

**The Annual
Technical
Report
2017**

Introduction

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) is still exerting its efforts to find out scientific and practical solutions for the problems that face the agricultural sector in the Arab region. In spite of the current circumstances, it has accelerated the implementation of its annual plans. The following is a summary of ACSAD's activities which were implemented in the year 2017.

ACSAD has maintained the implementation of strategic developmental projects in most Arab countries through 5 main programs in the fields of: plant resources, lands and water uses, animal wealth, water resources and economy and planning. These programs included 20 subprograms covering 52 projects, in addition to the main program of human capacities building which contained two subprograms for training and scientific meetings.

ACSAD has been able to achieve positive results in the fields of: creation of highly productive and environmental stress-tolerant wheat and barley varieties, expansion and dissemination of conservation agriculture system and improvement of wheat productivity in the Arab countries. It also continued the implementation of several projects in the fields of: rangelands rehabilitation and development, production and development of fruit trees appropriate to arid areas and provision of improved genetic resources among several Arab countries, in addition to drought impacts alleviation in the Arab region, degraded lands rehabilitation and saline and waste water uses in agriculture.

ACSAD, moreover, has paid a special attention to vital water projects implementation, particularly the executive plan of Arab strategy for water security in the Arab region, rainfall water harvesting, adaptation with climatic changes in the Arab countries, study of extreme climatic phenomena impact on water resources in the Arab region, modern modeling uses in water resources management and expansion of non-conventional water resources uses.

In the field of Arab livestock development, ACSAD has maintained the implementation of its researches and studies in the fields of: goat and sheep genetic improvement and care in the Arab countries, technology development of embryo transfer and artificial insemination for small ruminants, camel production development and fodder processing of agricultural residues.

In the year 2017, ACSAD has issued several socio-economic studies to evaluate research and technical results reached by ACSAD's experts to prove their feasibility at the farmers' fields. It has also paid an extreme attention to human capacities building in the field of Arab agricultural development.

Finally, it is worthwhile mentioning that ACSAD will continue exerting all the potential efforts for the sake of developing and modernizing research tools, providing the necessary technical and technological data and upgrading its performance for achieving its goals and sustainable development plan goals of 2030 reflected in renewable natural resources development in the Arab arid and semi-arid areas.

Allah is the Arbiter of Success

Prof. Dr. Rafik Ali Saleh
Director General

Plant Resources

The Plant Resources Department works on implementing its activities through the following main programs:

1- Program of «Rainfed Agriculture Development and Improvement in the Arab Countries»:

This program aims to improve the cereal crops productivity, especially wheat (durum and bread) and barley, increase their productive capacity under the Arab arid and semi-arid areas conditions and develop the cultivation of sorghum and millet crops due to their food and feeding importance and highly drought- tolerance.

2- Program of “Conservation Agriculture”:

This program encourages farmers in the Arab countries to adopt the conservation agriculture system. It aims to improve the crops productivity, alleviate the severity of drought, build the Arab agricultural institutions’ capacities in the field of sustainable agricultural production and increase the awareness of researchers and technicians towards the positive effects of this new agricultural system.

3- Program of “Development of Appropriate Fruit Tree Lines for Arid Areas”:

This program aims to improve the productivity of fruit trees that are appropriate for Arab arid and semi-arid areas (olive, almonds, pistachio, figs and grapes), conserve the reliable genetic material and provide Arab countries with it.

4- Program of “Palm tree Development in the Arab Countries”:

It aims to develop and take care of date palm trees in the Arab countries through services and picking up process improvement, integrated pest management and extension activities promotion.

5- Program of “Rangelands and Forestry Resources Rehabilitation and Development”:

It aims to survey and inventory the pastoral vegetation cover, identify the proper grazing systems and pastoral management practices, rehabilitate the degraded pastoral arid and semi-arid areas, collect, evaluate and classify the pastoral varieties and select the environmental stress- tolerant genotypes to be propagated and distributed among the Arab countries.

It also aims to establish gene banks and breeding fields for the pastoral species that have a good feeding value and high adaptive capacity.

6- Program of “Biodiversity Conservation”:

It aims to document the biodiversity in the Arab region by inventorying, collecting and documenting the plant varieties that grow in the arid and semi-arid environments, establishing databases and producing qualitative atlases that meet the requirements of specialists in the related research and developmental programs. It also aims to support other programs with the genetic resources of economically important plants and coordinate among Arab countries to implement the CBD convention and Cartagena Protocol for Biosafety.

First: Program of “Rainfed Agriculture Development and Improvement in the Arab Countries”

The cereal program includes 7 projects (5 ongoing research projects and 2 developmental projects) which are implemented in cooperation with the concerned agencies and commissions in the Arab countries. The following is the activities and achievements of the implemented projects during the season 2016-2017:

1: Project of “Development of Highly Biotic and Abiotic Stress-Tolerant and Highly Productive Wheat and Barley Varieties”:

Project site: Jordan, Tunisia, Algeria, Saudi Arabia, Sudan, Syria, Oman, Iraq, Palestine, Kuwait, Lebanon, Libya, Egypt, Morocco, Mauritania and Yemen

1.1: Evaluation of genetic resources for biotic and abiotic stress tolerance:

- Evaluate 2736 entries from some Arab countries and specialized regional and international organizations, in addition to ACSAD’s lines that are used in the experiments of primary production efficiency, Arab production efficiency and observation lines. As a result of this evaluation, 478 genetic resources of the three crops were selected to be tested later in the various breeding stages aiming at reaching the promising lines.

1.2: General hybrids:

-Conduct 512/successful hybridization processes between the selected parents for the crops of durum wheat, bread wheat and barley (six-row and two-row) at a rate of 128/ hybrids of each crop for the purpose of developing new promising lines during the isolated and next advanced generations.

1.3: Evaluation of hybrids; isolated and advanced generations:

These generations cover the different stages of durum wheat, bread wheat and barley breeding programs starting from the first generation “F1” till the fifth generation “F5”. 867/ hybrids that contained 4092/ families and lines were evaluated; out of which 521/ hybrids, containing 3720/ families and lines, were selected. The evaluation and selection processes will be continued during the different isolated generations aiming at introducing the successful lines in the fifth generation to be used as promising ones in the primary production efficiency experiment which is considered the first stage of line evaluation.

1.4: Observation lines:

-Evaluate 3464 entries of durum wheat, bread wheat and barley for two successive agricultural seasons to make sure of their traits stability and their adaptation with the test environment. 228/ promising entries were selected to be used as hybrid parents for genetic improvement.

1.5: Primary production efficiency experiments:

In the first year of the primary production efficiency experiments, 120/ lines of durum wheat, bread wheat and barley were tested during the season 2016-2017. As a result, 60/ promising lines were selected to be tested for a second year in the season 2017-2018 and introduced later into the Arab production efficiency experiments.

1.6: Arab production efficiency experiments:

-Evaluate the performance of ACSAD’s superior lines of the primary production efficiency experiments under the rainfed and irrigated agriculture conditions at many different environmental sites distributed among 13 Arab countries (Jordan, Tunisia, Algeria, Saudi Arabia, Susan, Syria, Oman, Iraq, Palestine, Lebanon, Egypt, Morocco and Mauritania).

Each experiment included 19/ superior lines of durum and bread wheat and 18/ superior lines of barley (six and two rows), in addition to the local and improved control plants. The 2016-2017 experiments at several sites in the Arab countries showed the superiority of ACSAD’s lines over the local control plants in more than one country; these lines were the following:

Durum wheat: ACSAD (1453 - 1471 - 1407 - 1483 - 1487 - 1523 - 1527 - 1541 - 1543 - 1551 - 1553).

Bread wheat: ACSAD (1240 - 1288 - 1300 - 1304 - 1314 - 1344 - 1288 - 1346 - 1362 - 1364 - 1370).

Barley: ACSAD (1746 - 1724 - 1787 - 1779 - 1772 - 1766 - 1765 - 1758).

1.7: ACSAD's varieties of durum wheat, bread wheat and barley which are registered in the Arab countries:

/24/ varieties have been registered in /8/ Arab countries up to date as illustrated in the following table:

Table (1): Number of varieties registered in the Arab countries

Country	Durum wheat	Bread wheat	Barley
Jordan	1	--	2
Syria	3	3	2
Lebanon	2	1	--
Morocco	1	1	2
Algeria	1	6	5
Yemen	2	2	--
Libya	3	2	1
Iraq	1	--	--

Table (2): ACSAD's durum wheat varieties registered in the Arab countries

Variety/breed	Country	Given name	Year of adoption
ACSAD 65	Jordan	ACSAD 65	1985
	Syria	ACSAD 65	1985
	Morocco	ACSAD 65	1985
	Lebanon	Tel Amara 1	2010
	Iraq	ACSAD 65	-
ACSAD 357	Libya	Bhouth 107	
ACSAD 363	Libya		
ACSAD 1105	Syria	Douma 1	2002
	Lebanon	Tel Amara 3	2013
ACSAD 1107	Algeria	Sawra	2012
ACSAD 1119	Yemen	Na'aem 1	2008
ACSAD 1169	Yemen	Bhouth 5	2008
ACSAD 1229	Syria	Douma 3	2010

Table (3): ACSAD's bread wheat varieties registered in the Arab countries

Variety/breed	Country	Given name	Year of adoption
ACSAD 59	Algeria	Haddna	1985
	Morocco	ACSAD 59	1985
ACSAD 885	Syria	Douma 2	2004
	Algeria	Ramada	2011
ACSAD 899	Algeria	Jannat	2012
ACSAD 901	Syria	Douma 4	2007
	Lebanon	Tel Ammara 2	2010
	Libya		2010
	Algeria	Mouna	2013
ACSAD 935	Libya		2010
ACSAD 969	Algeria	Jamila	2012
ACSAD 1097	Yemen	Shibam 1	2008
ACSAD 1119	Yemen	Shibam 2	2008
ACSAD 1133	Syria	Douma 6	2014
ACSAD 1139	Algeria	Taitari	2014

Table (4): ACSAD's barley varieties registered in the Arab countries

Variety/breed	Country	Given name	Year of adoption
ACSAD 60	Syria	ACSAD 60	1985
	Jordan	ACSAD 60	1985
	Morocco	ACSAD 60	1985
	Algeria	Bahria	1985
ACSAD 68	Morocco	ACSAD 68	1985
ACSAD 68	Algeria	Ramada	1985
ACSAD 176	Syria	ACSAD 176	1985
	Jordan	ACSAD 176	1985
	Morocco	ACSAD 176	1985
	Algeria	Nailia	1985
ACSAD 1230	Libya	Maimoun	
ACSAD 1688	Algeria	Soukar	2014
ACSAD 1704	Algeria	Tahart	2014

ACSAD's varieties of durum wheat, bread wheat and barley proposed for registration in the Arab countries

Country	Crop	Variety	Local name	Registration year
Algeria	Barley	ACSAD1731	Wad Al-Bsbus	Second year of registration
		ACSAD1737	Wad Mlah	
		ACSAD1704	Tihert	First year of registration
	Bread wheat	ACSAD1236	Wad Shffa	First year of registration
	Durum wheat	ACSAD1431	Zamalet Al-Amir Abdelkader	First year of registration
		ACSAD1459	Al-Safa project	
Sudan	Durum wheat	ACSAD885	---	Second year of registration
Jordan	Bread wheat	ACSAD901	---	First year of registration
		ACSAD1455	---	
		ACSAD1467	---	
	Barley	ACSAD1700	---	First year of registration
		ACSAD1706	---	

2: Development of modern agricultural technique package to improve the productivity of cereal crops under rainfed and irrigated agriculture conditions:

2.1: Study of the impact of different salinity levels on the productivity of (bread wheat, durum wheat and barley):

This study has been implemented at ACSAD's research station of Ezra'a in the agricultural season (2016-2017) by conducting cultivation in lysimeters and irrigating with highly-saline solutions (0, 50, 100 and 150mmol/l). Six varieties have been cultivated namely; ACSAD885, ACSAD899, ACSAD901, ACSAD969, ACSAD 1133 and ACSAD 981. The plant growth has been monitored and the required properties indicators have been registered: grain weight, grain number, plant height, number of tillers per plant and number of spikes per plant. After the statistical analysis of the data, the results have showed that the variety; ACSAD 885, had the highest yield.

2.2: Analysis of yield trait and some morphological and physiological traits in the isolated generations, and identification of some genetic locations of yield and environmental-stress tolerance traits in the bread wheat:

Parents of bread wheat crop were cultivated under rainfed conditions at Ezra'a research station during the season 2016/2017, and seeds of F₁ hybrids of the first generation F₁ were produced. Currently, the parents and hybrids are evaluated in order to select the most tolerant ones towards drought stress.

2.3: Study of the use of genetic resources and local lines in developing and improving wheat tolerance for abiotic stresses and productivity stability:

Cultivate 36 local lines of durum and bread wheat and ACSAD's adopted varieties of durum and bread wheat, where 5 hybrids were selected and showed superiority over their parents.

2.4: Effect of humic acid use on some productive traits of sorghum bicolor:

The research aims to study the effect of humic acid use on some productive traits of sorghum bicolor. The results showed a positive impact of this organic matter which increased the grain product by 14% due to the increase of the crop tolerance capacity towards drought stress.

2.5: Evaluation of green fodder production of some gramineous genetic resources under environmental- stress conditions:

The study aims to evaluate the performance of F₁ varieties of sorghum bicolor (which can be used as a fodder crop) under Ezra'a research station conditions. The varieties were: Egypt6, Giza113, Red Jazan, White Jazan, Mayo, Veterei, Fello, Biufuel, Jioui and Bodelly; of which 6 were selected (Egypt6, Giza113, Veterei, Fello, Biufuel and Jioui) for green fodder production. The results were confirmed during the season 2017.

2.6: Evaluation and breeding of barley lines for green fodder production:

The study was carried out by Ezra'a research station aiming at selecting non-grain barley lines which are adaptable to arid environments and highly productive in terms of green fodder production. The results showed the presence of a significant difference among the cultivated varieties. The productivity ranged between 15.71 and 32.59 tons/ha as a wet weight and 6.48 and 12.83 tons/ha as a dry weight. On the other hand, ACSAD1760 and ACSAD1779 exceeded the other lines in terms of wet weight and dry weight respectively.

