goals. The following are the technical elements concerning each component and intended targets.

First: First Sub-component: Expanding Cereal Cropping

a. Commodity Structure of the Gap in Cereals Group

Cereals group ranks on top of the deficit food commodity groups in the Arab world. Over the period 2015-2017, the value of the gap in this group accounted for 56.6% of the average value of commodity gap at the level of the Arab world, estimated at US$20.3 billion, noting that this gap is formed by a number of food and/or feed crops. The final volume of the commodity gap depends on consumer preferences in Arab countries. In all cases, demand for cereals is increasing, whether for direct use as human food, or indirect use as animal feed, i.e., a demand that is derived from human demand for meat of all kinds.

The following table presents the qualitative structure of the quantitative gap in cereals as average of the period 2015-2017:

(Quantity in 1000 Tons)

Crop	Total Supply	Production	Gap		Self-Sufficiency %
			Quantity	%	
Wheat & Wheat Flour	63119.7	25409.0	37710.7	50.3	40.15
Maize	27852.7	8361.5	19491.2	26.2	30.02
Rice	10711.1	5593.3	5117.8	6.8	52.22
Barley	18233.6	5614.7	12618.9	16.8	30.79
Sorghum & Millet	9047.1	9067.1	(59.9)	00	100.22
Gross Total of the Cereals Group	129288.2	54370.0	74918.2	100	42.05

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

b. Relative Importance of Cereal Crops' Utilization

Arab countries differ in terms of end uses of cereals, whether for food, feed, or other uses. This component is concerned with distinguishing between different uses when expanding cereals cultivations to be consistent with the nature of demand for the produced crops. The following table presents the relative importance of main uses of cereals consumed in some Arab countries(1) as averages of the period 2015-2017:

Crop	Utilized as Human Food	Utilized as Animal Feed
Wheat	74.8	14.0
Maize	30.3	58.6
Barley	13.3	79.6
Sorghum & Millet	64.2	18.5
Cereals Group	85.4	38.4

(1) Calculated based on the total of 15 countries for which commodity balance data are published on FAOSTAT Database on the Internet.

c. Prospects for Reducing the Gap in Cereal Crops

Technical measures for cultivating some of the cereal crops grown under rainfed conditions impose fundamental limitation on expanding rice cultivation. Hence, opportunities to improve the gap in rice through horizontal expansion are limited in Arab countries, and are almost hardly possible in the future in light of the persistent problem of water scarcity in Arab countries that currently cultivate the crop.

As for sorghum, millet and barley, some Arab countries have comparative advantages and experience in cultivating such crops under rainfed conditions in the central region. Other countries have comparative advantages in cultivating wheat and maize. The program takes into account such advantages when proposing expansions of cereal crops cultivated areas under rainfed agriculture.

On the other hand, there exist opportunities for substitution among cereal crops, especially for feed uses. Accordingly, the program will take into account this point to maximize benefiting from the advantages and potentials for expanding the cultivations of such crops in untapped rainfed arable lands to improve livestock productivity in concerned countries.

d. Targets

This first subcomponent aims to achieve seven targets from increasing the area of cereals crops that can be grown under rainfed agriculture, including wheat, barley, maize, sorghum and millet (together), as per the methodology proposed for each single target.

- **Target 1: Reducing the Gap in Wheat Used as Food by 25%**

Estimated average gap in wheat used as food over the period 2015-2017 amounted to 37.71 million tons, and is projected to reach 48.78 million tons by 2030[(1) 10], i.e., by the end of the second phase of the program. Therefore, based on estimates of average productivity per hectare of wheat grown under rainfed conditions in Arab countries, it is proposed to cultivate the crop in an area estimated at 3915 thousand hectares to increase production by 12.2 million tons, which is the volume of increase that contributes to reducing the projected gap size by 25%.

The following table illustrates the proposed gradual expansion of wheat to be used as food[(2)] over the program's term[(3)]:

Year	Projected Gap in Food Utilization[(4)] (Mil Tons)	Targeted Reduction in Gap* %	Volume of Production Needed to Attain the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)
2026	45.067	5	2253	965
2027	45.968	10	4597	1835
2028	46.888	15	7033	2600
2029	47.825	20	9565	3300
2030	48.782	25	12200	3915

* Cumulative Rate

At this stage, Algeria and Morocco come on top of the qualified countries for expansions in wheat cultivation as per the basis and measures set by the program.

- **Target 2: Reducing the Gap in Barley Used as Food by 50%**

Average gap in barley used as food over the period 2015-2017 amounted to 1678.3 thousand tons, and is projected to reach 2171.1 thousand tons by 2030 due to population increase. The program proposes that expansion areas for barely cultivation be in the untapped arable lands of the countries where barley use as human food is concentrated (East African Arab Countries [11(1)], and Iraq, to some extent). Achieving the targeted percent of reduction in this gap by the end of the program requires cultivating around 500 thousand hectares, the expansion of which will be achieved gradually, as illustrated in the following table:

[(1)10] The expected gap has been estimated on annual basis, assuming that demand for wheat and wheat products used as human food grows at the same annual rate of population growth in the Arab world, estimated at 2%, ceteris paribus (i.e., Holding all other factors affecting demand for this basic food commodity, constant).

[(2)] The program does not encourage using domestic supply of wheat as animal feed in the framework of import substitution goals.

[(3)] The program adopts the approach of projecting the volume of production required to reduce the gap at the annual targeted rates in order to determine the areas to be utilized from untapped arable lands based on improved annual productivities per hectare of the crops proposed under the second component of this program.

[(4)] This component does not take into account, either for wheat or other crops, increases in production realized under the second component.

[(1)11] Excluding Mauritania

Year	Projected Gap in Food Utilization (Mil Tons)	Targeted Reduction in Gap* %	Volume of Production Needed to Attain the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)
2026	2005.7	10	200	125
2027	2045.8	20	410	235
2028	2086.8	30	630	335
2029	2128.5	40	850	420
2030	2171.1	50	1085	500

* Cumulative Rate

- **Target 3: Reducing the Gap in Barley Used as Feed by 25%**

Average gap in barley crop used as animal feed amounted to 14.5 million tons over the period under consideration. Assuming that demand for barley uses as animal feed is derived from the demand for food (meat consumption), it is projected that demand for barely as animal feed will follow an annual increasing trend matching the annual rate of increase in population, to reach around 18.4 million tons in 2030. The program aims to cover 25% of this gap at a cumulative rate within five years through gradual expansion of barley cultivated area in untapped arable lands. The following table illustrates the annual proposed areas, expected to reach some 2160 thousand hectares by the end of the program term, from which the produced volume of barley is projected to cover the targeted percent of the gap:

Year	Projected Gap in Feed Utilization (Mil Tons)	Targeted Reduction in Gap* %	Volume of Production Needed to Attain the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)
2026	17346	5	867	535
2027	17692	10	1769	1010
2028	18046	15	2707	1440
2029	18407	20	3681	1780
2030	18775	25	4694	2160

* Cumulative Rate

According to the criteria of expansion, three countries are eligible to achieve this goal; these are Morocco and Algeria from the countries belonging to the first category, followed by Iraq from the countries belonging to the second category, and Saudi Arabia and Egypt from countries belonging to the third category.

- **Target 4: Reducing the Gap in Maize Used as Feed by 50%**

The volume of maize used as animal feed is projected to reach around 17.6 million tons by the end of the program in 2030, assuming that growth in demand for maize as animal feed is the same as the average growth rate in population (2%). Achieving the targeted percent of reduction in the gap of maize used as feed (50%) requires expanding maize production in rainfed arable land area that is projected to reach 3750 thousand hectares by the end of the program's term. Eligible countries for expanding the cultivation of this crop include Algeria, Somalia and Yemen from the countries belonging to the first category, and Iraq from the countries belonging to the second category. The following table presents the proposed gradation for expanding the cultivation of maize to be used as animal feed over the years of the second phase of the program:

Year	Projected Gap in Feed Utilization (Mil Tons)	Targeted Reduction in Gap* %	Volume of Production Needed to Attain the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)
2026	16235	10	1624	925
2027	16560	20	3312	1760
2028	16891	30	5067	2500
2029	17229	40	6892	3160
2030	17574	50	8787	3750

* Cumulative Rate

- **Target 5: Reducing the Gap in Maize Used as Food by 50%**

Average volume of maize used as human food amounted to 5.9 million tons[12(1)] over the period under consideration, and is projected to reach around 7.64 million tons by 2030. The program proposes gradual expansion of maize production for food uses over an area that is projected to reach 1,630,000 hectares by the end of the program term to achieve the targeted percent of reduction in this gap, as illustrated in the following table:

Year	Projected Gap in Feed Utilization (Mil Tons)	Targeted Reduction in Gap* %	Volume of Production Needed to Attain the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)
2026	7058	10	706	400
2027	7199	20	1440	765
2028	7343	30	2203	1090
2029	7490	40	2996	1375
2030	7640	50	3820	1630

* Cumulative Rate

(1) [12] Maize used as food is quantitatively concentrated in Egypt, Morocco, Saudi Arabia, Algeria, and Yemen.

The list of countries eligible for cultivating maize under rainfed conditions includes Morocco, Yemen and Sudan, in addition to Algeria (introducing maize cultivation in the country's agricultural pattern as a major importer of the crop) from countries belonging to the first category, and Iraq from countries belonging to second category.

- **Target 6: Maize Substitution by Sorghum and Millet as Animal Feed to Reduce the Remaining Gap in Feed by 52%**

To maximize the relative advantages some countries enjoy in sorghum and millet production under rainfed conditions, where an average surplus of 60 thousand tons of the two crops has been achieved over the period 2015-2017, the program proposes substituting maize by the two crops to reduce the remaining gap in animal feed by 52%. Adding this percent to the previously referred to target percent sum up a total reduction of 76% in the feed gap. Projecting the area required for expanding sorghum and millet production revealed that it amounts to 4515 thousand hectares. The proposed gradation in expanding sorghum and millet cultivation in rainfed arable areas to achieve the targeted reduction in gap is illustrated in the following table:

Year	Projected Remaining Gap(1) (1000 Tons)	Rate of Substitution by Sorghum & Millet(2) (%)	Gap in Maize Targeted for Substitution by Sorghum & Millet (1000 Tons)	Proposed Annual Expansion in Sorghum & Millet Area(3) (1000 ha)
2026	14612	10	1461	1930
2027	13248	20	2650	3260
2028	11824	30	3547	3550
2029	10337	40	4135	4400
2030	8787	52	4570	4525

(1) This gap is calculated by subtracting the gap proposed to be reduced under target (1.5) from the total projected gap in feed use.

(2) The cumulative rate varies in the last year for technical reasons related to the continuity of expansion and growth in productivity per hectare.

(3) The projected area was estimated based on average yield (productivity) of Sorghum and Millet under rainfed conditions for the period 2015-2017 as a basis (490 kg/ha), and a compound annual growth rate of 7.5%.

In regards to candidate countries, it is proposed to expand sorghum and millet cultivations in rainfed arable areas in Sudan as substitutes for maize in favor of main importing Arab countries that import the crop for animal feed uses, hence export quantities of the two crops in the framework of the Greater Arab Free Trade Zone in accordance with special protocols between member countries.

- **Target 7: Expanding Sorghum and Millet Production as Fodder Crops to Improve the Productivity of 50% of the Herding Animals (Cows) before Slaughter**

The number of annually slaughtered cows in main primitive-grazing (traditional) countries[13(1)], including Sudan, Somalia and Mauritania, reached an average of 4203.6 thousand heads for the period 2014-2018[(2)]. The carcass weight of grazing animal is considered low in these countries due several reasons such as lack of basic services, malnutrition due to the high prices of animal feed, lack of health and veterinary services, lack of potable water, besides other environmental factors associated with the rainfed sector.

In the framework of the program's interest in expanding feed grains production, it is proposed to adopt a specific program that aims to improve meat productivity of grazing animals through good preparation before slaughter, and it is proposed to start with the cow herds. The preparation process involves providing finishing ration for the cattle herd for one complete month before slaughter. To achieve this target, the program proposes expanding sorghum and millet cultivation to be provided as finishing rations, at soft conditions, for small breeders and herders in the mentioned countries. The following table presents expansion areas and projected annual production:

Year	Projected Total No. of Slaughter (3) (1000 heads/year)	Quantity Required of Finishing Ration for Total Slaughter(4) (1000 Tons)	Proposed Annual Rates of Slaughter Animals Covered under the Program %	Quantity Required of Sorghum & Millet to get the Annual Targeted Percent of the Herd Ready (1000 Tons)	Required Annual Expansion in Sorghum & Millet Area (1000 ha)
2026	4925	591.00	10	59.10	78.2
2027	5024	602.88	20	123.15	151.5
2028	5124	614.88	30	184.46	211.1
2029	5227	627.24	40	250.90	267.1
2030	5331	639.72	50	319.86	316.7

[13] (1) This rearing and production system is the most dominant in the three countries.

(2) These slaughters are distributed over the three mentioned countries at rates of 81.5%, 12.9%, and 5.6%, respectively. It is proposed to distribute the targeted expansion area between the three countries at the same rates.

(3) Estimates have been made based on a compound annual growth rate of 2%, equivalent to the average rate of increase in population, which also reflects the increase in demand for meat.

(4) An animal needs 4 kilograms per day for one month before slaughter, in addition to rest. The finishing ration should fulfill certain requirements to achieve the targeted increase in animal's weight (10% of the live weight), the most important of which is adding of salts, minerals and vitamins. It is also important to provide shaded areas or stations as rests, potable water for drinking at the necessary rates, veterinary care to examine animals before preparation for slaughter, in addition to improving the level of veterinary care services for the grazing herd in general.

Second: The Second Subcomponent: Expanding Oilseeds Cultivation

a. Qualitative Structure of the Current gap in Edible Vegetable Oils

The current gap in edible vegetable oils consists of a group of varieties that reflect consumer food preferences, as well as other direct and indirect uses, which differ to some extent among regions of the Arab world. The following table illustrates the relative importance of the gaps in edible vegetable oils based on average quantities of gaps over the period 2015-2017:

Sources of Edible Vegetable Oils	Gap (1000 Tons)	Relative Importance %
Palm Oil	(2071.08)	33.18
Soybeans Oil	(1752.78)	28.08
Sunflower Oil	(1261.89	20.21
Corn Oil	(232.82)	3.73
Coconut Oil	(103.45)	1.66
Sesame Oil	(6.75)	0.11
Olive Oil	159.08	-2.55
Peanuts Oil	3.14	-0.05
Cottonseed Oil	(0.52)	0.01
Flax Oil	(0.50)	0.01
Margarine	(248.37)	3.98
Other	(726.5)	11.64
Total	**6242.34**	**100.00**

b. Determinants of Curbing the Food Gap in Vegetable Oils

The list of vegetable oils that can be produced in the Arab world does not include coconut or palm oils, as the environmental and climate conditions are not favorable for their cultivation. Besides, water scarcity, in addition to scarcity of arable lands in some of the Arab countries that produce oil crops, may prevent expanding the cultivation of such crops under irrigated farming to curb the gap in this basic food commodity, such as maize and soybeans, for example.

c. Pillars for Curbing the Gap in Edible Vegetable Oils

Prospects to curb the gap in edible vegetable oils through expanding the cultivation of oilseed crops are based on the following pillars:

- Expanding the cultivation of those oil crops that some Arab countries have relative experience in growing under rainfed farming conditions, including sunflower, sesame and peanuts.

- Substituting oilseed crops that can only be grown under irrigated agricultural conditions by oilseed crops that proved promising under rainfed farming conditions for edible oil extraction purposes, the most important of which is maize. This involves modifying the consumption pattern of vegetable oils that can be considered perfect substitutes for food consumption purposes (sunflower oil and maize oil).
- Expanding the cultivation of soybean as a promising oilseed crop under rainfed agricultural conditions, especially in countries that are keen to adopt this approach, and have potentials for horizontal expansion in soybean cultivation, which is consistent with the global trend regarding the cultivation of this crop[(1) 14].
- Expanding the cultivation of oilseed crops in which some countries have comparative advantages in production, to realize surplus in the commodity balances of oils extracted from them, like olive, peanut and sesame, especially that such crops can be successfully grown under rainfed conditions in those countries.

d. Desired Targets

The second subcomponent aims to achieve four targets that collectively contribute to improving the multiple gaps that form the total gap in oilseeds group, these are:

- **Target 1: Reducing the Gap in Sunflower Oil by 50%**

Sunflower is one of the most promising oilseed crops under rainfed conditions. The average gap in sunflower oil amounted to 1.262 million tons over the period 2015-2017, and is projected to reach 1.633 million tons by 2030 due to population growth. Based on the extraction coefficient for this type of vegetable oil[(2)], covering 50% of this gap requires gradual expansion of sunflower cultivation in the proposed rainfed regions, over an area that is projected to reach 1780 thousand hectares by the end of the program's term, as illustrated in the following table:

(1)[14] Sub-Saharan countries, including Sudan, are considered candidates for the targeted global expansion in soybean cultivation after the new duties the United States of America imposed on soybean production.
(2) Extraction coefficient of oil from sunflower seeds is 35%.

Year	Projected Gap in Sunflower Oil (1000 Tons)	Equivalent Quantity of Sunflower Seeds (1000 Tons)	Targeted Reduction in Gap[(1)] %	Volume of Production Required to Achieve the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area (1000 ha)[(2)]
2026	1508.2	4309.1	10	430.90	480
2027	1538.3	4395.1	20	879.02	890
2028	1569.1	4483.1	30	1344.93	1130
2029	1600.5	4572.9	40	1829.16	1535
2030	1932.5	4664.3	50	2332.15	1780

(1) Cumulative Rate

(2) Calculated based on the improved productivities per hectare of oil crops applied under the second component

Sudan and Morocco are among the countries most qualified for expanding the cultivation of this important crop, whether in terms of favorable climate conditions or experience and know-how in cultivating the crop in rainfed lands.

- **Target 2: Using the Locally Produced Sunflower Oil as a Substitute for 50% of the Net Imports of Sunflower Oil:**

The gap in sunflower oil accounts for 3.7% of the quantitative gap in vegetable oils, estimated at 232.8 thousand tons as average of the period 2015-2017. Based on population growth rates in Arab countries, this gap is projected to reach some 301.2 thousand tons by 2030. The program aims to substitute maize oil by sunflower oil, as perfect substitutes, on gradual basis until reaching the target 50% by the end of the program term, considering that sunflower is a promising crop under rainfed conditions.

As previously mentioned, Sudan and Morocco are among the most qualified countries for expansions in rainfed cultivation. Syria and Iraq under the second category follow as qualified countries. The following table presents the proposed time gradation program for expanding sunflower cultivation to achieve the desired target:

Year	**Projected Gap in Corn Oil (1000 Tons)**	**Equivalent Quantity of Sunflower Seeds (1000 Tons)**	**Substitution Rate to achieve the Targeted Reduction in Gap(1) (%)**	**Volume of Sunflower Production Required to Achieve the Targeted Reduction in Gap (1000 Tons)**	**Proposed Annual Expansion in Sunflower Area (1000 ha)**
2026	278.42	794.97	10	79.5	90
2027	283.81	810.87	20	162.2	165
2028	289.48	827.09	30	248.1	230
2029	295.27	843.63	40	337.5	285
2030	301.18	860.51	50	430.3	330

(1) Cumulative Rate

- **Target 3: Reducing the Gap in Soybean Oil by 33.3%**

a. Current Situation of Soybean Production

Soybean is not produced as an oil crop in Arab countries except in very limited areas that are mainly concentrated in Egypt, where it is grown under irrigated agriculture, and expansions in cultivation is done on gradual basis. It is also grown in Syria, Iraq and Morocco in areas that seem to be on experimental scale, not a commercial scale.

It has already been pointed out that this crop is considered promising as a multi-purpose crop. As a result, it attracted the attention of breeders and research to expand its cultivation under rainfed conditions in several regions of the world[(1) 15], and in Sudan in the Arab region, which has achieved promising results from cultivating varieties[(2)] that are grown in irrigated and rainfed areas. In total, soybean cultivated area has significantly increased from 3,000 acres in 2013 up to 8,000 acres in 2018.

[15] (1) Although the potentially suitable area for soybean production in sub-Saharan Africa, including Sudan, ranges between 140-270 million hectares, of which only less than 3% is currently utilized and cultivated, there exist looming indications that soybean production is poised to dominate across Africa. Source: "Planet. Cell& Environment", Wiley online Library, "Modeling predicts that soya bean is poised to dominate crop production across Africa, 10/14/2016".
One of the success factors in Africa this study indicated is that climate changes are not likely to have negative impacts on the future of production in Africa, as these changes could allow for a substantial increase in soybean production in this continent.
(2) In 2016, soybean varieties Soy (3) and Soy (4) were approved. Both are recommended for soybean cultivations in rainfed areas, and both are early-maturing varieties that are not genetically modified. Sudan (1) and Sudan (2) varieties, previously approved in 2012, are late-maturing varieties grown under irrigated conditions, with average productivity of (1-1.2 tons/acre). Average productivity in the areas where they were planted reached around 1.3 tons/acre, which is the same as that realized in soybean production countries, i.e., Argentina, Brazil and the USA.

Of course, pre-requisites should be fulfilled to achieve success in the production of this promising crop, on top of which are enhancing the adoption of intensive research system, and development of the current extension systems. It is also imperative to develop the country's policy agenda to promote the adoption of this approach to ensure that genetic improvement and production technologies meet future demand and achieve sustainable production. These priorities are among the essential pre-requisites for achieving the so-called "Soybean Bonanza" in Africa[16(1)]. It should be noted that productivity per hectare of soybean varies between regions within Africa, where average productivity at the level of the continent ranges between 1186 and 1395 kilograms per hectare. As for between regions, average productivity per hectare over the period 2015-2018 ranged between the following rates:

North Africa: 3208-3460 kg/ha (influenced by the high irrigated rates in Egypt).

East Africa: 1232-1254 kg/ha.

West Africa[(2)]: 1016-1040 kg/ha.

South Africa: 1476-2293 kg/ha.

b. Soybeans Utilization

Soybean is utilized as a food and forage legume crop. It is largely utilized in Asian countries, (especially China and Japan), where it constitutes a basic ingredient in various products like bakeries and chocolate, in addition to extraction of vegetable oils.

It is also utilized as feed for poultry and livestock fattening. Residuals remaining once oil is extracted are used to produce soybean meal, which is utilized as animal feed. Soybean is also considered a source of fuel that some countries resorts to, where a number of companies use the crop as a substitute for petrochemicals, and also use it in some products like cosmetics.

The following commodity balances of soybean seeds and soybean oil in Arab countries[17(3)] illustrate the relative importance of supply utilizations for both commodities, as averages of the period 2015-2017:

(1)[16] "Africa's Cinderella Crop/Successful "Soya beans Bonanza", same reference mentioned above.

(2) Nigeria, a West African country, is the largest soybean producer in sub-Saharan Africa (750,000 hectares), where average rainfall is 700 mm. Average productivity realized over the period 2006-2008 amounted to 0.95 tons/ha, which is 105.8% higher than that realized over the period 1994-1996, i.e., around 0.46 tons/ha, indicating an annual growth rate of 6.2%. More recently, average productivity realized over the period 2015-2018 amounted to 0.967 tons/ha. In West Africa, annual growth rate amounted to 5.9%, while amounted to 0.3% in the rest of Sub-Saharan countries.

[17](3) Countries for which detailed commodity balances are available in the FAOSTAT database amount to 15 countries.

Attributes (1000 Tons)	Soybean Seeds	Soybean Oil
Production	47.67	527
Imports	2876	1864
Exports	2	217
Change in Stock	11	87.67
Total Domestic Supply	2885	2104
Total Utilization:		
Food	43.33	1125.33
Feed	112.33	-
Non-food	139.7	867.67
Industrial	3008.3	104.0
Residuals	-425.33	-
Seeds	0.67	-
Waste	2.33	-

Source: Calculated based on data collected from FAOSTAT database on the internet.

As clear from the table, soybean oil used as food in Arab countries represents around 53.3%, while non-food uses represent 41.4%, quite a significant percent. Such fact affirms the importance of adopting the program's proposal to expand the cultivation of this promising multi-purpose crop under rainfed conditions.

c. Expansion Areas and Projected Production to Achieve the Target Percent

The studied qualitative structure indicates that the gap in soybean oil amounted to 1.75 million tons as average of the period 2015-2017, accounting for 28% of the total gap in edible vegetable oils in the Arab world over the same period. This gap is expected to widen with the growing increase in population until reaching 2.3 million tons by 2030. The following table illustrates the proposed gradation to expand the cultivation of this crop during the second phase of the program:

Year	Projected Gap in Soybean Oil (1000 Tons)	Equivalent Quantity of Soybean Seeds[(1)] (1000 Tons)	Targeted Reduction in Gap (%)	Volume of Production Required to Achieve the Targeted Reduction in Gap (1000 Tons)	Proposed Annual Expansion in Area[(2)] (1000 ha)
2026	2094.73	10473.7	5.0	523.7	370
2027	2136.62	10683.1	10.0	1068.3	715
2028	2179.35	10896.8	17.0	1852.5	1175
2029	2222.94	11114.7	25.0	2778.7	1680
2030	2267.40	1137.0	33.3	3778.6	2175

(1) Calculated based on extraction rate of 20%.

(2) Calculated based on average productivity realized during the base period, estimated at 967 kg/ha, and an annual compound growth rate of 15%, guided by the previously referred to case of Nigeria, as well as assuming a modest growth considering that the program is still at the beginning of expansions, expected to continue in case the desired results are achieved .

It is proposed to concentrate the targeted expansion in Sudan, as it is considered the most qualified for rainfed agriculture, in addition to the fact that prevalent environmental conditions are similar to the case compared to (crop cultivation in Nigeria). In addition, the Government is devoting great attention to expanding the cultivation of this crop, either under rainfed or irrigated agriculture. Somalia can also be considered of the countries eligible to expand the cultivation of this crop (introducing its cultivation).

- **Target 4: Raising Olive Oil Exports Capacity by 200%**

a. Olives Planted Area and Trade in Olive Oil

Olives planted area at the level of the Arab world witnessed remarkable expansions over the last two decades due to the rising trend in olive oil production to meet the growing demand for consumption, both at the Arab or international levels. Olives planted area in Arab countries accounts for 43% of the world's olive planted area, estimated at 10.34 million hectares.

It is worth noting that olives planted area followed a steadily increasing trend, estimated at 140% on average, between the two periods 2015-2017 and 2000-2004, as shown in the following table:

Year	Olive Planted Area (1000 ha)	Trade in Olive Oil (1000 Tons)		
		Exports	Imports	Surplus
2004-2000	3187.54	121.58	20.32	101.26
2009-2005	3699.46	190.63	23.65	166.98
2014-2010	4070.27	170.26	43.07	137.19
2017-2015	4377.78	230.97	71.89	159.08

Source: Calculated based on data collected from the "Arab Agricultural Statistics Yearbook" published by the Arab Organization for Agricultural Development, different issues.

