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Original Article

Securing Foods In Libya Concepts, Challenges and Strategies

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Abstract

In general securing food is affected by the economy and related phenomena. Food scarcity affects food prices and hence affects social and political instability, which rise a civilized crisis. Accordingly, to study securing food this work adopted the definition of food security given by the Rome Declaration on World Food Security in 1996 and the Sustainable Development Goals given by the United Nation in 2000. The definitions used to depend on concepts that were used as a guide to face the challenges in implementing food security planning in Libya. The problem of underinvestment in agriculture and the bad practice of agricultural process form a major issue in securing food in Libya. Also, the planning for securing water and energy does not cop with the program set for securing food. Therefore, and to plan a better strategy, water, energy, and food nexus approach must be adopted. The three sectors are inextricably linked and protecting the vital ecosystem.

Key Words: Ecosystem, Food Security, Water Energy Food nexus, Agriculture, Libya.

Introduction

Simply, food security is defined as the right of entry by all people to obtain enough food for an energetic healthy life at all times. Libya planned its food security since it joined the Food and Agricultural Organization (FAO). Recently three major programs were carried out for planning food security in Libya (World Food Programme, reports 2011 and 2016 and FAO report 2011). However, all these reports concentrate on rapid programs to secure food neglecting to improve the agricultural infrastructure, although they mentioned the challenges to secure the food in Libya.

Geography

Libya with a population of about 6 millions, classified as an arid country, separated into three zones; the coastal, mountainous, and desert (which count for 90% of the total land area). Rainfall is scarce with high temperatures. The main water resources in Libya are the scarce and erratic rainfall and the fossil groundwater that resides in four major aquifers.

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Rainfall average for Libya is about 56 mm per year (WELL, 2014) and form the main water resources.

Libya's conditions Common Evaluation

Libya has joined the Food and Agricultural Organization (FAO) on 24 November 1953. FAO mission provided all technical assistance and projects to bring up to date and improve agriculture and fisheries in Libya. Heavy investments were injected in agriculture following the year 1969 in an attempt to develop food security conditions. This investment supported by various policies and programs (FAO, 2011). None of these policies and programs of the agricultural sector perform an acceptable satisfaction for coping with rising food demands.

The agricultural useful land is restricted to a narrow belt along the Mediterranean Sea, which characterized by most of the rain falls. This belt is divided into two main areas, Jabal Al Akhdar in the north-east, form natural farmland at the coastal plateau, while Tripolitania and Cyrenaica in the north-west form the fertile coastal plain, where irrigation is still essential (FAO, 2016). The desert has some oases irrigated from water obtained from shallow wells. In Libya, the major cereals planted are wheat and barley besides olives, dates, grapes, oranges, and almonds which form the important crops.

FAO (2016) in their work on Libya showed the importance of livestock with poultry which is estimated (according to count up of 2018, about 24.8 million). Ruminants like sheep and goats are estimated to (5.1 and 1.9 million respectively) and cattle to (210 000). Currently, the full-time farmers almost 40 percent of the 170 000 farm holders. The areas of most farms are less than 20 ha which forms 90 percent of all existing farms and 1 percent with an area of more than 100 ha (WFP and FAO, 2011).

Libya's economy was based on agriculture near the beginning of the 1960s, as agriculture contributes 30% of the GDP(Abduldayem and Scott, 2014). By 2007 this contribution became 2% and employs 6% of the labor force (FAO, 2011). After the discovery of oil, Libya's economy depends mainly on the contribution of oil which form 71% of the GDP (CW, 2001a and 2001b) and form a resource for its foreign exchange. Accordingly, Libya became an example of a twofold economy (CW, 2001a, and 2001b), depending mainly on the oil sector. Moreover, the performance of agriculture in Libya faced a shortage in research policy, its impact, and the outcome of the expanding agricultural sector (Masiulene, et al., 2016). Forty percent of all agricultural products were imported by Libya represented as four of wheat, milk, and oil of maize, whereas the main agricultural products exported are groundnuts forming about 50% of all agricultural exports (FAO, 2011). Owing to different natural, economic, environmental, and institutional challenges and constraints the performance of the agricultural sector is low.

Five major basins (Table, 1) with underground water representing the only source for different uses in Libya, no water neither comes nor goes out. Two coastal basins, one in the northwest (Al-Jefara) and the other in the northeast (Al-Jabal Al Akdar) exist on the coast

and have shallow aquifers recharged naturally from rainfall. Whereas the other three basins (Al-Hamada, Murzuq, and Al Sarir-Kufra, laying south of North latitude 290) have fossil water, stored during the Quaternary.