2.7: Pearl millet evaluation and introduction into semi- arid environments:

Superior genotypes out of F₂ imported genotypes of pearl millet (from CRISAT) were selected and crossbred during the season 2017 at ACSAD's research station of Ezra'a. F₁ hybrids (F₁) were produced and are currently compared with the parents and evaluated in terms of adaptation with the semi-arid environments.

2.8: Evaluation of response and growth of some bread wheat genotypes (Triticum aestivum) in terms of saline-stress tolerance under field cultivation conditions:

Two registered bread wheat varieties (ACSAD901 and ACSAD1133) and two promising lines (ACSAD1149 and ACSAD1256) were cultivated under different levels of salinity (0, 50, 100 and 150mmol/l) at Ezra'a research station. The initial results showed all varieties' growth capacity at all the different levels of salinity. ACSAD901 showed superiority in terms of the spike length trait and ACSAD1133 exceeded the others in terms of the 1000 grains weight and harvest coefficient traits. On

the other hand, ACSAD1149 and ACSAD256 showed superiority in terms of the buds number and the 1000 grains weight traits.

2.9: Estimation of water use efficiency for some of ACSAD's registered varieties of wheat and barley:

The results indicated the superiority of the selected genetic genotypes in terms of water use efficiency including: wheat varieties of ACSAD1229, ACSAD969 and ACSAD1107 which registered 21.9, 20.21 and 19.79 kg of grains/mm/ha respectively, and barley varieties of ACSAD1230, ACSAD68 and ACSAD176 which registered 22.68, 21.44 and 19.79 kg of grains/mm/ha respectively. These varieties can be used as parents in the future genetic improvement and breeding programs of drought-tolerant wheat and barley varieties.

2.10: Development of appropriate agricultural technique package to improve the productivity of ACSAD's registered wheat varieties under rainfed and irrigated agriculture conditions:

The results indicated that the bread wheat variety ACSAD1133 is more superior in terms of leaf size in comparison with other ACSAD's registered varieties of bread wheat and control plant Sham6. They also indicated that the best time for cultivation is the early timing (20/11) and that the grain yield would increase upon increasing the added nitrogen fertilizer quantity till 200 kg of N/ha and cultivating at a seeding rate of 125 kg/ha.

2.11: Performance evaluation and morphological characterization of some cultivated vetch genotypes:

/11/local vetch varieties were cultivated; out of which the best ones were selected as parents and /18/ hybridization processes were conducted to get F1 generation during the season 2016/2017. The work will be continued in terms of morphological and biotechnological characterization of these hybrids during the season 2017/2018.

3: Project of "Seed Multiplication of Promising Wheat and Barley Lines and Varieties Seeds":

Project progress: /137/ varieties and lines of durum wheat, bread wheat and barley were multiplied during the agricultural season 2016- 2017 at different multiplication stages (G0 and G1); and /316/ kg of seeds were sent to /13/ Arab countries as promising lines and hybrids to be cultivated during the agricultural season 2017-2018.

Wheat and barley seeds quantities that were sent to the Arab countries to be cultivated in the agricultural season 2017-2018

Country	Seed quantity (kg)
Syria	27
Lebanon	27
Jordan	25
Palestine	13
Iraq	13
Saudi Arabia	13
Sultanate of Oman	13
Sudan	27
Egypt	25
Tunisia	80
Algeria	27
Morocco	13
Mauritania	13
Total	316

4: Sorghum Bicolor Development and Improvement Project:

Project progress:

- Provide Arab countries with the sorghum seeds of Arab productive efficiency experiments.
- Conduct crossbreeding among 31 lines, and prepare /60/ hybrids of “F0” for cultivation in the 2018 season to be evaluated under dry conditions.
- Cultivate /28/ families of generation F4 in the season of 2017 and select /39/ superior families of generation F5 of which the best was selected to be tested in the Arab efficiency experiments.
- Evaluate /11/ individual hybrids of “F1” and select /39/ families of the isolated fifth generation, based on the morphological and productive traits, pest tolerance and genetic stability, at three different times of cultivation.
- Evaluate and propagate /25/ sorghum lines of the breeding program of ACSAD and ICRISAT based on morphological traits and environmental adaptation.
- Evaluate /21/ millet lines at Ezra’a research station and conduct the potential crossbreeding between them.

5: Project of “Sorghum Bicolor Hybrids Production”:

- /7/ sorghum genotypes and /1/ millet genotype (ICSV-700) were selected based on morphological characteristics and environmental adaptation.
- /20/ plant parents were cultivated for hybridization during the season 2017.
- /120/ male-sterile sorghum bicolor lines were introduced by ICRISAT for propagation, evaluation and hybridization purposes.

6: Biological Technique Researches and Studies Project:

Project Progress:

ACSAD’s experts have conducted laboratory studies and analysis for /124/ cereal samples.

7- Spectral Studies in Wheat and Barley Fields:

Outputs:

- Identify the spectral print in wheat and barley experimental fields.
- Study the spectral separation potential between wheat and barley.
- Study the spectral impact of environmental factors on plant growth.

8: Special Developmental Projects in Arab Countries:

8.1: Project of “Wheat and Barley Productivity Improvement in the State of Palestine”

8.2: Project of “Multiplication of 30000 Tons of Wheat Seeds by Cultivating 200000 ha in the Northern State of Sudan”

9: Cooperation with the Arab and Foreign Centers and Commissions:

9.1: Ministry of Agriculture and Agrarian Reform of the Syrian Arab Republic:

-General Organization for Seeds Multiplication:

9.2: Faculty of Agriculture- Damascus University- Syrian Arab Republic:

9.3: Publication of a number of scientific articles.

10: Cooperation with International Organizations:

- Activate cooperation with the International Center for Agricultural Research in Dry Lands (ICARDA) to exchange genetic materials, as /700/ lines of barley, bread wheat and durum wheat have been received to be cultivated during the season 2017/2018.
- Activate cooperation with the International Center for Wheat and Corn Improvement (CYMMET) to exchange genetic materials, as /1024/ lines of bread wheat and durum wheat have been received to be cultivated during the season 2017/2018.
- Activate cooperation with (ICRISAT) to exchange the genetic resources of sorghum bicolor, as /121/ genotypes of sorghum bicolor have been received to be cultivated during the season 2017/2018.

Second: Program of “Conservation Agriculture”

Outputs:

1: Evaluation of the Importance of Conservation Agriculture System Application for the Long-Term Improvement of Cereal Crops and Soil Properties at ACSAD’s Research Station of Ezra’a:

- The average grain yield of wheat crop has increased under the conservation agriculture conditions

(2593.3 kg/ha) in comparison with conventional agriculture system (2317.5 kg/ha) at an increase rate estimated at 11.90%.

-Upon the application of agricultural rotation with the vetch crop, the average grain yield has increased (2511.5 kg/ha) in comparison with the absence of the agricultural rotation (2399.0 kg/ha) at an increase rate estimated at 4.69%.

-It was noticed that the average grain yield was the highest for the bread wheat variety of ACSAD 901 (2573.0 kg/ha) in comparison with the bread wheat variety of ACSAD 899 (2337.5 kg/ha) at an increase rate estimated at 10.07%.

-The superiority of the conservation agriculture system was proven in terms of rainfall water use efficiency (10.69kg/mm/season) in comparison with the conventional agriculture system (9.55 kg/mm/season) at an increase rate estimated at 10.66%.

-The increase rates of revenue and return/ ha were 10.63% and 20.52% respectively under the conservation agriculture system in comparison with the conventional one. The decrease rate of costs was about 21.46%.

-The application of conservation agriculture system has led to the improvement of soil content of organic matter and big mineral elements NPK in comparison with the conventional agriculture system.

2: Application of Conservation Agriculture System to Improve Small Cereals Productivity- Wheat and Barley- and Soil Properties in the Arab Countries.

Third: Program of “Development of Appropriate Fruit Tree Lines for Arid Areas”:

1: Project of Development of Appropriate Fruit Tree Lines for Arid Areas in the Arab Countries:

1.1: Project of Development of Fruit Tree Lines in Arid and Semi-Arid Areas in Cooperation with the Technical Institute for Fruit Trees and Vines.

2: Project of “Conservation of Drought-Tolerant Wild Fruit Tree Resources”:

Project site: The gene bank of Gellin- Syria and Al-Bouqa research station.

The most important studied wild trees are:

Olea europaea, Amygdalus orientalis, Pistacia atlantica, Cateagrus spp., Pyrus Syriaca and Ziyphus spp. All of these trees are from the Syrian natural environment.

3: Project of “Fruit Tree Seedlings Production Expansion for Meeting Arab Countries Demands”:

ACSAD’s research stations specialized in fruit seedlings production:

-ACSAD’s research station of AL-Bouqa has produced 100000 seedlings of different olive varieties- including 21000 Khaddirri seedlings, 47300 Sorani seedlings, 19500 Kaissi seedlings and 11000 other seedling (table and bi-purpose varieties).

-In 2017, ACSAD has sent 35000 seedlings to the Arab countries.

-ACSAD’s research station of Ezra’a is continuing the production of grafted pistachio seedlings as- /4000/ seeds were cultivated to produce seed seedlings and /2000/ grafted seedlings of female and male varieties are produced annually.

Seedlings distribution among Arab countries:

The total quantities of the consignments of the fruit trees program to the Arab countries during the period 1997-2017 are estimated in the following table:

Country	Quantity	Number	Item
Algeria- Libya- Saudi Arabia- Iraq- Bahrain- Yemen- Jordan- Egypt- Lebanon- Syria- Kuwait		409529	Olive seedlings
Saudi Arabia-Algeria- Egypt- Iraq- Yemen- Libya- Lebanon-		2014148	Olive cuttings
Algeria- Libya- Yemen- Jordan	700		Olive seeds
Algeria- Libya- Jordan- Tunisia- Saudi Arabia- Iraq- Morocco- Yemen- Egypt- Lebanon- Palestine		77746	Pistachio seedlings
Algeria- Libya- Saudi Arabia- Tunisia- Iraq- Egypt- Lebanon- Jordan	3412		Pistachio seeds
Libya- Jordan- Syria		92195	Pistachio cuttings
Saudi Arabia- Iraq- Algeria- Syria- Libya- Yemen- Egypt- Lebanon- Jordan		25630	Almond seedlings
Iraq		500	Almond cuttings
Libya- Lebanon- Algeria- Jordan	2800		Almond seeds
Lebanon- Libya- Yemen- Egypt- Syria		4495	Fig seedlings
Iraq- Jordan- Syria- Lebanon- Yemen- Egypt- Libya		4675	Fig cuttings
Syria- Iraq- Saudi Arabia		2450	Vine cuttings
Lebanon- Libya		9575	Vine seedlings
Libya		17475	Vine cuttings
Libya- Lebanon		246135	Pome and stone fruit seedlings
Libya	6400		Apricot seeds
Tunisia- Morocco- Yemen		8600	Pistacia atlantica seedlings
Libya	5		Mahaleb seeds

4: Scientific Researches and Studies at ACSAD's Research Stations in the Field of Fruit Trees:

4.1: In the field of olives:

4.1.1: Project of "Characterization of Cultivated Olive Varieties at the Gene Bank of Gellin".

4.1.2: Project of "Impact of Time and Method on the Success of Mature Olive Trees Grafting".

4.1.3: Project of "Study of the Reaction of Some Olive Varieties and Types with Different Origins towards the Pseudomonas savastanoipv. Savastanoi Disease".

4.1.4: Project of "Selection of Verticillium wilt (Verticillium dahlia Kleb) Disease- Resistant Wild Olive Lines and Grafting of Some Economic Varieties with them":

4.2: In the field of pistachio:

4.2.1: Study the genetic relation between some Syrian pistachio varieties and other pistachio varieties of Al-Maghreb countries.

Forth: Program of Palm tree Development

1: Project of "Land and Vertical Palm Trees Service Processes Development for Production Increase and Quality Improvement in the Arab Region":

-The project is implemented in Jordan, Tunisia, Algeria, Saudi Arabia, Sudan, Syria, Somalia, Palestine, Egypt, Mauritania and Iraq.

-The necessary service processes and required activities on the typical field trees are conducted according to the project document.

-Training courses and field days are also conducted on "service processes in the typical fields".

Research Plan of Palm Tree Development Program:

Research Project of "Genetic Identification and Comparison of Local Isolates Efficiency of Pathogenic Microbes with Palm Pests and the Potential of the Isolates' Production in the Fermenters".

Fifth: Program of "Rangeland and Forestry Resource Rehabilitation and Development"

5.1: Project of "Arab Rangeland Rehabilitation and Management and Collection and Propagation of Promising Plant Species Seeds":

1: Project of "Rangeland Rehabilitation in the Algerian steppes".

2: Project of "Desert Rangeland Development and Productive Capacity Raising in Algeria".

3: Project of "Al-Hammad Basin Development in Iraq".

5-2: Project of "Inventory of Multi- Purpose Tree and Shrub Species and Enhancing their Role in the Support of Local Community Income Sources".

Sixth: Biodiversity Program

6.1: Project of "Biodiversity Conservation and International Convention on Biodiversity Implementation Follow-up":

6.2: Project of "Medical and Aromatic Plants Study the Arab Region":

-Study some Syrian multi-use natural wood species.-

-Use «Allelopathy» extractions of pastoral and forestry species in integrated pest management in arid and semi-arid areas.

-Study some indicators of vegetation cover and biodiversity in some Syrian areas.

-Study factors affecting the fruit production of Rhuscoriaria L. in the Syrian coast.

-Evaluate the use of waste sludge and pruning residues in the forestry seedlings production.

Lands and Water Uses

The lands and water uses Department works on implementing its activities through the following main programs:

1-Program of Desertification Combat and Monitoring in the Arab Countries:

The program aims to monitor and combat desertification through the adoption of a sound and scientific methodology by using advanced techniques for early detection of lands degradation and implementing pilot projects to rehabilitate desertification areas in the Arab countries.