Olives are grown under rainfed conditions in main production countries that possess a well-established manufacturing bases and long-standing marketing and export experiences, on top of which are North African countries, Syria, Palestine and Lebanon. Egypt and Saudi Arabia have also been expanding olive production.

b. Olives Utilizations

Reviewing the commodity balance of olive crop in Arab countries indicates that around two-third of the total supply is directed to oil production (67.1%), while 26% is used as human food, and waste is estimated at 10.4%, as averages of the period 2015-2017, based on data published on the website of the Food and Agriculture Organization of the United Nations[18(1)].

(1)[18] FAOSTAT database

c. Expansion Areas and Projected Production of Olive Oil

It is proposed to expand olive cultivation in the main rainfed olive production countries, especially Morocco and Algeria under the first category; Tunisia and Jordan under the second category; and Libya and Palestine under the third category. According to the technical requirements for olive cultivation, where olive trees start to bear fruits starting from the third year of tree's life, then productivity develops gradually and successively until reaching maximum levels (full fruit production) in the eighth year, after which it becomes stable. To achieve the desired target, it is proposed to start cultivating the required area in 2023 so that olive trees reach maximum production level and stability by the end of the program's term in 2030. The estimated expansion area is 1020 thousand hectares. This area will help double the volume of oil surpluses that amounted to 159 thousand tons as average of the period 2015-2017. The following table presents the proposed gradation in production, either for olives or for oil extraction, based on the technical rates of use, processing and extraction.

Year	Proposed Expansion Area (1000 ha)	Projected Olive Production[1] (1000 Tons)	Manufactured Quantities of Olive Oil[2] (1000 Tons)	Projected Production of Olive Oil[3] (1000 Tons)
2023	1020	-		
2024	1020	-		
2025	1020	59.53	39.84	8
End of Phase I	**1020**	**59.53**	**39.84**	**8**
2026	1020	218.21	164.20	29
2027	1020	480.25	321.76	64
2028	1020	1056.33	707.74	142
2029	1020	1743.07	1167.86	234
2030	1020	2397.00	1605.99	321

1. Yield/ha used to project production is the developed productivity applied under the second component.
2. Utilization for manufacturing in North African countries is estimated at 67%.
3. Oil extraction rate is estimated at 20%.

5.5.1.7. Main Areas of Work

Based on the nature of the program's first major component, areas of work differ between the two phases. The first is the preliminary phase, while the second is the production phase, where actual expansion and utilization of arable lands in rainfed areas is implemented. Work during the first phase focuses on fulfilling the pre-requisites for starting the cultivation process, while horizontal and vertical development activities and interventions will be initiated during the second. The referred to areas of work include, but are not limited to:

1. Conducting an accurate and documented inventory to define untapped arable lands in each country before commencing work in the program, based on which topographic maps are to be constructed for each country. Criteria to judge the suitability of untapped arable lands to agricultural purposes in each country will be identified by national experts.
2. Constructing climate maps based on various primary data pertaining to agriculture in each country and merging them with the topographic maps, besides defining timeseries data on climate elements based on historical data recorded by official meteorological and climate agencies in each country, especially precipitation rates, rainfall amounts, temperature, relative humidity, etc.
3. Creating maps of the public and agricultural infrastructure, services and facilities available for use in the areas where unused arable lands will be utilized for cultivating seasonal or permanent crops (if any), or in the nearest surrounding areas, as well as referring to the official national authorities in each country to explore the possibility of benefiting from them.
4. Based on the information to be collected under the three previous areas of work, an evaluation agenda defining the spatial and temporal expansion of each crop in the countries with comparative advantages, listed under the country categories specified by the program, is to be prepared, along with proposals regarding the appropriate coordination mechanisms and agreement between member countries on the evaluation agenda. The body entrusted with the coordination process shall take the necessary measures and procedures to give the executive work program an official status through obtaining approvals of the legislative bodies within the framework of the Joint Arab Action System.
5. Designing national preparation programs for the cultivation of arable lands appropriate for investment, including, but not limited to, the following:
   - Survey and enumeration of the existing tenure systems (if any).
   - Land Classification Surveys.
   - Soil Amioleration Programs.
   - Monitoring climate changes during the years of preparation and establishing early warning systems.
   - Civil works or constructions necessary to expand the use of water harvesting technologies, such as rainwater reservoirs and dams, etc.
   - Tenure systems, legislation and laws necessary for new land uses, or legalization of the existing ones.

- Securing the required the energy sources, with special focus on renewable sources when expanding.
- Securing the sources of improved seeds for rainfed agriculture.
- Designing and the preparation of modern (advanced) supplemental irrigation methods.

6. In light of the expected increases in quantities produced of the cereal crops group, either for human food or animal feed uses, as well as in the quantities of oilseed crops required to produce edible vegetable oils, the main areas of work proposed to start with during the first preliminary phase, and will continue over the years of the second phase concerned with gradual expansion, include, but are not limited to, the following:
   - Increasing the storage capacities of grains of all kinds, and defining the locations of expansion proportionate to expansion areas in the concerned countries.
   - Increasing the milling capacities of food grains, as well as defining the locations of expansion to accommodate the new production.
   - Increasing the capacities of the processing industries that are based on domestic extraction of edible vegetable oils, in compliance with the geographical distribution of the proposed areas for expanding the cultivation of oilseed crops.
   - Increasing the capacities of feed processing industries that are based on the main products and byproducts, either grains or oilseeds.
   - Increasing the number of service stations for farmers in expansion areas, and resorting to the private sector to establish companies for renting agricultural machinery, especially heavy machinery.
   - Developing and increasing the capacity of producing high quality and tolerant seed varieties on commercial scale to meet the expected increase in usage.
7. The proposed expansion of arable lands in the rainfed sector is not only based on horizontal expansion, but rather is done simultaneously with the vertical improvement in productivity, which requires focusing on the following developmental work areas throughout the program's term:
   - Designing the technology farming packages recommended for adoption under rainfed conditions in the areas identified for expansion in the light of the results of surveys and field studies, including varieties, fertilization, protection and pest control, supplemental irrigation standards and schedules, and other

agricultural practices based on successful local, Arab and international experiences in rainfed agriculture.

- Implementing appropriate extension systems. This includes providing experienced extension teams, pilot plots, and proper means of communication adopted in the field of agricultural extension.
- Supporting qualitative research programs targeting the development of rainfed agriculture, a work area that will be of continuous nature, and will be performed in mutual coordination between extension systems and farmers' organizations.
- Determining the appropriate level of mechanization based on the dominant farm sizes/scales, and the modern farming systems expected to be expanded in under the conditions of rainfed agriculture.
- Upgrading the levels of training and qualification programs for farmers, especially small-scale farmers' category, in addition to upgrading field schools to promote farmers' adoption of the recommended technologies.

8. Based on dominant farm sizes in expansion areas in the eligible countries that enjoy comparative advantages, especially those with previous experience in rainfed farming, small-scale farmers' category is considered the cornerstone for disseminating and expanding the scope of applying modern agricultural technology packages. Therefore, it is essential to promote small farmers' adoption of development trends, which requires devoting efforts towards creating the following system:
   - Increasing small farmers accessibility to production inputs used in modern rainfed agriculture, and to fixed assets.
   - Providing sources of micro-finance for farmers in both the modernized and old areas under the rainfed sector; adopting supportive financing policies to grant facilities and benefits to develop the rainfed sector and the farmers; and resolving the issue of collaterals for this category.
   - Introducing risk insurance systems through formulating insurance or solidarity policies to protect small farmers against the negative impacts of instability in farm incomes associated with the occurrence of undesirable conditions.
   - Supporting and encouraging the establishment of farmer organizations in the rainfed sector to protect their interests, whether during the production stage, or the marketing stage.

- Developing the markets and marketing systems in the framework of value chain development.

9. Developing and modernizing the breeding and nutrition systems in the pastoral farming sector, based on a number of pillars and fields, the most important of which are:
   - Adequacy and efficiency of animal health.
   - Improving veterinary care services to reach an appropriate level of efficiency, including mobile units to serve nomadic pastoralists.
   - Providing medicines and vaccines, and facilitating small breeders' accessibility to them.
   - Improving the productivity of the grazing animal based on improved nutrition and health care.
   - Establishing sufficient numbers of shades and spreading them out over gathering areas to serve shepherds and provide rest for the herds before slaughter.
   - Improving shepherds, small breeders and producers' access to feed of all kinds, in terms of quantity, price and timing.
   - Providing sufficient quantities of potable water, in appropriate areas for nomadic shepherds, so that it is located near to, or in the vicinity of gathering areas.
   - Improving the standards of living and income levels for small breeders, especially shepherds.
10. Establishing the required infrastructure, services and public utilities, whether for the purposes of settlement and establishing rural agricultural communities for the labor expected to be employed in the targeted expansion areas; or for the activities and industries to be based on the production expected from these areas, etc. Given the huge size of the workforce expected to be gradually employed, it is necessary to design urban plans in conformity with the expansion agenda previously referred to for each country.

5.5.1.8. Key Monitoring and Evaluation Indicators:

- Total annual expansion areas in rainfed regions.
- Seasonal cropping patterns in areas cultivated relative to the total area of annual expansion in rainfed lands.

- Harvested areas of lands cultivated with the seasonal crops targeted under the first component.
- Annually added production quantities of the seasonal crops targeted under the first component.
- Annual rate of improvement in crop productivity per hectare.
- Number of dams and water reservoirs annually established to harvest rainwater.
- Amounts of annual rainfall collected from precipitation in expansion areas.
- Volume of annual governmental and private investments allocated for cultivating arable land areas in rainfed regions.
- Number of slaughtered heads from the grazing herd of cows after gaining (increasing) weight due to improving the finishing ration.
- Additional quantities of beef resulting from improving the productivity of grazing animals.
- Number and quality of services provided to shepherds.
- Number of annually added manpower/labor force in rainfed expansion areas, classified by occupation.
- Additional storage capacities and grain mills, classified by type.
- Additional feed processing capacities of all kinds.
- Additional capacities of extracting vegetable oils of all kinds.
- Percentage decline in the gaps of commodities targeted under the first component.
- Percentage increase in the surplus of commodities targeted under the first component.
- Annual import substitution rate of the food and feed commodities targeted under the first component.
- The number and titles of mega joint agricultural and industrial production and services projects, and the fields thereof.
- Percentages increase in the volume of intra-Arab trade in food commodities produced from rainfed horizontal expansion areas.
- Volume of annual governmental and private investments allocated for irrigated agriculture regions.

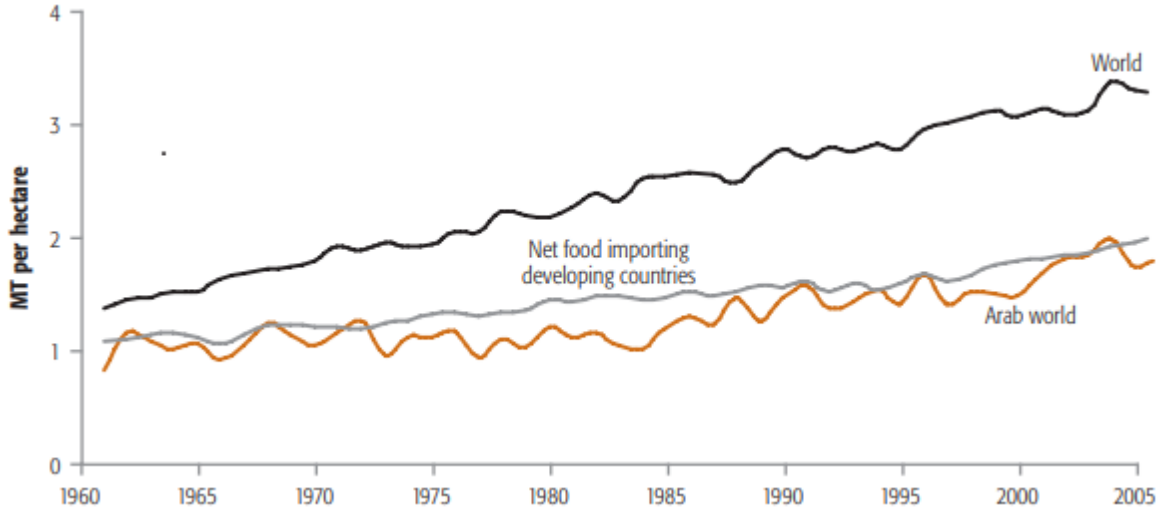
5.5.2. Boosting Productivity Growth Rates of Current Agricultural Activities

5.5.2.1. Importance and Justification

Extrapolating recent history of agriculture at the world level indicates that agricultural productivity of various crops has not stopped growing, reinforced by the achievements of scientific research and technical developments. Despite what Arab countries have in turn achieved from this extent of growth, productivities of most crops at the general level of the Arab world are still low, to one degree or another, compared to those achieved at the world level, while are considered very low when compared to developed countries and some of the developing countries.

The following figure exemplifies this situation, as it clarifies the extent to which average cereal productivities in Arab countries have been lagging behind world average, and the widening gap between the two productivity levels over time.

Arab Countries' Cereal Productivities Lags behind World Average



Source: "Improving Food Security in Arab Countries" Report, published by the World Bank, FAO and IFAD, January 2009

The following table also presents some examples on the low productivities of basic crops under major food-deficit groups at the level of the Arab world compared to those realized at the world level, as averages of the years 2016, 2017, 2018.

(Yield in kg/ha)

Attributes	Wheat	Barley	Maize	Sorghum	Rice	Sunflower	Peanuts	Sesame	Olives	Sugar beet	Sugarcane
Arab World	2639	931	5693	435	8210	781	1230	261	1049	51528	96119
World	3461	3025	5861	1392	4642	1854	1643	527	1999	60178	71310
Gap	822	2094	168	957	(3568)	1073	413	266	950	8650	(24809)
% of the Gap	23.8	69.2	2.9	68.8	(43.5)	57.9	25.1	50.5	47.5	14.4	(25.8)

Numbers between parentheses indicate a positive gap (increase).
Source: World Crop Yields, FAOSTAT
Arab World Crop Yields, AOAD, Arab Agricultural Statistics Yearbook

As can be inferred from the table, noticeable decline exist in the productivities of various crops grown in the Arab world, except for rice and sugarcane crops, where productivity levels recorded higher levels compared to world levels. This is mainly due to the fact that cultivations of the two crops in the Arab world are concentrated in irrigated agricultural areas, while are cultivated in irrigated and rainfed areas in other regions at the world level. However, the most important observation is the significant decline in the productivities of major cereals and oilseed crops, despite the fact that the percentage of rainfed cultivations of these crops in the Arab world is not much different than that of the world.

It follows from the foregoing that an urgent need backed up by strong justifications exist for seeking to raise the productivity levels of various crops in the Arab world, either in the irrigated or rainfed agricultural sectors. However, interest in rainfed agriculture in particular can be justified by the fact that, in spite of entailing wide opportunities for improving crop productivities, this sector has not received adequate attention yet, or development, despite the promising development prospects.

5.5.2.2. Goals

In light of the abovementioned justifications, the main goal this component aims to attain is to raise productivity levels of main food-deficit crops, namely cereals, oilseeds and sugar crops, currently grown under rainfed and irrigated farming, alike.

Quantitatively, the goal of this component is to raise annual growth rate of irrigated crops' productivity up to 2.5% until 2030. As for rainfed crops, the aim is to raise annual growth rates of crop productivity up to 7.5% for cereal crops and 10% for oil crops. The following factors were taken into account while setting these target percentages:

a. For those crops that are often grown under irrigated farming, the gap between Arab world and world level productivity does not appear to be large, and in some cases productivity in the Arab world surpasses that of the world level, like the cases of rice and sugarcane. However, prospects still exist for increasing productivity in irrigated agriculture in light of the outcomes achieved from research experiments conducted in extension fields and pilot plots in different countries of the Arab world, and also in light of the higher productivity some Arab countries realize compared to other countries, as well as in certain regions within each country compared with other regions or farms.

   Hence, the program targets boosting productivity in irrigated agriculture at an annual rate that combines realism and ambition, i.e., 2.5% until 2030.

b. As for the crops grown under rainfed farming, comparison with the world level revealed a wide gap in the productivity levels of these crops in the Arab world in general. This is due to the fact that rainfed crops in the Arab world are mostly considered poor, or marginal, crops that have not received adequate or appropriate attention in agricultural development plans, programs or projects for many years. It is therefore clear that great opportunities exist for developing and boosting productivity levels of these crops, which will effectively contribute to improving the conditions of Arab food security.

   Hence, the program targets improving productivity in irrigated agriculture at an annual rate of 7.5% for cereal crops and 10% for oil crops, as the latter is one of the lowest groups in terms of self-sufficiency, thus requires a strong push to achieve the required improvement. In this regard, it is worth noting that the relatively high rates of increase in crop productivities under rainfed agriculture this component targets are not far from reality, where some of the Arab countries have already realized, in some years, for most crops, high productivity levels close to those targeted in the coming years.

   In all cases, the target rates of growth in productivities of various irrigated and rainfed crops are no more than averages at the Arab world level, which some countries or regions can exceed, while may not be fully achieved in some other countries or regions.

5.5.2.3. Pillars of Work

In fact, researchers, specialists and experts in each crop, or crop group, in various Arab countries, have the know-how and sufficient knowledge regarding the means and methods that need to be mobilized to achieve the targets of this component, i.e., to improve the productivity rates of food-deficit crops. In this context, it might be impossible to fully present the means and methods as pillars of work to achieve the desired goals, especially that some of them are general and common for different

crops, while some are of special nature pertaining to each crop, or crop group. However, the most important pillars of work under this component are as follows:

- Promoting and enhancing the financial, technical and human capabilities of relevant research institutions, with a special focus on research programs and projects targeting the development of crop productivities under rainfed agriculture, developing high-yielding varieties, and upgrading agricultural operations and practices adopted in both irrigated and rainfed agriculture.
- Supporting and developing agricultural extension agencies' capabilities in the field of modern agricultural technology transfer, as well as promoting and disseminating the use of information and communication technology and associated applications in these areas.
- Promoting networking and linking between agencies working in the field of agricultural research and development in various Arab countries to enhance coordination and joint work, reduce duplication, exchange information, experiences and research results.
- Taking the necessary measures and procedures to provide farmers with the appropriate quantities and qualities of production inputs and requirements, especially improved seeds and fertilizers, along with designing suitable credit lines to enable farmers obtain their needs of inputs and requirements as per the recommended rates.
- Establishing marketing systems and supply chains that facilitate achieving the target of development and performance efficiency in various marketing operations and services, and ensure fair prices thus revenues for farmers. Needless to say, encouraging and supporting various forms of joint work among farmers at the level of village, or region, contributes to achieving the desired target.
- Stimulating and encouraging transformation towards modern field irrigation systems in irrigated areas, as well as supplemental irrigation systems and water harvesting in rainfed areas, which can play an important role in improving productivity levels.

5.5.2.4. Basis of Projecting Outcomes of the Component

- Despite the importance of raising productivity levels of various agricultural crops, as a general development goal, the commodity range underlined in this component focuses on crop groups that constitute the major part of the Arab's gap in food, namely grain crops, oilseeds and sugar crops.
- According to the latest available data while preparing this program, averages of the years 2016, 2017, 2018 are regarded as reflections of the dominant conditions in irrigated and rainfed areas during the base period, including areas, productivity levels and production volumes of the target crops. Such averages and the target

growth rates (2.5% for irrigated crops, 7.5% for cereal crops in rainfed areas, and 10% for oil crops in rainfed area) were used as the basis of projecting the expected productivity levels until 2030.

- The projected outputs under this component were estimated on the basis that the areas targeted for development and productivity improvement are gradually increased to cover 50% of the area in the base period, ahead until 2025, and then expanded to cover the entire area starting from 2026 until 2030.
- The geographic scope of this component expands to include all countries that grow one or more of the target crops, whether under irrigated or rainfed agriculture.
- Rainfed and irrigated areas, as well as the productivity levels for crops grown under both farming methods in the base period have been estimated using detailed data available to the Arab Organization for Agricultural Development through country reports, which were prepared for the same purpose during the time when the emergency program for the period 2004-2006 was under preparation. The estimated figures were used as indicatives for estimating seasonal irrigated and rainfed expansion areas for different crops for the period (2016-2018).

5.5.2.5. Projected Outcomes

The following table presents the projected quantitative outcomes for the component targeting boosting productivity levels by 2025 and 2030, based on the aforementioned considerations. Such outcomes are expected to increase the volumes of production by 2030 as follows: from 49.1 million tons during the base period (2016-2018) to 77.2 million tons for grains, up by 57%; from 8.1 to 17.0 million tons for oilseeds, up by 110%; and from 37.8 to 48.3 million tons for sugar crops, up by 28%.

Projected Outcomes for Cereals, Oilseeds and Sugar Crops by 2025, 2030

(Area in 1000 ha; Yield in kg/ha; Production in 1000 Tons)

Crop and Farming Method	Base Period (2018 -2016)			2025			2030		
	Area	Yield	Production	Developed Area	Yield	Production (1)	Developed Area	Yield	Production
Wheat, Irrigated	2991	5024	15027	1496	5683	16019	2991	6431	19238
Wheat, Rainfed	6355	1512	9609	3178	2171	11704	6355	3116	19802
Barley, Irrigated	35	1669	58	18	1888	62	35	2136	75
Barley, Rainfed	4060	1054	4279	2030	1513	5211	4060	2172	8818
Maize, Irrigated	1053	7335	7724	527	8287	8234	1053	9377	9874
Maize, Rainfed	380	1137	432	190	1632	526	380	2343	890

Crop and Farming Method	Base Period (2018 -2016)			2025			2030		
	Area	Yield	Production	Developed Area	Yield	Production (1)	Developed Area	Yield	Production
Sorghum, Irrigated	1664	1593	2651	832	1802	2825	1664	2039	3393
Sorghum, Rainfed	12203	326	3978	6102	468	4845	12203	672	8200
Peanuts, Irrigated	558	2846	1588	279	3220	1692	558	3643	2033
Peanuts, Rainfed	1867	550	1027	934	886	1341	1867	1427	2664
Sesame, Irrigated	139	1036	144	70	1172	153	139	1326	184
Sesame, Rainfed	2580	214	552	1290	345	721	2580	555	1432
Sunflower, Irrigated	65	1323	86	33	1534	93	65	1736	113
Sunflower, Rainfed	89	506	45	45	815	59	89	1312	117
Olive, Irrigated	544	2108	1147	272	2385	1222	544	2698	1468
Olive, Rainfed	3842	906	3481	1921	1459	4543	3842	2350	9029
Ric , Irrigated	656	8210	5386	328	9289	5740	656	10509	6894
Sugarcane, Irrigated	232	96118	22299	116	108749	23765	232	123039	28545
Sugar beet, Irrigated	300	51528	15458	150	58299	16474	300	65960	19788

(1)Production during 2025 = (One-half of the Land Area x Developed Yield) + (One-half of the Land Area x Yield in the Base Period)

5.5.2.6. Major Indicators for Monitoring and Evaluation

The main indicator used for monitoring and evaluating the performance of this component is calculating the annual percentage increase in productivity for each of the targeted crops at the level of irrigated and rainfed agriculture, separately. Furthermore, this should be carried out at the level of each country, after which the aggregate value can be estimated at the level of the Arab world.

For each case, the following equation is used to calculate this indicator:

Percentage increase = [(Productivity in a particular year - Productivity in the previous year) ÷ Productivity in the previous year] x 100.

It should be noted that average productivities for the period (2016-2018) have been used as the base period to estimate the value of this indicator for the program's initial year.

5.5.3. The Component of Expansion in Irrigated Agriculture through Modernizing Field Irrigation Systems

5.5.3.1. Importance and Justifications

Area under irrigated crops, both permanent and seasonal, accounts for 26% of the total cultivated area in the Arab world. However, its contribution to production makes up some 65%, indicating the pivotal role irrigated agriculture play in achieving Arab food security. It is noteworthy that total area of irrigated agriculture at the level of the Arab world hovered around eight million hectares until the end of the eighties of the last century.

During the nineties, remarkable expansions were achieved in the area under these crops, where it reached some 14 million hectares at the beginning of the third millennium. Since then, no noticeable expansions have been achieved in irrigated agriculture, where it has been hovering around the same figure in recent years (i.e., 14 million hectares) as a direct result of lacking sufficient amounts of surface and ground water necessary for such expansion.

Despite the severity of the water resources problem at the general level of the Arab world, water use for irrigation purposes in irrigated agriculture involves a significant amount of waste, and low efficiency, where traditional irrigation systems (surface irrigation by flooding) prevail in approximately 70% of the total irrigated area. Under such systems, irrigation efficiency is only 50%, and one hectare consumes around 16 thousand cubic meters of water throughout the year, as a general average for different Arab countries. By contrast, under modern irrigation systems (sprinkler and drip irrigation), one hectare consumes around 10.5 thousand cubic meters, while the efficiency of field irrigation is estimated at 70%. Such modern systems are being applied in most Arab countries, but on a relatively limited scale due to the fact that expanding the range of their application is still limited and slow to a noticeable degree.

Of the estimated 14.8 million hectares under irrigated agriculture, approximately 10.5 million hectares are still irrigated using traditional, low-efficient and wasteful irrigation systems. Nevertheless, there exist wide and very important opportunities for rationalizing water use in irrigation, thus save large quantities of water that can be used in irrigating additional areas under the irrigated agricultural sector. This is inevitable in the framework of the critical water conditions in the Arab world, and the worsening state of water scarcity.

The following table illustrates irrigated cropped areas in Arab countries, and the percent to which traditional irrigation systems are applied:

Country	Irrigated Area[1] (1000 ha)	As % of Surface Irrigation[2]	Surface Irrigated Area (1000 ha)	Country	Irrigated Area[1] (1000 ha)	As % of Surface Irrigation[2]	Surface Irrigated Area (1000 ha)
Jordan	103.5	13.0	13.45	Iraq	1706.1	99.7	1700.98
UAE	51.7	18.1	9.36	Sultanate of Oman	84.0	49.2	41.33
Bahrain	3.3	90.9	3.0	Palestine	19.1	Zero	-
Tunisia	461.5	41.2	190.14	Qatar	11.5	75.0	8.63
Algeria	1220.3	45.4	554.0	Kuwait	15.9	63.3	10.06
Comoros	50.6	NA	NA	Lebanon	140.2	53.7	75.29
Djibouti	-	-	-	Libya	258.0	100.0	258.0
Saudi Arabia	1029.6	43.6	448.91	Egypt	3669.4	77.0	2825.44
Sudan	1521.5	100.00	1521.50	Morocco	1475.5	71.6	1056.46
Syria	1058.2	71.8	759.79	Mauritania	50.3	NA	NA
Somalia	160.0	100.00	160.00	Yemen	843.4	99.9	842.56

(1) Average of 2015 and 2016. Source: Arab Agricultural Statistics Yearbook, AOAD.
(2) Source: Food and Agriculture Organization of the United Nations, AQUASTAT database on the Internet.