Table (1): Major basins in Libya (After Abdudayem and Scott, 2014)

	Basins	Areas within Libya (km2)
1	Al Hamada: Jabal Nafusa, Ghadamis and Al Hamada sl Hamara sub-basins	215 000
2	Al Jefara Plain	18 000
3	Al Jabal Al Akhdar	145 000
4	Murzuq	350 000
5	Al Sarir-Kufra	700 000

Earlier than the 1960s, water from coastal aquifers could be dug out from shallow depth using traditional apparatus. From the 1960s onwards, deep fossil aquifers were discovered as oil exploration proceeded. This fossil water was used on-site to develop agricultural projects. Expanding the agricultural projects in the coastal area led to using pumps due to falling the shallow water table (CEDARE, 2014). Fossil water was also needed to balance water scarcity in the coastal areas due to the rise of people concentration, which initiates the Man-made River Project (MRP) in 1984. Ninety-eight percent of the transferred water from the (MRP) is used by the municipalities (EGA, 2013).

Water Use

The work carried out by FAO (2016) estimated the water withdrawal for irrigation about 3543 million m3 forming 83% of the total groundwater withdrawal (4268 million m3). While other uses, like municipal form 14% (about 598 million m3) and in industry form 3% (about 128 million m3). These estimations were observed to increase by 2012. The total groundwater withdrawal reached 5830 million m3, including 280 million m3 for industry (or 3%), 700 million m3 (or 14%), and 4850 million m3 (or 83%) for irrigation (Figure, 1).

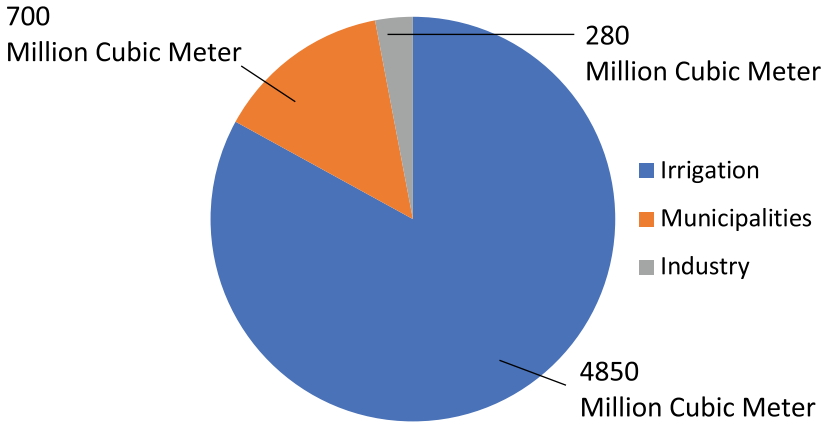


Figure 1: Water used by sectors (5830 million m3 in 2012).

Objectives and Methodology of the study

The objectives of the study through reviewing the literature on food security studies in Libya are, to identify challenges that were not covered and recommend future research and strategy on how the water, energy, and agriculture sectors can contribute significantly to food security in the country.

State of art reviews on research studies carried out internationally and on a national scale checked the factors (institutional, demographic, and socioeconomic) which affect food productions. The concepts of development and those used in the field of food security and their challenges were also reviewed in order to select and follow what suits Libya's conditions. Accordingly, the strategy is then set to adopt and implement the program suggested for securing sustainable food and the related subjects.

Concepts

In order to establish a successful strategy, the concept of food security must be defined clearly. Therefore, the researchers in this work had reviewed the history of the food security concept since it is originated in 1974 by the World Food Conference. Food security is defined in expressions of the food supply. This definition evolved by FAO (1983) focusing on food access, leading to the concept based on the balance between the demand and supply of food security equation. In 1986, the World Bank Report (WBR) on Poverty and Hunger focused on the chronological dynamics of food insecurity (Clay, 2002). The (WBR) report raised the effects of intensified pressure caused by natural disasters and/or economic conflict.

In 1996 World Food Summit reinforces the definition of food security with multidimensional nature depending on four pillars; food access, availability utilization, and stability (figure 2). This concept enabled responses of policies to focus on the support and recovery of livelihood options (FAO, 2006). Livelihood approaches are now essential in any development programs, as they were used in emergency contexts due to their coverage of the concepts of vulnerability and risk management.