2-Program of Soil and Land Studies and Mapping:

This program aims to prepare soil, lands and mapping studies, as the land resource survey studies ,particularly the land and digital purpose mapping, are considered one of the most important elements that helps in understanding the land resources components in the Arab region to establish a database for natural resources in the region and assists the decision makers in the rational planning process, sustainable use of the limited available resources, agricultural production intensification and ,ultimately, agricultural income and revenue increase. This is all done through a more efficient and appropriate use of lands and resources.

3-Program of Sustainable Management of Lands and Water Uses:

This program aims to develop an optimal management for lands and water and find improved scientific techniques and methods that achieve an economic production. Accordingly, ACSAD continues its applied and research programs which lead to the efficient and safe use of non-conventional water (such as saline and waste water) and the safe treatment that does not cause soil degradation and conserves its sustainability.

First: Program of Desertification Combat and Monitoring in the Arab Countries

1.1: Project of “Sand Dunes Fixation and Creeping Sand Control”:

Project objective: Conserve environment and control the impact of sand storms and creeping sands on man and environment in the Arab region.

Project site: The Republic of Iraq and the Arab Republic of Egypt.

Outputs: The Arab Center (ACSAD) has worked to achieve positive results in this field as follows:

1.1.1: Project of “Sand Dunes Fixation Using Agricultural Waste Water in Siewa Oasis in the Arab Republic of Egypt”:

Outputs:

1- Temporary protection:

A- Construct a tunnel with a length of /1/ km, width of /1/ m and depth of /1/ m for the purpose of decreasing the sand quantity that creep towards the green belt site in the project area.

B- Fences establishment: A fence made of palm leaves has been established with /1/ km length, /1.5/m height and leaf content estimated at /8/ leaves in length, i.e. with a penetration capacity of 30%. The construction has been made at /10/ m away from the tunnel; in parallel with it and vertically with the wind direction. The purpose of this fence is to protect green belt (the cultivated plants) from the sand creeping risks.

2- Green belt cultivation.

3- Identify the chemical properties of irrigation water.

4- Study soil properties.

5- Drip irrigation network implementation.

6- Training courses.

1.1.2: Project of “Infrastructure Protection from Sand Creeping Risks in Sina’a”:

Project parties: The project is implemented in cooperation between the Arab Center (ACSAD) and the Desert Research Center in the Arab Republic of Egypt.

Outputs:

-Implement the preparatory activities.

-Study the geological situation.

-Study the topographical situation.

-Study the natural and chemical properties of soil and irrigation water.

-Study the vegetative cover.

-Analyze satellite images of various dates.

-Set up proposals for the protection of the area from sand creeping and green belt establishment. The project activities have started by leveling works to facilitate the intervention process and the movement of vehicles and workers.

1.1.3: Preparation of Sand Dunes Encyclopedia in the Arab Region:

Under the initiative of the Arab Center (ACSAD) and led by its concern towards enhancing the cooperation with the national institutions in the Arab countries, a mutual project has been launched in cooperation with the Desert Research Center in Egypt and the Arid Zones Institute in Madnin in Tunisia, on “Preparation of Sand Dunes Encyclopedia in The Arab Region”.

A start-up workshop for the “Preparation of Sand Dunes Encyclopedia in the Arab Region” has been held on 27/11/2017 in Syria with the attendance of their Excellencies; the Minister of Agriculture and Agrarian Reform and the Minister of Local Administration and Environment, two Arab delegations from the Desert Research Center in Egypt and the Arid Zones Institute in Madnin in Tunisia and 100 interested participants from Syria.

1.2: Project of “Degraded Land Rehabilitation in the Arab Countries”:

Project site: The Syrian Arab Republic and the Arab Republic of Egypt.

1.2.1: Project of “Desertification and Land Degradation Indicators Development in the Syrian Arab Republic”:

Project parties: The project is implemented in cooperation between ACSAD and the Ministry of Local Administration and Environment in the Syrian Arab Republic.

Outputs:

- Review the indicators of land and water resources, vegetation cover, climate, remote sensing and socio-economic conditions.
- Organize a workshop on “Launching the National Indicators for Land Degradation and Desertification in the Syrian Arab Republic” on 31 July 2017.
- Start up the implementation of two applied projects in cooperation between ACSAD and the Ministry of Local Administration and Environment:
 - A project to evaluate land degradation and desertification extent in Syria by using the national indicators for land degradation and desertification.
 - Prepare strategies for solving the problems resulted from the Syrian war by using the national indicators for land degradation and desertification.

1.2.3: Project of “Estimation of Water Drifting Severity and Quantity by Using Field Measurements and Math Modeling”:

Outputs:

- A- Install tanks for surface water flow harvesting
- B- Harvest surface flow during the rainfall season and take samples from the harvested water to be analyzed in the laboratory.
- C- Collect the climatic data of the coastal area to be used in the scheduled math modeling.
- D- Collect the data of soil and vegetation cover.
- E- Apply the math model (RUSLE) and conduct the necessary calibration.

1.2.4: Project of “Degraded Natural Resources Rehabilitation in the Governorate of Matrouh in the Arab Republic of Egypt”:

Outputs:

- A- Conduct chemical and microbiological analysis of water and soil in the project areas.
- B- Study the land, geological and water resources and vegetation cover and the most important characteristics of the agricultural activity.
- C- Protect the natural resources in the project area by conducting some agricultural operations to adapt with the climatic changes.
- D- Train the technical staff and farmers of the project area on natural resource management and rehabilitation.

2.3: Project of “Follow-up of UNCCD Convention Recommendations and Activities and the Related Arab Mechanisms”:

Project objective:

The project is implemented by ACSAD being officially- authorized by the Secretary General of the League of Arab States to follow up the implementation of the convention in the Arab countries. The project aims to support the implementation of the convention in the Arab countries, coordinate among them, unify their attitudes and coordinate with the concerned Arab mechanisms in this field.

Project site: ACSAD and the Arab countries.

Outputs:

The Arab Center (ACSAD) has implemented the following activities in the year 2017:

- A- Prepare a technical memo on “land degradation neutrality” for the purpose of implementing the resolutions of the Arab Ministers Council for Environmental Affairs in its 27th session, submit it to the Secretary General of the council and present it in the 16th session meeting of the Arab team responsible for following-up the international environmental agreements.
- B- For the purpose of implementing the resolutions of the Arab Minister Council for Environmental Affairs, a training course on desertification and drought mapping has been organized for engineers from the Palestinian Environment Quality Authority.
- C- Participate in the 16th session meeting of the Arab team responsible for following-up the implementation of international environmental agreements and present a detailed report on ACSAD’s activities in the field of desertification combat and biodiversity. ACSAD has also participated in the 17th session meetings of the Arab team responsible for following-up the implementation of international

environmental agreements held at the Secretary General headquarters in Cairo during the period 10-12/4/2017. The meeting has invited the Arab countries to compliment the efforts of ACSAD for preparing periodical reports on drought and desertification situation and recommended to continue ACSAD's technical support to the Arab countries in the field of desertification combat and monitoring.

D- Participate in the 18th session meetings of Environment and Development Committee in the Arab Region and the 28th session meetings of the Arab Ministers Council for Environmental Affairs, present "PowerPoint" presentations on the progress of the project of "Green Belts Establishment in the Arab Region" and prepare desertification and drought maps for the State of Palestine. ACSAD has also participated in the 19th session meetings of Environment and Development Committee in the Arab Region held in Cairo during the period 14-17/10/2017 and the 29th session meetings of the Arab Ministers Council for Environmental Affairs held in Cairo on 19/10/2017.

E- Participate in the UNCCD coordinating meeting held in Cairo on 21-22/8/2017 for the purpose of preparing for the 13th Parties Meeting held in China on 6-16/9/2017. ACSAD's representative has presented a PowerPoint presentation on ACSAD's efforts in the fields of land degradation neutrality and sustainable development in the Arab World.

F- Participate in the meeting invited by the Arab Organization for Agricultural Development and held in Cairo on 12-13/10/2017 to discuss the regional framework plan for supporting Arab countries in the implementation of the "2018-2030 desertification combat strategic plan" and the 15th SDG.

Second: Program of Soil and Land Studies and Mapping

2.1: Project of "Land Degradation Monitoring and Evaluation at the National Level by Using Remote Sensing Techniques":

2.1.1: Vegetation Cover Degradation Monitoring in the Arab World:

ACSAD's research studies on "Early Warning System of Desertification in the Arab Region" indicate that 28.1 million ha are exposed to degradation of which 12.7 million ha are classified as "severe", 9.6 million ha are medium and 5.7 million ha are low, and that an area of almost 4 million ha has improved.

The archives analysis (MODIS and SPOT Vegetation 1km) of the project of "Early Warning System for Land Degradation between the Years 2000-2011" has shown that there is a clear decline in the vegetation cover in general estimated at about 45% as a result of calculating the "degradation" and "improvement" percentages as in the table below.

The severely-affected areas by land degradation and agricultural drought risks have been estimated at about 7.1% (94.30 million ha) of the total area; as 1.7% of the agricultural area is highly affected by both land degradation and agricultural drought risks, 3.3% is highly affected by land degradation and moderately by agricultural drought risks, 0.5% is moderately affected by land degradation and highly by agricultural drought risks and 1.6% is moderately affected by both land degradation and agricultural drought risks.

The recent results of the project of "Early Warning of Land Degradation by Analyzing Satellite Image Archives of MODIS and SPOT Vegetation 1km for the years 2000-2014" have shown that there is a clear decline in the vegetation cover in general estimated at about 387794115 ha (about 28.93% of the total area) as a result of calculating the "degradation" and "improvement" percentages in the Arab region, and that the human factor has had a clear impact on accelerating the land degradation as a result of agricultural intensification, groundwater depletion and drought in particular; which has negatively affected the "Mashreq" region. On the other hand, an area of about 208422809.8 ha (15.55%) has improved.

The vegetation cover change, which is considered one of the most important indicators of land degradation, has been analyzed separately for each country and presented in a report published in the year 2016 under the title of "Monitoring and Estimation of Vegetation Cover Changes and Land Degradation by Using Remote Sensing Techniques". The following table illustrates the vegetation cover changes during the period (2000-2014):

Arab country	Bright spots (ha)	%	Degraded spots (ha)	%
Morocco	1690327	4	6338726	15
Algeria	2603744	3	34716584	40
Tunisia	1257957	13	2612679	27
Mauritania	6831317	9	28084304	37
Libya	7098288	13	25117021	46
Syria	762212	9	5335482	63
Lebanon	92639	60	15440	10
Iraq	4130786	10	26437028	64
Jordan	28817	2	417853	29
Palestine	10559	15	26748	38
Egypt	2007514	2	47176588	47
Sudan	5534573	5	52024989	47
Somalia	2313710	15	7712366	50
Djibouti	78136	2	3203559	82
Saudi Arabia	2338468	1	161354286	69
Qatar	35382	2	813784	46
Oman	1195979	3	15149064	38
Kuwait	94367	3	2610822	83
UAE	1406417	17	2895564	35
Yemen	1433960	2	32981079	46
Total	40945151	5	455023968	50

Land degradation areas in the Arab countries (2000-2014)

Arab country	Area (ha)	Bright spots (ha)	%	Degraded areas (ha)	%
Jordan	8934200	1621429	18.15	2879094	32.23
UAE	8360000	643596.5	7.70	3795276	45.40
Bahrain	66500	14548	21.88	38939.85	58.56
Tunisia	16361000	6798319	41.55	5124669	31.32
Algeria	238174100	41915523.61	17.60	76763512	32.23
Djibouti	2300000	51746.27	2.25	2157749	93.82
KSA	214968999.9	12162681.86	5.66	139362972.3	64.83
Sudan	186581300	38537492	20.65	65703967	35.21
Syria	18518000	1420912.78	7.67	10327523.42	55.77
Somalia	63765700	17037595	26.73	34051394	53.43
Iraq	43831700	12974337.06	29.60	20476034.73	46.72
Oman	30950000	4499816	14.54	12120855.96	39.16
Palestine	622000	124861.3	20.07	63990.76	10.29
Qatar	1143700	114592.6	10.02	592243.8	51.78
Kuwait	1781800	127068.4	7.13	1285746	72.16
Lebanon	1040000	750926.8	72.20	195928	18.84
Libya	175954000	6329608	3.60	66655265.27	37.88
Egypt	99545000	8461298.515	8.50	34372380.39	34.53
Morocco	71255000	42564151.13	59.73	7996973	11.22
Mauritania	103070000	27330808	26.52	37580816	36.46
Yemen	52800000	5964764.56	11.30	27725648	52.51
Total	1339993000	229446076.4	17.12	549270978.5	40.99

2.2: Project of "Green Belts in the Arab World Regions (Phase 1 and Phase 2)":

Project site: Hashemite Kingdom of Jordan, Democratic People's Republic of Algeria, Republic of Iraq, Republic of Sudan, Syrian Arab Republic and Arab Republic of Egypt.

Outputs:

A- Issue the first-phase technical report.

B-The Arab Center (ACSAD) has prepared the executive plan of the second phase including objectives, period, general and annual executive plan and estimated budget, in addition to detailed tables on the activities of this phase including vegetation cover development, sand creeping control, capacity building of the concerned national institutions and development of human communities living in the green belt areas.

C- ACSAD has adopted the project of "Green Belts in Arab World' Regions (phase 2)" within its work plan for the years 2017-2018. It continues its efforts in communicating with the Arab countries and financing funds to implement the second phase of the project.

2.3: Land Cover and Land Uses Mapping Project:

Project site: Democratic People's Republic of Algeria.

2.3.1: Project of "Monitoring of Land Use Changes in Main Crops Areas by Using the Remote Sensing Technique in the Desert Areas of Algeria":

Project parties: This project is implemented within the framework of cooperation between the Arab Center (ACSAD) and the Governorate of Agricultural Development in the Desert areas in the Democratic People's Republic of Algeria.