5.5.3.2. Goals

From the perspective of improving food security conditions and increasing production of food crops, the direct and main goal of this component is to expand as much as possible the area of irrigated agriculture in the Arab world. But since water resources have become a main constrain impeding this expansion, it became inevitable to rationalize water use in irrigation as a goal in itself, necessitated by considerations of sustainability and resource conservation, as well as the increasing scarcity of water resources. This last goal, in turn, represents the viable way to achieving the main and direct goal from the perspective of food security, i.e., expansion of areas in the irrigated sector by benefiting from water resources saved through developing field irrigation systems. Quantitatively, the indirect goal is to develop field irrigation systems in irrigated plantations at an annual rate of 2.5% of the areas irrigated using traditional field systems.

The direct and main goal is to cultivate additional land areas under developed irrigation systems, within the limits of water amounts saved from developing field irrigation systems, and to invest the additional areas in growing food-deficit crops, the cultivation of which mainly depend on irrigated areas, especially the group of sugar crops, including both sugarcane and sugar beet.

The following table illustrates the target areas for developing field irrigation, as well as the target areas for new cultivations based on water saved from the implemented development of traditional filed irrigation systems:

Country	Surface Irrigation Area[1] (1000 ha)	Annually Developed Area[2] (1000 ha)	Cumulative Developed Area[3] (1000 ha)		Annual Saving[4] in Water that can be Invested (Mil m^3)	Cumulative savings[5] in water that can be invested (Mil m^3)		Additional New Areas[6] to be cultivated using Water Savings (1000 ???)	
			2025	2030		2025	2030	2025	2030
Jordan	13.45	0.34	0.68	2.38	1.683	3.37	11.78	0.32	1.12
UAE	9.36	0.23	0.46	1.61	1.138	2.28	7.97	0.22	0.76
Bahrain	3.00	0.07	0.14	0.49	0.347	0.69	2.43	0.06	0.23
Tunisia	190.14	4.75	9.50	31.99	23.512	47.02	164.58	4.48	15.67
Algeria	554.02	13.85	27.70	96.95	68.557	137.11	479.90	13.06	45.70
Saudi Arabia	448.91	11.22	22.44	78.54	55.539	111.08	388.77	10.58	37.02
Sudan	1521.50	38.04	76.08	266.28	188.298	376.60	1318.09	35.87	125.53
Syria	759.79	18.99	37.98	132.93	94.001	188.00	658.01	17.90	62.67
Somalia	160.00	4.00	8.00	28.00	19.800	39.60	138.60	3.77	13.20
Iraq	1700.98	42.52	85.04	297.64	210.474	420.95	1473.32	40.09	140.32
Sultanate of Oman	41.33	1.03	2.06	7.21	5.098	10.20	35.69	0.97	3.40
Qatar	8.63	0.22	0.44	1.54	1.089	2.18	7.62	0.21	0.73
Kuwait	10.06	0.25	0.50	1.75	1.237	2.47	8.66	0.23	0.82
Lebanon	75.29	1.88	3.76	13.16	9.306	18.61	65.14	1.77	6.20
Libya	258.00	6.45	12.90	45.15	31.928	63.86	223.50	6.08	21.28
Egypt	2825.44	70.64	141.28	494.48	349.668	699.34	2447.68	66.60	233.11
Morocco	1056.46	26.41	52.82	184.87	130.730	261.46	915.11	24.90	87.15
Yemen	842.56	21.06	42.12	147.42	104.247	208.49	729.73	19.86	69.50
Total	10478.92	261.95	523.90	1832.39	1297	2593	9076	246.97	864.41

1. Source: previous Table.
2. Annually developed area represents 2.5% of the surface irrigated area.
3. Cumulative area by 2025 = (Annually developed area x 2), and by 2030 = (Developed area x 7).
4. Annual water savings that can be used = [(Annually developed area x 5.5 thousand m^3) x 90%].
5. Cumulative water savings = Annual savings x 2 for the year 2025, and multiplied by 7 for the year 2030.
6. New area in 2025 and 2030 = (cumulative savings in the corresponding year ÷ 10.5 thousand m^3).

5.5.3.3. Pillars of Work

- Each of the countries participating in field irrigation development and cultivating the additional new areas is to develop a national strategy and a comprehensive plan for field irrigation development and raising water use efficiency in agriculture, which will ensure that areas targeted for development are well identified and prioritized in a structured schedule containing the areas this component targets until 2030. Of course, this plan will continue extending to cover various areas under traditional irrigation at a gradual and successive manner in the longer term, taking into account available funds, and technical and logistical capabilities for annual implementation rates.

- Providing a binding legislative framework to rationalize irrigation water use in agriculture and the application of modern irrigation systems, which is to be supported by a framework of necessary incentives and facilities that push and encourage the transformation towards these systems, including the provision of easy credit lines for this purpose, especially for medium and small holders.
- Developing the agricultural investment climate to be more attractive and encouraging for local investment, joint Arab investment, and even foreign investment, in related fields and projects, foremost of which are industrial projects that produce and provide equipment and supplies for advanced irrigation systems, and projects with large capacities for the reclamation and cultivation of the additional new land areas, including the projects of establishing integrated agro-industrial parks for cultivating and the processing of sugar crops.
- Designing and implementing national campaigns targeting farmers to raise awareness and publicize the importance and necessity of rationalizing irrigation water use, applying modern irrigation systems, and the incentives and facilities each country provides for this purpose.
- Each country is to prepare and equip the additional agricultural expansion areas with national utilities and infrastructure (such as main roads and power lines, etc.), together with mapping such areas, preliminary classification of soil, and the preparation of pre-feasibility studies that contribute to promoting investment in related projects.
- Establishing and developing modern and integrated agricultural meteorological networks to serve the purposes of integrated agricultural management in irrigated areas, especially for the purposes of irrigation water management and field irrigation.
- Encouraging investment in modern protected agriculture projects of different types in the additional new irrigated agriculture areas as one of the main pillars for rationalizing water use and developing agricultural irrigation systems, in addition to representing advancement in the farming methods and agricultural development that contribute to raising agricultural production efficiency and increasing the rates of return per unit of land and water.

5.5.3.4. Basis of Projecting Component's Outputs

- In light of the previously presented projections regarding areas cultivated under irrigated agriculture in Arab countries, as well as the percentage of areas where traditional irrigation systems prevail, areas where irrigation systems can be developed were estimated based on an annual increase of 2.5% in areas in the base period (2015-2016). Although this percentage seems relatively conservative, it is

considered ambitious in the light of previously achieved development rates in field irrigation systems in Arab countries, which are considered limited and slow to a marked degree. Also, this percentage has taken into account the actual capabilities and capacities available for practical implementation, as well as providing the necessary financial and technical requirements.

- In light of the available technical information regarding field irrigation systems, the amount of water saved per hectare as a result of developing field irrigation systems was estimated on the following basis:
  - Average need per hectare under traditional irrigation systems is nearly 16 thousand cubic meters, based on efficiency rate of 50%, approximately.
  - Average need per hectare in developed irrigation systems (drip and sprinkler) is nearly 10.5 thousand cubic meters, where efficiency of field irrigation rises to about 70%. Thus, the amount of irrigation water saved per hectare is approximately 5.5 thousand cubic meters.
  - The amount of water that can be transferred to cultivate additional new areas is estimated at 90% of that saved through developing field irrigation systems. The remaining 10% represents the loss and waste in water during transfer and delivery to the new areas.
  - It was taken into account that the process of developing field irrigation systems, as well as the reclamation and cultivation of additional new areas, entails an appropriate period of time to complete the organizational, technical and executive procedures necessary to reach the stage of actual cultivation and production. Therefore, the program allocated three years to complete the necessary procedures and operations, after which production starts in the fourth year (2040).
  - It was considered that countries where cropping patterns involve sugar crops (sugar cane and sugar beet) will allocate all of the additional new areas for cultivating the two crops to promote sugar production thus improve the state of food security in sugar.
  - Decisions regarding the utilization of additional new areas in the rest of countries were left for them to take based on the priorities of crops that fall under their production patterns. It was assumed that such areas contribute to achieving the goal of expanding in new areas under irrigated agriculture without adding the produce to be achieved from such areas to the projected outcomes. In this regard, estimation of the projected quantitative outcomes was limited to those countries that grow sugar crops, namely Tunisia, Sudan, Syria, Somalia, Iraq, Lebanon, Egypt and Morocco, as illustrated in the following table, which presents the areas allocated for sugarcane and sugar beet, expressed in thousand hectares:

Attributes	Tunisia	Sudan	Syria	Somalia	Iraq	Lebanon	Egypt	Morocco	Total
New Area (2025)	**4.48**	**35.87**	**17.90**	**3.77**	**40.09**	**1.77**	**66.60**	**24.90**	**195.38**
Of which is Allocated for Sugarcane:	2.24	35.87	-	3.77	-	-	33.30	12.45	87.63
Of which is Allocated for Sugar beet:	2.24	-	17.90	-	40.09	1.77	33.30	12.45	107.75
New Area (2030)	**15.67**	**125.53**	**62.67**	**13.20**	**140.32**	**6.20**	**233.11**	**87.15**	**683.85**
Of which is Allocated for Sugarcane:	7.84	125.53	-	13.20	-	-	116.55	43.57	306.69
Of which is Allocated for Sugar beet:	7.83	-	62.67	-	140.32	6.20	116.55	43.57	377.14

5.5.3.5. Projected Outcomes

1. Developing field irrigation systems serving an area estimated at 262,000 hectares per year, thus saving some 1.3 billion cubic meters of water per year. As a result, total developed area is projected to reach some 523.9 thousand hectares by 2025, and to rise to some 1.83 million hectares by 2030. Accordingly, the amount of water to be available for irrigation is projected to reach some 2.59 billion cubic meters by 2025, and to rise to some 9.1 billion by 2030.

2. Adding new areas to the areas under irrigated agriculture, projected at 247 thousand hectares by 2025, and 864 thousand hectares by 2030.

3. Increasing sugar crops planted area by 195 thousand hectares, approximately, by 2025, projected to rise to some 684 thousand hectares by 2030. Such areas are expected to contribute to realizing an increase in sugar production projected at 1.95 million tons by 2025, and 7.75 million tons by 2030 [(19)].

[(19)] Projected sugar production for the year 2025 has been estimated on the basis of realizing an average yield of 108.75 tons/ha for sugarcane, and 58.3 tons/ha for sugar beet. For the year 2030, yields are projected to increase to 123.04 tons/ha for sugarcane and 65.96 tons/ha for sugar beet, on the basis that refined sugar extraction factor is 10% for sugarcane and 16% for sugar beet.

5.5.3.6. Main Indicators for Monitoring and Evaluation

Monitoring and evaluation indicators can be classified into two levels, or two groups, based on the goals pursued by this sub-component:

The first group comprises the set of indicators related to field irrigation systems' development in irrigated crop areas:

a. Annual increase in area (in hectares) where developed field irrigation systems have been implemented.

b. Percentage of land area where field irrigation systems have been developed relative to total area under irrigated agriculture.

The second group comprises the set of indicators related to expansions in areas under irrigated crops:

a. Annual increase in newly reclaimed and cultivated areas under irrigated agriculture, expressed in hectares.

b. Annual increase in sugarcane planted area in newly reclaimed and cultivated areas under irrigated agriculture.

c. Annual increase in sugar beet planted area in newly reclaimed and cultivated areas under irrigated agriculture.

Of course, these indicators are measured at the level of each country, based on which indicators at the level of the Arab world can be estimated.

5.5.4. The Component of Investment in Agri-food, Food Processing and Storage Projects

5.5.4.1. Importance and Justifications

It is not an exaggeration to say that the bulk of industrial and service activities and projects in most Arab countries are based on agriculture and agricultural products. In contemporary economies, the components of food security are no longer solely based on developing and increasing production of food crops, where investment projects in production and services linked to, and integrated with, agricultural production have become a basic pillar and a vital component for achieving food security in the framework of food supply chain system, with all underlying links and activities, which start up before the stage of agricultural production and only ends after reaching the final consumer.

In between agricultural production activities and other interlinked and integrated processing and service stages, there exist a close relationship of interdependence. While processing and service projects depend on agricultural production and the developments and increases thereof, such projects, on the other hand, play an important role in stimulating production sectors, as they take the lead to achieving quantitative and qualitative development of the produced products, and help in promoting thus increasing demand for such products. In addition, they play an important role in the preparation and transformation of many agricultural products into forms suitable for consumption.

In this context, it is important that agricultural development projects and related processing/manufacturing and service investment projects be integrated into this program. Hence, the ambitions of improving the state of food security have become increasingly dependent on the initiatives and participations undertaken by businessmen and investors alongside the governmental sector. It also became a requirement to mobilize large capacities of national and joint Arab investments and capitals, as well as direct foreign investment.

5.5.4.2. Goal

The goal this component seeks to achieve is to stimulate and encourage national and joint Arab investments to maximize their effective, and unprecedented, participation in supporting and improving the state of Arab food security through establishing investment projects that help achieve the following:

1. Providing the finance and services required to support and enhance the efficiency and effectiveness of agricultural development projects in the field of vertical and horizontal expansion targeted under the program's first and second components, especially production inputs and requirements.
2. Establishing appropriate and sufficient capacities of processing, storage and service activities that can absorb the projected increases in production of food crops resulting from implementing the program's first and second components, especially in regards to grain crops, oilseeds and sugar crops.
3. Establishing various processing, service and agricultural development projects in the field of plant and animal products, which contribute to improving the state of Arab food security, on a general and comprehensive term, in various groups and food commodities (other than the groups of cereal crops, oilseeds and sugar crops). Besides widening the scope of these projects, the program pays special attention to livestock and fisheries production projects, which were not addressed under the two main components (first and second) in this program.

Heading from that general objective and associated sub-objectives, the following is a presentation of the main projects for which the program seeks to stimulate and encourage joint national and Arab investments:

a. Mega Farms Specialized in the Multiplication of Improved High-Yielding Seed Varieties

Such types of projects do not need to demonstrate their vital and pivotal importance in supporting the general goals and main components of this program. The scope of these projects expands to include many food crops, especially cereal crops and oilseeds. It also expands to include many of the Arab countries that participate in the component of improving productivity levels, or in the component of expanding the utilization of untapped agricultural land resources. It should be noted that agricultural areas defined under the first and second components, which require improved seeds as inputs, exceed 60 million hectares, whether the existing areas in which productivity levels are to be improved, or the new areas in both rainfed and irrigated lands.

b. Fertilizers and Nutrients Production Projects

These projects, as the case of seed multiplication projects, are considered of the fundamental projects that provide one of the most important agricultural inputs supporting crop production and productivity development. The scope of such projects expands to include various crops, as well as the majority of Arab countries. It is worth indicating that development of the vast areas targeted under the first and second components depends on projects of this type.

c. Integrated Agro-industrial Parks

In terms of feasibility, agro-industrial parks are considered the most preferred by major investors. These projects integrate two phases together, food crops production phase and crop processing phase. They often have relatively large capacities to meet the needs of the processing units of large economic scales that use modern and advanced technologies. Major projects under this program include cultivating oilseed crops, along with the establishment of units for extracting and refining edible vegetable oils. Another type is the projects of cultivating sugar crops (sugarcane and/or sugar beet), along with the establishment of sugar extraction and refining units.

Based on the goals and targets of the program's first and second components, there are wide opportunities and large areas for cultivating oilseed crops, especially in rainfed areas, as well as sugar crops, especially in irrigated areas.

d. Sugar and Edible Vegetable Oils Processing Projects

These are complementary projects to the abovementioned projects, except that they do not involve the cultivation stage, rather, they are limited to the processing stage. As previously indicated regarding the outputs of both the first and second components, large production quantities of oilseeds and sugar crops are projected, which will be sufficient for providing many opportunities for the establishment of projects in these two areas, either of the integrated agro-industrial pattern, or the processing pattern alone.

e. Manufacturing of Equipment and Supplies for Modern Irrigation Systems

These are considered of the important and essential projects in the framework of policies and directions aiming to rationalize irrigation water use, and developing field irrigation systems in irrigated agricultural lands. Of these areas, the total area that needs irrigation development is estimated at some 10 million hectares. The program aims to develop field irrigation systems serving around 2.2 million hectares by 2030, which requires large quantities of modern irrigation equipment and supplies. Accordingly, great opportunities will exist for establishing investment projects to manufacture them. As some Arab countries have large experiences in practices in such projects, they can be expanded in the same countries, or introduced as new projects in other countries listed under the field irrigation development component.

f. Manufacturing Farm Machinery and Equipment

The fact that the Arab world, in general, suffers from a noticeable shortcoming in this type of projects due to the huge investments and modern technologies required, in addition to facing fierce competition from manufacturing companies in developed countries, resulted in Arab countries dependency to a large extent on imports of farm machinery and equipment. However, ambitions to achieve agricultural development and a better state of Arab food security require a common Arab vision to break into the field of manufacturing these machinery and equipment from an integrated Arab perspective, with joint Arab investments to which foreign capital can contribute, and in cooperation with leading foreign companies in this field. Projects of this type will greatly support the success of agricultural development projects targeted under the main components of this program (first and second components).

g. Intensive Fish Farming in Fresh and Marine Water

The importance of these projects comes in the framework of keeping pace with the global trend in fish production, and also in the framework of lessons learned from the successes achieved in this field in some Arab countries, particularly Egypt. Although the fish group has not yet faced a problem specific to the food gap in the Arab world, future population increase along with the decline in fish production from natural resources, in addition to the environmental problems surrounding such resources, calls for an early initiative to move towards fish farming, which methods and technologies have unprecedentedly developed. It is worth mentioning that fish farming projects have become of high economic feasibility, as well as investment-attractive, either fresh-water farming, marine and ocean cage culture, or inland saline aquaculture (fish farming using inland sources of saline groundwater).

From the perspective of food security in animal products, it is necessary to move towards sustainable consumption patterns by increasing dependency on white meat through relative substitution of animal protein sources by fish and poultry meat while reducing dependency on red meat in which most Arab countries do not enjoy comparative advantage in production, or resource potentials. In addition, red meat production drains water resources to a large extent compared with fish or poultry meat production, based on what is known as the "water footprint" for each of the two products.

h. Commercial Breeding and Fattening of Large Ruminants in Pastoral Areas and Associated Meat Production and Processing Projects

These projects can be established in countries that have adequate pastoral resources, such as Sudan, Somalia and Mauritania, where the beef cattle sector suffers a marked decline in meat productivity levels per head due to adopting traditional and primitive breeding and care methods. It is possible to encourage the entry of advanced commercial projects with Joint Arab capital to this sector to establish specialized farms in pastoral areas, supported by supplemental feed, advanced care and breeding methods, veterinary services, and other requirements for specialized commercial production systems. Such projects should also be supported by facilities and services related to modern slaughterhouses, besides preparation and processing for local consumption or export purposes. In fact, joint Arab agricultural food and industrial investment projects do not end at the limits of the previous list, but there exist many areas and projects to which investments can be directed to support the aspirations of Arab food security in the coming era. This is due to fact that, with the increase in population thus demand for food, there will remain a necessary and urgent need to expand the production capacities of broiler and table eggs projects; dairy cattle projects; and dairy products manufacturing projects; as well as regular and cold

storage projects; manufacturing of packing and packaging materials; preparation, processing and preservation of vegetables and fruits, in addition to many other projects that cannot be listed herein.

i. Strategic Storages for Major Food Crops

It is necessary to develop and establish warehouses and silos to secure a strategic buffer stock for Arab countries sufficient to cover a period of no less than 12 months to meet countries' needs of such commodities in cases of emergency, crises or pandemics. It is also necessary to take into account adopting modern technologies in storage and inventory control operations in order to reduce losses resulting from various technical and mechanical factors performed during storage operations. Moreover, it is necessary to ensure that these warehouses are well distributed over different areas within the same country, and among countries in different regions to avoid any accidents, disasters or closures that certain areas may be exposed to.

5.5.4.3. Pillars of Work

In order to achieve the goals of this component, it is essential that all Arab countries and governments revisit the various laws, policies and legislation related to agricultural investment, in particular, in order to create an investment environment for interlinked and integrated agricultural development and investment projects, which ensures, in an unprecedented way, providing the best incentives and facilities to attract joint national and Arab investments, and foreign direct investments too, if there is a real political will to make a qualitative leap in the field of Arab food security in accordance with this program. The matter also extends to developing and activating all forms and means of joint Arab action in various related investment, production and commercial fields.

In this regard, it is possible to refer to some of the necessary procedures and arrangements that each concerned country is required to take, foremost of which are:

- Conducting surveys and preparing maps for the targeted development and cultivation areas, either rainfed or irrigated areas.
- Conducting preliminary soil classification works in the targeted reclamation and cultivation areas.
- Planning and executing works regarding the establishment of main public utility services (national infrastructure) in the targeted development areas, especially in the targeted rainfed cultivation areas, or in the additional new areas targeted for reclamation and cultivation in irrigated lands. This includes utilities, public roads and electricity networks.

- Revisiting and upgrading the frameworks for national and Arab joint investment incentives, and related laws and legislations, provided that they ensure offering the best advantages/benefits and facilities for the establishment of agricultural investment projects and associated and integrated processing, manufacturing and service projects, while giving special preferences to projects targeting development and investment in rainfed areas.
- Preparing project identification cards to promote the participation of investors and businessmen in carrying them out. Preliminary feasibility studies regarding some of the major and most important projects must also be prepared.
- Using project identification cards and preliminary feasibility studies to advertise and promote various investment projects.

5.5.4.4. Projected Outcomes

Needless to say, the extent and amount of the outcomes projected for this component depends on the amount of achievements, represented in the numbers and sizes of the projects being implemented, and the amount of fund and investments available for their execution.

Outcomes projected for this component are numerous and varied, some of which are achieved at the general level of the Arab world, while others are achieved at the national level where each of the projects is endemic, or at the level of the local community in specific regions inside each country.

Among the most important projected outcomes are the following:

a. At the Level of the Arab World

- Direct contribution to supporting and improving the state of food security.
- Supporting and promoting inter-Arab trade exchanges.
- Promoting joint Arab cooperation in the field of investment and joint ventures.

b. At the National/Country Level

- Contributing to strengthening and improving macroeconomic conditions and indicators.
- Providing direct and indirect job opportunities.
- Developing food supply chain systems and increasing integration between the underlying various stages and links at the country level.

- Introducing and transferring new and advanced technologies and methods in the implemented projects.

c. At the Local Level

- Creating work activities and sub-branches that are linked, and integrated with, the implemented projects.
- Contributing to reviving the economic and social conditions of local communities.

5.5.4.5. Major Indicators for Monitoring and Evaluation

1. Annual number and production capacities of new projects in the field of agricultural production, agro-industrial parks, and interlinked and integrated processing/manufacturing and service projects.
2. Annual volume of expansion in the production capacities of projects in the previously referred to fields.
3. Annual volume of governmental investments allocated to the previously referred to projects.
4. Annual volume of private national investments allocated to the previously referred to projects.
5. Annual volume of joint Arab investments allocated to the previously referred to projects.
6. Annual volume of foreign direct investment flows allocated to the previously referred to projects.
7. Volume of financing from institutions, funds and credit associations allocated to the previously referred to projects, and to agricultural development in general.

5.5.5. The Component of Reducing Food Loss and Waste

5.5.5.1. Importance and Justifications

The issue of food loss and waste has become one of the most important issues and challenges at the global level due to the direct relationship with the issues of hunger and food security, and to increasing relative scarcity of natural agricultural resources, especially water and arable land. In addition, the issue of food loss and waste contributes to causing negative impacts on the environment as it exacerbates the climate change crisis along with the associated significant greenhouse gas emissions.

Food loss and waste also represents losses in the factors of production like labour, energy and capital. Moreover, it has negative impacts on the returns and incomes of agricultural producers as a result of the losses incurred in their agricultural products. Estimates[(20)] indicate that, in recent years, annual losses in food at the world level reached some 1.3 billion tons, accounting for nearly one-third of the global production. The matter is not much different in the Arab world, where a study by the researchers Muhammad Obeid and others from the Faculty of Agriculture at the American University of Beirut, conducted in 2018, revealed that per capita average volume of food loss and waste is estimated at some 210 kilograms/year. Consequently, total quantity of food losses at the level of the Arab world amounted to some 88 million tons, accounting for 28% of the total food supply, and nearly 40% of total production. Such estimates are bound to represent a shock that raises sufficient interest in the issue of food loss and waste and Arab food security among officials and decision makers.

Naturally, rates of food loss and waste may vary between countries based on multiple factors, such as the economic and technological level, as well as the social, cultural and behavioral characteristics. They also differ between food groups, and among commodities within each group. Nevertheless, the issue of food loss and waste remains, in all cases, a very important issue, especially from the perspective of food security, which calls for serious actions to reduce these rates to the least possible extent by all means and methods. Therefore, the Global Agenda for Sustainable Development has been keen to include among its goals and targets cutting in half food loss and waste by 2030, according to target 3 under goal 12 of this agenda. (Appendix No. 1).

5.5.5.2. Goal

The goal this component seeks to achieve is to reduce food losses in major commodity groups, especially cereals, as well as other groups suffering high rates of loss and waste (in terms of quantity and value), especially vegetables and fruits; meat and fish; and milk and dairy products. The targeted reduction rate until 2030 is 25% (which is half that targeted by the Global Sustainable Development Goals), i.e., an average of 2.5% per year. The main focus of this goal is to reduce loss and waste along food production and supply chains, including at the farm level, post-harvest operations like sorting, grading, packaging, transportation, storage, processing and wholesale trade. These are the stages during which the largest percentages of loss and waste occur in developing countries in particular.

(20) FAO, Global Initiative on Food loss and Waste Reduction, 2013.

It should be noted that the goal of cutting in quarter (25%) food loss and waste has taken into account the following:

a. The targeted reduction is focused on loss and waste occurring along the stages of the food supply chain, not all stage, where the stages of retail trade and consumption are not included due the special nature they are dealt with, in addition to the fact that, despite the importance they represent, they do not directly fall under the interests of agricultural development.

b. Directions and concerns regarding the issue of reducing food loss and waste, whether from the perspective of governments or the perspective of public awareness in Arab countries, are still absent, or in the early stages at best. Therefore, the expected achievement in this area will be relatively limited compared to SDG target number 12.3 that calls for cutting in half per capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains (including postharvest losses) by 2030..