Recently, the concept of food insecurity as a societal and political put up was emerged by Devereux (2001). The definition was also expanded to focus on the ethical and human rights aspect of food security (FAO, 2006). In 1996 World Food Summit adopted the concept of Right to Adequate Food, which pointed the mode towards the opportunity of securing food based on the rights approach. McClain-Nhlapo (2004) showed that about 54 countries enshrined the right to food in their constitutions whereas the Intergovernmental Working Group under the sponsorship of the FAO, set guidelines supporting the realization of the right to sufficient food in the framework of the national food security.

In the last three decades events like increasing food prices, oil spills and climatic change and drought, inform us that we can't plan to secure our food, water, and energy systems in

loneliness. As this is the case the authors think about adding the concept of nexus to overcome these problems when planning for food security. The term NEXUS means how and where these systems intersect (Peter Hanlon et al., 2013). Management and use of one of these resources impact the others, therefore using a nexus approach will help considering all the three systems together. Peter Hanlon et al. (2013) mentioned that if the nexus is unbalanced, then the cost shall be problems in public health, economy, and environment. The imbalances frequently appear through poorer water quality and limited food, energy, and water for humans, and habitat loss.

Implementing successful nexus needs a better understanding of how food, water, and energy systems interrelate (Figure, 3), then followed by planning food, water, and energy security taking into consideration their sustainability for the future.

Figure 2: Elements of food security (FAO, 2014)

Figure 3: Water Energy and Food Nexus and their interrelationship

Challenges

The quick and unsustainable development characterized the 1970's and 1980's, resulted in unconstructive interactions between agricultural activities and the reserve of natural resources. Accordingly, the quality of the natural environment is spoiled. The conditions disturbing concerned with increasing the use of groundwater (the only source for agriculture production). The exploitation of water in the coastal area is far away from a sustainable point. The results are reflected in water table depletion, seawater intrusion, and salination of water and soil (Sadeg and Al-Samarrai, 2020). Therefore, urgent and serious comprehensive programs are needed to implement sustainable policies for the sake of efficient water management in agricultural products. The same aims are important for the water transported from the desert, which is exploited for agriculture and now used for domestic utilization in urban cities.

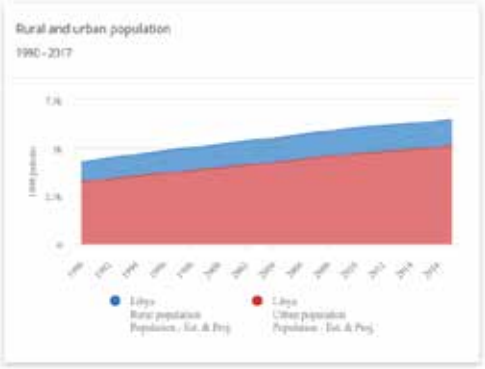
In general, WFP and FAO (2011), concluded that the progress of the agricultural sector has been held back through lacking practical institutions, unsteadiness, and frequent changes in the institutional sector. Although the Ministry for Agriculture, Animal and Marine Wealth was re-organized in 2006, but its structure has not completed and most of its functions duplicated with the other national institutions like agricultural planning, policy design, and statistics, which draw closer to stop the progress during decentralization time (WFP and

FAO, 2011). Dealing with food security problems challenges must be defined first. Here are some of the main challenges that face food security; rising population, changing diets, unstable incomes, increasing foodless days, slowing irrigation, reducing water reserves, falling water tables, increasing soil irrigation, and climate change.

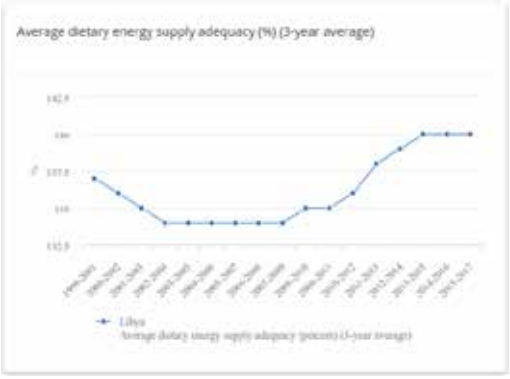
According to the concepts adopted in this study for defining food security, the authors presenting indicators given by FAOSTAT (2017) which are thought to stand as challenges for implementing sustainable food security in Libya.