Outputs:

A digital database has been developed for land uses. This database is always used to monitor, control, compare and review the various changes of land uses and select the best solutions for the optimal use. No doubt, the techniques of remote sensing and GISs related to the databases are considered the most important techniques that serve this purpose in line with the field study.

The monthly satellite imagery archives of MODIS type (with a spatial resolution of 250 m for a period of 15 years 2000-2014) have been prepared. The vegetation cover curve of the four states has been analyzed to detect the areas with positive change in the vegetation cover; this is an indicator of the cultivation expansion and the prominence of new areas like reclaimed, pastoral or forest areas. On the other hand, areas with negative change could be degraded areas, areas that are left without cultivation or degraded rangelands and forests.

A physiographic unit map has been also developed to help the field team in surveying the agricultural places and getting acquainted with the degraded places. The field check points have been spotted on this map.

2.3.2: Project of "Rainfall Water Harvesting in the State of Tamnast-Algeria":

Project parties: The project is implemented in the state of Tamnast in cooperation between the Arab Center (ACSAD) and the Governorate of Agricultural Development in the Algerian Republic.

Outputs:

ACSAD has produced a number of maps that are considered the base for identifying the optimal sites for water storage dikes establishment and developing math models for identifying the promising development areas. The study of surface water discharge is considered very important in analyzing the factors that affect water resources and understanding the geomorphologic process in general, especially that the surface water discharge networks reflect the actual situation of the climate, topography, soil, rocky structure and vegetation cover. The measurement and analysis of surface water discharge network is considered one of the basic missions in the geomorphologic studies and highly important in several geomorphologic and hydrologic applications.

2.3.3: Sand Dunes Distribution Mapping in the Arab World:

-Using Remote Sensing Techniques in Sand Dunes Study and Monitoring:

A map at a scale of 1/1000000 on sand dunes distribution was produced under this project.

3-4: Project of "Drought Monitoring at the National Level by Using Remote Sensing Techniques and GISs":

Outputs: Develop a national vision and strategy on controlling and managing disasters, identifying

and classifying national risks including the slow natural risks (drought and other risks) and identifying in details the nature of these risks and the endangered sectors. The project is implemented in all Arab countries.

3-4-1: Project of “Study of Drought Monitoring and Agricultural Drought Risks Mapping in the Arab World”:

The work has continued by the Arab Center (ACSAD) on monitoring agricultural drought by using remote sensing techniques including analyzing MODIS satellite images with a spatial resolution of 1/1 km and using the international index to calculate the vegetation condition index (VCI), temperature condition index(TCI) and vegetation condition index(VHI), in addition to ACSAD’s methodology for drought hazards assessment (which was internationally adopted by the WMO) to calculate drought intensity, frequency and consecution in addition to rainfall variability in order to produce drought risks map.

Third: Program of Sustainable Management of Lands and Water Uses

3.1: Project of Optimal Management of Saline and Brackish Water Use in Irrigation”:

3.1.1: Project of Technology Transfer of Saline and Brackish Water Uses to the Arab Farmer:

Project site: The Tunisian Republic.

Project parties: This project is implemented in cooperation with the National Institute for Rural Engineering, Water and Forest Research within the framework of the cooperation agreement.

Outputs:

-Impact of Irrigation with Saline Water on the Growth and Production of Chenopodium Quinoa Willd:

The results of the water stress impact on the growth of Chenopodium Quinoa Willd have showed the following:

The plant growth is very good in spite of the high rate of water stress and there is an increase in the root size and in the sucking hairs growing for the water stress rates of 50% and 75% in comparison with the control plant (100%).The highest production is registered at the stress rate of 75% followed by 50% in comparison with the control plant (100%).

The results of the salinity stress impact on the growth of Chenopodium Quinoa Willd have showed the following:

The plant height and branching number have increased with the increase of the irrigation water salinity in comparison with the control plant. The root size has increased for the concentration of 6g/l in comparison with the control plant (0g/l). According to this experiment, the best yield of grains has been registered for the plants irrigated with saline water of concentration at 6g/l. Currently, the salts rate is being identified in the grains.

In the year 2017, the protein rate in the grains was identified, as the highest rate was registered for the grains irrigated with saline water of concentration at 6 g/l; (estimated at 14% in comparison with other concentrations).

3-2: Project of “Sustainable and Safe Use of Treated Waste Water and its Solid Residues in the Arab Agriculture and its Impact on Environment”:

3.2.1: Project of “Use of Treated Waste Water and its Solid Residues in the Arab Agriculture and its Impact on Environment”:

Project site: The Democratic People’s Republic of Algeria, the Republic of Tunisia and the Syrian Arab Republic.

3.2.1.1: The Tunisian Republic:

-Safe Agricultural Use of Treated Water in Agriculture:

*The impact of electromagnetic treatment of water on some soil properties and waste water:

The initial results have shown the following:

-The quantity of discharged waste water from the treated irrigation water is less than that from the non-treated irrigation water.

-The salinity of discharged waste water from the treated irrigation water is less than that from the non-treated irrigation water.

-The harmful microbe number inside the discharged waste water from non-treated irrigation water is higher than that from treated irrigation water.

-The harmful microbe number inside the soil irrigated with non-treated water is higher than that inside the soil irrigated with electromagnetically treated water.

3.2.1.2: The Algerian Republic:

-Use of Treated Waste Water in Agriculture and its Environmental Impact:

This project is implemented in cooperation with the National Institute for Lands, Irrigation and Waste Water in Algeria in the state of Talmsan. Within the framework of this project, the following activities have been implemented:

*Impact of waste sludge adding on soil properties and wheat productivity:

The wheat crop cultivation and fertilization with sludge at rates of (10 and 15tons/ha) have been repeated for the winter season 2016-2017 with the recommended mineral fertilization content. The following table illustrates the properties of the sludge used in the study

Sludge source	pH	EC (dS/m)	O.M (%)	K (mg/kg)	P (mg/kg)	T.N %
Ain Hout station in Talmsan	6.49	3.29	30.67	1600	2.5	1.73

The following table illustrates the sludge contents of the most important heavy minerals:

Sludge source	mg/kg			
Ain Hout station in Talmsan	Cd	Cr	Ni	Pb
	2	32	39	181
Allowed limits	20	1000	200	800

The following table illustrates the concentrations of Cr and Pb in the grains and straw of the wheat that is fertilized with sludge and mineral fertilizers in comparison with the control plant.

Treatment type	Plant part	Cr, mg/kg	Pb, mg/kg
Control plant	Grain	0.97	1.09
	Straw	0.92	0.82
Chemical fertilizer adding	Grain	1.12	1.13
	Straw	0.89	0.83
Sludge adding (15 tons/ha)	Grain	1.17	1.16
	Straw	0.99	1.09
Sludge adding (10 tons/ha)	Grain	1.05	1.10
	Straw	0.95	0.92
Natural content (mg/kg)		5 >	30 >

3.2.1.3: The Syrian Arab Republic:

This project is implemented in cooperation between the Arab Center (ACSAD) and the General Commission for Scientific Agricultural Research (GCSAR) of the Ministry of Agriculture and Agrarian Reform aiming at utilizing and using the non-conventional water like waste water and agricultural waste water in the production of environmentally- safe and healthy fodder crops to support livestock breeders by providing fodders all over the year. The aim also is to alleviate the burden on the use of fresh water. The project has included the implementation of several activities in three areas which are Al-Salamiah,

Al-Ghab and Lattakia.

- Study of Impact of Irrigation with Treated Waste Water on Fodder Crop Productivity and Accumulation of Heavy Minerals in the Soil and Plant:

This study has been implemented in each of Al-Salamiah Research Center in Hama governorate and Lattakia Research Center/Snowbar Research Station, where the treated water quality, soil nature and climatic conditions are different, to irrigate the crops of Triticale and Sesbania aculeata under a specific agricultural rotation. The experiment in split plot design has included two irrigation methods namely; included two irrigation methods namely; drip and surface irrigation, and two water qualities namely; ground water and treated waste water.

The soil and water have been analyzed before cultivation; the results have shown that all the measurements were within the allowed limits according to the Syrian standard specification No. 2752/2008.

Triticale:

The results have shown the presence of significant differences among the three treatments in terms of the crop productivity, as the grain productivity has been estimated at 2.06tons/ha with the treated waste water irrigation and 1.39tons/ha with the ground water irrigation. On the other hand, the increase in the productivity of grain and straw has not been significant with the drip irrigation method (1.88 and 7.20tons/ha respectively) in comparison with the surface irrigation method (1.57 and 6.71tons/ha respectively). No significant differences have been noticed in terms of heavy minerals accumulation in the plant tissue of this crop.

The experiment was repeated for the winter season 2016-2017 and showed non-significant increase in the crop productivity, as the grain productivity was estimated at 2.30tons/ha with the treated waste water irrigation and 2.03tons/ha with the ground water irrigation.

3.2.2: Project of “Soil Management to Conserve its Fertility and Improve its Productivity”:

Project objective: Increase the productive capacity of the soil, conserve its fertility and control its degradation by following the appropriate methods and techniques.

Project site: ACSAD’s research stations.

Outputs: In the year 2017, some new research activities have been conducted at ACSAD’s research station of Ezra’a aiming at improving the soil properties, increasing its productive capacity and cultivating new crops, as the following experiments have been implemented:

-Impact of Biogas Fertilizer Use on the Fertility Properties of the Soil and the Corn Crop Productivity (Variety Ezra’a 7):

The experiment aims to study the biogas fertilizer impact on the fertility properties of the soil in comparison with the mineral fertilizes, organic fertilizers and control plant, and on the corn crop productivity. The biogas fertilizer, resulted from the anaerobic fermentation process of organic residues, has been added. On the other hand, the organic manure has been added according to the crop demand of nitrogen and the mineral fertilizer has been added according to the recommended fertilizer quantity and soil analysis.

Fertilization type	Total weight	Vegetative mass	Grain
Biogas fertilizer	29.77 a	18.48 a	8.17 a
Organic manure	25.91 ab	16.79 ab	6.81 ab
Mineral fertilizer	20.33 ab	12.77 ab	5.39 b
Mineral and biogas fertilizers	28.83 a	17.17 ab	8.67 a
Mineral and organic manure fertilizers	29.81 a	18.23 a	8.62 a
Control plant	16.24 b	9.49 b	5.05 b
LSD _{0.05}	11.66	8.56	2.78

The experiment has included six treatment types as illustrated in the above mentioned table, which shows the impact of the fertilization type on the maize productivity, yield of grains and vegetative mass for the season 2017.

The results, in terms of grain productivity, have shown a significant difference between the crop productivity with the biogas fertilization and the control plant. The best yield has been registered with the biogas and mineral fertilization type in comparison with all other fertilization types.

-Impact of Fertilizer Quality (Green, Organic and Mineral) on Some Soil Properties and Chenopodium Quinoa Willd Productivity:

The Chenopodium Quinoa Willd cultivation has been introduced into Syria in the year 2015, as the cultivation has been successful in the coastal area with a productivity estimated at more than 3tons/ha of grains. It is necessary to promote researches and studies concerning this crop due to its importance as a supportive crop for wheat. Therefore, this experiment aims to study the impact of different types of fertilization (green, organic and mineral) on the soil properties and Quinoa growth and productivity.

The soil samples have been collected before cultivation to be analyzed and to get acquainted with the soil's fertility properties. The experiment has included four fertilization types: green fertilization, organic manure, mineral fertilizer and the control plant. The *Sesbania aculeata* legume plant has been cultivated as a green fertilizer and then turned upside down inside the soil at the blooming stage. This crop has been cultivated in February 2017.

The results showed a significant superiority in the Quinoa grain productivity for the green, organic and mineral fertilizations (1.88, 1.60 and 1.85tons/ha respectively) in comparison with the control plant (0.75tons/ha). The Quinoa straw productivity also increased when treated with green, organic and mineral fertilizations (3.66, 3.66 and 3.55tons/ha respectively) in comparison with the control plant (2tons/ha).

It is concluded that green fertilization showed the same efficiency of mineral and organic fertilizations, which means that this technique can be used as an alternative to mineral and organic fertilizers. However, the study needs to be replicated and reviewed, as the experiment will be continued for several seasons on new crops.

3.3: Project of "Biogas Technology Transfer to the Arab Rural Areas":

The project activities in 2017 were restricted to maintenance and service operations of biogas production units in Lattakia and Ezra'a research station in Syria, in addition to the implementation of several training courses to a number of technicians on biogas production units design.

Animal Wealth

The Animal Wealth Department

The Animal Wealth Department works on implementing its activities through the following main programs:

First: Program of “Small Ruminant Care and Genetic Improvement in the Arab Countries”:

The program aims to develop the productive performance of local breeds, especially the promising ones, in the Arab countries by applying the animal genetic selection method based on the breeding properties of milk and meat production and taking into consideration the appearance characteristics of the promising breeds.

Second: Program of “Development and Application of Artificial Insemination and Embryo Transfer Techniques in the Arab Countries”:

The program aims to exert efforts in the field of the optimal use of superior goat and sheep breeds that are genetically selected and improved in some Arab countries. The Arab Center (ACSAD) has established this program to accelerate the genetic improvement processes in the improved flocks and flocks planned to be improved through collecting the semen and embryos of the selected animals of the core herds and disseminating them as can as possible among the cooperative stations and breeders' flocks in the Arab countries.

Third: Program of “Camel Research and Development”:

The program aims to improve the camel breeders' living standards by supporting the sustainable development research of camel production in the pastoral areas, improving and facilitating the processing and marketing of the various products, controlling the different diseases of camel, alleviating camels' mortality causes, improving camels' health, nutrition and care and raising the reproduction rates of camel. During the last years, the Arab Center (ACSAD) has paid a special attention to the “camel research and development program” in cooperation with the Arab countries, in which camels constitute a vital part of its livestock sector; as it has established a camel breeding and care station (Wadi Al-A'azib research station) in order to train the Arab technical staffs and study the productive and reproductive performance of camels. This station and its facilities serve as a center for providing expertise and consultations to the Arab countries.