According to this goal, whether in terms of targeted reduction rates, or priority food groups, the desired reduction target has been quantified at some 11.6 million tons at the level of the Arab world, based on estimates shown in the below table:

(Quantity in Mil Tons)

Food Group	Average Annual Production for the Period (2016-2018)	Loss and Waste(1) (%)	Quantity of Loss & Waste under Current Conditions (2016-2018)	Targeted Reduction in Loss & Waste until 2030 (25%)
Cereals	50.66	14-19%, i.e., 16.5% on average	8.36	2.09
Vegetables	57.36	19-45%, i.e., 32% on average	18.36	4.59
Fruits	36.63	19-45%, i.e., 32% on average	11.72	2.93
Meat	9.48	13%	1.23	0.31
Fish	5.38	28%	1.51	0.38
Milk & Dairy Products	28.05	18%	5.13	1.28
Total	187.56		46.31	11.58

(1) FAO estimates

5.5.5.3. Pillars of Work

In fact, many pillars of work and areas of intervention are required to achieve the goal of reducing food loss and waste. In this regard, governmental agencies alone will not be able to directly achieve the desired reduction, as this matter depends, to a large extent, on the various partners and players engaged in the food supply chains,

including producers, marketers, processors/manufacturers, and wholesalers. The most important work pillars for achieving the goal of this component can be presented as follows:

- Creating an appropriate and effective enabling environment by formulating relevant policies, institutions and legislations.
- Raising public awareness among different groups and classes on the issue of food loss and waste, especially among producers, consumers and other parties involved in the food supply chains.
- Improving the level of facilities and infrastructure in agricultural and rural areas.
- Setting standards and specifications for levels and degrees of quality and safety conditions for food crops, and obligating various dealers to follow and apply them.
- Spreading good agricultural practices on a large scale, while supporting and strengthening agricultural extension agencies and methods in this regard.
- Providing methodological and technical assistance, guidance and training in the field of data collection and estimation of food losses. To achieve that, food loss estimation models should be developed (in the absence of measurable data) with the guidance of FAO indicative models in this field.
- Encouraging and stimulating investment, public and private, in advanced and modern projects in the fields of storage and transportation of food products, sorting, grading and packaging stations, and the manufacture of advanced packaging materials and packs for various agricultural products based on the nature of each product.
- Encouraging partnership and cooperation between various bodies engaged in the food supply chains to be more interconnected and integrated on the one hand, and to ensure that various participants, especially food producers, receive fair shares of the benefits and returns.
- Encouraging, and the development of, systems for linking farmers to the final markets of food products, including contract farming systems, as well as direct selling systems.
- Encouraging civil society organizations and civil society initiatives to become engaged in activities and areas aimed at reducing food loss and waste.
- Planning production, imports and buffer stock policies in a way that ensures achieving balance between supply and demand, and limits extreme market volatilities due to supply surplus during some periods, and shortage during others.

- Urging and encouraging research agencies and institutions to devote attention to conducting studies and researches on food loss and waste, especially in terms of measuring and estimation, analysis regarding where it occurs, causes, impacts, and appropriate solutions to reduce it.
- Networking and cooperation at the level of the Arab world, and the international level as well, in the field of exchanging experiences related to food loss and waste, raising awareness, information and studies. This includes joining the 2015 FAO's Global Initiative on Food Loss and Waste Reduction.

5.5.5.4. Projected Outcomes

The most important direct outcome of cutting loss and waste in the targeted food groups is saving a quantity of food estimated at 11.58 million tons. This amount is enough to provide food for some 15.4 million people, which can be achieved without the need for additional land and water resources to produce this amount of food, estimated at 2.97 million hectares of land, and around 8.2 billion cubic meters of water.

In addition to this direct outcomes, a number of indirect outcomes can be achieved, perhaps the most important of which are the following:

- Providing quantities of surplus production from some food groups, such as vegetables and fruits, to meet the increasing consumption needs, and to maintain, or increase export capabilities.
- Improving the economic efficiency of land and water resources use.
- Improving marketing efficiency, developing food supply chain systems and increasing the level of integration and coordination between their various links and stages.
- Improving the quality levels of food products to comply with quality standards and safety controls.
- Reducing the rates of environmental pollution resulting from food loss and waste.
- Improving the income levels of food producers, plant and animal products, due to receiving fair revenues for their products upon developing food supply chain systems, in addition to developing the systems linking farmers to markets through contract farming, direct marketing, or other marketing systems.

5.5.5.5. Major Indicators for Monitoring and Evaluation

Under this component, M&E indicators are supposed to be developed to measure the change in the food losses for the targeted food groups, and at the level of the links and stages of interest, in order to reflect the extent to which policies and investments have influenced the efficiency of food supply chains thus reduction of food loss and waste. Given the lack of, or significant shortcomings, in interest in measuring or estimating such losses in the Arab world in general, it is possible to rely on indirect indicators that reflect the extent of development in some areas that would help achieve the targeted reduction. Among these indicators are the following:

- Presence/lack of policies or laws targeting reduction of food loss and waste.
- Presence/lack of governmental and/or non-governmental initiatives to reduce food waste and waste.
- Presence/lack of systems for registering farms that apply good agricultural practices, and the percentage their total area represents.
- Percent of areas, number of farms, or volume of production marketed under contract farming systems.
- Annual additional numbers and capacities of sorting, grading and filling & packaging stations.
- Annual additional capacities of advanced grain warehouses/silos (in tons).
- Annual additional capacities for refrigerated storage and refrigerated trucks (in tons or cubic meter).
- Presence/lack of effective standards and legislation regarding quality standards, specifications and safety of agricultural food products.

5.5.6. The Component of Shifting Towards Sustainable Food Consumption Patterns

5.5.6.1. Background

In the context of the growing imbalance in the relationship between population and natural agricultural resources at the global level, interest has increased during the last three decades to the issue of sustainable consumption patterns on the basis that sustainable consumption is the main and decisive factor in directing and driving sustainable production, and that together, consumption and production affect both natural resources and ecosystems.

In the final report of the United Nations Conference on Environment and Development (Rio de Janiro, 1992), it was stated that the main reason for the continuous deterioration of the environment at the global level is the unsustainable patterns of consumption and production. At the Oslo Forum (1994), the working definition of sustainable consumption was proposed, and the framework program was later developed to accelerate shifting towards sustainable consumption and production patterns, and countries were called to comply with this program to encourage patterns of economic and social development compatible with the resilience of the ecosystem.

In the Global Sustainable Development Agenda (2030), goal 12 is dedicated towards promoting countries adherence to sustainable consumption and production patterns.

Sustainable consumption means "the use of products and services that meet basic requirements and provide a better quality of life, while reducing the use of natural resources, toxic materials, and emissions of waste and pollutants throughout the life cycle of goods and services, without threatening the needs of future generations."

At the level of the Arab world, food consumption patterns may differ between regions and countries, to a degree or another, but they share common features and characteristics, the most prominent of which is that they are all considered dietary patterns in the phase of transition from traditional to modern patterns prevailing in Western countries, which have severe negative impacts on resources and the environment.

5.5.6.2. General Characteristics of Arab Food Consumption Pattern

Average per capita share of food supply in the Arab world amounted to 727 kg/year for the period (2016-2018), which is not much different from that of the period (1996-1998), estimated at 728 kg. However, composition of food consumption pattern in the Arab world witnessed some variations, the most important of which are:

- Lower average per capita share of total supply of some commodities and food groups, like rice, barley, legumes, vegetables, fruits, and dairy products.
- By contrast, average per capita share of total supply of wheat & wheat flour, maize, roots and tubers, sugar, oils & fats, white meat, fish, and eggs have increased.

Such shifts induced some favorable and unfavorable changes in the general characteristics of Arab dietary patterns. On the one hand, favorable changes include increased reliance on poultry meat, fish and eggs as sources of animal protein,

although it did not significantly reduce per capita consumption of red meat, of which average per capita share of total supply reached some 14 kg/year. On the other hand, unfavorable changes include increased dependency on cereals, especially wheat, where average per capita share of total wheat supply increased from 148.5 to 160.1 kg/year. Also, per capita share of total supply of vegetables and fruit declined, although they are important preventive foods for human health, and they fall under the groups in which Arab countries realize production surpluses. In addition, average per capita share of total supply of milk and dairy products declined from some 98.2 kg to 74.6 kg/year. Such declines contradict the rules of proper nutrition behavior, besides leading to an apparent and unreal improvement in the rate of self-sufficiency in this group.

In fact, average per capita share of total food supply at the level of the Arab word hide wide differences, which can be attributed to the fact that food basket composition differ across countries. For instance:

- Average per capita share of the vegetables group sharply declines to reach 20-40 kg/year in some countries, including Yemen, Iraq and Mauritania, while highly rises to 150 kg/year, or more, in countries like Tunisia, Egypt and Kuwait. It is worth noting that, while global average per capita share of the vegetables group is estimated at 142 kg/year, and 75 kg/year for the fruits group, it drops to nearly 30 kg/year, or even less, in some Arab countries, as the case of Mauritania, Djibouti and Yemen, while rises to more than 100 kg/year in countries like Egypt, Oman, UAE and Algeria.

- Global average per capita share of total supply of meat (red and white) is around 26.1 kg/year. In Arab countries, this average drops to less than 20 kg/year in Algeria, Iraq, Djibouti and Yemen, while rises to 50 kg/year, or more, in Kuwait, UAE and Saudi Arabia. In some countries, dependency rate on white meat markedly rises to 70%, or more, like in Saudi Arabia, UAE, Kuwait, and Iraq, while markedly drops to less than 20% in other countries, like Sudan, Djibouti and Mauritania.

- Discrepancies are also obvious in average per capita share of fish total supply, where it drops to less than 5 kg/year in some countries, like Algeria, Djibouti, Iraq, Sudan, and Yemen, while rises to more than 20 kg/year in other countries, like the UAE, Oman, and Egypt. It is worth mentioning that global average per capita share of fish total supply is estimated at 20.4 kg/year.

- Average per capita share of total supply of milk and dairy products' group rises to 236 kg/year in countries of the European Community, indicating the importance this food

group represents in developed countries' dietary pattern. At the world level, this average is estimated at 88 kg/year. In some Arab countries, the estimated average is close to, or slightly more than, the world average, like Algeria, Mauritania, Oman, Sudan, and Tunisia. However, it drops to less than 50 kg in other countries, like Egypt, Djibouti, Kuwait, the UAE, and Yemen.

Such general characteristics, which reflect numerous variations in food consumption patterns across Arab countries, may be affected by a number of factors such as income levels, agricultural production patterns, in addition to inherited traditional food cultures. However, various Arab dietary patterns rarely take into account, or pay attention to, considerations regarding the relationship between diet and public health, environmental safety, and resource conservation. These considerations have become of great importance in many world countries, especially developed countries, and have become the core of the concept of sustainable consumption they call other countries to adopt, and target achieving among the seventeen goals of the 2030 Global Sustainable Development Agenda.

5.5.6.3. Importance and Justifications

In light of the previously described general characteristics of food consumptions pattern in the Arab world, justifications for modifying and improving this pattern can be inferred, whether at the general level, or at the country level, based on the peculiarity of the food pattern prevailing therein, which calls for working in the framework of shifting towards more sustainable consumption patterns through taking into account a number of aspects and considerations, including health and nutrition, environmental safety, as well as conservation of natural resources, especially agricultural land and water resources. Some examples regarding the relationship between dietary pattern and each of these aspects are listed in what follows:

a. From a Public Health Perspective

From the perspective of proper nutrition's impact on the health of individuals, prevalent dietary patterns in the Arab world suffer imbalance between components from plant and animal sources, where the proportion of animal sources is lower compared to the global average, and to a greater extent compared to developed countries' average, whereas per capita consumption of cereals in the Arab world is a significantly high compared to the global level, or developed countries' level. The following table, and tables (7), (8) in the Annex, present some examples.

Per Capita Share of Total Supply of Major Food Commodity Groups at the Level of Some Arab Counties and the World

(Quantity in Kg/year)

Attributes	World Average	Arab World[1] Average	North Africa	USA	EU	Saudi Arabia	Tunisia	Morocco	Jordan	Egypt
Total Calories	2870	NA	3189	3639	3416	2133	3362	3334	3149	3557
From plant sources	2362	NA	2806	2644	2424	2635	3018	3026	2757	3220
From animal sources	508	NA	383	995	993	487	344	307	391	336
Food grains	147.2	220[2]	216.4	105.8	124.9	158.3	213.3	254.0	166.5	252.4
Legumes/Pulses	6.9	6.7	7.4	3.2	2.9	5.8	9.0	7.0	7.9	6.2
Sugar	24.1	34.9	30.3	60.6	38.1	32.4	36.1	39.5	41.5	30.3
Vegetables	135.8	137.8	154.1	113.1	115.8	95.1	228.0	139.2	131.0	206.2
Fruits	75.0	82.7	87.9	97.1	100.1	86.5	96.1	87.6	55.0	96.1
Red Meat	27.8	14.0	16.5	66.2	60.9	14.0	12.0	13.5	12.9	16.4
Poultry	14.5	16.4	10.0	51.4	21.7	48.0	13.7	20.2	33.7	11.6
Milk	90.7	75.1	104.3	256.8	240.1	90.6	107.8	56.0	82.6	64.7
Fish	18.9	11.9	12.5	21.7	22.9	8.1	12.7	13.3	6.4	12.1

[1] Averages of the Period 2016-2018 based on Commodity Balance Data, Agricultural Statistics Yearbook, Arab Organization for Agricultural Development.

[2] Estimates based on 30% non-food uses.

Source of data for the remaining columns: FAOSTAT, 2015.

- Although fruits are considered preventive food, and the Arab world is considered a net source of many types of fruits, average per capita consumption is estimated at 82.7 kg/year, while that recommended by the World Health Organization is 110 kg/year[21].
- According to the World Health Organization, recommended per capita consumption of red meat is 100 grams per week, equivalent to some 5.5 kg/year, whereas average per capita consumption of red meat at the level of the Arab world rises to reach 14 kg/year.
- Given the importance of fatty acids derived from seafood (Omega-3), World Health Organization recommends a daily per capita consumption of 250 milligrams, while daily per capita consumption in the Arab world ranges between 50-75 milligrams, i.e., one-quarter of the recommended amount. This means that per capita consumption of seafood and fish is much less than the amount required to supply Arab citizens with the recommended needs of fatty acids from this source.

[21] Report of the Arab Forum for Environment and Development, Arab Environment and sustainable consumption for better resource 2012.

b. From the Perspective of Natural Resources

- Food consumption pattern, hence production, is directly related to using water resources in agriculture. In this regard, the amount of water used to produce one kilogram of red meat is estimated at 16 m^3. By contrast, this quantity is estimated at 3.9 m^3 per kilogram of poultry meat, and much less for one kilogram of fish. Such facts call for more production and consumption of fish and poultry meat, and reduction of red meat consumption in order to rationalize water resources use and conserve this critically vital resource.
- One ton of sugar extracted from sugarcane requires some 2700m^3 of irrigation water, compared with 1300 m^3 to produce one ton of sugar extracted from sugar beet, which calls for exerting efforts to shift towards substituting of cane sugar consumption by beet sugar.

c. From an Environmental Perspective

- Environmental impacts of different food products vary greatly. In this regard, red meat production from beef cattle is considered the most harmful to the environment due to greenhouse gas emissions from livestock farming, which is another justification for modifying dietary patterns towards reducing red meat consumption and using meat derived of poultry and fish instead.

5.5.6.4. Goal

In light of the models and examples presented in the aforementioned justifications, the goal of developing and modifying dietary patterns may focus on the following aspects:

1. Seeking to shift towards reducing average per capita consumption of red meat in favor of more reliance on poultry and fish as sources of animal protein, not only for considerations related to environmental and natural resources, but also for considerations related to human health.
2. Shifting towards reducing consumption, thus production, of sugar extracted from sugarcane, and substituting it by sugar extracted from sugar beet, due to the large savings in the amount of water used to produce sugar.
3. Shifting towards reducing average per capita consumption of food grains, especially wheat, in favor of increasing consumption of preventive foods, either from plant sources like fruits and vegetables, or from animal sources like fish, whereby a partial shift from foodstuffs in which import dependency is high towards foodstuffs in which the Arab world enjoys high self-sufficiency rates, can be achieved.

5.5.6.5. Pillars of Work

General speaking, modifying and developing dietary patterns are matters that require relatively long periods of time, as they aim at inducing changes in the behavior and general culture related to nutrition. Also, they cannot be carried out by virtue of decisions or legislation; rather, they require indirect interventions to create conditions that stimulate the desired development and amendment within the appropriate time horizon. The following are some of the main interventions suggested:

- Raising awareness regarding the direct relationship between nutrition & dietary patterns and human health.
- Using price tools and relative prices of substitute goods to achieve the desired impact of reducing consumption of some good and stimulating the consumption of others, in line with the progress towards sustainable consumption patterns.
- Amending the implemented subsidy systems and policies, either at the level of agricultural production or at the level of some consumer goods to which any form of subsidy is directed.
- Strengthening regional and international coordination and cooperation in related fields, especially in the field of concepts, information, studies, and the ways and mechanisms adopted to shift towards sustainable consumption patterns.
- Expanding the application of labeling food packages to fresh, processed and manufactured food products, and promoting the idea that such data include information on health, environmental and resource indicators related to the product.
- Encouraging non-governmental initiatives in the field of nutrition awareness.
- Developing statistics on food commodity balances to be a more accurate tool in the field of monitoring and follow-up of food patterns and nutritional conditions.
- Encouraging studies and researches related to sustainable food consumption in general.

5.5.6.6. Projected Outcomes

Certainly, it is not possible to quantify the projected outcomes of this component due to the fact that they depend on the progress that can be achieved in developing and modifying dietary patterns. Besides, in case they can be achieved, the process will move at relatively slow rates thus will take a relatively long period of time. Nevertheless, the projected outcomes can be presented on hypothetical basis as follows:

- Each one kg reduction in per capita consumption of red meat and substitution by an equivalent amount of poultry meat at the level of the Arab world is projected to save five billion m^3 of water used. This amount would rise to about 17.5 billion m^3 in case per capita red meat consumption is cut by 25% of the current average, estimated at 14 kg. This amount of saved water will further increase in case poultry meat is substituted by fish.
- Each one kg reduction in per capita consumption of cane sugar and substitution by an equivalent amount of beet sugar at the level of the Arab world is projected save half a billion cubic meters in water used.

It is worth noting that such projected outcomes were based on the amount of water required to produce one kilogram of the mentioned food products, as shown below:

- One kilogram of red meat requires $16m^3$ of water.
- One kilogram of poultry meat requires $4m^3$ of water.
- One kilogram of cane sugar requires $2.7m^3$ of water.
- One kilogram of beet sugar requires $1.3m^3$ of water, based on FAO estimates.

In addition to the abovementioned, shifting food consumption patterns towards sustainable dietary patterns has important outcomes in terms of health conditions of the population, as well as in terms of environmental safety and reducing greenhouse gas emissions.

5.5.6.7. Major Indicators for Monitoring and Evaluation

1. Annual change in per capita share of calories from animal sources relative to total calories.
2. Annual change in per capita share of protein (in grams) from animal sources relative to total protein.
3. Annual change in per capita consumption of red meat (in kilograms) relative to the total consumption of white meat and fish.
4. Annual change in per capita consumption of beet sugar relative to total consumption of sugar, as well as the share of beet sugar produced or imported relative to total sugar production or imports.
5. Water footprint of per capita food consumption pattern (the amount of water, in m3, used in producing and providing the food basket for an individual).
6. Country participation, or non-participation, in regional and international initiatives or events related to sustainable consumption.
7. Presence or absence of governmental or private initiatives to disseminate the culture of healthy and sustainable food consumption.

5.5.7. Reducing the Risk of Pandemics, Including those Associated with the COVID-19 Pandemic, on Agriculture and Food

5.5.7.1. Pandemic Evolution and Expectations

The program's document has previously referred to Covid-19 pandemic under the section concerning developments and advancements. This part of the program's components addresses the proposed supporting interventions or reduce the negative impacts of potential risks associated with the Covid-19 pandemic, as an exceptional pandemic that has caused an unprecedented crisis at the level of world countries. Such crisis was officially announced by the World Health Organization on January 30, 2020, confirming its transformation into a global pandemic on March 11 of the same year.

At the time this document was under preparation, the number of Covid-19 cases exceeded 55 million people, and the number of deaths exceeded 1.3 million people worldwide. There are indications of a fierce rebound of the virus, the extent of which varied among announcing countries, indicating that the situation is still worrying and unstable, and that the risks of Covid-19 are still looming in the world, and the state of panic and terror from returning to the state of great closure that all countries of the world witnessed is still looming on the horizon.

As explained above in the document, impacts of the pandemic on the global economy are not expected to stabilize until the picture becomes clear about the continuity of repercussions and possible results after it is fully, not partially, contained. The International Monetary Fund estimates that the cumulative losses in global GDP during 2020-2021 as a result of this crisis could reach some $9.0 trillion, which exceeds the economies of Japan and Germany combined. The expected recovery during 2021 is only partial; because the level of economic activity is expected to remain lower than that achieved before the pandemic[22(1)].

According to the FAO[(2)], the pandemic may push an additional 130 million people worldwide into chronic hunger by the end of 2020, and is further estimated to reach around 250 million by the end of this year, hampering progress in achieving the 2030 Global Sustainable Development Goals (SDGs). It is also expected that economic stagnation resulting from the pandemic will hinder investment in alternative energy technologies.

[22] (1) International Monetary Fund (IMF), IMF blogs, The Great Shutdown, The Worst Economic Downturn Since the Great Depression, April 2020.

(2) Food and Agriculture Organization of the United Nations (FAO), The State of Food Security and Nutrition in the World. 2020

Certainly, risks associated with the Covid-19 pandemic threaten the agriculture sector, food security and nutrition in many interconnected directions, perhaps the most important of which are:

- Measures to combat the spread of the virus are disrupting global food supply chains.
- Border restrictions and closures slow harvests, destroy livelihoods and impede food transportation.
- Food loss and waste is increasing, as farmers have to resort to getting rid of perishable resources and products.
- Many people in urban centers struggle to get fresh food.
- Small farmers and their families, food workers in all sectors, and those living in commodity-dependent economies, including agricultural and food commodities, are particularly at risk.

According to the World Bank, the existing and growing threats caused by the Covid-19 pandemic are equally urgent to the crises caused by conflicts, natural disasters, climate change, pests and epidemics that are already stressing the food systems and causing food insecurity worldwide.

5.5.7.2. Goal

The goal this component aims to achieve is to identify sectoral and macro interventions that involve a set of procedures and measures at various levels, which would limit, or mitigate, the potential negative impacts of the short, long and medium-term risks and repercussions of the Covid-19 pandemic on the agricultural and food sector, thus increase the chances to achieve the proposed sustainability of the quantitative and qualitative goals and targets originally specified under the program, i.e., they are considered supporting elements for the program's implementation and contribute to improving the state of sustainable Arab food security.

5.5.7.3. Pillars of Work

a. Strengthening Arab Cooperation in the Field of Food Supply Chains

Despite the imbalances that occurred in global value chains during the high peak of the Covid-19 pandemic crisis, it has been regarded suitable, in the framework of preventive measures against the recurrence of a similar pandemic, or the occurrence of a second wave of Covid-19 pandemic, which is a possibility for which some indicators are seen on the horizon, that food supply chains be protected. It is proposed that Arab countries enter into partnerships to enhance Arab integration in creating food production networks that are closer to the final consumers of products in the

Arab region, especially since there are existing cooperation and integration frameworks within the general framework of the Joint Arab Action system in most economic sectors, including the agriculture and food sectors.

Naturally, this approach requires a high-level political commitment and will, and effective, highly coordinated implementation mechanisms, in a manner that enhances collective or joint resilience at the level of regions within the Arab or regional context; maintains social and economic stability; and protects job opportunities and livelihoods of the Arab world's population.

b. Strengthening International Cooperation to keep Active the International Trade in Food

During the year 2020, production of staple crops has not been affected by the outbreak of the Covid-19 pandemic. According to estimates published by the Food and Agriculture Organization of the United Nations, there is enough food for everyone around the world. While exporting countries are required to continue supply of goods to the global market, importing countries are also required to reduce trade barriers to facilitate the free flow of trade in food commodities, even in light of the logistical challenges imposed by the pandemic. This approach is considered an entry point for Arab countries to increase their import capacities of these commodities to raise the level of buffer stocks from the perspective of global/regional/Arab solidarity. At the same time, this is considered the beginning of coordinated Arab/regional policies to build up national food stocks that take into account the possibilities and scenes created by the pandemic in 2020.

c. Providing Protection and Support for Small Farmers and Rural Small & Medium Enterprises

Impacts posed by the Covid-19 pandemic on this broad sector in most Arab countries have been multiple, on top of which are disruptions in the flow of basic inputs (production inputs) and final products. However, Arab governments managed to implement a number of temporary support measures to overcome this crisis with minimum possible damage.

Lessons learned indicate the importance of transforming such type of intervention into preventive and precautionary structural measures to facilitate the adaptation of vulnerable groups to new work patterns by creating a digital information infrastructure and providing the support necessary to create new markets and arrangements in light of instability that occurs in the value chains when similar conditions recur.

d. Ensuring Stability of Food Supply

Restrictions of various degrees that Arab countries imposed to curb the spread of Covid-19 resulted in impairing the mobility of inputs and outputs in the food and agriculture systems. Accordingly, ensuring the continuity of agricultural activities and avoiding crisis at the level of supply chains in the foreseeable future requires adopting national and Arab level policies and measures to supports the following future directions:

1. Giving priority to domestic food products.
2. Ensuring that farmers and producers in remote areas have access to a certain level of income, whether farm or non-farm income, in addition to supporting their access to necessary financing.
3. Achieving the highest possible levels of self-sufficiency at the level of food supplies, whether at the Arab, regional or national level.
4. Maintaining price stability by various means, including undesirable government interventions in the markets and pricing.
5. Establishing decentralized distribution networks for food commodities and inputs; besides establishing storage systems in different regions, especially in remote areas, to meet the country's population demand for basic food commodities and basic inputs for plant, animal and fish production.
6. Devoting attention to promoting agricultural processing/manufacturing and food preservation and storage, which helps limit food products' vulnerability to perishability and extends their validity for human use.
7. Expanding the scope and spread of in-field sorting, grading and packaging units, and the proper methods of collecting and the transportation of outputs from production sites, especially for perishable goods

e. Protecting the Nutritional Needs of Vulnerable Groups

Vulnerable groups include the rural poor, small farmers, pastoralists, fishermen and craftsmen engaged in activities related to agriculture, pastoralism and hunting. Protection policies and programs begin with accurately determining the size of each group in the society in order to determine the percentage of those who need assistance in each country, and the ways to reach them. Thereafter, budgetary resources should be reallocated and adjusted in a manner commensurate with the procedure for dealing with emergency food insecurity situations, like the recurring of pandemics, catastrophic conditions, or similar conditions. Such databases and information facilitate taking the necessary and ordinary precautionary and preventive measures and procedures.