Indicators

Demography



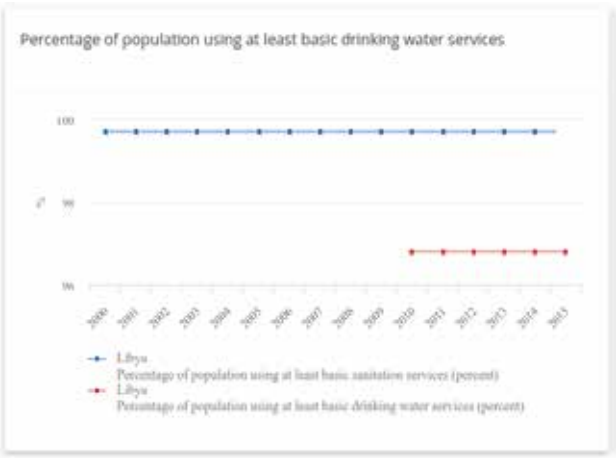
Food Availability

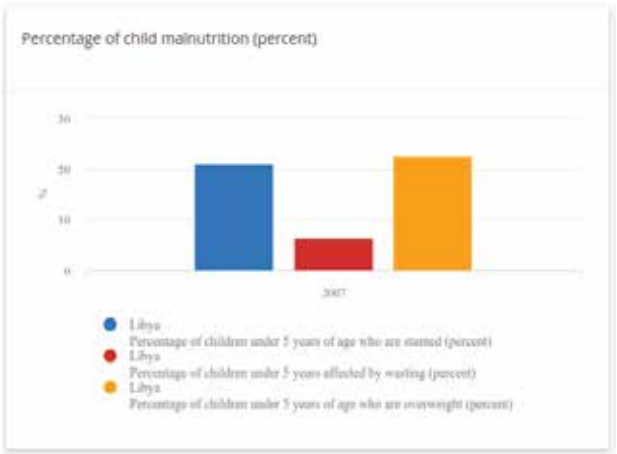


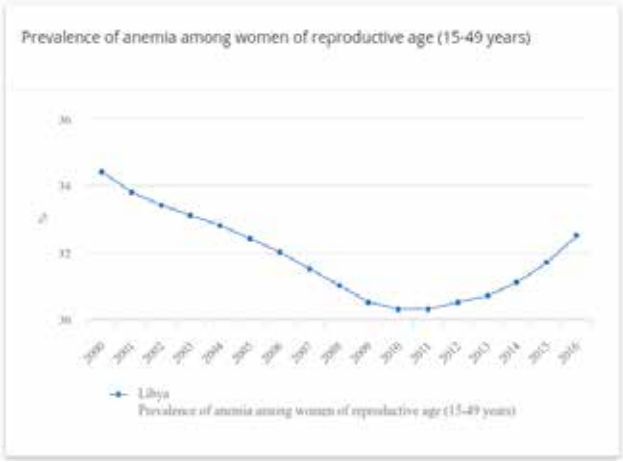
The indicator of average protein supply (g/capita/day) (3-year average) has no data available.