Fourth: Program of “Fodder Sources and Animal Nutrition Development in the Arab Countries”:

The program aims to implement surveys on the conventional and non-conventional fodder resources in the Arab countries, benefit from the relative advantage that some Arab countries enjoy in the fodder sources field, find the appropriate fodder alternatives, improve and enhance the role of agricultural and agro-industrial residues through the physical and chemical treatment to raise their food value and achieve their optimal utilization, and finally use the residues that have not been utilized yet (by the application of modern techniques) as balanced fodder mixes capable of filling a part of the fodder gap by the easiest and cheapest means.

Fifth: Program of “Inventory and Characterization of Animal Genetic Resources in the Arab Countries”:

The Arab countries have a diversified agricultural livestock sector, which has enabled them to become the world leading countries in animal production. The Arab local breeds enjoy unique properties reflected in the disease-resistance and climate stress-tolerance traits that are necessary for facing the challenges of climate change, new animal diseases and increasing demand of animal products. However, the extinction rate of local animal breeds and lines has reached a terrifying level, the reason that leads to the possibility of breeds extinction before even studying their properties and assessing their productive capacity. This fact has forced the Arab Center (ACSAD) to start up the initiative of protecting animal genetic resources and ensuring the achievement of an improved management and sustainable use types especially for the extinction-endangered local animal breeds that fall under the conventional production system and exist in poor environments. Under these actual circumstances, ACSAD has established the animal genetic resources survey and characterization program.

First: Program of “Genetic Improvement and Small Ruminants Care in the Arab Countries”

1.1: Project of Sheep Genetic Improvement and Production Care in the Arab Countries:

1.1.1: Improvement of Awassi sheep productivity by the selection process at ACSAD’s research stations:

A. Agricultural scientific research center in Al-Salamiah:

*The reproductive indicators: The fertilization rates were 98.2%, 100% and 100% and the birth rates were 89.55%, 100% and 100% for milk, meat and bi-purpose flocks respectively, while the general average of the twin- birth rate was estimated at 58.9% in the year 2017.

*The milk production indicators: The milk production rate for a period of 60 days was 94.64kg; the total milk production was 222.26kg, the flow of milk period was 188.3 days and the daily milk production average was 1180g for the three herd types in the year 2017.

*The newborns’ weight: The weight average at birth was 4.821 kg; the weight average at weaning of age 60 days was 18.97 kg; the weight average at age 180 days was 43.36 kg and the growth rates were 235.88 g/day and 203.62 g/day for the “birth till weaning” period and the “birth till age 180 days” period respectively for the year 2017.

B. Ezra’a research station for Awassi sheep improvement and propagation:

*The reproductive indicators: The fertilization rate was 100%; the birth rate was 91.7% and the twin-birth rate was 29.7% for the sheep flock in Ezra’a in the year 2017.

*The milk production indicators: The daily milk production rate was 1.753 kg; the milk production rate for a period of 60 days was 130.7 kg; the total milk production was 216.3kg, the flow of milk period was 127 days and the modified milk production rate for a period of 175 days was 306.8kg for the year 2017.

*The newborns’ weight: The weight average at birth was 4.660 kg; the weight average at weaning was 27.191 kg; the weight average at age 180 days was 45.145 kg and the growth rates were 325.15 g/day and 199.17 g/day for the “birth till age 60 days” period and the “age 60 days till age 180 days” period .respectively for the year 2017

C. Kherbet Ghazi research station for Awassi sheep improvement and propagation:

For the purpose of enhancing ACSAD’s infrastructure and due to the expansion of research and study activities and implementation of developed projects, this station has been established in Kherbet Al-Teen-Nour in the year 2016 where the experts have started up the implementation of projects and researches. The results were as follows:

*The reproductive indicators: The fertilization rate was 100%; the birth rate was 83.0% and the twin-birth rate was 37.0% for the sheep flock in the year 2017.

*The milk production indicators: The daily milk production rate was 1.545 kg; the milk production rate for a period of 60 days was 78.9 kg; the total milk production was 235.6 kg, the flow of milk period was 152.5 days and the modified milk production rate for a period of 175 days was 270.3 kg for the year 2017.

Milk production indicators averages for Awassi ewes at Kherbet Ghazi research station

Age (year)	Daily milk production (kg)	Milk production for a period of 60 days (kg)	Total milk production (kg)	Modified milk production for 175 days (kg)	Flow of milk period (day)
2	1.330	74.55	218.12	232.75	164.00
3	1.610	79.81	236.67	281.75	147.00
4	1.992	88.08	290.54	348.75	146.00
+5	1.250	73.16	197.50	218.75	158.00
General average	1.545	78.90	235.60	270.50	152.00

*Newborns' weight: The results have showed that the weight averages at birth, weaning and age 180 days were 4.147 kg, 20.33 kg and 33.17kg respectively; the annual growth rates were 203.78g/day and 135.32g/day for the “birth till weaning” period and for the “weaning till age 180 days” period respectively for the year 2017.

1.2: Project of “Goat Genetic Improvement and Care in the Arab Countries”:

*The reproductive indicators: The average rate of the pregnant females by natural mating was 97%, the birth rate was 96.1%, the single-birth rate was 18.9%, the twin-birth rate was 55.0% and the triple (and above) birth rate was 26.1% in the year 2017.

*Milk production indicators: The daily milk production rate was 2268.3g; the milk production rate for a period of 90 days was 249.5kg; the total milk production rate was 462kg; the flow of milk period was 203 days and the modified milk production rate for a period of 220 days was 499kg for the year 2017.

*Newborns' weight: The weight averages at birth, weaning and age 180 days were 4.20 kg, 19.49 kg and 29.73kg respectively for the year 2017

Averages of Milk production indicators for Shami goats at different ages at Ezra’a research station for the year 2016

Age (year)	Daily milk production (g)	Milk production for a period of 90 days (kg)	Total milk production (kg)	Modified milk production for 220 days (kg)	Flow of milk period (day)
2	1746.9	186.9	318.3	384.3	188
3	2254.4	254.1	461.6	496.0	205
4	2728.9	304.5	576.2	600.4	211
+5	2592.0	278.6	551.0	570.2	213
Average	2268.3	249.5	462.0	499.0	203

*The birth and weaning masses: The general mass averages for birth, weaning and age 180 days were 8.57kg, 42.01kg and 63.6kg respectively. On the other hand, the birth masses for single, twin and triple and above deliveries were 4.39kg, 8.01kg and 13.32kg respectively and the weaning masses for single, twin and triple and above deliveries were 23.48kg, 38.54kg and 66.8kg respectively, taking into consideration that the 180 days age masses for single, twin and triple and above deliveries were 32.7kg, 57.3kg and 100.6kg respectively.

1.3: Project of “Sheep and Goat Productivity Improvement in the Arab Countries”:

The total number of ACSAD’s improved Awassi goats distributed among the Arab countries during the period 2003-2017 was /1008/ heads; of which /328/ heads were rams, /659/ heads were ewes, /21/ heads were weaned ewes and /500/ heads were for a fattening purpose. On the other hand, the Arab Center (ACSAD) has distributed during the period 1994-2017: /977/ improved heads of Shami goats (348 males and 629 females). Within the framework of this project, the most important implemented activities in the Arab countries for the year 2016 and 2017 can be summarized as follows:

1.3.1 Jordan:

The cooperation has continued with the Hashemite Kingdom of Jordan in terms of two projects namely “sheep production improvement in the Arab countries project” and “goats production improvement in the Arab countries project” at Al-Fajij Al-Khnasri station for the first project and Al-Walla station of the Jordanian Ministry of Agriculture- National Center for Agricultural Extension and Research for the second project. In the year 2015, /600/ frozen semen straws of Awassi sheep were sent to implement the project plan. At the end of 2017, it was agreed to enhance the mutual cooperation in the field of livestock improvement in Jordan.

1.3.2 Tunisia:

Within the framework of the current cooperation in the field of genetic improvement of small ruminants

between the Arab Center (ACSAD) and the Ministry of Agriculture, Water Resources and Marine Fishery of the Republic of Tunisia, ACSAD has established an artificial insemination laboratory in Kairouan in the year 2016. Under this project, the Tunisian side has been provided with /3000/ straws of frozen semen (1500 straws of Shami goats and 1500 straws of Awassi sheep) and the production activities have been launched for livestock improvement.

For the purpose of enhancing the mutual cooperation, ACSAD is currently implementing two new projects in Tunisia, namely; the project of “Decreasing the Mortality Rate of Newborn Camels in Some Arab Countries” where samples were taken and analyzed and a final report would be produced, and the project of “Optimal Use and Processing of Agricultural Residues” through which Tunisia was provided with a machine for agricultural residues processing and 28 Tunisian Technicians were trained on installing, maintaining and using the machine and processing fodder cubes.

1.3.3: Democratic People’s Republic of Algeria:

In reference to the executive program signed among ACSAD, Ministry of Agriculture and Rural Development and the Technical Institute for Animal Breeding in Algeria in the field of goat development, a plan was set up in 2015 for inseminating the local goat flock with frozen semen straws of Shami goats. 600 straws were sent in 2017 and the project was extended for a period of 3 years till the year 2018.

In 2017, the results showed an improvement in the weights of the crossbred newborn goats produced by the two breeds of Shami goats males and Local goats females. The weight improvement was perfectly noticed from birth till age year and a half indicating the potential of weight properties improvement for local goats when crossbred with the improved Shami goats. The female’s belly mass was noticeably improved and estimated at 1.3kg, and the results also indicated the improvement of milk production property for crossbred goats.

The plan for inseminating the local goat flock with frozen semen straws of Shami goats was also implemented for 2017 and a training course was held for Algerian technician on “Artificial Insemination Process”.

ACSAD also implemented the project of “Decreasing the Mortality Rate of Newborn Camels in Some Arab Countries”, and the project of “Camel Grazing Systems and Breeders’ Income Improvement” in Algeria under which an inventory study was produced and mutual meetings were held to present the outcomes, outputs and recommendations of the study. The required interventions in the study areas were also discussed to achieve the promising goals.

1.3.4 Sudan:

The cooperation has continued with the Republic of Sudan under the goats and sheep improvement program by sending live animals and frozen semen straws, as 2000 straws (1000 goat straws and 1000 sheep straws) were sent in 2013.

Two new projects are currently implemented by ACSAD in Sudan, namely; the project of “Decreasing the Mortality Rate of Newborn Camels in Some Arab Countries” where samples were taken and analyzed and a final report would be produced, and the project of “Optimal Use and Processing of Agricultural Residues” through which the Republic of Sudan was provided with a machine for agricultural residues processing and 20 Sudanese Technicians were trained on installing, maintaining and using the machine and processing fodder cubes. Moreover, the Animal Wealth Administration is participating in the project of “Optimal Use of Agricultural Lands in Sudan” in terms of animal production component.

1.3.5: Syrian Arab Republic:

The cooperation between ACSAD and the Syrian Arab Republic is considered a distinguished model. In 2017, the implementation of the project of “Early Recovery and Livelihood Support of Crisis-Affected Poor Households in Syria”, in cooperation with the Spanish Action Against Hunger (AAH), has continued. The Animal Wealth Department participated in the implementation process by assisting /1000/ breeders’ households in conserving livelihoods and productive assets as follows:

- 1-Distribute 500kg/household among 500 households to cover the requirements of 20 heads of sheep, in addition to medicines, vitamins and ointments.
- 2-Distribute cheese processing inputs among 500 women households that work in dairy processing.

3-Train 1000 participants on: “livestock management”, “care and health” and “dairy production”.

In addition to that, three agreements on scientific cooperation were signed with the General Commission for Scientific Agricultural Research/Ministry of Agriculture in the fields of:

- Awassi sheep productivity improvement.
- Camel research development.
- Shami goat productivity development.

A project on “Comparative Study between Conventional and Organic Care for some Productive Indicators of Mountainous Goats” was also implemented between ACSAD and GCSAR, in addition to enhancing research cooperation in the fields of:

- Sheep wool falling.
- Genetic differences of udder characteristics for Shami camel.
- Early response to pregnancy poisoning symptoms for Shami goats.

1.3.6 State of Palestine:

For the purpose of implementing the decisions of the “Economic and Social Council” and “General Assembly” of ACSAD and within the framework of the program of “Sheep and Goats Productivity Improvement in the Arab Countries” and the project of “Artificial Insemination Use and Development of Small Ruminants in the Arab Countries”, ACSAD is cooperating with the Ministry of Agriculture in the State of Palestine to establish a livestock improvement station in Palestine through ACSAD’s financing by an amount of 150000 USD.. The Palestinian Ministry of Agriculture sent a report on the project results for the year 2017. Due the project importance, the financing was increased by 100000 USD during 2018 aiming at introducing highly improved and productive breeds, transferring technology and improving the income of Palestinian breeders

1.3.7 State of Kuwait:

For the purpose of implementing the signed agreement between the Arab Center (ACSAD) and the General Commission for Agriculture and Fishery Affairs in Kuwait in the field of Al-A’aredi goat production improvement and development, (300) heads of Awassi sheep and Shami goats (125 females and 25 males of Awassi sheep and 125 females and 25 males of Shami goats) were in the year 2016 and 2017, in addition to the previous consignments totaling (75) heads of live animals. Moreover, (1800) frozen semen straws were also sent; of which (1500) straws were of Awassi sheep and (300) straws were of Shami goats.

1.3.8 Lebanon:

The Arab Center (ACSAD) has provided the Lebanese Ministry of Agriculture with (38) heads of improved Shami goats and Awassi sheep (6 goat males, 23 goat females, 5 ewes and 4 rams) in the year 2017. The total number of the sent improved live animals have been estimated at (67) heads of Awassi sheep and (139) heads of Shami goats in addition to (600) frozen semen straws; of which (300) straws were of Awassi sheep and (300) straws were of Shami goats.