It is possible to implement a number of social safety net programs of various forms currently applied by Arab countries, but what is required in this context are networks of an emergency nature, which require exceptional financial resources that some countries' budgets might not bear. This situation calls for Arab cooperation and integration to protect the nutritional needs of these groups all over the Arab world. In this context, the Director-General of the Economic and Social Commission for Western Asia (ESCWA) called for establishing a regional social solidarity fund to support the least developed and Arab countries at-risk [23(1)] in the event of disease and other pandemics. The current program emphasizes the importance of crystallizing this idea and preparing a project document regarding the proposed fund in coordination between ESCWA and concerned parties of the General Secretariat of the League of Arab States, including the Arab Organization for Agricultural Development.

It should be noted that the Arab Organization for Agricultural Development has previously prepared the "Arab Food Program". In light of the threats and dangers of the outbreak of Covid-19 that still exist until the preparation of this document; it might be required to revive this program as an appropriate framework for dealing with such pandemic, and other pandemics, from an Arab perspective.

f. Guarantee Covering Official External Needs of Merchandise Imports

The time period during which a country can officially cover its external needs of merchandise imports can be used as an indicator of the countries' ability to secure its needs of merchandise imports during financially secure periods.

Food commodities represent an important part of the Arab region's merchandise imports, as they accounted for 18.8-20.8% of Arab countries' total merchandise imports over the period 2014-2018, estimated at US$7603.4 billion, on average. Of course, overall stability necessarily involves partial stability, meaning that securing food commodities by importing them from abroad is considered safe and stable whenever the value of that indicator increases, expressed in months, as illustrated in Table No. (9) in the Annex.

Coverage rate indicator for all Arab countries scored 17.6 months, on average. At the level of individual Arab countries, great discrepancies have been observed, in addition to the wide difference between the upper limit (68.3 months) and the lower limit (1.0 months), as averages of the mentioned period. It has also been observed that this indicator is somewhat low for the least developed Arab countries.

[23(1)] A Statement declared by the Under-Secretary-General of the United Nations and the Executive Secretary of ESCWA on “Urgent Regional Response to Mitigating the Repercussions of the Global Coronavirus Epidemic”, Beirut/Lebanon, March 25, 2020.

One of the lessons learned from repercussions of the Covid-19 pandemic is the necessity of providing security and stability in countries' capabilities to secure their populations' needs of food commodities, especially those imported from abroad. This is because the imbalances that occurred in countries' economies and resources were due to the fact that major sectors were greatly affected by the pandemic, such as crude oil, which prices have fallen; and tourism, which revenues have stopped; and industry, which production has disrupted, etc. Preventive measures and precaution against the extension of such pandemics raise countries' keenness to secure official external sources commensurate with their import needs and to raise the value of the coverage rate index.

The current sustainable program suggests that the least developed Arab countries, and other countries with relatively short coverage periods, work hard to raise the value of the coverage rate index successively in a systematic manner during normal economic conditions, which can be done by availing the times when there are increases in the volume of official external reserves, or reducing commodity imports through increasing self-sufficiency rate by increasing domestic production thus contribution to the total supply of goods and food products.

5.5.8. The Component of Mitigating Impacts Associated with Climate Change Risks on Agriculture and Food Security

5.5.8.1. Threats of Climate Changes to Agriculture and Food Security

1. The Arab region is expected to witness a rise in temperature faster than the global average, with a global temperature rise of 4 degrees Celsius by the end of this century[24(1)].
2. Droughts are becoming more frequent and severe, threatening to cause a 20% reduction in agricultural production by 2080.
3. Climate change is expected to cause a 20% reduction in renewable water in the region by 2030, and to lead to a change in agricultural ranges.

[24] (1) Temperature on the earth's surface has increased by 0.89 degrees Celsius compared to the pre-industrial period. This rise should not exceed two degrees Celsius in order to avoid climate-related disasters. The negative impacts of rising temperatures have become well known, especially on agricultural development, where agriculture suffers significant losses that endanger food security, threatening that efforts exerted over decades might be lost, and the cost of responding to climate repercussions will become unbearable. Target 13 of the Global Sustainable Development Goals (SDGs) seeks to mobilize $100 billion annually by 2030 to meet the needs of developing countries to scale up climate change mitigation and adaptation measures. Source: Global Sustainable Development Goals Document.

4. Climate-induced forced displacement, whether due to drought or rising sea levels, poses a particular threat, where nearly 5% of the Arab region's populations live in coastal areas that are expected to drop by 5% below sea level.
5. One of the most important threats to Arab food security is the loss of fertile agricultural land areas.
6. Relative change in the types and components of fisheries.
7. A higher food imports bill due to lower plant, animal and fish production.
8. A technological crisis is anticipated in case appropriate investments are not made in the field of developing agricultural technological regarding adaptation to climate changes.

5.5.8.2. Factors Affecting Adaptation to Climate Change Risks

- Availability of basic information, including meteorological data, land use, distribution of crops and livestock, especially types of cultivated crops and their distribution over different regions, inside countries, and at the level of the Arab world, which all require highly efficient and adequate statistical and information institutions.
- Substituting current varieties (according to the conditions of each country), and providing information on weather conditions, at high degree of accuracy, for a number of months that cover the longest agricultural seasons, which helps producers take decisions regarding the appropriate crop varieties to cultivate, or the type of animal feed that is consistent with the expected changes.
- Scientific research and training programs targeting adaptation to the expected changes, which can help in building capacities in the field of selecting the appropriate plant varieties that can use CO_2 more efficiently.
- Formulating agricultural policies that can help identify and distribute plant varieties based on the expected climate changes, as well as the agricultural policies that can help organize the internal migration of farmers, or even rehabilitating and changing their lifestyle.
- Devoting attention to productivity levels small farmers achieve, as they are among the sectors that have the ability to adapt, which contributes to achieving food security and developing rural communities.
- Devoting attention to health conditions, education and women is one of the measures that activate real adapting to climate changes.

- Reducing carbon dioxide emissions from the agricultural sector, as agricultural activities contribution to greenhouse gases is estimated at 14%, most of which are emitted from animal production and extensive use of nitrogenous fertilizers, as well as the unsafe handling of animal waste.
- Improving and enhancing the performance of extension agencies so that farmers and producers can learn how to adapt to climate changes, as there are many traditional technologies which small farms can use to distribute the expected risks.

5.5.8.3. Main Pillars of Work

Main pillars focus on a set of direct and indirect governmental interventions that can help mitigate or reduce the negative impacts of tangible and expected climate changes, the most important of which include:

1. Expanding the Application of Climate-smart Farming Practices and Expanding Forests

These practices help farmers increase crop productivity, thus resilience to the impacts of climate change, such as drought. At the same time, they act as carbon sinks that help reduce emissions. Forests are also useful reservoirs for carbon capture and storage in soil, trees and leaves.

2. Encouraging and Expanding the Use of Renewable Energy

Encouraging and expanding the use of renewable energy can be done through those programs and policies adopted by Arab countries in various sectors that use energy, including the agricultural sector, which promote the "Sustainable Energy for All Initiative" supported by the World Bank Group. This initiative seeks to achieve three objectives by 2030, these are:

a. Universal access to electricity and modern cooking solutions

b. Double the energy efficiency improvement rate

c. Double the share of renewable energy in the global energy mix

The current sustainable program is concerned with the policies and programs that support this initiative in the targeted mega projects, whether in the framework of the first component that targets projects; or through expanding the utilization of arable lands in vast areas using modern technologies, including renewable energy; or in the framework of the fourth component that targets joint and national agricultural investment projects related to, or based on, the outcomes of this program.

3. Institutional Development of Agricultural Climate Information Systems

This pillar is considered of the most important tools for reducing the impacts of climate change on the agricultural sector and food security. Naturally, the hoped for development involves developing the existing institutions to keep pace with the expected changes in climate conditions; adopting risk monitoring and early warning systems; and establishing an Arab coordination mechanism among the existing institutional frameworks in Arab countries, whether committees, public or central administrations, etc., to improve performance at the regional (Arab) level in the field of adaptation to climate changes, with special focus on the aspects of agriculture and sustainable food security in the mandate of this mechanism.

4. Steering Research Activities towards Adaptation to Climate Change

Under this pillar, concerned institutions in Arab countries should seek to adopt national and joint sectoral research policies by virtue of which specialized national research centers are established, and laboratory & field research programs and projects are prepared for future adaptation of crops, animal, fish to climatic changes, including the development of drought and heat tolerant varieties; technologies and good agricultural practices appropriate for dry agriculture; modern irrigation methods; seed production and multiplication, etc. Regional and international centers can play a supportive and coordinating role, technically, financially and institutionally.

5. Promoting Climate Innovations

There is a dire need to strengthen and activate the role of innovation units, agribusiness incubators and partnerships in the organization and countries. One of the most important issues to focus on is motivating investors' participation in transforming innovations into real projects that serve the agricultural sector; supporting new business projects that aim to transform ideas related to clean & modern technology, conservation agriculture, and good agricultural practices into opportunities for economic growth; in addition to attracting and mobilizing financial resources from various sources to finance activities related to limiting the negative impacts of climate changes on agricultural production in the foreseeable future, which all contribute to supporting and enhancing sustainable food security production and consumption.

5.5.8.4. Private Sector's Role

Private sector has an essential role to play in facing climate change, as the levels of investment set by the 21st session of the Conference of the Parties of the United Nations Framework Convention on Climate Change cannot be met through

international institutions or country budgets alone, especially in developing countries, including Arab countries.

Climate innovation centers, including the one proposed under this program, represent an important platform for the idea of establishing a dialogue between public and private sectors to integrate the developmental roles that have already started in developing countries. By creating structured public-private dialogue forums that bring together business leaders, policy makers, and civil society representatives, governments and the private sector can be helped to work in mutually beneficial ways and collaborate to identify solutions to climate challenges and develop applicable actionable recommendations.

6. Projected Aggregate Outcomes of the Program

6.1. Projected Outcomes from the First-level Component

The program comprises the following three main components

Component 1: Expanding the utilization of arable land resources in rainfed areas.

Component II: Enhancing productivity growth rates in the current plant production activities.

Component III: Expansion in irrigated agriculture through modernizing field irrigation systems**.**

Aggregately, the three components are projected to result in direct quantitative outcomes at the level of horizontal agricultural expansion in both the rainfed and irrigated agricultural sectors, expressed in the form of additional new areas; and at the level of vertical expansions in existing rainfed and irrigated crops, expressed in the form of increase in productivity levels. Such outcomes include:

1. Adding new areas to the rainfed agricultural sector, estimated to reach a total of 1.02 million hectares by 2025, to rise to 22.1 million hectares by 2030.
2. Adding new areas to the irrigated agricultural sector, to be reclaimed and cultivated using the amounts of water saved through developing field irrigation systems in the existing irrigated areas. The increase is estimated to reach a total of 247 thousand hectares by 2025, to rise to 864 thousand hectares by 2030.

3. Developing field irrigation systems in the irrigated areas still applying traditional irrigation systems (surface irrigation/flood irrigation), an area that is estimated to reach 524 thousand hectares by 2025, to rise to 1.83 million hectares by 2030. Developing irrigation systems in these areas is projected to result in saving an amount of irrigation water estimated at about 2.6 billion cubic meters in 2025, to rise to 9.1 billion cubic meters in 2030.

4. Achieving a vertical increase in average productivity per hectare of the main food-gap crops that is estimated to reach 13% for irrigated crops by 2025, to rise to 28% by 2030, relative to productivity levels in the base period (2016-2018).

   As for rainfed crops, increase in productivity varies between cereal crops and oilseed crops. For cereal crops, the increase is projected to reach 43.5% by 2025, and to reach twice productivity in the base period by 2030. As for oilseeds, relatively better outcomes are projected, where increase in productivity is projected to reach 61% by 2029, to rise to a high of 159% by 2030.

5. Developments in both area and productivity are projected to result in outcomes related to producing additional quantities of the main food-gap crops (cereals, oilseeds, sugar crops). For cereal crops, the increase is projected to reach 6.022 million tons by 2025, to rise to 63.516 million tons by 2030. For oilseed crops, the increase is projected to reach 1.79 million tons by 2025, to rise to 15.37 million tons by 2030. As for sugar crops, the increase is projected to reach 18.3 million tons by 2025, to rise to 73.2 million tons by 2030.

6. Aggregate outcomes of the three main components indicate improvement in self-sufficiency rate in the groups of main crops, from the perspective of the food gap, where self-sufficiency in cereal crops is projected to rise from 41.93% in the base period (2015-2017) to 39.75% by 2025, to rise to 70.27% by 2030. Self-sufficiency in vegetable oils is projected to rise from 30.90% in the base period to 33.10% by 2025, to rise to 71.80% by 2030. As for sugar (in the form of refined sugar) self-sufficiency is projected to rise from 30.25% in the base period to 39.3% by 2025, to rise to 74.43% by 2030. The following tables present the projected increases in production volume and self-sufficiency rates regarding the mentioned food groups.

Projected total supply and self-sufficiency rates in major high-food-deficit groups by 2025 and 2030

Attributes	Cereals Group	Vegetable Oils Group	Sugar Group (Refined Sugar)(1)
Base Period 2015-2017			
Production	54.730	2507	4154.6
Total Supply	129.64	7854	13732.5
Self-sufficiency (%)	41.93	31.9	30.25
Projections (2025)			
Increase in Production	6022	538	2267
Total Production	60392	3045	6422
Required Total Supply(2)	151940	9205	16095
Self-sufficiency (%)	39.75	33.1	39.9
Projections (2030)			
Increase in Production	63516	4746.6	9071
Total Production	117886	7300	13226
Required Total Supply(3)	16775	10163	17770
Self-sufficiency (%)	70.27	71.8	74.43

(1) Projected quantities of refined sugar were estimated based on extraction rate of 11% of total production as a general average for cane and beet sugar summed together.

(2) Total supply requirements are calculated based on equivalent rate of increase in population until 2025, estimated at 17.2% of the base period figures.

(3) Total supply requirements are calculated based on equivalent rate of increase in population until 2030, estimated at 29.4% of the base period figures.

Increase in the productivities of main gap crops at the level of the program and basic components(1)

Food Groups and underlying Crops	Increase in Production by 2025 (1000 Tons)				Increase in Production by 2030 (1000 Tons)			
	First Component	Second Component	Third Component	Total	First Component	Second Component	Third Component	Total
Wheat	-	3087	-	3087	12200	14404	-	26604
Barley	-	936	-	936	5779	4556	-	10335
Maize	-	604	-	604	12607	2608	-	15215
Sorghum	-	1041	-	1041	4890	4964	-	9854
Rice	-	354	-	354	-	1508	-	1508
Total Cereals		6022	-	6022	35476	28040	-	63516
Peanuts	-	418	-	418	-	1664	-	1664
Sesame	-	178	-	178	-	742	-	742
Sunflower	-	21	-	21	2762	78	-	2840
Olives	40	1137	-	1177	1610	4732	-	6342
Soybeans	-	-	-	-	3779	-	-	3779
Total Oilseeds	40	1754	-	1794	8151	7216	-	15367
Sugarcane	-	1466	9530	10996	——	6246	37735	43981
Sugar beet	-	1016	6282	7298	———	4330	24876	29206
Total Sugar Crops	-	2482	15812	18294	——	10576	62611	73187

(1) **Source:** Projected outcomes for each of the three main components under the program (First, Second, Third).

6.2. Projected Outcomes from the Second-level Component

Outcomes projected from the second-level component mainly depend on the results to be achieved under the fourth component, which targets agricultural, food and manufacturing/processing investment projects.

Of course, such outcomes are reflections of the goals and outcomes of the three main components mentioned above, on the basis that investment projects are directly linked to, and integrated with, the agricultural projects, as they are investment projects in the fields of agri-food production; integrated agro-industrial parks; services, marketing and processing projects dependent on agricultural products; and feeding commercial industrial projects to supply agricultural production inputs and requirements, all of which are intertwined and integrated in the framework of the food supply chain systems, the reason why interdependence between them is established. Therefore, estimating the projected outcomes in the field of investment projects is, in fact, with broad and unlimited prospects, although their magnitude, numbers and scale depends on the actual achievements from the activities and projects under the three main components.

Besides the fact that investment projects themselves represent one of the important and direct outcomes of the program, they also hold a set of impacts and implications that are not less important from the perspective of agricultural development and joint action at the level of the Arab world. These impacts and implications have already been referred to under the fourth component concerning investment projects. Major impacts can be summarized as follows:

1. Enhancing and promoting Intra-Arab Trade Exchange in the framework of the Arab Free Trade Area Agreement.
2. Enhancing and activating Arab investment partnerships in agricultural and food projects, and related and integrated services and manufacturing/processing projects.
3. Enhancing developmental partnerships between public and private sectors in Arab countries in the areas that serve the purposes of agricultural development and improving the state of food security.
4. Advancing and boosting the levels of contribution of various Arab entities and institutions in the technical, financing, regulatory and supervisory fields, as well as the levels of coordination and cooperation in tackling the challenges facing food production development and improving the state of food security at the general level of the Arab world

5. Developing and boosting the levels of coordination and integration among various Arab entities, activities and stages forming up food supply chains, whether at the level of Arab countries, or at the common Arab level.

6.3. Projected Outcomes from the Third-level Component

Third-level component include:

- The fifth component targeting cutting food loss and waste,
- The sixth component targeting shifting towards more sustainable consumption patterns.
- The seventh component targeting reduction of the risks associated with COVID-19 pandemic on agriculture and food.

The combined outcomes of these components, which are based on achievements made in each component, are considered complementary and enhancing to the state of food security in the Arab world in general. However, the importance of these components and outcomes achieved lies in, besides` improving the state of food security, in that they:

- Contribute to achieving the requirements and commitments made by Arab countries to comply with the Global Sustainable Development Goals (SDGs) until 2030.
- Contribute to improving the nutritional conditions and food consumption patterns of the Arab world's population by shifting towards the healthy dietary patterns recommended by the World Health Organization.
- Contribute to improving aspects related to environmental safety and reducing greenhouse gas emissions.
- Contribute to raising the efficiency of agricultural resources' use and conservation, especially with regard to water resources.
- Contribute to reducing fluctuations in the state of food security and food supply caused by crises and potential risks, whether fluctuations in international food markets, impacts of climate change, or the risks of pandemics similar to the Covid-19 pandemic.

  Among the outcomes of these components (previously listed under each component) is: Reducing the quantities and percentages of food loss and waste, which is projected to save quantities of food products that could reach some 11.6 million tons by 2030. Such quantity is sufficient to provide food for nearly 15.4 million people in case the targeted annual percent of reduction (i.e., 2.5%) is

actually achieved, based on which the cumulative reduction rate will reach around 25% by 2030.

- Improve the nutritional state of Arab world's population by shifting towards sustainable consumption patterns, in line with the global trends in this regard, which will help achieve significant positive outcomes in terms of population health, the environment and resource use rationalization. Such trends promote reducing red meat consumption while increasing reliance on other sources of animal protein, especially white meat and fish, as well as reducing cane sugar consumption in favor of increasing reliance on beet sugar instead.
- Assist governments and the private sector to work in mutually beneficial and collaborative ways to find solutions to challenges associated with climate change, and to develop actionable and applicable recommendations to address them.
- Design laboratory and field research programs and projects targeting adaptation of crops, animals, fish, and the agriculture in general, to future climatic changes, including the development of drought and heat-tolerant varieties, as well as developing good agricultural technologies and practices suitable for dry farming, modern irrigation systems, seed production, etc.
- Establish partnerships between Arab countries to promote Arab integration in combating repercussions of the Covid-19 pandemic through creating food production networks that are closer to the final consumers in the Arab region, especially since there are existing cooperation and integration frameworks in most economic sectors within the framework of the Joint Arab Economic Action, including the agri-food sector. Such partnerships would enhance the collective, or joint, resilience ability at the level of regions in both the Arab and the regional context, and in the same time ensures social and economic stability, and protects job opportunities and livelihoods of the Arab world's population.
- Ensure the continuity of agricultural activities to evade crisis in the food supply chains in the foreseeable future, and adopt national and Arab policies and measures that support future directions to adapt to the recurrence of the Covid-19 pandemic.
- Enhance free movement of inputs and outputs related to food and agriculture; ensure the continuity of agricultural activities to avoid any sort of crisis at the level of food supply chains in the foreseeable future; and adopt national and Arab policies and measures to enable farmers and producers in remote areas obtain certain levels of incomes, either from farm or non-farm sources, as well as providing support for them to access the necessary finance.

6.4. Indirect Developmental Outcomes of the Program

In addition to direct outcomes of the program's various components, there exist other aspects of great importance for indirect general impacts and outcomes expected at the level of each Arab country, and, to a greater extent, the aggregate level of the Arab world. These impacts and outcomes can be viewed and valued based on several aspects, the most important of which are represented in:

- The additional large agricultural areas resulting from the program.
- The large increases in the volumes agricultural products.
- The expected large numbers of large-scale investment projects that can be established in various fields of related and integrated activities throughout various links of the food supply chains.
- The volume of large investments, perhaps unprecedented, to be pumped, employed and circulated in the Arab economy, and the national economies.
- Mobilizing the technical, research and executive staffs to contribute to the program's various components, elements and fields.
- The huge number of farm households the program is expected to accommodate under various components:

  In light of the abovementioned aspects, it is possible to visualize and estimate the indirect developmental outcomes and impacts to be generated by implementing the program. Such outcomes and impacts are reflected in multiple aspects and areas, the most important of which that can be referred as follows:

  - Increasing self-reliance, Arab and national, in providing own requirements of basic food products (i.e., increasing self-sufficiency rate), which leads to strengthening Arab national security on the one hand, and reducing exposure to potential risks to Arab food security as a result of unexpected international incidents and fluctuations, on the other hand.
  - Increasing contribution of the integrated agricultural and food sector in promoting economic growth rates at the Arab and national levels, and increasing its contribution to gross domestic product on both levels.
  - Raising the standards of living of a broad sector of the rural and agricultural population thus reducing poverty levels among this sector, especially those with small and medium-scale farm holdings.
  - Creating tens of millions of new job opportunities, whether from direct agricultural activities, or various services, manufacturing, commercial and marketing activities at all stages of the food supply chains. In light of the approximate estimates regarding the direct and indirect labor needs, the size of

such opportunities is projected to reach around 2.5 workers per additional hectare of irrigated agriculture, around 1.5 workers per additional hectare of rainfed agriculture, and around one worker, at least, per additional ton of agricultural production.

- Making a qualitative leap in the direction of developing agricultural systems, and farm management systems, especially in the rainfed sector.
- Improving public utilities and services associated with the various activities and projects of the program, especially in rural areas.
- Creating new agricultural societies/settlements, and expanding the spread of population over wider land areas.
- Reviving and strengthening the activities of agricultural research centers, agricultural extension institutions and other governmental and non-governmental institutions engaged in the field of agricultural development.

7. Program's Executive Requirements

Implementation of this comprehensive program requires a set of multifaceted measures and procedures at various levels. Executive requirements can be classified into four groups, the first of which is concerned with finance and financial aspects, the second with institutional aspects, the third with organizational aspects, and the fourth with coordination aspects, at the national, Arab, regional and international levels (if necessary) in each aspect.

7.1. Finance Measures/Resources

The principle of solidarity is one of the main pillars upon which the program's philosophy is based. Perhaps the finance and financial aspects are among the first aspects to which this principle applies, especially when it relates to implementation at the joint Arab level. At the country level, which primarily serves an issue, or concern, related to a particular country, finance measures primarily fall on the shoulders of this country, whether from its own resources, or through bilateral financial arrangements with potential sources that it deems appropriate, including aid or grants supporting the commitment to implement this program. The proposed arrangements at the country level start by focusing on giving the agricultural sector the importance commensurate with its contribution to gross domestic product, especially in main agricultural countries, whether in terms of investment, capital formation, financing or investment flows, where existing indicators emphasize the fact that allocating fair shares to this sector will contribute, to an almost sufficient degree, to improving the level of performance in sustainable agricultural development rates and improving the state of food security.

7.1.1. Relative Importance of Agricultural Product

Average value of Arab Agricultural Product for the period 2015-2018 amounted to US$134.2 billion[25(1)], accounting for 5.37% of the average value of Arab Gross Domestic Product (GDP). Such importance varies between countries, ranging from 53% to less than 1%.

The following Table classifies Arab countries based on the relative importance of contribution to Arab agricultural product. It also presents the relative importance of agricultural sector's contribution to GDP in each country:

Category(1) in terms of Agricultural Sector's Importance	Country	Value of Agricultural Product (US$ Billion)	Contribution to Total Arab Agricultural Product (%)	Agricultural Product's Contribution to Country's GDP (%)
(First) Approximately US$ 10 Billion	Egypt	29.62	22.07	11.47
	Sudan	22.99	17.13	26.42
	Algeria	19.90	14.83	11.93
	Saudi Arabia	17.33	12.91	2.50
	Morocco	13.30	9.91	12.31
(Second) More than US$ 1Billion	Iraq*	5.83	4.34	3.17
	Yemen*	4.74	3.53	18.54
	Tunisia*	4.03	3.00	9.79
	Syria*	3.16	2.35	20.61
	UAE	2.86	2.13	0.76
	Jordan	2.16	1.61	5.39
	Sultanate of Oman	1.73	1.29	2.24
	Lebanon	1.62	1.21	3.08
	Mauritania*	1.44	1.07	20.92
	Palestine	1.14	0.85	7.35
(Third) Less than US$ 1Billion	Somalia*	0.78	0.58	52.88
	Kuwait	0.62	0.46	0.51
	Comoros*	0.32	0.24	30.52
	Qatar	0.30	0.22	0.18
	Libya	0.18	0.13	0.80
	Bahrain	0.10	0.07	0.31
	Djibouti	0.04	0.03	1.29
Arab Countries' Total		134.19	100	5.37

*Is considered among the main agricultural countries based on the criterion of "importance of Agricultural Product's contribution to Gross Domestic Product in these countries"

Source: Calculated using Data Collected from UNCTADSTAT

[25(1)] Agriculture, Fisheries, and Hunting & Forestry Sector

7.1.2. Measures Taken at the National Level

7.1.2.1. Increasing Agricultural Sector's Share of Public Budget Allocations

Financial arrangements at the country level begin with proposing that countries review their policies regarding sectoral finance allocations in their public budgets so that the agricultural sector receives a share commensurate with its contribution to Gross Domestic Product, especially in main agricultural countries, which are the countries under the first category, and some Arab countries under the second and third categories(1). Such proposal focuses on three main items:

1. Allocations from Gross fixed capital formation.
2. Allocations from development resources' flows.
3. Allocations from total credit.