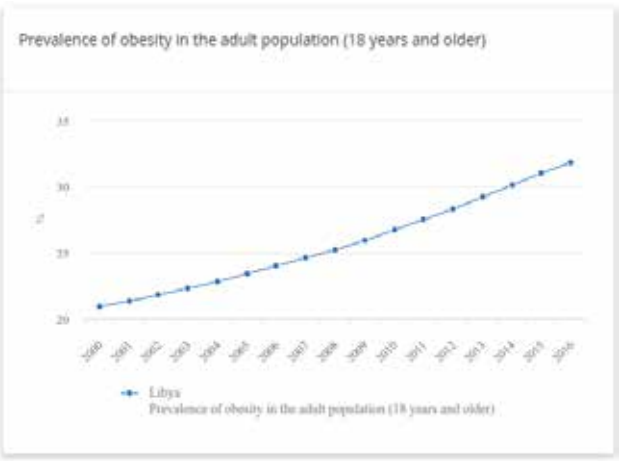
Food Access

Food Utilization

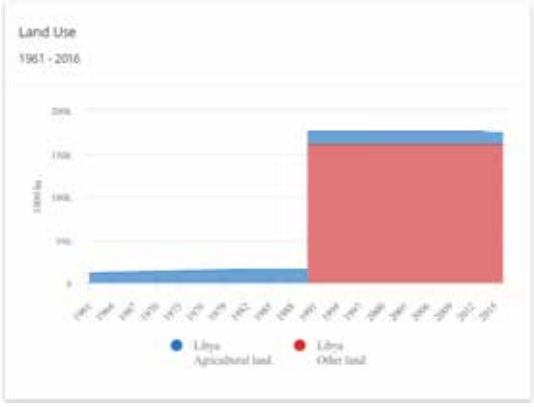


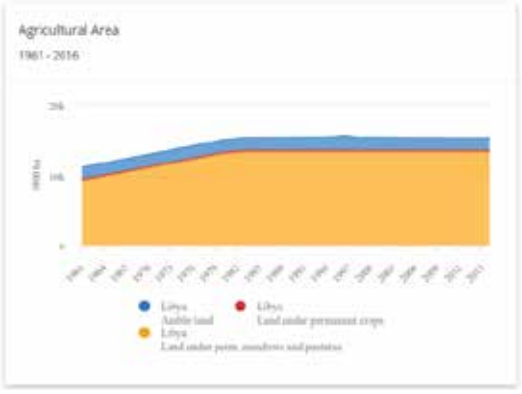




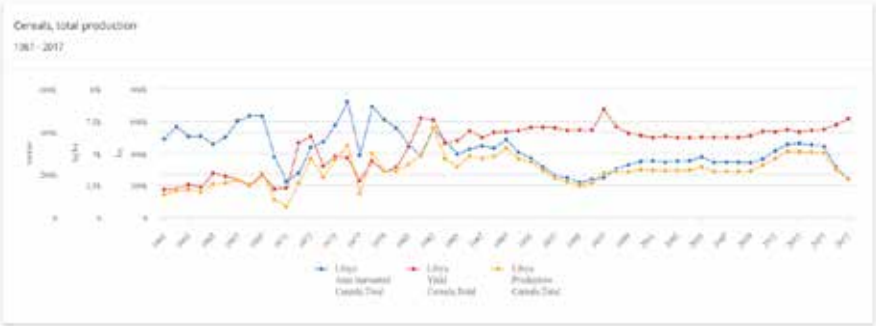


Land Use

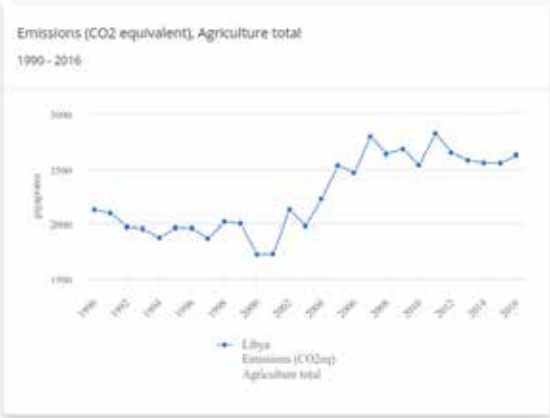


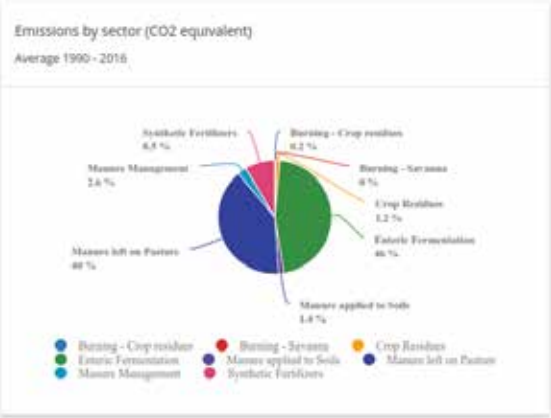


Production

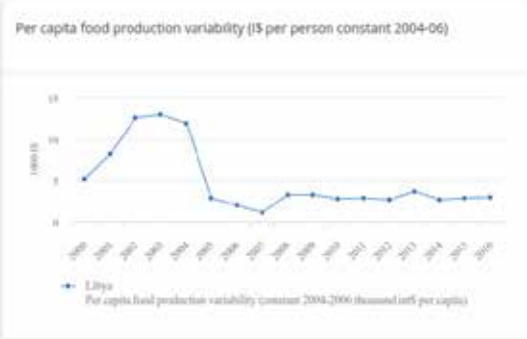


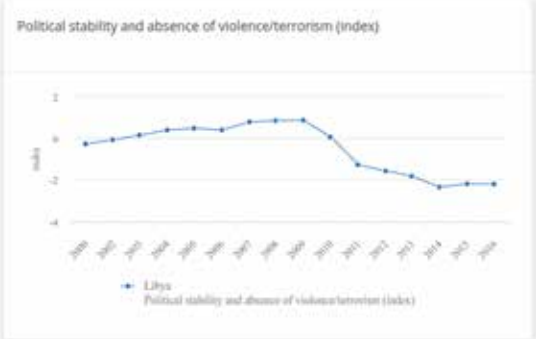
Emission





Economic and Political Stability





Overall the indicators reflect the scope of work needed to solve the challenges of securing the food for increasing population, facing changes in land use, for food production, increasing food utilization problems, and unstable economic and political conditions. WFP (2011) concluded that food security in Libya suffering from changes in their factors conditions, and short-term perspectives. Several reports based on their studies on qualitative assumptions rather than quantifying evidence. Since food production needs water and irrigation water rests on access to electricity, then any studies deal with challenges of food security should manage agricultural resources which represent a major challenge as pollution of water and soil, and arise an environmental problem influence the ability of self-restoration of vegetative communities.

Water and Energy Challenges

Securing water and energy as discussed before are very important for food production. Both sectors were discussed under the concept of nexus (Al Samarrai, et al., 2017) in order to sustain them for life in Libya. The main challenges, which are thought to be considered related to securing the food are, technical, institutional, economic and social, and cultural. All these factors lacking suitable plans, accurate future visions, and research programs dealing with technologies and innovations.

Food Security Strategy

From the previous investigations carried out by the authors, it is suggested to adopt the Swiss Agency for Development and Cooperation (SDC, 2017) approach to built food security in Libya. The steps proposed by SDC (2017) in our view meet the challenges faced and enable seriously to sustain water, energy, and food security for life in Libya.

A. How we act

SDC (2017) suggested in their Global Programme Food Security GPFS three major shared help modalities:

1. International policy and norm-setting including implementation and monitoring at a regional level and continental with perfect outreach to national levels. Norms in economic and social development are standards of expected performance about how different actors must manage public and private affairs on the ground and are deemed essential for societies. Program of food security should support the dissemination and monitoring of selected framework and policies with aims enabling the country and private sector to improve food security and nutrition-related to the framework policy implemented.