1.3.9: Arab Republic of Egypt:

ACSAD implements several important projects in the livestock field in Egypt, particularly with the Animal Production Research Institute of the Ministry of Agriculture and Land Reclamation in the fields of local sheep and goat improvement by crossbreeding process with Awassi sheep and Shami goats. This was performed by providing Egypt with live animals and semen straws of improved male animals. The project results included distributing the males of Shami goats and Awassi sheep among breeders of the Delta and northern east coast, and sending 1000 frozen semen straws (500 Awassi sheep straws and 500 Shami goat straws) to the Desert Research institute.

In 2016, It was agreed to implement the project of “Development of Camel and Small Ruminants Breeding and Production Systems in the Northern East Coast of Egypt” with the financing of ACSAD and the cooperation of Desert Research Institute. The implementation started by sending the first installment of the project budget for 2017. Currently, it is coordinated to start up a mutual research on “Agricultural Residues Use in Ruminants Feeding”.

Second: Program of “Development and Use of Artificial Insemination and Embryo Transfer Techniques in the Arab Countries”

2.1 Project of “Artificial Insemination Use Development in Small Ruminants”:

Project site:

The Hashemite Kingdom of Jordan, the Republic of Tunisia, the Democratic People s’ Republic of Algeria, the Republic of Sudan, the Syrian Arab Republic, the State of Qatar, the State of Libya, the Republic of Iraq, the State of Palestine, the Republic of Lebanon and the Republic of Yemen.

Project progress: The activities have effectively continued in the laboratory of artificial insemination and embryo transfer at Ezra’a research station. This has been reflected in the processes of semen collection, freezing and development methods, in addition to the tests of embryo collection, manipulation and freezing, use of new programs for fertility improvement of small ruminants and training of Arab technical staff on all stages of the use of artificial insemination and embryo transfer techniques for small ruminants.

In the years 2016-2017, a PhD research was implemented at Ezra>a research station, in cooperation with Prof. Daniel Tantourieh from the Reproduction Department, National Veterinary School, University of Nantes- France, on the «effect of low density lipoproteins on freezing solutions indicators of Shami goats».

2.1.1: Distribution of semen straws among Arab countries:

The work has continued in the laboratory of artificial insemination and embryo transfer at Ezra’a research station, where /18500/ straws of improved Awassi sheep and Shami goats lines have been produced during the period 2015-2017 to be distributed among the interested Arab countries (4200 straws have already distributed).

It is worthwhile mentioning that the total quantity of the frozen straws which were sent to the Arab countries is estimated at 31000 straws since the project start-up.

2.1.2: Provision of expertise and consultation, participation in scientific meetings and publication of scientific papers:

The program provides expertise and consultation in the field of the necessary supplies, tools and materials for the establishment of artificial insemination laboratories. This service was provided to Tunisia, Algeria, Jordan and Qatar and several scientific papers were published in refereed scientific journals.

Third: Program of “Camel Researches and Development”

3.1: Project of “Camel Newborns’ Mortality Rate Decrease in Some Arab Countries”:

Project site: The project is implemented through ACSAD’s financing in Tunisia, Algeria, Sudan and Mauritania.

Project progress: The project activities have continued this year, as several field and study visits have been conducted to collect and bring the pathogenic samples of the mortal or sick camel newborns to the central laboratories to be diagnosed for the purpose of identifying the disease or mortality reasons.

3.2: Study Project of “Camel Grazing Systems, Breeders’ Income Improvement and Expertise Exchange in Algeria”:

Project site: The Democratic People’s Republic of Algeria.

Project progress: An inventory study was conducted in seven desert states namely; Adrar, Bashar, Tamnra, Warqia, Al-Wadi, Eliezi and Tandoof to get acquainted with the constraints that face camel breeding and care in the study area. The study also concentrates on recognizing the diseases that prevail among camel flocks in the area.

Technical plans were developed and appropriate service projects for camel sustainable development were proposed in the project areas. In addition, training courses were held and the following units were purchased: 1-an integrated fodder processing unit, 2-mobile milking units and 3-a milk collecting, cooling and pasteurizing unit.

Fourth: Program of “Development of Fodder Sources and Animal Feeding in the Arab “Countries

4.1: Project of “Fodder Processing From Agricultural Residues and Agro-industrial Residues and Improvement of Fodder food Value”:

Project site: Egypt, Qatar and Syria.

Project progress:

- Design, process and provide Qatar with a machine for agricultural residues processing; as the experts in ACSAD have exerted their efforts to install a machine for agricultural residue processing and train the Qatari technical staff on the machine installment, maintenance and use.
- Set up the technical specification of the agricultural residues processing unit (capsule fodder).
- Complete the mutual research on the use of agricultural and agro-industrial residues (orange pomace and olive pruning residues) with the Egyptian side.
- Carry out initial experiments on orange pomace silage at Al-Sinn research station to be introduced into the herd feeding plan of ACSAD's research stations.
- Carry out researches on the use of tomato pomace silage in the Shami goat feeding at Ezra'a research station.

Fifth: Program of “Animal Genetic Resources Inventory and Characterization”

5.1: Project of “Establishment of Regional or Sub-Regional Networks for Conservation and Exchange of Animal Genetic Resources (Gene Banks in the Arab countries)”:

5.1.1: Assistance in the Establishment of Animal Genetic Banks (Regional or Sub-Regional Assistance):

Project progress:

- Continue the in situ propagation process of genetic resources in the banks of the headquarters country and cooperating stations in the Arab countries (totaling 20 cooperating stations in 13 Arab countries). 400 heads of genetic resources have been sent to each of Qatar, Kuwait and Lebanon within the framework of propagation and dissemination of live genetic types under different environmental conditions.
- Establish a mini bank for ex situ animal genetic resources in the form of frozen semen of Awassi rams and Shami goat males in the headquarters country- Directorate of Animal Production- Artificial Insemination Section. As /12000/ straws of Awassi sheep and Shami goats' semen are frozen and stored to meet the requirements of the Arab countries and serve as a genetic resources bank for highly productive lines and limited numbers of rare animals like Shami goats.
- A database for animal genetic resources in the Arab countries is developed. It will facilitate the process of linking the cooperating stations in the Arab countries with the Arab Center (ACSAD) and will help in the process of exchanging and receiving data from these stations to ACSAD to be processed, analyzed and then returned, in a way that contributed to the protection of animal genetic resources and the continuation of the local breeds propagation and productivity improvement.

5.2: Project of “Unifying Scientific Terms in the Livestock Field”:

A scientific terminology dictionary for livestock was issued in 2017, for the researchers at the livestock scientific research centers in the Arab countries, to achieve the following objectives:

- Facilitate information exchange among experts and researchers of the Arab countries in the field of livestock terminology.
- Depend on a clear scientific reference upon discussing livestock scientific terminology.
- Unify suggestions and definitions related to the livestock terminology in the Arab countries.

Water Resources

The Water Resources Department

The Water Resources Department implements its activities through the following main programs:

First: Program of Integrated Water Resources Management:

This program aims to apply the principles of integrated water resources management and participatory approach for the purpose of optimal and sustainable use of available surface and ground water resources.

Second: Program of Water Resources Development:

The main objective of this program is to implement a number of important projects which contribute to the achievement of optimal use of the available water resources, control their waste and loss and develop them at the same time.

Third: Program of Water Environment Protection:

This program aims to evaluate the impacts of climate change and its extreme aspects on the fresh water resources in the Arab region, provide assistance in the preparation of alleviation and adaptation plans and policies at the national, regional and sub-regional levels and provide the necessary scientific and information base to expand the use of non- conventional water resources in the Arab region to provide additional resources that meet the future requirements and control water deficiency.

First: Program of Integrated Water Resources Management

1.1: Project of Arab Water Security

1.1.1: Project of Executive Plan of Arab Strategy for Water Security in the Arab Region to Face the Challenges and Future Requirements of Sustainable Development (2010-2030):

Objectives:

The strategy aims to face the challenges and future requirements of sustainable development, while the executive plan aims basically to present executive projects in a way that ensures the best management of available water resources and protects water resources from contamination and depletion. It also aims to enhance cooperation, exchange climatic and water information and experiences among Arab countries in the field of water policies implementation, raise the awareness level of communities on water and environment and protect Arab water rights.

Project parties: Technical Secretary of Arab Ministerial Council for Water, Arab Ministerial Council for Water, Center of Hydrological Studies and Arab Water Security, United Nations Economic and Social Commission for Western Asia (ESCWA), Center for Environment and Development for the Arab Region and Europe (CEDARE), Food and Agriculture Organization (FAO/RNE), United Nations Environmental Program/Regional Office for West Asia (UNEP/ROWA), International Center for Biosaline Agriculture (ICBA), German Agency for International Cooperation (GIZ), Ministry of Water Resources in Iraq.

Main achievements:

-Carry out a training course on the use of "Aquacrop" model for evaluating the climate change impact on agricultural crops for a number of technicians in Arab countries.

1.1.3: Project of Integrated Water Resources Management to Achieve a Sustainable Development in the Arab Region:

The Arab Center (ACSAD) seeks to implement four main projects under the project of integrated water resources management; these projects that have been approved by the "Arab Ministerial Council for Water" are:

1.1.3.1: Irrigation Efficiency Raising in the Arab Countries:

Project participating parties:

-The Arab Center- ACSAD.

-13 Arab countries namely; Kuwait, Jordan, Iraq, Syria, Lebanon, Palestine, Egypt, Sudan, Libya, Tunisia, Algeria, Morocco and Mauritania.

Main achievements:

-Finalize the final draft of the comprehensive study on irrigation efficiency in the Arab countries which is based on reference studies prepared by Arab experts on irrigation efficiency in the Arab countries participating in the project implementation. The summery has also included the most important proposals of the Arab Center (ACSAD) for improving irrigation efficiency.

1.1.3.2: Project of "Towards Concerted Sharing: Development of a Regional Economic Model for Water in the Jordan River Basin":

Project participating parties:

-The Arab Center (ACSAD).

-The Jordanian University for Science and Technology.

-The American University in Beirut.

-The Jerusalem University in Palestine.

-The World Food Study Center of Vrije University- Netherlands which serves as a coordinator for the project activities and interventions.

Main achievements:

-ACSAD's experts have prepared the required climatic maps for the study area at an accuracy of /1 km/ including three basic climatic elements namely; the rainfall rate, the maximum and minimum temperature average and the reference evapotranspiration rate.

-Participate in the model building and application on different case studies according to the conditions

of each participating country.

- Prepare a report on “woman role in the water resources management of the basin”, in addition to other reports on “impact of big water establishments on the available resources of the basin”.
- Prepare and submit the project final report to the financing agency (SIDA).

1.1.3.3: Project of “Arab Countries’ Capacities Development to Adapt with Climatic Changes by Using Integrated Water Resource Management Tools”:

Objectives:

-Provide several tools of integrated water resources management which are appropriate for the prevailing conditions in the Arab region in order to support the procedures of adaptation with climatic changes that can be taken in five main sectors namely, agriculture, economic development, environment, health and human settlements. This can be done by preparing a training guidebook in each of these sectors; ACSAD has been authorized, in cooperation with the German Agency for International Cooperation (GIZ), to prepare the training guidebook of agriculture, forest and fishery sector.

Project participating parties:

- The Arab Center (ACSAD).
- The United Nations Economic and Social Commission for Western Asia (ESCWA).
- The United Nations Environmental Program/Regional Office for West Asia as the coordinating agency (UNEP/ROWA).
- The Arab Countries Water Utilities Association (ACWUA).
- The World Health Organization/the Regional Center for Environmental Health Action (WHO/CEHA).
- The German Agency for International Cooperation (GIZ).

1.2: Project of “Application of Integrated Water Resources Management through Using Modern Modeling Tools”:

1.2.1: Project of Groundwater Modeling of Orontes Basin/Syria:

Project objective:

- Identify geological layers and aquifers and illustrate their hydrological characteristics.
- Study the impact of tectonic cracks on the prevailing hydrological conditions.
- Study the groundwater aquifer recharge by rainfall and irrigation water, and illustrate the hydrological relationship between aquifers and spring runoffs.
- Identify the direction and movement of the groundwater.
- Set up the groundwater budget of Orontes basin.
- Identify the promising groundwater areas and study the future expectations according to virtual scenarios.

Project participating parties:

- The Arab Center (ACSAD).
- The Ministry of Water Resources in Syria (General Commission for Water Resources- General Company for Hydrological Studies).

Main achievements:

-Six promising areas have been identified for groundwater exploitation of the Jurassic, Cretaceous, basalt Neogene and Neogene aquifers located in the western part of the Orontes basin. The activities have adopted the 2010 stress data and the rainfall and irrigation aquifer recharge as a basis for calculating the future predictions for each of the following scenarios:

- First scenario: The groundwater recharge average by rainfall and irrigation water is steady and the exploited pumping quantities are steady, according to the 2010 data, for a period of 20 years (till the year 2030).
- Second scenario: The exploited groundwater quantities by wells for drinking purposes will increase by 4%, while the exploitation average of the irrigation wells is steady as well as the groundwater recharge -average by rainfall and irrigation water.
- Third scenario: This scenario is related to the promising areas for groundwater exploitation as a result of the hydrological studies and modeling.

- Fourth scenario: It depends on exploiting the groundwater that is recharged into the Orontes' river in some areas.

1.2.2: Project of “Modeling the Euphrates Basin in the Syrian Arab Republic”:

Project objectives:

- Illustrate the groundwater movement, direction and hydro-chemical situation.
- Prepare a water budget (surface, ground and reserve water) for the basin (for all aquifers including the Jurassic one).
- Illustrate the hydro-geological relation between the basin and other neighboring basins.
- Identify the groundwater promising areas.

Project participating parties:

-The Arab Center (ACSAD).

-General Company for Hydrological Studies, General Commission for Water Resources and Ministry of Water Resources in Syria.

Main achievements:

-Operate the mathematical model and apply the four different scenarios according to the expectations for the period 2010-2030.

-After studying and comparing the different scenarios with the data of water budget changes, we can conclude that the Euphrates basin is currently suffering from water deficiency and that there are no investable promising groundwater sources and it is preferable not to increase groundwater investments and conserve the present rates.