Tables (10) and (11) in the Annex present agricultural sector's share of each of the abovementioned three items, in addition to the Agriculture Orientation Index (AOI)[26(2)], defined as the Agriculture share of Government Expenditure, divided by the Agriculture value added share of Gross Domestic Product (GDP). The reference value for AOI is 1. The following are the most important facts that can be inferred based on the real situation of such allocations:

First: Gross Fixed Capital Formation in Agriculture

It can be noted that gross fixed capital formation in the agricultural sector in all Arab countries (listed under various categories in the table above) is less than its contribution to GDP, albeit at varying degrees as clear from the computed AOI values, during the years 2010, 2013, 2016, as follows:

- AOI does not exceed 0.50 (by measurement) in all Arab countries classified as major agricultural countries, except for Tunisia, where it ranges between 0.79 and 0.90.
- AOI is low in important agricultural countries, despite its tending to improve during some years of the mentioned period, like the cases of Algeria, Egypt, Iraq, and the Sultanate of Oman, where it ranges between 0.06 and 0.37.
- The high share of the agricultural sector in total fixed capital formation in main agricultural countries, and countries with low GDP (least developed). This seems

[26(2)] Agriculture Orientation Index (AOI)

(1) Concerns Domestic Product's ccontribution to GDP of Arab oil countries, such as Saudi Arabia and Iraq, despite their large contribution to agricultural product..

clear in the cases of Somalia, Sudan, Comoros, Syria and Yemen. However, in all countries, this share is lower than agricultural sector's contribution to this product.

Second: Development Flows to the Agricultural Sector

There is a limited number of Arab countries in which development flows disbursed to the agricultural sector is relatively high, namely Morocco, Sudan, Egypt and Tunisia, all of which are agricultural countries. In 2016, Sudan received more than 21% of the total development flows to the agricultural sector. However, agricultural sector's share did not exceed its contribution to GDP at maximum value. Referring to AOI values, the following can be concluded:

- Agricultural sector's share of development flows is less than its share in capital formation in general, and is less than the values of this indicator.
- With the exception of Morocco as an agricultural country, the value of AOI does not exceed 0.50.
- The value of AOI has improved in some countries, including less developed countries such as Djibouti and Sudan, in addition to Egypt, Palestine and Morocco, indicating a general orientation towards developing the agricultural sector, which may help achieve the objectives of the sustainable program.

Third: Agricultural Sector's Share of Total Credit

Agricultural Sector's share of credit disbursed to economic sectors appears to be very low, compared to capital formation and development flows, where it did not exceed 18% in all countries during the referred to three years. Sudan is the only country that achieves a distinct share, in addition to Syria. This is reflected on the value of AOI as follows:

- Only in Tunisia, the value of this index did not exceed 0.5 along the entire referred to period, and in Sudan during 2016.
- Credit index is the considered the lowest compared to the previous two indices in all countries during the three years.
- There is a high number of countries in which the agricultural sector does not receive credit, or data regarding credit allocated to the sector are not available, either totally, or for some years.

Such results confirm the fact that adopting supportive policies to move towards improving the value AOI to get close to 1, as much as possible, especially in major agricultural countries, by allocating a specific source out of the local national financial resources to provide the finance/funds required for this program. This

source, by nature, should meet the conditions of sustainability and stability due to the fact that it depends on the countries' own resources.

7.1.2.2. Developing the Capacities of Local Financing Resources

In addition to developing some quantitative resources to increase governmental financial allocations for sustainable agricultural development, the proposed local measures also include a package of qualitative procedures that support national credit and financing capacities to meet the needs of the agricultural sector, and create a developmental investment climate at the macro level, as well as at the farm level. This includes:

- Adopting preferential credit and financing policies for small farmers, breeders and fishermen that address the issues of soft loans, interest rates and collaterals, especially for farmers of the rainfed sector.
- Implementing policies and procedures to improve the investment climate in main agricultural countries, and providing adequate facilities and privileges for investing in mega agricultural projects in those countries, either for the local private sector, or the joint Arab investors.
- Expanding the scope of financial inclusion policies and measures aimed at providing financial and banking services to the groups that are not financially included such as rural residents and the youth (male and female) working in agricultural activities, or activities related to, or based on agriculture, by strengthening the infrastructure of financial inclusion.
- Raising the share of credit allocated to small and micro agricultural projects to appropriate levels, in line with the size and rate of spread of such projects, in the framework of "Responsible Investment Strategies", and devoting attention to microfinance in the agricultural, animal and fishery fields.
- Expanding the family banking mechanism, specialized in microfinance. Sudan has a pioneering experience in this field, covering the agricultural plant and animal fields, which other countries can use as a guide.
- Performing institutional reform of national sources of financing by improving the efficiency of performance; restructuring (if needed) and developing systems and regulations in a way that supports the approach of providing financial resources for agricultural financing and credit in the main Arab agricultural countries, thus the financing needs of the sustainable program.
- Supporting the resources of the existing development financial institutions at all levels, and enhancing the role of national agricultural financial institutions of all names in the Arab countries.

- Seeking to provide additional sources of stable funding to help provide an appropriate level of contribution to cover the future needs of agricultural financing for the sustainable program and associated projects in various fields.
- Creating credit lines in agricultural financial institutions and national commercial banks to contribute to providing the financial resources necessary for expansion in the rainfed sector to achieve the program's objectives, and to grant preferential terms and privileges to the private sector and investors in the areas of expansions in services and production, in line with the framework policies and strategic orientations to achieve sustainable development in the program's countries of implementation.
- Expanding the dissemination of services offered by the agricultural financing institutions in the Arab countries through all stages of production, processing/manufacturing, marketing, supply, intermediaries, buyers, etc., in a way that enables the combination of financial services and marketing activities, and supports the existing relationship between different players in the supply chains of goods and products. It should be noted that establishing branches of these institutions, or mobile units in the places where service seekers are located, contributes to expanding the scope of such services.

7.1.3. Measures at the Arab and Joint Levels

7.1.3.1. Coordination Group Institutions

National, regional and international trusts and funding institutions contribute to providing development aid to Arab countries in accordance with the frameworks determined by their laws and regulations, and in the areas which priorities are determined by the policies of such bodies in coordination and agreement with the beneficiary countries.

In order to coordinate Arab efforts in the fields of financing, and to maximize the effectiveness and benefit from the financial resources available for these institutions, they have jointly formed the Coordination Group, which includes ten member institutions, including four national institutions. These are:

1. Kuwait Fund for Arab Economic Development.
2. Saudi Fund for Development.
3. Abu Dhabi Fund for Development.
4. Qatar Fund for Development.

It also includes six regional institutions, namely:

1. The Arab Fund for Economic & Social Development.
2. Islamic Development Bank Group.
3. The OPEC Fund for International Development (OFID).
4. Arab Bank for Economic Development in Africa.
5. The Arab Gulf Program for Development (AGFUND)- to support the United Nations development agencies.
6. Arab Monetary Fund (AMF).

These institutions provide Arab development aid through multiple and different channels, the most important of which is bilateral governmental aid, and Arab countries contributions through international aid donors, in addition to aid provided by national and regional, charitable, and non-governmental organizations.

At the bilateral level, the bulk of Arab development aid is provided by the countries of the Cooperation Council for the Arab States of the Gulf, also known as the Gulf Cooperation Council (GCC). Bilateral governmental aid is either directed to support development projects, or granted as direct support to the beneficiary country's treasury, through which development projects and programs are agreed upon. On the other hand, this aid provides support to countries to implement their development plans and achieve their sustainable development goals, while respecting their independence in achieving their goals, arranging their development priorities and choosing their projects[27(1)]. National development funds are considered the main channel through which the governments of Donor Arab countries provide facilitated bilateral aid to the beneficiary countries via Arab regional bodies and institutions who are members of the Coordination Group.

There exist two additional institutions at the Regional Arab level, these are:

A. **The Arab Authority for Agricultural Investment and Development (AAAID),** which is the only specialized Arab institution that deals with financing and investment in the agricultural fields. It is one the institutions which Arab governments and Arab development funds contribute to its capital, with the aim of

[27](1) Arab Fund for Economic and Social Development, Unified Arab Economic Report, Arab Development Aid, 2019.

carrying out an investment or service activity that would enhance Arab agricultural cohesion and integration.

B. **The Arab Investment and Export Credit Guarantee Corporation (Dhaman),** which provides political and commercial risk insurance to Arab investors and exporters in different countries, in a way that helps promote investments and inter-Arab trade through providing a mechanism for risk insurance, similar to that provided by the International Agency to promote multilateral investment in member countries of the World Bank Group.

Studying the operations and activities carried by Arab institutions and funds over the years since established, some important facts can be drawn:

- Development goals for which these institutions were established and the geographical scope of their work are almost identical to their global counterparts, especially national institutions. As for the regional level, it is certainly limited to Arab countries, except for the Arab Bank for Economic Development in Africa that is concerned with African countries only.
- Activities, services and operations carried out by these institutions cover all areas and sectors of economic and service development, and all methods, forms and forms of traditional and modern financing are used, including lending or direct participation in projects, providing collaterals, etc.
- Over the last two decades, the majority of these institutions devoted attention to supporting the private sector. However, funds disbursed to this sector are still limited compared with those approved for governments and the public sector in the beneficiary countries.
- Such institutions are committed to the specific and declared conditions and procedures to benefit from the aid provided for development programs and projects in the countries that fall within their scope of work, especially with regard to the priorities the governments of those countries set based on their development priorities, meaning that these institutions do not have a development agenda that must be adhered to as long as the state fulfills the eligibility conditions to obtain the service.

7.1.3.2. Development Finance Offered by the Coordination Group and Agricultural Sector's Share Thereof

The total amount of financing operations offered by member institutions of the Coordination Group reached some US$13.9 billion in 2018. Such finances covered various economic, production and service sectors in Arab countries. The group also

provided technical support through financing the preparation of technical and economic feasibility studies for development projects, and to support and enhance the capacity of beneficiary countries' institutions to enable them develop technical and administrative staff and improve their performance levels.

Agricultural sector's share accounted for 10.6% of this total amount, where the total amount of development aid allocated for this sector reached some US$ 1469.3 million in the same year (2018). Agricultural sector's share (including animal production) of the cumulative total financing operations made by member institutions of the Coordination Group accounted for (10.5%), approximately the same as that recorded during December 31, 2018, where the total amount received reached US$22,885 million, out of a cumulative total of US$217,995 million.

The Islamic Bank topped the list with 48.2%; followed by the Saudi Fund (17.5%); Arab Fund for Economic and Social Development (8%); Abu Dhabi Fund (7.6%); the OFID (5.9%); Kuwait Fund (5.5%). The rest of the funds recorded lower percentages based on the distribution of financing operations according to sources of financing over the period (2016-2018).

The referred to development operations involved loans and grants, capital contributions and various guarantees, and loans compatible with Islamic law. The aid also involved the adoption and application of common working rules for project management and implementation, which are important areas to the nature of the proposed sustainable program.

7.1.3.3. Measures for Activating the Role of Arab and Regional Financial Institutions

Despite the fact that indicators reflect the adequacy and efficiency of financing and regional development institutions and funds, the importance and priority they give to Arab sustainable agricultural development and food security and the role they play in achieving Global Sustainable Development Goals (SDGs), the specificity of the sustainable program and unprecedented goals it targets requires highly specialized measures to achieve maximum benefit from the financial and technical resources provided by the mentioned institutions, the most important of which are as follows:

- Creating a coordination mechanism for requests submitted by Arab countries to Arab institutions and funds that achieve balance between credits at the national and regional levels within the agricultural sector, in addition to the role played by the Coordination Group of these institutions.

- Establishing a classification for small farmers, breeders and fishermen in the agricultural sectors of Arab countries under the category of small and medium enterprises to enable them benefit from the special account that has been established by the initiative of His Highness the Prince of Kuwait, and managed by the Arab Fund for Economic and Social Development, through enabling national agricultural finance institutions access, as qualified entities, to loans granted to this category in their specific countries through revolving loans facility in compliance with the mechanisms that allow granting concessional loans (in terms of repayment and collateral).
- Enhancing the role of member institutions of the Coordination Group in achieving the second goal of the 2030 Global Sustainable Development Goals (zero hunger), and pursuing their efforts to adapt and harmonize their operations and activities to link them with the requirements for achieving these goals. Among the most important areas of adaptation that are consistent with the goals of the sustainable program, and need to be of priority, are: doubling agricultural productivity, improving the income of small-scale food producers, achieving a sustainable food production system, in addition to increasing investments in the rural infrastructure, agricultural research and agricultural extension services.
- Giving preferential privileges to the countries hosting joint ventures emanating from the sustainable program in various agricultural and service production fields to benefit from export credit, especially those countries that realize production under the sustainable program and direct it to inter-Arab trade exchange in the framework of the Greater Arab Free Trade Area.
- Inclusion of private investors and the Arab business sector in the field of mega projects (large-scale agricultural projects) in rainfed arable land areas in Arab countries enjoying comparative advantages qualifying investment in these lands, in the guarantee against risks provided by the Arab Investment & Export Credit Guarantee Corporation.
- The Arab Authority for Agricultural Development and Investment is to play a leading role in contributing to financing joint or mega national agricultural projects emanating from the sustainable program.

7.1.4. Measures at the Regional and International Levels

This level of financing measures relates to international development funds and development institutions that can also contribute to providing financial resources and technical assistance required for implementation of the sustainable program by governments or the private sector, given that the Arab countries are members as well. These include:

- The World Bank Group.
- African Development Bank Group.
- International Fund for Agricultural Development.

The World Bank Group comprises five constituent institutions:

a. **The International Bank for Reconstruction and Development (IBRD),** which provides dept financing to the governments of middle-income and low-income countries with developmental eligibilities.

b. **The International Corporation (IDA),** which provides which provides concessional financing (called credits) and grants to governments of the poorest countries in the world.

c. **The International Finance Corporation (IFC),** which provides loans, equity contributions, and technical assistance to promote private sector investment in developing countries.

d. **The International Investment Guarantee Agency (MIGA),** which provides insurance against losses arising from commercial risks faced by investors in developing countries.

e. **The International Center for Settlement of Investment Disputes (ICSID),** which provides international facilities for conciliation and arbitration of investment disputes.

The African Development Bank group comprises three governmental entities:

a. **The African Development Bank (AfDB),** which aims to contribute to achieving economic and sustainable development and progress in members countries of the region, individually or collectively. It is a multilateral regional bank, and its membership includes non-African countries[28(1)].

b. **The African Development Fund (ADF),** which is considered the concessional lending window of the group, and primarily aims to reduce the number of the poor in member countries of the region.

c. **Nigeria Trust Fund (NTF),** which is a special fund belonging to the group to assist the development efforts of the Bank's low-income regional member

[28(1)] 55 African Countries and 24 Non-African Countries

[(2)] The Nigeria Trust Fund (NTF) ended operations 30 years after establishment (1976), as initially agreed. But in 2007, the Federal Republic of Nigeria and the Bank agreed to a ten-year extension of the NTF.

countries whose economic and social conditions and prospects require concessional financing[(2)] .

As for **The International Fund for Agricultural Development (IFAD),** it works with the rural poor to enable them grow and sell more food in order to increase their incomes. It provides grants and low-interest loans to developing countries. The Fund is an international financial institution and a specialized agency of the United Nations[29(1)].

Considering that Arab countries are members of the aforementioned regional and international institutions, there exist opportunities for them to obtain their needs of development aid, financing and financial assistance made available to these countries.

Studies indicate that the Arab region has benefited from the developmental contributions offered by these institutions at rates far exceeding those obtained from Arab and national counterparts.

7.1.5. Comprehensive Framework of Financing Measures

The sources of financial resources at the local, Arab and regional levels form an integrated system that can help provide the finance requirements for implementing the sustainable program. The financing measures at the holistic level of these sources are based on a set of principles and general rules, among which are achieving maximum benefit from the privileges of each source, and benefiting from the diversity of available tools and mechanisms, whether financing or development aid offered by each source, in addition to enjoying the privileges, preferential treatment and peculiarity granted by virtue of affiliation or membership in each source. Based on that, the comprehensive framework measures include, but not limited to, the following:

- Intensifying Arab countries' coordination efforts to ensure that the agricultural sector obtains the highest share of what these institutions provide to countries in terms of financing, technical assistance or grants, so that these institutions, especially the Arab ones, increase their allocations to sustainable agricultural development and food security.
- Exerting efforts to maximize the shares received by main Arab agricultural countries, and eligible courtiers that enjoy comparative advantages to localize or

[29(1)] The Fund is a unique partnership of 166 members from the Organization of the Petroleum Exporting Countries (OPEC), other developing countries and the Organization for Economic Co-operation and Development (OECD).
Source: Arab Organization for Agricultural Development, "an Arab mechanism for financing agricultural development and Arab food security", Khartoum, 2012.

host projects of the sustainable program, receive from the financing operations and various types of financial aid, in coordination with the rest of the Arab countries to achieve the Arab and joint goals of the sustainable program, as an exception to the rules of geographical or sectoral balance.

- Seeking to attain maximum benefits by availing the privileges offered by the mentioned sources, including, but not limited to, obtaining the highest level of lending facilities, the easiest credit terms, and the highest share of grants and technical aid, especially for the least developed Arab countries; sustainable food security projects; small and micro enterprises for small farmers' categories; or for any categories targeted by preferential treatment in the policies and systems of these institutions.
- Coordinating the national, joint and collective Arab efforts of countries' governments, and legislative bodies of the Joint Arab Action System, to create accounts for financial institutions, especially the Arab and regional ones, to finance and support joint Arab projects in the areas of food security, whether agricultural production, service, manufacturing or food processing. It might be appropriate to have a leadership initiative to adopt the establishment of a "Special Account for Sustainable Arab Food Security", which would give impetus and support to secure this stable source of financing for such projects.
- Giving high priority, through measures collectively agreed upon by concerned countries, to direct the bulk of financial allocations for technical aid and consultancy that may be provided to these countries in favor of preparing feasibility studies for joint food security projects, or building and developing human and institutional capacities that support implementation of the sustainable program.
- Mobilizing efforts towards adopting the Arab Program for the Sustainability of Food Security as an Arab agenda for which Development Finance Institutions (DFIs) are primarily responsible for supporting countries secure the financial resources necessary to achieve its goals within the limits of their capabilities, while institutions at the regional and international levels are regarded as tributaries to such Arab institutions.
- Emphasizing the importance of increasing the value of credit allocated to the private sector in the credit operations of Development Finance Institutions at various levels, as it is a major partner in the development process, and it is expected to play an important role in implementing the sustainable program.

7.2. Institutional Aspects

Pluralism in the work areas of the sustainable program, and its counterpart the implementation levels, imposes a broad institutional scope for implementation of the sustainable program at the country, Arab and regional levels. However, it is necessary to distinguish between institutions directly related to implementation of the program's components, and those that do not directly undertake executive procedures, rather, they serve as supportive and complementary entities providing contributing to the factors of success in achieving the program's goals and targets.

7.2.1. Country Level

Country level mainly refers to institutions directly concerned with implementing the sustainable program in Arab countries. Major entities related to the institutional aspects of implementation include:

- Ministries of Agriculture or bodies concerned with agricultural affairs and affiliated, or attached, agencies, including but not limited to:
    - Agricultural research institutions, centers and agencies.
    - Agencies, centers or institutes specialized in various plant, animal, fisheries, hunting & forest production and services sectors.
    - Agricultural extension institutions.
    - Agricultural Marketing institutions (crops, products and services).
    - Agricultural credit and finance institutions (of various national titles).
    - Land reclamation and soil improvement institutions.
    - Water resources entities (available in some countries).

- Ministries of Animal Production, Hunting and Forestry (available in some countries).
- Farmers' institutions and organizations, including cooperative societies and specific occupational associations related to the sector; Civil Society Organizations; and councils, federations and unions working in various fields of agriculture, of different names/titles in Arab countries.
- Ministries of irrigation, and ministries and agencies concerned with water and environmental resources (available in some countries).
- Ministries of Finance, Economy, Investment, Planning, Industry, Labor and Foreign Trade, and transport, according to each country's ministerial formation and institutional specializations.

- Institutions concerned with silos, warehouses and mills.
- Consumer protection and food safety agencies.
- Commercial banks, lending and financial institutions, stock exchanges and money markets.
- Academic educational and research institutes.
- Meteorological, statistical and information agencies, whether independent, or linked, affiliated, attached to the abovementioned ministries.
- Legislative and constitutional institutions concerned with creating and issuing legislation and laws.

  These institutions, depending on the nature of the tasks they are entrusted to, and within their areas of competence, either work individually, jointly or collectively, to create the enabling environment that helps implement the program and provide its requirements, including creating some entities needed by virtue of the program's work, or restructuring them to be in line with the program's components. This includes, but is not limited to, the following:

  - Institutional framing regarding the utilization of arable lands in rainfed areas, in case such a framework is absent.
  - Institutional development of research centers to establish research stations concerned with rainfed agriculture and dry areas, in order to meet the sustainable program's needs of improved seeds and varieties (drought, heat and salinity tolerant).
  - Institutional framing of contract farming in the expansion land areas proposed by the program, as a non-traditional pattern that is still limited under the conditions of rainfed agriculture.
  - Supporting the establishment of civil society organizations and specific cooperative societies in the Arab rural sectors, or developing the existing ones, to improve their performance, and to serve the needs of all parties involved in the value chains.
  - Institutional framing of the establishment of agricultural companies specialized in specific fields that serve the goals and targets of the sustainable program, especially rental of farm machinery and equipment; securing production inputs, especially seeds, fertilizers and pesticides; construction works and the establishment of water reservoirs and dams; development of field irrigation systems; provide extension services; conduct agricultural development

research, etc. This can be done by the private sector, or in partnership between the private and business sectors.

- Institutional development for commercial banks, agricultural credit and finance institutions, and risk insurance companies, so that their areas of work cover activities in the rainfed agricultural sector, whether for farmers or companies.
- Creating intermediate and university educational institutions specialized in rainfed agriculture and dry areas, guided by the Saudi "King Salman International University" in Egypt, which includes the Faculty of Desert Agriculture that is concerned with integrated development programs in desert areas.
- Developing and upgrading agricultural quarantine institutions and health & veterinary services, in line with the program's goals of improving grazing animals' productivity and raise the standards of living of nomads community.
- Organizing and/or developing human and institutional capacity building institutions in the fields of training and occupational qualification in specific areas, including modern rainfed agriculture technologies, climate change, risk management, natural disasters, conservation agriculture, etc.
- Developing and/or framing food research institutions, food safety, consumer protection, consumption patterns and commodity budgets, field research and studies on food loss and waste, which all serve achieving the goal of sustainable consumption of the SDGs.
- Restructuring, or the development of institutions responsible for silos and mills, and building strategic buffer stocks of basic food commodities, in line with the measures taken to face repercussions of the Covid-19 pandemic, including spatial distribution of capacities and storage levels of basic food commodities, especially in remote rural areas.
- Establishing Arab networks, or strengthening the existing ones, by linking national institutions in the fields of rainfed agriculture research, training and extension, water and irrigation system development, genetic engineering, climate change, epidemics, agricultural and health quarantine, food safety, informatics, etc.

7.2.2. Joint Arab Level

Joint Arab level includes institutions concerned with joint Arab action, including those concerned with the agricultural and food security sectors that fall in the scope of the sustainable program's work, represented in the following:

- Legislative bodies of the joint Arab action system.
- The General Secretariat of the League of Arab States.
- Specialized Arab technical organizations, including the Arab Organization for Agricultural Development (AOAD), and The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD).
- Arab and Islamic trust and financing institutions and funds, previously referred to under the financing measures.
- Arab bodies and companies concerned with agricultural investment, including the Arab Authority for Agricultural Investment and Development, the Arab Company for Livestock Development, and the Arab Investment Company.
- Councils, unions and relevant Arab institutions, including, but not limited to, the Council of Economic Unity; Arab Water Council; Union of Arab Investors; the General Union of Chambers of Commerce, Industry and Agriculture for Arab Countries; Union of Arab Banks; and other qualitative unions and relevant civil society organizations.

Institutions of this level carry out their tasks (each according to the specified field of work) and provide technical assistance, consultations and services (each in the field of competence), either through the activities they carry out in member Arab countries, or through the joint activities in which they cooperate with the Arab Organization for Development Agriculture as the institution concerned with Arab food security, and directly responsible for the sustainable program. It should be noted that implementation of this program requires accreditation and approval by legislative authorities of the joint Arab action at various levels, starting with Their Excellencies, the Ministers of Agriculture and counterparts in Arab countries through the Executive Council and the General Assembly of the Arab Organization for Agricultural Development (the entity that launched the initiative within which the current program was prepared); and their Excellencies the Arab Ministers of Finance and Economy through the Economic and Social Council; and finally to Their Majesties and Highness the Arab leaders through the Arab Summit.

The role of the General Secretariat of the League of Arab States is manifested in taking the regular and institutional measures within the framework of its tasks to adopt the program in accordance with the hierarchical structure, until it enters into

force, so that it acquires the legitimacy required to oblige countries to implement it, while respecting national sovereignty.

According to the nature and areas of work at this level, it is required that many entities support the implementation of the sustainable program institutionally. Among the institutions that can have a prominent role are:

- The Arab Center for the Studies of Arid Zones and Dry Lands through its work plan, programs and activities supporting the implementation of the program's components in the field of horizontal expansion in rainfed agriculture, improving its productivity, reducing associated risks and creating stability in this sector.
- The Arab Authority for Agricultural Development and Investment, which can play a leading role in implementing the program in cooperation with countries by adopting some of the joint ventures emanating from the program, whether in Sudan or any Arab country, and contributing to implementation as a partner, as well as contributing to providing finance in compliance with the predetermined financial measures.
- The Union of Arab Investors through adopting the implementation of mega joint ventures, developed in the framework of the sustainable program, in the fields of manufacturing/processing and service, and promoting Arab investors, and participation of the Arab Investment Company as well.
- The General Federation of Chambers of Commerce, Industry and Agriculture for the Arab Countries, which is required to provide institutional support for the program by activating private sector's role and encouraging its contributions to implementation of the sustainable program in the three sectors, through the Union's activities and mechanisms that achieve its objectives, and in same time are in line with the program's goals.