2. Innovation of accessible solutions that have the prospective to reach smallholder farm families. This modality increases the livelihoods of smallholder farmers as well as changes unsustainable utilization and production patterns towards sustainability using innovation in all dimensions of the agricultural and food system. Innovation, in this case, should involve a presentation of new and improved frameworks, processes, and products into markets and society. It should also introduce potential methods (new agroecological production methods) to reach smallholder farm families to increase farmer's incomes (SDC, 2017).
3. Knowledge management including invention, switch over, and spreading of knowledge. Generally, the program of food security must advocates and supports useful knowledge management in all programs set in any project (SDC, 2017). This step means using knowledge, experience, and practices are the most significant resources for humanity. Both traditional and modern knowledge have to be implemented and a must for improving decision-making. Knowledge management also supports selecting the partners and the initiatives which make knowledge management possible, including creating, exchange, and spreading the food security and nutrition programs for the benefit of individual smallholder farmers and organizations. So, Constructing Agriculture and Food Security network in Libya will foster institutional learning and knowledge management.

B. The Agriculture and Food Security Network (A&FS network).

According to SDC (2017), the A&FS network is an internal instrument of food security programs used for knowledge management, providing strategic orientation on agriculture, food security, and nutrition. The focal point of the network is to connect the Libyan program of food security with different organizational units of the Libyan's agriculture and administration, as well as civil societies and involved actors of the private sectors. The connection shall be through learning journeys, appropriate international knowledge, and any other means to support strategy development processes.

The mandate of the A&FS network as given by SDC (2017)

- To promote learning and improve practiced and methodological knowledge;
- To offer theme-related operational advice to Libya's organizational units;
- To profit from the experience and invent good practices;
- To link global proposals and policy discussion with field activities and vice versa.

Work modalities of the A&FS network and the focal point are the followings after SDC (2017):

- Online information: newsletter, events, reports;
- Online interaction: blogs, e-fora;
- Face-to-face meetings at regional and global levels;

- "Learning fora" providing a platform for exchange during workshops and conferences;
- Longer term (12 to 24 months) in-depth "learning journey" on priority themes;
- In-house advice on conceptual issues related to agriculture and food security.