1.2.3: Project of “Study of Wheat Cultivation Expansion by Using Groundwater in the Nile River and Northern States of the Republic of Sudan- Hydrological Studies”:

A- Groundwater study in the study area.

B- Available information on the study area.

C- Conceptual model preparation.

D- Database building.

E- Satellite imagery preparation for the study area.

1.3: Project of Coastal Basins Management:

1.3.1: Project of Developing a Groundwater Model for Damsarkho area – Assessing the Impact of Sea Water Intrusion on Groundwater Quality/Syria:

Project implementing parties:

- The Arab Center (ACSAD).

-The Ministry of Water Resources in the Syrian Arab Republic and the General Company for Hydrological Studies.

Project outputs:

- Collecting data (geological, hydro-geological and hydro chemical data) about the study area.
- Building interactive database and checking the available information on the water points.
- Building a “geo-database” for Damsarkho area to serve as a reference for the future water studies.
- Preparing a hydro-geological study for Damsarkho area.
- Developing a mathematical digital model for sea water intrusion in Damsarkho to serve as a base for future hydro-geological studies.
- The results showed that the best scenario is reducing water pumping with maintaining the average rainfall recharge, this scenario prevents the depletion of groundwater reserve and ensures a stability in groundwater level and salinity after 3 years. The results showed also that the groundwater exploitation at a distance of 1000 m from the coast should be reduced.
- Setting up recommendations and criteria for groundwater exploitation in Damsarkho.

Second: Program of Water Resources Development

2.1: Project of Rainfall Water Harvesting:

2.1.1: Project of “Rainfall Water Harvesting in the State of Palestine”:

Project participating parties:

- The Arab Center- ACSAD.
- The Palestinian Ministry of Agriculture.
- The Palestinian Water Authority.
- Local authorities and civil society bodies.
- Male and female farmers in the target project area.

Main achievements:

-Phase 1:

- Construct 27 wells for rainfall water harvesting.
- Increase the water quantity that is allocated for supplementary irrigation by around 5400 m³ annually.
- Increase the supplementary irrigation area by around 54 dunums.
- Construct a rainfall water catchment with a capacity of 1000m³ to be used in supplementary irrigation.

-Phase 2:

- Construct 16 wells for rainfall water harvesting.
- Increase the water quantity that is allocated for supplementary irrigation by around 3300 m³ annually.
- Increase the supplementary irrigation area by around 33 dunums.
- Organize two training courses in which 80 farmers and 50 agricultural engineers participated.

2.1.2: Project of “Optimal Utilization of Surface Water Resources-Water Harvesting, Management and Utilization in Al-Haqqar Area in Tamnrast State in Algeria”:

Project participating parties:

- The Arab Center (ACSAD).
- The Governorate of Agriculture Development in the Desert Areas- Warqala State- the Democratic People’s Republic of Algeria.

Main achievements:

- Collect the necessary climatic and water data, maps and reports.
- Analyze and process the collected data.
- Extract purpose maps and sub-basins maps (39 basins) and identify the characteristics of these basins.
- Conduct an accurate study for the basin no. 26 proposed for constructing rainfall water harvesting establishments.
- Identify some sites proposed for rainfall harvesting in sub-basins no. 25, 26 and 28, carry out the necessary hydrological studies and evaluate some hydraulical characteristics in Tamnrast valley.
- Prepare the second technical report under the title of “Topographic and Hydrological Study in Tamnrast, Al-Haqqar- Algeria, and Suggestion of Rainfall Water Harvesting Sites”.

2.1.3: Project of Sustainable Agricultural Development of the Northern West Coast Region in Egypt (Al-Qassabeh basin/Bajoush):

Project participating parties:

- The Arab Center (ACSAD).
- The Desert Research Center in the Arab Republic of Egypt.

Main achievements:

- Conduct field surveys and studies in terms of the potential of groundwater presence in the study area, the vegetation cover in the pastoral area of Wadi Sakhr, the land use efficiency in Al-Qassabeh basin Bajoush and the socioeconomic aspects of the typical site in Fira’a Ramadan.

- Organize three training programs on “rainfall water harvesting”, “rangeland development” and “cultivation of grove tree seedlings”.
- Organize a workshop in which the project outputs, learned lessons and future work plan were presented.

2.1.4: Project of “Mountainous Lakes Construction in the Syrian Coast”:

Project participating parties:

- The Arab Center (ACSAD).
- Local authorities and institutions.
- Interested local communities.

Main achievements:

- Construct a mountainous lake in Haddadeh village, Al-Qaddmous district, with a capacity of 40000m³.
- Construct a mountainous lake in Bsmalekh village, Jableh district, with a capacity of 15000m³.
- Construct a mountainous lake in Srabion village, Jableh district, with a capacity of 50000m³.

Site	Latitude (degree)	Longitude (degree)	Altitude (m)
Haddadeh village	35.135440	36.205662	1000
Bsmalekh village	35.270124	36.156062	1045
Srabion village	35.237174	36.017432	335
Al-Zaitouneh village	35.785222	35.885954	201

- Construct a mountainous lake in Al-Zaitouneh village, Lattakia governorate, with a capacity of 100000m³.

2.1.5: Project of “Rainfall Water Harvesting in Maqna Town, Ba’albak Governorate, Al-Hermel, Lebanese Republic”:

Project participating parties:

- The Arab Center (ACSAD).
- Ministry of Agriculture in Lebanon.

Main achievements:

- Select a site for lake construction at an area of 10000m².
- Conduct a topographical survey for the lake site to carry out the geometric designs and size calculation of digging and filling up works.
- Conduct a geotechnical survey for the lake site and identify soil permeability. The results showed that the soil is highly permeable; the reason why the lakes’ interior surface will be covered with 2.5mm thick polyethylene plates.
- Lake’s design.

2.3: project of Adaptation with Climatic Changes:

2.3.1: Project of Agricultural Waste Water Reuse to Adapt with Climatic Changes in Egypt:

Project objective: Reuse agricultural waste water by using a mobile pumping unit to help local communities. This method is based on mixing waste water with irrigation water during the climax period of water demand (from May to September), taking into consideration that the main crops that will benefit from this method are rice, wheat, corn, alfalfa and vegetables in the governorate of Al-Bheira in the north of Egypt (Al-Mahmoudia city).

Project participating parties: The project is implemented in cooperation between the Arab Center (ACSAD), the Ministry of Irrigation and Water Resources of the Arab Republic of Egypt and the German Agency for International Cooperation (GIZ) within the framework of the Project of “Adaptation with Climatic Changes” (ACCWAM).

Third: Program of Water Environment Protection

3.1: Project of Evaluation of Climatic Change Impact on the Arab Water Resources:

3.1.1: Project of “Arab Climatic and water Database Building”:

Project participating parties:

-The Arab Center (ACSAD).

Main achievements:

-Technical review and quality and harmony tests of Arab climatic data by using specialized known climatic programs (Rclimdex, X1stat).

-Use of “Rclimdex” program in reviewing the daily climatic data of maximum and minimum temperatures and rainfall. These tests are carried out by applying “Load data” and “Run QC” steps.

3.1.2: Project of Study of Climatic Change Impact on Water Resources in the Arab Countries:

Project objective: Analyze the impact of current and future climatic changes on the fresh water resources in the Arab region.

Project participating parties:

-The Arab Center (ACSAD).

-The United Nations Economic and Social Commission for Western Asia (ESCWA).

-The Swedish Meteorological and Hydrological Institute (SMHI).

-The German Agency for International Cooperation (GIZ).

-The United Nations Environment Program/Regional Office for West Asia.

-The Food and Agriculture Organization of the United Nations (FAO).

-The Swedish International Development Cooperation Agency (SIDA)-financing agency.

Outputs:

-The RCA4 model was operated by using the high emission scenario (RCP8.5) and the medium emission scenario (RCP4.5). The results were obtained for the whole Arab range at a spatial resolution of 50km.

-HYPER and VIC were used to estimate the change in the surface runoff and evapotranspiration until the year 2100, taking into consideration that the climatic model results were used as inputs for the hydrological models.

The following was studied:

Expected Future Changes of Temperatures.

Expected Future Changes of Rainfalls.

Expected Future Changes of Water Resources.

3.1.3: Project of “ Assessment of Water Resources Vulnerability to Climatic Changes in the Arab Region and its Economic and social Impact”:

Project participating parties:

-The Arab Center (ACSAD).

-The United Nations Economic and Social Commission for Western Asia (ESCWA).

-The German Agency for International Cooperation (GIZ).

Main achievements:

Identify the Arab climatic range by using climatic models and registered climatic data, taking into consideration that this activity was achieved for the first time at the world level and was added to the other world climatic ranges.

-Assess vulnerability through three components:

- Exposure.
- Sensitivity.
- Adaptive capacity.

-Describe each component through a number of indicators, as the vulnerability fields were divided into /5/ sectors:

1-Water.

2-Agriculture.

3-Biodiversity and ecosystems.

4-Infrastructure and human settlements.

5-Human resources.

-The Arab Center (ACSAD) participated in vulnerability indicators development as follows:

- Develop /65/ indicators for the different sectors.
- Participate in the mapping of each indicator by using GISs.

-Participate in the classification methodology development for each indicator by giving vulnerability values ranging from 1-10 (as the value /1/ stands for the least vulnerable and value /10/ stands for the most vulnerable).

-Carry out the “aggregation” process, according to the vulnerability components, for three sectors namely; the biodiversity and ecosystems sector, the agricultural sector and the infrastructure and human settlements sector.

-Finalize the vulnerability maps produced by the aggregation process.-

-Prepare a training manual distributed among all Arab countries on “Integrated Assessment Methodology of Vulnerability”.

3.1.4: Project of “Evaluation of Climatic Change Impact on the Productivity of Some Agricultural Crops in the Arab Region”:

Project participating parties:

-The Arab Center (ACSAD).

-The United Nations Food and Agriculture Organization (FAO).

-The German Agency for International Cooperation (GIZ).

-The United Nations Economic and Social Commission for Western Asia (ESCWA).

Main achievements:

-The results indicated that the climatic change will lead to productivity decrease. For irrigated crops, for example, the productivity decrease ranged between 1% and 5% at the mid of the century and 6% and 27% at the end of the century for RCP8.5 and RCP4.5 respectively.

Main achievements:

-The results indicated that climatic changes will lead to productivity decrease. For irrigated crops, for example, the productivity decrease ranged between 1% and 5% at the mid of the century and 6% and 27% at the end of the century for RCP8.5 and RCP4.5 respectively.

-The results indicated that rainfed crops are more vulnerable to climatic changes than irrigated crops. In Jordan, rainfed wheat productivity decrease, for example, is expected to range between 2 and 5% at the mid of the century and 15 and 55% at the end of the century for RCP8.5 and RCP4.5 respectively.

-The results indicated that crop growth period will decrease by /18/ days and /32/ days for irrigated wheat in Egypt and Orontes basin in Lebanon respectively. In spite of the temperature increase, it is expected that crop water requirement will decrease due to the short growth period.

-The results indicated that the increase in CO₂ atmospheric concentration is probably to have a positive impact on the plant production. This impact depends on the plant nature, as C₃- classified plants (like wheat and cotton) is more sensitive than C₄-classified plants (like corn).

3.1.5: Project of “Study of Agricultural Sector Vulnerability to Climatic Changes in the Lebanese Republic”:

:Project participating parties

-The Arab Center (ACSAD).

-The German Agency for International Cooperation (GIZ).

-The National Center for Remote Sensing in Lebanon (CNRS).

Main achievements:

-Prepare a reference study summarizing the previous studies on the agricultural sector in Lebanon, the expected climatic change impact according to the various climatic models and the adopted indicators.

-Classify indicators according to the vulnerability components: 15 indicators for sensitivity, 10 indicators

for adaptive capacity and 3 for exposure.

-Develop two maps for each indicator (one map with real values and another with classified ones) and a fact sheet for data.

3.1.6: Project of “National Indicators for Desertification in Water Sector in the Syrian Arab Republic”:

Project objectives:

-Develop national indicators for desertification in Syria covering all sectors like water, soil and vegetation cover. These indicators take into consideration the local desertification conditions and the work nature of the concerned institutions.

-Circulate these indicators among the concerned institutions to be adopted in the decision making process in the field of desertification combat and alleviation.

Project participating parties:

- The Arab Center (ACSAD).

-The Syrian Ministry of Local Administration and Environment.

-All Syrian ministries and commissions concerned with the desertification issue in Syria.

3.2: Project of “Study of Extreme Climatic Phenomena Impact on Water Resources in the Arab Region”:

3.2.1: Project of “Study of Climatic Change Impact on Extreme Climatic Events Occurrence”:

Project participating parties:

-The Arab Center (ACSAD).

-The United Nations Economic and Social Commission for Western Asia (ESCWA).

-The Swedish Meteorological and Hydrological Institute (SMHI).

-The World Meteorology Organization (WMO).

-The German Cooperation for International Cooperation (GIZ).

-The Swedish International Development Agency (SIDA).

Main achievements:

-ACSAD’s study of Wadi Dayka basin in Oman indicated that there will be an increase in extreme temperature indicators, like the warm wave period, hot days number and very hot days and tropical nights number along the study period. There will be also an increase in rainfall heaviness and dry days frequency, along with a decrease in severe flood frequency and gradual increase in maximum discharge values.

-For Wadi Mjardah in Tunisia, the results indicated that there will be an increase in maximum temperature and rainfall heaviness, along with an increase in dry days period and decrease in extreme floods number.

-For the Southern Great River basin, the results indicated that there will be an increase in extreme temperature indicators, like the warm wave period and hot days number. There will be also an increase in rainfall heaviness and dry days frequency, along with an increase in flood size and frequency in the 21st century under the high and medium emission scenarios.

-The study indicated that Wadi Dayka basin heads towards more humid conditions and less frequent and severe droughts. Wadi Mjardah, on the other hand, heads towards more dry conditions and more severe and frequent droughts along the 21st century period, while in the Southern Great River basin, there will be a tendency towards more dry, but not severe, conditions.