7.2.3. Regional and International Levels

Besides the specific roles of the regional and international financing institutions and trust funds referred to under the financing measures, there is a list of technical and specialized development institutions with regional and international scopes, which are expected to support Arab countries, based on membership, by providing assistance and technical advice, or securing financing for development projects to serve achieve the goals of sustainable program through their programs and activities. On the one hand, some of these institutions are major partners of the Arab Organization for Agricultural Development in supporting Arab countries efforts to fulfill their commitments towards achieving the Sustainable Development Goals (SDGs), to which the current sustainable program contributes. The most important of these institutions are:

- Food and Agriculture Organization of the United Nations (FAO).
- Economic and Social Commission for Western Asia (ESCWA).
- International Center for Agricultural Research in the Dry Areas (ICARDA).
- International Food Policy Research Institute (IFPRI).
- International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM).
- International Center for Biosaline Agriculture (ICBA).
- Association of Agricultural Research Institutions in the Near East & North Africa (AARINENA).
- Agricultural Food Marketing Association for the Near East and North Africa Region (AFMANENA).
- The Centre for Environment and Development for the Arab Region and Europe (CEDARE).
- The Regional Centre on Agrarian Reform and Rural Development for the Near East (CARDNI).
- International Center for Epidemiology (OIE).
- United Nations Environment Program (UNEP).
- The International Atomic Energy Agency (IAEA).
- The United Nation Convention to Combat Desertification (UNCCD).

7.3. Organizational Procedures

Organizational procedures required to implement the program refer to the set of measures, interventions, and controls, whether policies, legislation, systems or other forms of regulatory frameworks required, or supportive, for implementing the program's activities in concerned countries while keeping in line with their agricultural development plans and strategies to achieve food security. Some of the requirements under this organizational aspect may need striking a balance between the national and regional perspectives in the development process, and harmonizing the goals of the sustainable program with the national goals in the short and the near future terms, in order to achieve consistency between them, and to ensure that the program goals are included in the country's plans and programs, and that their strategies accommodate the Arab strategic dimension included in the current program.

It is expected that such procedures will take a dynamic nature, that is, interactive with the requirements of implementation in successive years of the program's term. In all cases, and according to the nature of development activities and interventions under this program, there is a clear need that concerned countries take the following measures, whether during the preliminary stage, or actual implementation:

A. Issuing legislation regulating and/or codifying acquisition of arable lands intended for utilization in rainfed areas, in accordance with the prevalent systems in concerned countries.

B. Issuing regulating and/or codified legislation regarding proper management of rainwater quantities to realize maximum use efficiency through adopting water harvesting technologies and supplemental irrigation; and regarding the establishment and ownership of the structural and industrial works in the water harvesting areas.

C. Regulating the settlement of agricultural workers, or other workers engaged in crafts and occupations related to agriculture, in the countries hosting mega agricultural projects, or horizontal expansion projects in rainfed areas, through issuing appropriate legislation or laws.

D. Taking measures to give the program's exportable agricultural outputs, either plant or animal products, the state of origin, in order to enjoy the benefits of inter-Arab trade exchange through membership of the Greater Arab Free Trade Zone.

E. Reformulate, or create, guiding, indicative or binding policies in a number of areas that serve achieving the project goals, the most important of which are, but not limited to:

- Expanding rural micro and small loans under the conditions of rainfed agriculture (the rainfed sector).
- Inclusion of small farmers and producers categories in rainfed areas in insurance policies and social integration, as well as nomadic shepherds.
- Providing marketing services for small producers and parties involved in the value chains of agricultural commodities and products of the rainfed areas.
- Enhancing the role of various organizations in Arab countries in providing production inputs for the rainfed sector, either the currently existing, or the proposed expansion areas.
- Enhancing the role of organizations in the value chains of the rainfed sector's products, as well as products of the irrigated sector, in order to maximize the value added for such products.

- Expanding the markets for final outputs and basic inputs, especially in the existing or expected rainfed expansion areas.
- Developing grazing and potable water services, health and veterinary services, and improving access to fodder, etc.
- Changing the consumption patterns and final uses of some agricultural products, either as human food or animal feed, in line with the program's goals and targets of substitution, either imports of some food and feed crops by local products, or substituting basic food commodities by others based on various considerations.
- Encouraging the private sector's complementary role in building up buffer stocks, and programming the scope of their spatial distribution, internally and externally, to face pandemics, disasters and unfavorable climatic conditions.
- Structuring appropriate measures to cope with the repercussions of the COVID-19 pandemic in terms of policies and mechanisms for building up buffer stocks, withdrawing from them, geographic locations, and distribution outlets for major food commodities, especially in remote areas, as well as other control measures that ensure elimination of disruption in the supply chains between regions.
- Encouraging and granting incentives and privileges to the private sector to invest in the program's horizontal expansion areas, and in agricultural production, processing and service projects, either national or joint ventures, to reduce of entrepreneurs migration to invest outside their countries.
- Encouraging the settlement of labor and population in expansion areas to reduce internal and external labor migration, and to attract Arab agricultural labor to such areas in the program's countries of implementation.

F. Adopting a set of national plans and programs that support the implementation of the program's activities, within the framework of the existing agricultural policies in the countries of implementation, after aligning and adapting them to the program's requirements. Among the most important areas of such national programs and plans are the following:

- Implementation of modern and developed field irrigation systems in the components of the sustainable program to achieve the highest level of water use efficiency, thus the broader target of maximizing water productivity, i.e., return per unit of water used.
- Deploying automated service stations in the areas of implementation.

- Strengthening the relationship between research, extension and farmers' organizations in the countries of implementations.
- Securing and distributing fertilizers and pesticides to small farmers in the areas of implementation.
- Providing and distributing improved seeds and locally appropriate varieties in the targeted productivity improvement areas, and horizontal expansion areas in irrigated lands.
- Using the Geographic Information Systems (GIS) and early warning systems in the improvement and expansion areas.
- Monitoring, detection and control of agriculture pests and diseases, as well as developing the capabilities of the border outlets of the sustainable program's countries of implementation.
- Determining the appropriate technology packages, recommended by research institutions, for the program's areas of implementation, either for productivity improvement, or horizontal expansion.
- Determining the most suitable areas for applying the recommended packages within the scope of the program, through conducting specialized field surveys for holdings and areas inventories at the level of regions in the concerned countries of implementation under the program's second component.
- Providing extension staff and specialized extension services, especially for rainfed agriculture, including pilot plots and field schools.
- Developing varieties compatible with the anticipated climate changes, and expanding the scope of their cultivation in the areas with certain climate conditions expected in the framework of the sustainable program.

7.4. Coordination Aspects

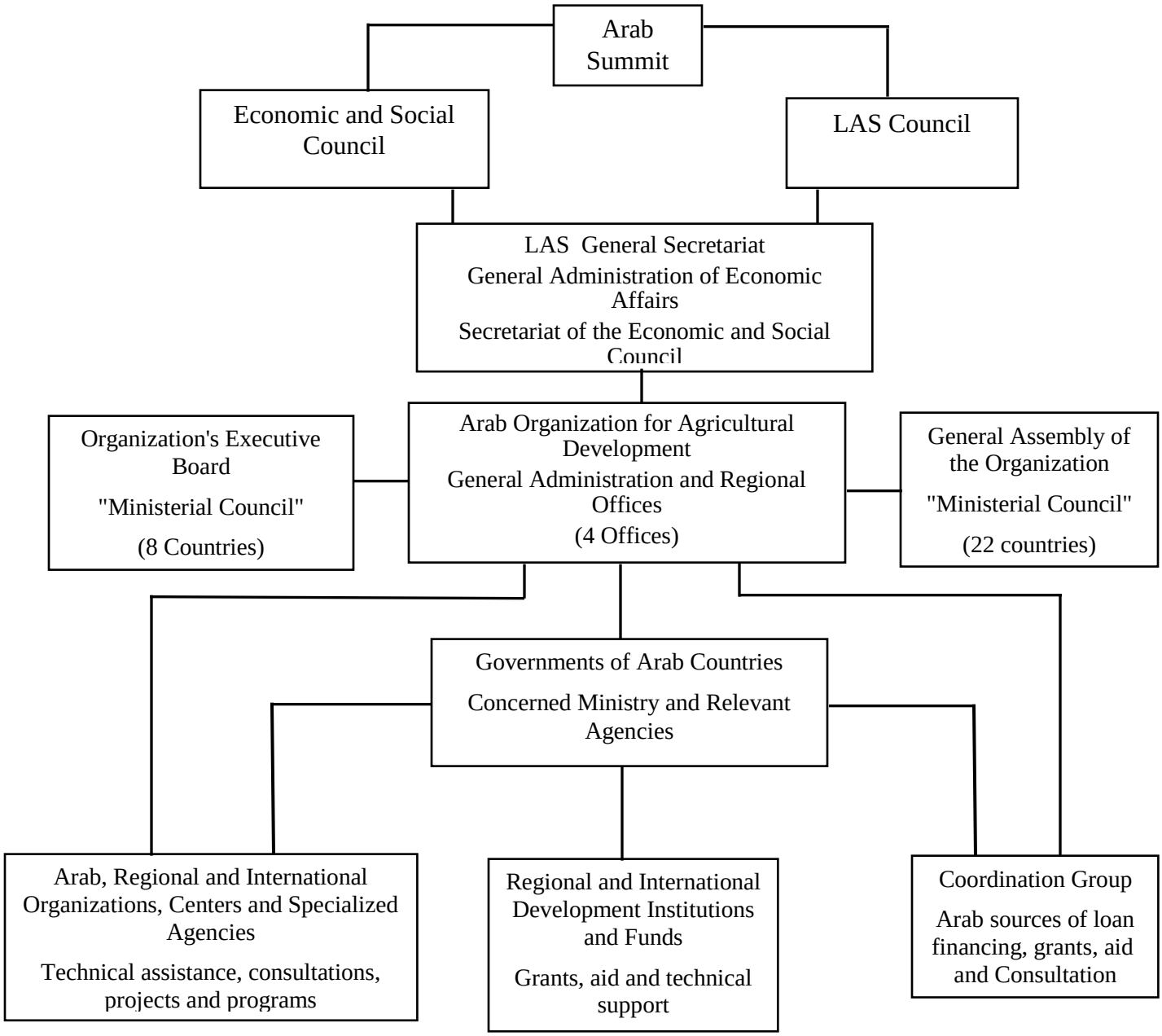
Institutional plurality proposed by the program, illustrated in the following figure, requires devoting an appropriate degree of attention to coordination aspects at various levels, which not only achieves supporting the program with the highest levels of political will, but also guarantees the elements of success through what this institutional mobilization can provide of the resources, and current & future capabilities at the national, Arab, regional and international levels.

Given this institutional plurality, the matter requires a corresponding plurality of focal points, thus coordination mechanisms in line with the nature of the relationship and the areas of work that link this system of institutions at all levels. In accordance with the institutional framework of the program, and the official form it will acquire after

being accredited by legislative bodies of the joint Arab action, the Arab Organization for Agricultural Development can be considered as the greatest common denominator for coordination among various parties. The General Secretariat of the League of Arab States - the General Administration of Economic Affairs, of course, comes to the fore as a primary partner for the organization, where it plays the leading role in supporting the program in all preparatory and final stages until implementation, also during work and follow-up until reaching the evaluation stage.

In line with this specificity, it is proposed that the Arab Organization for Agricultural Development create an entity within its existing organizational structure that deals with the program's affairs institutionally, technically and financially, besides establishing a network of institutional links with various relevant authorities in the framework of its role in providing technical assistance and advice to the program's countries of implementation, and to act as a facilitator for implementation by achieving the highest levels of coordination with implementation partners, based on countries' requests that it plays this role. Of course, the coordination tasks, in addition to the Monitoring and Evaluation tasks, which will be undertaken by the organization, are commissioned by its legislative bodies, and are implicitly mandated by decisions to approve the program by the legislative authorities of the joint Arab action system.

The following diagram summarizes the system of partner institutions in the program's implementation and goals' attainment, based on the funding measures, institutional aspects and organizational procedures:



The following statement clarifies the program's conception regarding main areas of coordination, relevant parties, suggested coordination institutions and mechanisms, as well as the auxiliary tools and means for the proposed mechanisms to ensure easy flow of work in the program:

Domain [1]	Main devlovni Parties	Focal Points	noitanidrooC smsinahceM	Tools and auxiliary means for the mechanism
Program Accreditation	1. Legislative bodies of the Arab Organization for Agricultural Development. 2. The summit and relevant ministerial councils of the League of Arab States (LAS).	- lareneG ehT fo noitartsinimdA barA eht rof noitazinagrO larutlucirgA .tnempoleveD - General fo tairaterceS LAS - eht fo tairaterceS dna cimonocE licnuoC laicoS	Convening regular sessions meetings at the level of experts and Ministers -Preparatory meetings and regular session meetings	- Memoranda submission to Legislative Assemblies - Preparing draft resolutions and circulating them after approval
Implementation of country program components	1. Country's governmental agencies concerned with implementation at the planning and management level. 2. Joint local and Arab private sector participating in the program implementation. 3. Organizations and institutions: centers and entities concerned with interventions to support the program at the country, Arab and regional levels.	- The General Administration of the Arab Organization for Agricultural Development and affiliated regional offices. - Ministries of agriculture and entities responsible for the agricultural sector in the countries of implementation.	- A special unit for the organization and affiliated regional offices - A specialized technical or administrative central unit within the organizational structure of the ministry concerned with the program. - Units, or focal points/ liaison officers in relevant ministries and authorities to connect with these units. - Form joint working groups from concerned parties. - Form joint multidisciplinary technical committees.	- Periodic, quarterly, annual and interim reports. - Regular technical and organizational meetings. - Plans and joint operational work programs for activities and interventions, plus defining the roles and tasks of various parties. - Allocating financial resources, setting financing plans, defining their sources and method of distribution within the framework of the executive work programs.

Domain [1]	Main devlovni Parties	Focal Points	noitanidrooC smsinahceM	Tools and auxiliary means for the mechanism
gnicnaniF stnemegnarrA	1- Competent ministries in the countries of implementation (agriculture, finance, planning, trade) 2- Coordination group of the Arab and regional financial institutions and trust funds. 3- Possible sources of funding from regional and international institutions, funds and banks. 4- National commercial banks. 5- Donor agencies and countries.	- Country representatives in the boards of governors of potential financing institutions and banks. - Coordination Group Secretariat. - Representatives of relevant ministries responsible for financial affairs and finance portfolios. - Governors of the concerned banks and financial departments in the concerned ministries in countries. - Higher Planning Committees - Regulatory and accounting authorities in concerned ministries. - General Administration of the Arab Organization for Agricultural Development and affiliated regional offices.	- Regular meetings of senior sectoral officials to identify potential sources of funding. - Technical/financial committees from the concerned ministries. - Focal points/liaison officers in the ministries of finance, economy, and planning agencies in the countries of implementation. - Alliances of funds or banks for country and joint lending.	- Defining the priorities and national general budget items and financing plans. - Project identification cards to determine the initial cost. - Preliminary and final investment studies regarding the financial, technical and environmental feasibility of projects. - Financial budgets for the activities, projects and public and private funding sources. - Financing plans for projects and potential sources of funding, at the national and Arab levels. - Private sector initiatives to contribute to public projects.
Providing aid, technical support and grants.	1- Donors. 2- Beneficiary countries. 3- Program coordinating bodies.	- Arab Organization for Agricultural Development - General	- Investment portfolios for the programs' projects. - Convening periodic specialized, or open,	ro slocotorP - fo adnaromem ,stnarg rof gnidnatsrednu ro ecnatsissa lacinhcet .snoitatlusnoc

Domain [1]	Main devlovni Parties	Focal Points	noitanidrooC smsinahceM	Tools and auxiliary means for the mechanism
		Administration. - Representatives of countries in institutions, funds or donor countries. - The Arab Organization for Agricultural Development and its regional offices. - Relevant Arab, regional and international organizations and centers.	meetings of the parties. - Joint work activities and meetings regarding the program's technical implementation. - Joint technical activities and programs of regional and international institutions & organizations in the countries of implementation.	- Development programs or projects aimed to support the program implementation in the work plans of Arab, regional and international institutions.
Preparation and implementation of joint ventures	1- Hosting countries of the projects. 2- Beneficiary participant countries. 3- Entities contributing to projects implementation. 4- Funding and donor agencies.	- Concerned ministries and specialized agencies in the beneficiary participant countries. - Arab Organization for Agricultural Development and affiliated offices. - General Secretariat of LAS.	- Joint technical meetings to elaborate and prepare the initial documents regarding the proposed projects. -Forming special joint bodies or entities to supervise the projects. - Joint technical/financial committees to distribute the burdens and benefits. - Approval of joint ventures agreed upon by relevant bodies in the countries of implementation and the League of Arab States. - Joint applications/requests from the countries of implementation to donors and financiers to receive aid, grants or loans.	- Identification cards for joint ventures for initial cost estimation. - Preliminary and final investment studies regarding the financial, technical and environmental feasibility of the agreed upon joint ventures. - Bilateral or multilateral agreements regarding the joint ventures between concerned countries. - Protocols or joint memoranda of understanding between concerned countries, donors and financiers. - Joint advisory and technical support to prepare the required feasibility studies. - Specialized external technical expertise from the participant countries and other House of Expertise to prepare studies necessary for the pre-investment stage.

[1] The program dedicates a part of the document for Monitoring and Evaluation that includes coordination aspects related to this important area.

8. Monitoring and Evaluation Mechanisms and Indicators

Results-based Monitoring and Evaluation (M&E) has become a powerful and effective basic tool for managing development programs, policies and projects. It is also considered one of the most important means that help policy makers and decision makers identify the progress and impacts achieved from the implemented programs, policies or projects. This is due to the fact that official and public interests no longer stops at investments and inputs mobilized, or implemented activities, but the greater attention is focused on what has actually been achieved in terms of outputs, outcomes, as well as the impacts achieved from various developmental interventions.

In this context, the current program was keen to include an effective monitoring and evaluation mechanism that work according to specific quantitative and/or qualitative indicators to measure outputs and outcomes achieved in light of the set goals and expected outcomes. Among the most important advantages M&E mechanism can provide for the sustainable program are the following:

- Contribute to providing guarantees for the success of the program and various components through regular monitoring and measuring of various indicators throughout the program term, thus assess the progress being made.
- Implementing the principles of participation in transparency and disclosure of achievements, or falters for one reason or another, to various target groups, entities and participation, especially investors and funding bodies, as well as governments.
- M&E mechanism that is based on disclosure and transparency provides an unfavourable environment for various negative practices and phenomena, such as corruption and bureaucracy, as well as poor coordination and integration between various partners and the program's management (of those who have relationships of interdependence). This framework includes, in particular, investors, financing agencies, providers of services and inputs, project and activity implementers from the public and private sectors, governmental officials, and related national and Arab institutions.

8.1. Mechanism

The Proposed Monitoring and Evaluation Mechanism is Defined as Follows:

A. The Arab Organization for Agricultural Development, in its capacity as the competent technical authority, plays the role of the central authority within the program's M&E mechanism. A specialized unit should be established for this purpose, to be affiliated to the office of the Director General, or to one of the competent departments. This unit will be supported by a staff of expertise and competence in the field of results-based monitoring and evaluation, according to

the World Bank approach in this regard. Among the tasks to be performed by this unit are:

- Setting and approving the monitoring and evaluation indicators for the program and various components.
- Designing forms to collect data required to measure M&E indicators from different countries and participating agencies, as well as reviewing and classifying the data collected from sub-units and sending them to the central unit.
- Analysing the collected data, measuring the set of indicators, drawing conclusions, and preparing annual and periodic reports.
- Designing and implementing training courses, preparing and publishing periodic guidance brochures to support capacity building of the staff to be responsible for undertaking M&E activities at the level of Arab countries.

B. Establishing individual sub-units at the level of Arab countries, under the ministry concerned with agricultural affairs in each country. It is also possible to establish intermediate units for this purpose in the framework of the Organization's regional offices in order to coordinate between the central unit (the Organization) and peripheral or sub-units in the countries of implementation.

   Such sub-units will be responsible for collecting data related to the required indicators at the country level, in addition to preparing annual and periodic reports regarding these indicators at the country level, and submitting them to the central M&E unit in the Organization.

C. The national authorities responsible for agricultural statistics and data, with the support and assistance of the Organization, shall be responsible for the process of developing whatever data and statistics that need to be developed in line with the requirements of various M&E indicators.

D. Contribution is expected from various entities and bodies participating in the program by providing to the central unit whatever might be required of data and information necessary for M&E purposes in the framework of the participatory responsibility adopted by this program.

8.2. Monitoring and Evaluation

A. Data collection and analysis for measuring M&E indicators, and for follow-up purposes, will be conducted on an annual basis. Accordingly, annual follow-up reports will be prepared.

B. The adopted M&E process will be developed on two stages: the first is after the first five years of the program's implementation (a mid-term evaluation), whereas the second is after is at the end of the program's term, i.e., after ten years since the start of implementation. In this regard, it is worth mentioning that the monitoring process is primarily concerned with monitoring progress and the extent of achievements, whereas the evaluation process is moreover concerned with causal analysis and objective interpretation regarding: why was it possible to succeed in realizing what has been achieving of the desired targets? Why was it not possible to succeed in achieving others?. Finding answers to these questions would help extract lessons learned, and recommendations to achieve a better level of performance in later stages, or similar programs and projects.

8.3. Proposed Indicators

The proposed indicators for monitoring and evaluating the performance of each of the program's components were previously presented. The following is a synthesis of these indicators:

- **First Component:** Expanding the utilization of arable land resources in rainfed areas:
- **Main M&E indicators regarding this component include**

1. Total annual expansion areas in the rainfed lands.
2. Seasonal cropping patterns in the annual rainfed expansion area.
3. Harvested areas of the lands planted with seasonal crops targeted under the first component.
4. Annually added production quantities of the seasonal crops targeted under the first component.
5. Annual improvement in productivity per hectare at the level of crops.
6. Number of dams and water reservoirs established to harvest rainwater annually.
7. Amounts of annual rainfall collected from precipitation in expansion areas.
8. Volume of annual governmental and private investments allocated for cultivating arable lands in rainfed areas.
9. Number of slaughtered heads of the grazing herd (cows) after gaining weight due to improved finishing ration.
10. Additional quantities of beef meat resulting from improved productivity of the grazing heard.

11. Number and quality of services provided to shepherds.
12. Number of annually added labor force in rainfed expansion areas, classified by occupation/profession.
13. Additional capacities of grain warehouses and mills, classified by type.
14. Additional capacities for feed processing of all types.
15. Additional capacities for manufacturing edible oils of all types.
16. Percentage decline in the gaps in commodities targeted under the first component.
17. Percentage increase in the volume of surplus commodities targeted under the first component.
18. Annual import substitution rates of the targeted food and feed under the first component.
19. Number and names of mega joint agricultural and industrial projects, either production or services, and their fields of work.
20. Percentage increase in the volume of intra-Arab trade in food commodities produced from rainfed horizontal expansion areas.

- **Component II:** Boosting productivity growth rates of the current agricultural activities:
  - Annual increase in productivity, expressed in kilograms, in each of the targeted crops in each country, for irrigated and rainfed crops separately, as well as the percentage increase compared to the previous year.

- **Component III:** Expansion in irrigated agriculture through modernization of field irrigation systems:
  - Annual additional areas, expressed in hectares, where modern field irrigation systems have been implemented in irrigated crop areas.
  - Annual percentage of areas where irrigation systems have been developed/modernized relative to the total irrigated land area.
  - Annual increase in hectares of the new land area for irrigated crops that are being reclaimed and cultivated.
  - Annual increase in sugarcane cropped area, expressed in hectares, in newly reclaimed and cultivated areas under irrigated agriculture.

- Annual increase in sugar beet cropped area, expressed in hectares, in newly reclaimed and cultivated areas under irrigated agriculture.

- **Component IV:** Joint Arab Agri-food and Industrial Investment Projects:
  1. Annual number and production capacities of new projects in the field of agricultural production, agro-industrial parks, and interlinked and integrated processing/manufacturing and service projects.
  2. Annual volume of expansion in the production capacities of projects in the previously referred to fields.
  3. Annual volume of governmental investments allocated to the previously referred to projects.
  4. Annual volume of private national investments allocated to the previously referred to projects.
  5. Annual volume of joint Arab investments allocated to the previously referred to projects.
  6. Annual volume of foreign direct investment flows allocated to the previously referred to projects.
  7. Volume of funding from institutions, funds and credit associations allocated to the previously referred to projects, and to agricultural development in general.

- **Component V:** Reducing Food Loss and Waste
  - Presence/lack of policies or laws targeting reduction of food loss and waste.
  - Presence /lack of governmental and/or non-governmental initiatives to reduce food waste and waste.
  - Presence /lack of systems for registering the farms that apply and follow good agricultural practices, and the percentage their areas represent.
  - Percent of areas, number of farms, or volume of production marketed under contract farming systems.
  - Annual additional numbers and capacities of sorting, grading and filling packaging stations.
  - Annual additional capacities of advanced grain stores/silos (in tons).
  - Annual additional capacities for refrigerated storage and refrigerated means of transport (in tons or cubic meter).

- Presence/lack of effective standards and legislation regarding quality standards, specifications and safety of agricultural food products.

- **Component VI:** Shifting Towards Sustainable Food Consumption Patterns
  - Annual change in per capita share of calories from animal sources relative to total calories.
  - Annual change in per capita share of protein (in grams) from animal sources relative to total protein.
  - Annual change in in per capita consumption of red meat (in kilograms) relative to the total consumption of white meat and fish.
  - Annual change in the per capita consumption of beet sugar relative to total consumption of sugar, as well as the share of beet sugar produced or imported relative to total sugar production or imports.
  - Water footprint of per capita food consumption pattern (the amount of water, in m^3, used in producing and providing the food basket for an individual).
  - Country participation, or non-participation, in regional and international initiatives or events related to sustainable consumption.
  - Presence/lack of governmental or private initiatives to disseminate the culture of healthy and sustainable food consumption.

- **Component VII:** Reducing the Risk of Pandemics, Including those Associated with the COVID-19 Pandemic, on Agriculture and Food
  - Presence/lack of coordinated Arab/regional policies to build up national food buffer stocks that take into account the probabilities and repercussions created by the Covid-19 pandemic.
  - Presence/ lack of decentralized distribution networks for food commodities and production requirements, and storage systems at the level of regions, especially remote areas.

- **Component VIII:** Mitigating Climate Change Risks on Agriculture and Food Security
  - Presence/lack of agricultural policies to identify and distribute plant varieties in line with the expected climatic changes, as well as the presence or lack of agricultural policies that help farmers migrate internally from the areas most likely to be affected by climatic changes.