SDC (2017) also set six priorities that should be considered by the network to sustain the strategy set for food security, these are:

- Land governance is the core of agriculture development and food security.
- Agricultural education and Rural consultative services even with the high magnitude of reaching farmers, particularly smallholders, this issue have received little attention, with inventive practices and approaches.
- Post-harvest management: The loss and waste of food produced forming about 30%, this figure may be reduced according to the scope to enhance the use of resources through reducing post-harvest losses.
- Nutrition: Undernourished people as mentioned by the SDSN (2015)were about 800 million people, the number increases as the population among poor in the developing countries suffering the threat of poverty and hunger.
- Rural – peri-urban – urban dynamics: By 2050 people living in urban and peri-urban may reach more than 70% of the world's population (SDC, 2017). This figure needs more food to be secured.
- Ecological agriculture: Ecological principles are important for agriculture to achieve a sustainable world.

C. Partners and cooperation

International and global partners

The strategy should orient to maintain a varied and targeted choice of international and global partners. Those bodies shall be engaged actively with the national institutions and networks for the sake of executing food security programs.

Partners in Libya

Due to the concepts adopted in this work related to water, energy, and food nexus, partners engaged in food security strategy should be specialists from those sectors to increase strategy coherence for growth.

Private sector

Private partnerships must be encouraged to participate as active actors in different forms of assistance. This act seeks to discover and trial new instruments with the potential to increase and advance private investments (SDC, 2017). Food security programs should be engaged with private sectors, directly and indirectly, to support the Value Chains in rural areas.

D. Sustainable Development Goals (SDGs)

Heads of State and Government of the UN in September 2015 decided to put the world on a path towards sustainable development through the adoption of the 2030 Agenda for Sustainable Development (SDSN, 2015). This agenda includes 17 Sustainable Development Goals (SDGs), which set out quantitative objectives across the social, economic, and environmental dimensions of sustainable development all to be achieved by 2030. SDSN (2015) showed that the goals afford a framework for mutual action "for people, planet, and prosperity," to be implemented by "all countries and all stakeholders, acting in a collaborative partnership."

This work concentrate on goals of particular importance to food security strategy in Libya. The target goals are zero hunger (Goal 2 aims to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture), clean water and sanitation (Goal 6 aims to "Ensure availability and sustainable management of water and sanitation for all") and affordable and clean energy (Goal 7 aims to "Ensure access to affordable, reliable, sustainable and modern energy for all").

		
Goal 2	**Goal 6**	**Goal 7**
End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Ensure availability and sustainable management of water and sanitation for all	Ensure access to affordable, reliable, sustainable, and modern energy for all

Sustainable Development Goals (UN, 2017) produce a complete framework for sustainable development of agriculture in nexus with water and energy. Since the selected goals serve for food security, the program should consider the following targets in each goal.

Goal 2:

2.1 Accelerating progress to end hunger and make sure access the food by all people, in particular people in dangerous situations, to safe nutritious and sufficient food all the time in the year.

2.2 Ending all forms of malnutrition affects and concentrate on the nutritional requirements of older persons, teenage girls, pregnant and lactating women.

2.3 Maintain plant and animal genetic resources to improve breeds and crops and their capacity to get used to changing environments and human desires.

2.4 Increasing agricultural output and incomes of the smallholder's food producers,

including family farmers and fisheries, through knowledge securing, equal access to land, financial support, and markets.

2.5 Implementing resilient agricultural practices that increase productivity and invention which assist preserve ecosystems, as well as a built-up capacity for adaptation to climate change, drought, disasters and improve land and soil quality.

2.6 Encouraging investment in agriculture both domestic and foreign is the most efficient way to alleviate poverty, get better food security and decrease hunger and malnutrition.

2.7 Prevent and correct trade limitations and distortions in world agricultural markets. Following the mandate of the Doha Development Round.

2.8 Adopting measuring systems guarantee the suitable functioning of food product markets and their derivatives, to facilitate limit severe food price instability.

Goal (6):

6.1 More capable ways of water consumption and producing food is needed to manage water stress intensification. Generally, people will be affected by water stress when the ratio of freshwater withdrawn to total renewable freshwater resources is above 25%. As population growth and the effects of climate change increase, the case becomes worse. In Libya, the primary sector for water use in agriculture. This issue poses an important challenge for sustainable development, especially when agricultural production is projected to increase to meet food needs.