- Presence/lack of an institutional structure that keeps pace with the expected climate changes, as well as proper monitoring and early warning systems.
- Presence/lack of policies for scientific research and training programs compatible with expected climate changes.

8.4. General Indicators at the Program Level

In light of the program's central goal, which focuses on improving the state of food security, especially with regard to improving and maximizing self-sufficiency rate in main food commodities, the most important general indicators for monitoring and evaluating performance from this perspective are as follows:

A. Self-sufficiency rate (annual) in main food groups and main underlying crops.

B. Volume and value of net food imports (annually) from main food groups and main underlying commodities.

Anexes

Annex I: GLOBAL SUSTAINABLE DEVELOPMENT GOALS RELATED TO FOOD SECURITY

Global Sustainable Development Goals (2030)

The United Nations summit for the adoption of the post-2015 development agenda was held from 25 to 27 September 2015, in New York and convened as a high-level plenary meeting of the General Assembly. During the seventieth session of the UN General Assembly, a conference was held and attended by presidents, leaders and heads of governments of 193 countries. The summit announced the adoption of the Global Sustainable Development Goals agenda under the title "The 2030 Agenda for Sustainable Development", which consists of 17 Sustainable Development Goals with 169 associated targets. It was also announced that "all countries and stakeholders will work to implement this plan within the framework of a collaborative partnership."

The following are brief references to the goals and targets that are most important and relevant to the conditions of agricultural development and food security[30].

- **Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Relevant targets include:**
  - **Target 2.1:** By 2030, end hunger and ensure access by all people, in pat1icular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.
  - **Target 2.3**: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.
  - **Target 2.4**: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
  - **Target 2.5**: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

[30] Source: United Nations, General Assembly, Draft Final Document of the United Nations Summit for the Adoption of the Post-2015 Development Agenda, Items 113, 115 of the Sixty-ninth Session Agenda.

- **Target 2.6**: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

- **Goal 12: Ensure sustainable consumption and production patterns**
  - **Target 12.2**: By 2030, achieve the sustainable management and efficient use of natural resources.
  - **Target 12.3**: By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.
  - **Target 12.8**: By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
  - **Target 12.9**: Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.

- **Goal 13: Take urgent action to combat climate change and its impacts**
  - **Target 13.1**: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in al1 countries.
  - **Target 13.2**: Integrate climate change measures into national policies, strategies and planning.
  - **Target 13.3**: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

- **Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development**
  - **Target 14.4**: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

- **Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.**
  - **Target 15.2**: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.
  - **Target 15.3**: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

Annex II: Tables

Annex Table No. (1): Areas under Rainfed Agriculture in Arab Countries over the Period 2015-2017

(1000 ha)

Country	2015		2016		2017		Period's Average		Period's Average for Rainfed Agriculture
	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	
Jordan	38.51	119.00	38.51	119.00	35	115.00	37.34	117.67	155.01
UAE	-	-	-	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-	-	-	-
Tunisia	2235.27	1510.99	2238.02	1459.39	2241.34	1588.71	2238.21	1519.70	3757.91
Algeria	533.00	3664.96	550.77	3621.29	576.19	3788.82	553.06	3691.69	4244.75
Comoros	-	-	112	-	-	-	37.3	-	37.3
Djibouti	-	1.33	-	1.37	-	1.37	-	1.36	1.36
Saudi Arabia	-	-	-	103.31	-	103.31	-	68.67	68.67
Sudan	1.68	21228.06	1.68	15167.46	1.68	20874.2	1.68	19089.91	19091.59
Syria	856.18	1936.22	862.22	2173.46	864.02	2363.35	861.47	2157.68	3019.15
Somalia	32.00	980.00	32.00	980.00	32.00	980.00	32.00	980.00	1012.00
Iraq	-	2402.75	-	95.00	-	86.00	-	861.25	861.25
Sultanate of Oman	-	0.10	-	0.10	-	0.16	-	0.12	0.12
Palestine	91.00	36.00	81.10	39.00	81.40	41.00	84.50	38.67	123.17
Qatar	-	-	-	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-	-	-	-
Lebanon	69.29	49.49	74.48	48.50	74.48	48.50	72.75	48.83	121.58
Libya	769.00	767.00	140.00	50.00	140.00	50.00	349.67	289.00	638.67
Egypt	96.91	43.92	101.80	56.00	101.00	97.00	99.90	65.64	165.54
Morocco	777.00	5659.00	777.00	5659.00	777.00	5659.0	77.00	5659.00	6436.0
Mauritania	50.00	235.70	50.00	235.70	50.00	235.7	50.00	235.70	285.70
Yemen	228.40	427.60	228.40	285.24	228.40	285.24	228.40	332.69	561.09
Total	**5778.24**	**396062.11**	**5287.97**	**30093.81**	**5314.51**	**36317.27**	**5461.14**	**35157.73**	**40618.87**

Source: Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different issues.

Annex Table No (2): Untapped of Arable Land Areas in the Arab World over the Period 2015-2018

(1000 ha)

Country	2015	2016	2017	Period's Average
Jordan	586.40	586.4	606.04	592.95
UAE	7.11	7.11	7.11	7.11
Bahrain	1.38	1.38	1.38	1.38
Tunisia	262.80	460.74	398.7	374.08
Algeria	34946.74	34946.74	35235.29	35042.92
Comoros	2.80	21.00	21.0	14.93
Djibouti	0.67	0.63	0.63	0.64
Saudi Arabia	13941.24	13941.24	13942.42	13941.63
Sudan	44796.36	51417.24	44650.96	46954.85
Syria	350.13	351.93	348.56	350.21
Somalia	42625.00	42625.00	42625.00	42625.00
Iraq	7782.50	10153.75	10064.75	9333.67
Sultanate of Oman	58.60	58.60	42.58	53.26
Palestine	169.08	159.50	155.6	161.39
Qatar	36.52	32.44	31.84	33.61
Kuwait	2.90	2.90	1.78	2.53
Lebanon	384.68	384.68	384.68	384.68
Libya	175.00	175.00	175.00	175.00
Egypt	1680.00	2731.20	2806.00	2405.7
Morocco	3762.66	3762.66	3762.66	3762.66
Mauritania	3635.10	3635.10	3635.10	3635.10
Yemen	1311.89	997.56	997.56	1102.34
Total	156519.56	166452.81	159894.66	160955.68

Source: Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different issues.

Annex Table No (3): Untapped Arable Land Areas, Annual Precipitation Rate, Quantities and Rainy Seasons in Arab Countries with Promising Potentials for Expanding Rainfed Agriculture

Country	Average Precipitation Rate (2016)	Average Untapped Arable Land (2015-2017) (1000 ha)	Rainy Seasons, Peak Months and Precipitation Rate	Monthly Precipitation Rate for Regions (2016)	Average Annual Rainfall in Billion m^3 (2017)(3)
Algeria	405.9	35042.92	September-May (March 86.1)	W 671-185	212.0
Egypt	78.5	2405.7	October-March (December 32.9)	C 210.3-0	18.13
Iraq	205.4	9333.67	Oct-March (November 35, December 36, March 28)	C 240.1-0	93.97
Jordan	238.5	592.95	October-March (January 92.1)	W 580.5-26.9	9.915
Libya	153.7	175.00	October-March (January 60)	C 318.9-0	98.53
Morocco	542.4	3762.66	All year round (October 102, November 102, March 130)	W 1223-21	154.5
Palestine	581.1	161.34	December-April (Dec 297.3)	3185.5-172W	2.42
Somalia	485.8	42625.0	All year round (October 108, November 149, March 130)	W 1017-176	179.8
Sudan(1)	325.1	46954.85	May-October (July 98, August 95)	C 506.1-0	469.8
Syria(2)	362.3	350.21	October-May (January, March, April)	W 1381-68.5	46.67
Tunisia	285.6	474.08	Sep-May (October-November 45)	W 970.9-31.5	6.521
Yemen	333.3	1102.34	All year round (May 85, June 88, July 72, August 109)	W 741.3-27.3	88.17
Saudi Arabia (2)	122.0	13941.63	November-May (April 61.8)	W 365-10.5	126.8
Mauritania	213.7	3635.1	July-October (August 91.2)	W 388.0-8.0	97.82
Lebanon	774.5	384.68	November-May (December 276.3)	877.2-610.4C	6.907
Total (3)					1613.628

C: Concentrated in some areas inside the country . W: Widespread over all regions of the country

(1) Precipitation is concentrated in Western States, except for the publishing country (111.9), in which Precipitation ranges between 3335-621.6.

(2) Monthly averages are not available, only rainfall distribution at the level of regions for this year is available.

(3) For all Arab countries (22 countries), including UAE (6.621), Bahrain (0.0646), Comoros (1.675), Djibouti (5.104), Kuwait (2.156), Qatar (0.8591), Sultanate of Oman (38.69), in billion meters. Cubic meters. Countries in listed in the Table represent around 95.4% of the average total rainfall amounts for the Arab world in 2017, estimated at 1691.4 billion cubic meters.

Annex Table No. (4): Annual Precipitation Rates in Arab countries during 1999, 2000, 2010, and 2016

(In Millimeters)

Country	2016		2010		2000		1990	
	Min	Max	Min	Max	Min	Max	Min	Max
Jordan	26.9	580.5	23.2	575	14.4	700.3	34.1	617.3
UAE	7.14	49.88	56.7 (2009)	195.4	13.1 (1999)	85.8	10.6	220.7
Tunisia	31.5	970.9	43.1	1166.8	28.0	742.0	151.0	971.0
Algeria	185	671.0	134.0	1105.0	43.0	630.0	-	920.0
Djibouti	NA	122.0	79.3 (1981)	194.0	79.3 (1981)	194.0	253 (1989)	60.1
Saudi Arabia	10.5	365.0	4.5	640.3	26.0	384.0	9.4	209.9
Sudan	0	506.1	14.8	726.4	00.0	1035.4	4.4	866.8
Syria	68.5	1381.0	117.8	1378.6	348.3	4128.6	108.0	544.0
Somalia	176.0 (1990)	1017	176.0 (1990)	1017.0	76.0 (1990)	1017.0	63.0 (1988)	917.0
Iraq	0	240.1	115.4	376.9	39.0	314.0	48.3	256.5
Sultanate of Oman	44.0	191.6	0.0	402.0	97.8 (1996)	496.9	5.7	440.6
Palestine(1)	172	3185.8	142.8	2736.2	224.6 (1997)	918.4	NA	NA
Qatar	37.5	95.4	4.0	66.6	6.6 (1999)	111.6	-	59.8
Kuwait	42.9	NA	141 (2002)	NA	215.8 (1998)	NA	72.2 (1989)	122.7
Lebanon	610.4	877.2	681.2	730.8	613.7	811.7	NA	NA
Libya	0	318.4	2.0	318.4	97.8 (1999)	365.4	1.6	336.3
Egypt	0	210.3	-	107.7	-	234.6	4.2	124.4
Morocco	21	1223	17.1	1313.4	12.5	699.7	63.1	867.1
Mauritania	8.0	388.0	52.6	530.9	7.0	3106.0	63.0	299.9
Yemen	27.3	741.3	40.1	1251.8	-	1006.6	12.7	349.0
Bahrain	60.0	NA	47.3 (2007)	NA	NA	NA	42.3	NA
Comoros	1392	NA	NA	NA	NA	NA	NA	NA

(1) Gaza Strip for the years 2010-2016, excluding Ramallah during the year 2000.

Source: Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different Issues.

Annex Table No (5): Some Indicators Regarding Water Resources in Arab Countries based on Latest Available Data[1]

Country	Total Renewable Water Resources in Bil m^3	Freshwater Withdrawal Rate from Renewable Water Resources[2] %	Dependency Rate on External Sources[3] %	Water Stress[4] %
Algeria	11.67	83.991 (2017)	3.599	137.9
Bahrain	0.116	132.2 (2016)	96.55	132.2
Comoros	1.2	0.8333 (1999)	0	0.8333
Djibouti	0.31	6.267 (2000)	0	6.267
Egypt	57.5	112 (2017)	98.26	117.3
Iraq	89.86	42.89 (2016)	60.83	54.13
Jordan	0.973	96.42 (2016)	27.21	100.1
Kuwait	0.02	2075 (2002)	10.0	2075
Lebanon	4.503	40.24 (2015)	40.24	58.79
Libya	0.7	822.9 (2012)	0.0	822.9
Mauritania	11.4	11.82 (2005)	96.49	13.2
Morocco	29	35.69 (2010)	0.0	49.68
Sultanate of Oman	1.4	116.7 (2013)	0.0	116.7
Palestine	0.837	34.41 (2017)	2.987	41.08
Qatar	0.058	432.4 (2016)	3.448	432.4
Saudi Arabia	2.41	883.3 (2017)	0.0	883.3
Somalia	14.7	22.44 (2003)	59.18	24.53
Sudan	37.8	71.24 (2011)	96.13	118.6
Syria	16.8	84.17 (2005)	72.36	125.9
Tunisia	4.615	103.3 (2017)	9.10	121.1
UAE	0.15	1708 (2017)	0.0	1708
Yemen	2.1	168.6 (2005)	0.0	168.6
Arab World	288.122			79.78

(1) Same years listed under the column "Freshwater Withdrawal Rate" for all columns of the table.
(2) MDGs Indicator 7.5.
(3) Upstream Countries.
(4) SDGs Indicator 6.4.2.
Source: Food and Agriculture Organization of the United Nations, AQUASTAT database on the Internet.

Annex Table No (6): Withdrawal Rates from Total Water Resources, Withdrawals by the Agricultural Sector, and Average Per Capita Share of Total Withdrawals in Arab Countries, based on Latest Available Data

Country	Total Withdrawal Rates m^3	Per Capita Share m^3	Withdrawals by the Agricultural Sector Bil m^3	Withdrawals by the Agricultural Sector Relative to Total Withdrawals(1) %
Algeria	10.46	253.2	6.671	(2017) 63.78
Bahrain	0.4344	291	0.1447	(2016) 33.31
Comoros	0.01	17.56	0.0047	(1999) 47
Djibouti	0.019	25.46	0.003	(2000) 15.79
Egypt	77.55	794.4	61.35	(2017) 79.16
Iraq	38.55	1007	35.27	(2016) 91.49
Jordan	1.044	107.6	0.5547	(2016) 53.13
Kuwait	0.9132	425.9	0.7784	(2002)53.78
Lebanon	1.84	302.5	0.7	(2015)38.04
Libya	5.83	940.6	4.85	(2012)83.19
Mauritania	1.35	407.5	1.223	(2005)90.95
Morocco	10.43	312.9	9.156	(2010) 87.79
Sultanate of Oman	1.872	403.8	1.607	(2013) 85.84
Palestine	0.3752	76.2	0.162	(2017) 43.18
Qatar	0.9126	345.8	0.2197	(2016) 31.96
Saudi Arabia	23.35	708.0	19.2	(2017) 82.23
Somalia	3.292	298.8	3.281	(2003) 99.48
Sudan	26.93	748.3	25.91	(2011) 96.21
Syria	16.76	853.7	14.67	(2005) 87.531
Tunisia	4.875	422.7	3.773	(2017) 77.39
UAE	3.998	661.5	3.312	(2005) 82.84
Yemen	3.565	163.9	3.235	90.74 (2005)

(1) Same years listed under the column "Freshwater Withdrawal Rate" for all columns of the table.
Source: Food and Agriculture Organization of the United Nations, AQUASTAT database on the Internet.

Annex Table No (7): Evolution of Per Capita Share of Total Supply of Food Groups at the Level of Arab World

(Quantity in Kg/capita/year)

Food Group	Annual Average of the Period (1996-1998)	Annual Average of the Period (2016-2018)	Food Group	Annual Average of the Period (1996-1998)	Annual Average of the Period (2016-2018)
			Sugar (Refined)	27.3	33.2
Wheat & Wheat Flour	148.5	160.1	Total Oils and Fats	13.9	16.2
Maize	53.6	69.6			
Rice	28.1	25.3	Red Meat	14.4	14.0
Barley	47.6	40.1	White Meat	8.6	16.4
Roots & Tubers	27.7	35.9	Fish	9.1	11.7
Total Legumes/Pulses	7.2	6.5	Eggs	3.4	6.1
Total Vegetables	139.2	136.3	Milk & Dairy Products	98.2	74.1
Total Fruits	101.2	81.3	Total Food	728.0	726.8

Source: Arab Organization for Agricultural Development, Arab Agricultural Statistics Yearbook, different Issues.

Annex Table No (8): Average Per Capita Share of Food Products in Some Arab Countries as Compared to World Average (2017)

(Kg/capita/year)

Attributes	World Average	EU (28)	Algeria	Djibouti	Egypt	Iraq	Kuwait	Mauritania	Morocco	Sultanate of Oman	Saudi Arabia	Sudan	Tunisia	UAE	Yemen
Cereals	176	176	218.6	174.9	262.1	182.4	157.1	187.2	262.0	137.5	178.4	130.8	208.3	162.0	164.6
Starchy Roots	61.8	66.2	66.0	16.1	40.3	8.2	44.4	9.3	48.1	24.1	45.9	19.4	30.6	11.2	6.5
Legumes	5.6	2.8	7.6	13.6	4.6	3.6	6.0	10.1	4.6	3.9	5.2	10.8	7.6	26.5	5.2
Vegetable Oils	10.4	16.7	16.5	13.9	5.7	15.3	16.5	14.4	11.4	9.9	19.3	9.5	21.7	10.0	6.5
Sugar and Sweeteners	26.2	44.7	29.3	36.3	26.9	25.6	40.1	39.4	37.6	36.8	31.2	31.6	36.0	45.9	30.5
Vegetables	142.2	111.4	186.1	84.3	159.3	37.5	178.8	36.4	102.1	154.6	62.3	84.5	272.6	103.8	19.4
Fruit	75.0	84.2	101.9	28.3	103.7	49.2	73.0	11.9	101.0	138.9	76.9	71.8	93.3	102.8	31.1
Red Meat	10.9	16.8	11.3	11.5	12.1	4.0	20.7	19.7	12.3	19.3	8.9	16.2	11.0	15.8	8.2
- Cows	9	14.8	4.6	6.7	10.8	2.6	7.8	7.0	7.2	7.6	4.0	7.7	5.6	7.4	4.3
- Lamb	1.9	1.9	6.7	4.8	1.3	1.5	12.9	12.7	5.1	11.7	4.9	8.5	5.5	8.4	4.0
Poultry Meat	15.2	23.5	6.4	2.7	13.0	15.0	46.3	5.1	21.0	21.6	43.4	1.6	17.0	43.5	8.5
Eggs	9.9	11.5	8.4	1.1	3.5	9.4	18.3	2.3	8.6	8.2	6.6	1.2	7.8	7.5	1.6
Fish and Seafood	20.4	23.1	3.9	3.7	23.7	3.4	11.5	9.2	19.5	28.5	11.3	1.0	13.2	24.7	3.2
Milk and Dairy Products	88.0	236.6	121.7	25.1	41.2	15.1	47.9	89.8	52.6	108.3	64.0	105.4	111.9	33.2	11.4
Nuts	2.1	3.9	1.8	0.4	0.4	1.0	2.1	-	3.6	0.7	1.2	-	6.0	7.3	-
Total Food	**643.7**	**817.4**	**779.5**	**411.9**	**696.5**	**369.7**	**662.7**	**434.8**	**684.4**	**692.3**	**554.6**	**483.8**	**837.1**	**594.2**	**296.7**
% Of Calories From Animal Products	**17.9**	**29.1**	**12.1**	**7.4**	**8.4**	**8.3**	**18.3**	**NA**	**9.7**	**20.1**	**15.2**	**15.9**	**11.6**	**17.7**	**6.9**
Total Calories	**2917**	**3416**	**3349**	**2680**	**3321**	**2506**	**3446**	**NA**	**3481**	**2931**	**3194**	**2433**	**3467**	**3366**	**2063**

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database on the Internet.

Annex Table No (9): Official Foreign Reserves Coverage of Merchandise Imports in Arab Countries over the Period 2014-2018 (In Months)

County	2014	2015	2016	2017	2018 (1)	Period's Average (in Months)
Jordan	7.1	8.3	7.4	6.9	7.7	7.5
UAE	3.8	4.7	4.3	4.6	5.1	4.5
Bahrain	3.7	1.6	2.2	2.0	1.4	2.4
Tunisia	3.9	4.6	3.8	3.4	2.8	3.7
Algeria	35.8	32.8	27.5	23.6	19.3	27.8
Djibouti	8.5	7.6	7.1	5.4	5.4	6.8
Saudi Arabia	55.4	46.4	50.3	48.2	48.4	49.7
Sudan	2.1	1.6	1.4	1.3	1.7	1.6
Syria	-	-	-	-	-	-
Somalia	-	-	-	-	-	-
Iraq	15.8	15.1	17.7	17.1	16.3	16.4
Sultanate of Oman	7.0	7.9	11.4	8.0	8.0	8.5
Palestine	1.3	1.2	0.6	0.8	0.9	1.0
Qatar	16.6	15.6	11.9	5.8	10.9	12.2
Comoros	9.0	8.9	10.9	10.1	11.2	10.0
Kuwait	12.5	11.0	12.1	12.0	14.2	12.4
Lebanon	24.5	27.8	31.1	28.3	27.3	27.8
Libya	34.1	52.0	91.3	94.0	70.0	68.3
Egypt	2.7	3.4	4.9	7.6	8.6	5.4
Morocco	6.3	8.2	8.3	7.5	6.6	7.4
Mauritania	2.9	5.1	5.6	5.1	5.0	4.7
Yemen	3.7	6.5	5.7	1.6	1.3	3.8
Arab Countries' Average	19.1	18.3	17.6	16.4	16.4	17.6

(1) Primary Data

Source: Arab Fund for Economic and Social Development, Joint Arab Economic Report, 2019.

Annex Table No (10): Agricultural Sector's Share of some Domestic Financial Resources in Arab Countries for 2010, 2013 and 2016

Country	Agricultural Sector's Share in Fixed Capital Formation (%)			Development Flow to Agricultural (DFA) %			Agricultural Sector's Share of Total Credit %		
	2016	2013	2010	2016	2013	2010	2016	2013	2010
Algeria	0.29	0.25	0.23	0.05	2.47	3.15	..	..	..
Egypt	4.4	3.48	1.75	9.65	4.83	6.61	0.08	0.15	0.09
Libya	0.41	0.55	0.88	0.0	2.36	0.07	..	..	..
Morocco	6.7	7.01	6.31	7.11	9.81	9.03	..	..	..
Sudan	12.93	10.37	18.32	21.32	9.61	6.66	1.02	1.07	1.38
Tunisia	7.23	7.32	6.74	5.05	4.11	1.79	3.04	2.28	0.06
Bahrain	0.12	0.10	0.10	..	..	..	1.32	1.23	1.42
Iraq	1.08	1.44	1.48	0.08	0.56	2.20	1.18	1.03	0.88
Jordan	1.28	0.68	0.30	0.40	0.76	0.28	..	..	..
Kuwait	0.22	0.30	0.23	..	..	..	..	..	..
Lebanon	1.46	1.67	1.67	0.9	1.55	4.98	3.87	3.88	4.07
Sultanate of Oman	0.08	0.10	0.17	..	..	0.34	0.29	0.30	0.38
Palestine	1.69	1.76	2.39	2.87	1.07	1.61	..	..	..
Qatar	0.19	0.15	0.16	..	..	..	..	..	..
Saudi Arabia	1.11	0.89	1.08	..	..	..	17.65	14.09	12.81
Syria	10.76	10.42	9.77	0.04	0.03	5.98	..	..	12.2
UAE	0.88	0.88	0.57	..	..	..	4.56	4.55	4.56
Yemen	11.1	11.34	8.9	0.31	1.48	4.78	0.09	0.26	0.07
Djibouti	0.85	0.98	1.00	3.32	5.96	0.87	..	2.63	1.73
Comoros	26.56	22.7	16.07	0.23	1.13	2.05	..	..	..
Mauritania	3.34	2.45	2.59	3.97	9.75	3.19	..	..	..
Somalia	31.1	30.63	30.28	0.34	2.66	0.25	..	..	..

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database on the Internet.

Annex Table No (11): Agriculture Orientation Index(1) for Agricultural Sector's Share of some Domestic Financial Resources during 2010, 2013 and 2016

Country	AOI for Agricultural Sector's Share in Fixed Capital Formation			AOI for Development Flow to Agricultural			AOI Agricultural Sector's Share of Total Credit		
	2016	2013	2010	2016	2013	2010	2016	2013	2010
Algeria	0.02	0.03	0.03	0	0.25	0.37	..	..	..
Bahrain	0.37	0.31	0.13	..	..	..	0.227	0.54	0.314
Comoros	0.48	0.61	0.36	0.01	0.03	0.05	..	..	..
Djibouti	0.56	0.52	0.49	1.13	1.70	0.24	..	..	..
Egypt	0.41	0.34	0.44	0.82	0.42	0.5	0.087	0.094	0.103
Iraq	0.79	0.82	0.90	0.02	0.10	0.36	0.69	0.421	0.01
Jordan	0.35	0.36	0.35	0.1	0.26	0.09	0.348	0.41	0.476
Lebanon	0.25	0.27	0.24	0.33	0.39	1.29	0.434	0.259	0.227
Libya	0.34	0.23	0.10	0	2.62	0.03	..	..	..
Mauritania	0.43	0.83	0.50	0.18	0.54	0.16	..	..	..
Morocco	0.53	0.42	0.43	0.59	0.73	0.70	0.32	0.29	0.314
Sultanate of Oman	0.06	0.07	0.12	..	..	0.24	0.208	0.231	0.274
Palestine	0.44	0.42	0.43	0.74	0.26	0.29	..	..	..
Somalia	1.01	1.53	1.35	0.01	0.05	0.0	..	..	..
Sudan	0.41	0.41	0.41	0.67	0.31	0.16	0.556	0.461	0.305
Syria	0.52	0.51	0.49	0	0	0.30	..	..	0.618
Tunisia	0.0	1.37	0.75	0.55	0.46	0.24	0.499	0.507	0.605
UAE	0.73	0.77	0.74	..	..	..	0.118	0.399	0.096
Yemen	0.29	0.28	0.28	0.02	0.10	0.40	..	0.178	0.144
Comoros	0.64	0.51	0.40	..	..	..	..	..	..
Mauritania	0.15	0.14	0.13	..	..	..	..	..	..
Somalia	0.59	0.58	0.57	..	..	..	..	..	..

(1) Agriculture Orientation Index (AOI) = Agriculture's share of Government Expenditure divided by the Agriculture value added share of GDP,

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database on the Internet.

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