6.2 Healthy management of protecting water and using it, shall be considered a critical point for producing food as well as in all other sectors (UN, 2017).

Goal (7):

Food security needs water. Since water in Libya exist mainly in the underground and rests on access to electricity, then improving energy efficiency and increasing the share of renewable energy lead to sustainability of food, water, and energy.

Furthermore related prospective synergies and trade-offs with goals and targets in the realms of poverty (Goal 1), health (Goal 3), decent work (Goal 8), responsible production and consumption (Goal 12), climate action (Goal 13), and life on land (Goal 15).

E. Monitoring & Evaluation

The monitoring and evaluation programs set by SDC (2017) are adopted by this work to deal with the performance of the strategy suggested implementing Libya's food security. The execution of the strategy should subject to regular monitoring to keep follow of the relevance, efficiency, and effectiveness of the program. Introducing Reference indicators and Aggregated Reference Indicator to measure project and program outcome levels.

Several parameters, such as international norms, policy frameworks, voluntary guidelines,

and newly generated knowledge may clarify their expected effects on farmer's livelihood. Regardless of the complexity of the sequence of effects and the procedural challenges to measuring such results empirically, the program of food security should be dedicated to achieve and account for measurable results. For outcomes that cannot be calculated quantitatively, subjective, non-systematic, descriptive methods must be used to account for their results and be reported annually. To strengthen the capacity of the food security program, monitor and report results, a backstopping arrange should be carried out.

F. Communication

Communication Concept must be disseminated within food security programs, targeting audiences, key messages and procedures, intending to:

Sustain the awareness of the current food security challenge and the importance of the program of food security.

Enhance awareness about the programs of food security and the expected results could be achieved

Demonstrate the functioning of the (innovative projects, mutual experience, and influencing policy) globally.

Food insecurity

Exists when people lack access to sufficient amounts of safe and nutritious food and therefore are not consuming enough for an active, healthy, and reproductive life. This may be due to the unavailability of food, inadequate purchasing power, or inappropriate utilization at the household level.

Conclusion And Recommendation

The concepts explained for defining food security and stands as challenges for implementing sustainable food security indicated that food deprivation prevalent within the population of Libya. The study showed that although Libya practiced several food programs, still Libya facing low food using levels plus unfairness in access to food. Accordingly, the authors recommended addressing food security and insecurity, well designed and comprehensive policies, particularly in the view of applying the sustainable development goals (2, 6, and 7) using the water energy and food nexus. The strategy suggested in this study, needs to have a legislation body adopt building the strategy, monitoring, and maintaining the framework constructed for the sake of securing food in Libya. A thorough study must be executed to solve the challenges to find solutions for implementing the strategy.

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تأمين الغذاء في ليبيا المباديء والتحديات والاستراتيجيات

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المستخلص

بشكل عام تأمين الغذاء يتأثر بالوضع الاقتصادي وما يرافقه من ظواهر. فندرة الغذاء تؤثر على الأسعار وعليه يتأثر استقرار الحالة الاجتماعية والسياسية، وهذه بدورها تأجج الأزمات. تبعا لما تقدم فان دراسة تأمين الغذاء لابد من أن تتبنى تعريف لتأمين الغذاء، والذي في هذه الدراسة اعتمد على التعريف الذي قدم في إعلان روما عام 1996 بخصوص تأمين الغذاء العالمي. ومن هذا التعريف انتقيت المفاهيم التي استند عليها هذا البحث. كما اعتمدت المفاهيم على أهداف التنمية المستدامة المعلنة من قبل الأمم المتحدة في عام 2000. المفاهيم التي استند إليها اختيرت أيضا لمواجهة التحديات التي تواجه توظيف سياسات تأمين الغذاء في ليبيا. ويعتبر الاستثمار في القطاع الزراعي والممارسات الخاطئة في العملية الزراعية من التحديات الواجب معالجتها لما لها الأثر الكبير على تامين الغذاء. بالإضافة إلى ذلك فان التخطيط لتامين الماء والطاقة لا يتماشى مع الخطط الموضوعة لتامين الغذاء، لذلك ومن اجل وضع إستراتيجية واضحة لابد من تبني التخطيط المتلازم بين الماء والطاقة والغذاء والذي بدوره يرتبط بالحفاظ على النظام البيئي الحيوي.

الكلمات الدالة: النظام البيئي، تأمين الغذاء، الترابط بين الماء والطاقة والغذاء، الزراعة، ليبيا.

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