Economy and Planning

Economic and Planning Department

The Economic and Planning Department implements its activities through the following programs:

1-Socio-economic Studies Program:

This program aims to solve the outstanding economic and social problems which may arise in the field of sustainable use and conservation of natural resources in the dry areas in the Arab countries, implement economic feasibility studies for the results reached by the conducted researches and technical-economic feasibility studies for the implemented pilot developmental projects, disseminate the research results and developed techniques based on national economic basis and develop rural woman.

2-Knowledge Management and Localization Program:

This program aims to achieve an integrated knowledge system with developed flexible information tools to rise up with ACSAD, reach an advanced level of internal and external knowledge exchange and make the Arab Center (ACSAD) a basic source for knowledge and information in its specialized fields, in a way that allows it to take the lead among regional and international institutions.

First: Socio-economic Studies Program:

1.1: Project of “Evaluation of ACSAD’s Research and Technical Results”

Project objective:

- Evaluate the research results that are reached by the Arab Center (ACSAD) aiming at confirming their economic feasibility in the field among farmers.
- Provide databases on the social and economic characteristics of the population of arid and semi-arid areas.
- Study agricultural systems.
- Identify the constraints of developed techniques adoption.
- Rehabilitate Arab staff and prepare economic and social studies which are required for the work of the Arab Center (ACSAD).

Project site: All Arab countries.

1.1.1: Study of “Small Ruminants Genetic Improvement and Economic Importance in the Arab Countries”:

The following study was achieved in coordination with the Animal Wealth Department in 2017:

The study showed that exerting special efforts in the field of sheep and goat genetic improvement in the Arab countries will reflect positively on production. Therefore, several scenarios were developed to improve 10% of the Arab World’s herd based on the adopted herd structure rates.

The improvement of 10% of the goat and sheep herds in the Arab World will lead to the increase of red meat and milk production, estimated at 37.5000tons/year and 2769000 tons/year respectively.

Thus, it is concluded that there is a decrease in the food gap of the Arab World whether in terms of red meat or dairy products, however, the gap is still big and requires an intensive continuous work, taking into consideration that this gap is related only to sheep and goats only and that meat and dairy consumption in the Arab World depends basically on cattle and buffalo. Therefore, a special attention should be given to the programs of cattle and buffalo genetic improvement to cover the food gap in the Arab World.

Reaching the highest rate in animal genetic improvement will enable Arab countries to decrease the number of animals against raising their production, thus alleviating pressure over rangelands and fodder imports in hard currency, and heading forward towards sustainable development.

1.1.2: Technical and Economic Study on Treated Water Uses in the Arab Countries:

The initial and secondary data was obtained and the socio-economic forms were designed (consumer-producer) for 4/ Arab countries (Jordan, Tunisia, Syria and Oman). The form data, then, was analyzed and the technical and economic study was prepared. The technical and economic study was prepared and issued at the end of 2017 in coordination with the Lands and Water Uses Department.

The study proved that the use of treated water in agricultural crop irrigation (according to the opinions of most farmers in the studied countries which comply highly with the results of ACSAD’s previous studies and experiments in most Arab countries) led to the increase of crop productivity/ha. The increase was estimated at 20% (for wheat and barley), 25% (for maize), 39% (for sorghum) and 30% (for most vegetables). When the world prices of these crops are taken into consideration, we can conclude the increase value in USD/ha for each one of these crops.

Crop	Increase value (USD/ha)
Wheat	126
Barley	81
Maize	617
Sorghum	1955
Vegetables	3711

1.1.3: Economic Feasibility Study on “ACSAD’s Factory for Agricultural Plastic Production at Al-Sinn Research Station”:

Within the framework of implementing ACSAD's plans and programs and expanding its infrastructure to serve the scientific research results and enhance self-financing, an economic feasibility study was carried out on “ACSAD’s Factory for Agricultural Plastic Production at Al-Sinn Research Station”. The study has shown that the project is economically feasible, as the profit and revenue rates of costs were estimated at 3.07% and 1.03% respectively, while the factory payback period was estimated at 3.6 years; the fact that indicates that the project is economically successful.

1.1.4: For the purpose of implementing ACSAD’s plan for the year 2017, the following is conducted:

- 1-Prepare an economic feasibility study on the small dams that have been constructed by the Arab Center (ACSAD).
- 2-Prepare an economic feasibility study on ACSAD’s developed wheat varieties registered recently by the Arab countries.

1.2: Project of “Agricultural Extension Development in the Arab Countries”:

1.2.1: Project of “Livelihood Support of Crisis-Affected Population in Syria-SDC”:

Project objective: Improve the food security of the crisis-affected households of farmers and breeders in the governorates of Dara’a and Al-Hasakeh in Syria by supporting the livelihoods of these households (101 beneficiaries from the animal production component and 104 beneficiaries from the plant production beneficiary).

Outputs:

The rainfed wheat yield increased by 10% for the beneficiaries from Dara’a and 13% for the beneficiaries from Al-Hasakeh, while the total income increased by 18% and 28% for the beneficiaries in Dara’a and Al-Hasakeh respectively. About 63% of the beneficiaries attended the training sessions of the project; of which 42% were women. A considerable improvement was noticed in the food situation of the target households in terms of vegetables, legumes and dairy products consumption.

The flock holding increased for the households benefiting from the animal production component by 20%, while the annual income increase was estimated at 30%. The health situation of the flock has improved, as all breeders vaccinated their animals against the contagious diseases. 42% of the total breeder number attended the project training sessions and a considerable improvement was noticed in the food situation of the target households in terms of eggs, fat and dairy products consumption.

***The second phase of the project was implemented, of which the most important activities were the following:**

- 2000 beneficiaries were selected for the project (800 beneficiaries from Dara’a governorate and 1200 beneficiaries from Al-Hasakeh governorate).
- Distribute a quantity of 300 kg of sieved and sterilized durum wheat seeds for each beneficiary from the agricultural component ((1000 beneficiaries in both governorates) in addition to a kit of agricultural inputs (6 different kinds) .
- Distribute a quantity of 750 kg of fodder barley for each beneficiary from the animal production component in Al-Hasakeh and 850 kg of bran for each beneficiary in Dara’a (1000 beneficiaries in both governorates) in addition to a kit of 11 necessary veterinary medicines for each breeder.
- Implement 25 water harvesting units based on the roof-water harvesting method as a model for rainfall water harvesting for the target households.
- A training course on “Gender” was conducted for the staff of the implemented projects in cooperation with AAH.
- Select 6 paravets in the two governorates to attend a training course in the fields of animal care and animal diseases diagnosis. The trainees were provided with veterinary kits containing 26 kinds of the necessary veterinary medicines and devices.
- The field team implemented about /20/ training sessions in both governorates to raise the awareness of the beneficiaries (farmers and breeders) in the fields of animal and plant production sectors.

- Carry out the post-distribution survey for the project components, as 12% of target households were randomly selected (117 households from animal production component and 116 households from plant production component) to review the distribution process of the animal and plant production inputs, make sure of the inputs' appropriateness to the beneficiaries' requirements and handle the obstacles facing the distribution process. The results showed that most of the beneficiaries were satisfied with the distribution process in terms of location, timing and inputs quality.
- Carry out the project final survey, as 10% of the target households were randomly selected (115 households from plant production component and 11 households from animal production component) to identify the socio-economic impact of the project on the target households.
- The project implementation ended on 31/3/2017.

Outputs:

- The sheep heads' number of the beneficiaries increased by about 15%.
- The livestock breeders' income increased by about 45% in Dara'a and 33% in Al-Hasakeh by the end of the project.
- The wheat farmers' income increased by about 25% due to the project production inputs.
- All breeders in Al-Hasakeh and 90% of breeders in Dar'aa were provided with periodical vaccines for their herds.
- The health situation of the herd improved due to the distributed veterinary medicines.
- 90% of beneficiaries and around 60% of women attended training by the project.
- The food security situation of the target households improved in the plant and animal production fields, as a decrease in the food insecure households' rate was estimated at 35%.
- All target households were able to cultivate all their lands with wheat crop.

1.2.2: Project of "Multi-Sector Emergent Support of the Crisis-Affected Population in the Governorates of Al-Hasakeh, Dara'a and Rural Damascus in Syria":

Project progress:

- 1550 beneficiaries were selected for the project (525 rural households from Dara'a, 525 rural households from Al-Hasakeh and 500 rural households from Rural Damascus).
- Distribute 1550 kits of vegetable seeds and agricultural equipment (each kit included 7 kinds of summer and winter vegetable seeds and 4 kinds of agricultural inputs).
- Implement 64 rainfall harvesting units by using house-roof rain harvesting method.
- Organize 21 extension seminars for the beneficiaries.
- Conduct the post-distribution survey for 10% sample of beneficiaries.
- Conduct the baseline survey to identify the economic and social actuality of the target households and evaluate their needs by selecting a random sample covering 84 target households.

Outputs:

- The age of most beneficiaries ranged between 40 and 60 years; rural women occupied 44% of the target sample.
- Most target households had less than 6 members; the age of most of them was less than 18 years.
- 60% of target households depended on well-irrigated agriculture as a main income source; the holding area average was 0.9ha/household (cultivated with different kinds of summer and winter vegetables).
- Less than fifth of the beneficiaries attended training courses in the vegetable cultivation and production field.
- Food Consumption Score (FCS) analysis indicated that about 35% of the target households were nutritionally-poor and about 43% of them were vulnerably food-secure.
- Household Dietary Diversity Score (HDDS) analysis indicated that 45.5% of the households were classified as middle-class and 51% of them were classified as good-class.
- Coping Strategies Index (CSI) analysis indicated that 89% of the households adopted two strategies of food-lack coping strategies namely; reducing food consumption and depending on less-favorable types of food.
- Livelihood Coping Strategies Index (LCSI) analysis indicated that 28% and 20% of the households

were at critical and emergent levels respectively.

1.2.3: Project of “Food Security and WASH Activities to Support Crisis-Affected Population in Syria”:

Project progress:

- Select 300, 100 and 100 poor rural households for “wheat cultivation”, “greenhouses” and “animal production” components respectively.
- Conduct the baseline survey for 10% sample of beneficiaries.
- Organize project orientation sessions for the local population.
- Distribute 100 kits of hybrid vegetable seeds for greenhouses. Each kit included 5 kinds of vegetable seeds namely; cucumber, squash, tomatoes, eggplant and green pepper.
- Distribute 30tons of improved wheat seeds registered by Ministry of Agriculture among 300 households (100kg/household).
- Distribute 50tons of concentrated fodder among 100 rural households of livestock breeders (500kg/household).
- Organize extension training seminars for farmers and breeders.
- Carry out post-distribution survey for protected vegetables farmers.

1.2.4: Emergent Assistance in the Field of Agriculture, Food Security and WASH for Crisis-Affected Population in Syria:

Project objective: Improve food security, agriculture and WASH situation for crisis-affected population in the governorates of Al-Hasakeh, Dara’a, Rural Damascus and Aleppo in the Syrian Arab Republic. The project is implemented during the period 1/6/2017-31/5/2018.

Project progress:

- Select 1200, 1200 and 600 poor rural households for “wheat cultivation”, “livestock breeders” and “household cultivations” components respectively.
- Conduct the baseline survey for 10% sample of target households.
- Organize project orientation sessions for the local population.
- Distribute 600 kits of vegetable seeds. Each kit included 5 kinds of vegetable seeds (cucumber, squash, tomatoes, eggplant and green pepper) and 2 kinds of agricultural equipment.
- Distribute 360tons of improved wheat seeds registered by Ministry of Agriculture among 1200 households (300kg/household).
- Distribute 600tons of concentrated fodder among 1200 rural households of livestock breeders (500kg/household).
- Organize extension training seminars for farmers and breeders.

1-2-5: The 5th Conference of Agricultural Extension and Research Officials in the Arab Countries:

“Desertification Combat and Control in the Arab Region”:

The 5th Conference of “Agricultural Extension and Research Officials in the Arab Countries” was held in Tunisia during the period 20-21/2/2017 under the title of “**Desertification Combat and Control in the Arab Region**”. The conference discussed the country work papers of the participated Arab countries and the scientific papers of ACSAD.

1.3: Arab and International Cooperation Department:

Objective: Increase the effective cooperation with all Arab and international developmental, research and extension institutions for the purpose of transferring ACSAD’s scientific and practical expertise to the Arab countries and benefiting from the scientific and technological progress of the Arab and international research centers to support the agricultural development process.

Arab Ministries and Commissions and Research Centers in the Arab Countries:

-The Arab Center (ACSAD) has established cooperation relations with all Arab countries through bilateral agreements with the Ministries of Agriculture, Environment and Water in these countries under its annual work program. The Arab Center (ACSAD) is implementing its activities in more than (17)

member and non-member Arab countries according to the requirements of each country to support the agricultural development process.

Arab, Regional and International Organizations and Commissions:

-The Arab Center (ACSAD) seeks to enhance cooperation linkages with all regional and international organizations and commissions for the purpose of implementing the recommendations of the General Assembly and Executive Council and the resolutions of the Higher Committee for Arab Work Coordination to benefit from the acquired expertise of ACSAD.

-During the past years, the Arab Center (ACSAD) has signed several cooperation agreements with international organizations and commissions such as: the Islamic Development Bank, the German Agency for International Cooperation (GIZ), the Spanish non-governmental organization of (RESCATE), the Spanish Action Against Hunger institution (AAH), the International Fund for Agricultural Development (IFAD), the Food and Agriculture Organization of the United Nations (FAO), the Economic and Social Committee for Western Asia (ESCWA), the Environment and Development Center for Arab Region and Europe (CIDARI), the International Center for Agricultural Research in the Dry Areas (ICARDA), the United Nations Development Program (UNDP), the European Union (EU), the Spanish Agency for Financing and Development, the UNICCD, the Secretariat General of Biodiversity Convention, the International Institute for Plant Genetic Resources, the International Center for Maize and Wheat Improvement and the International Network for Food Information.

Technical Cooperation Agencies, Research Centers and Universities in Developed Countries:

-The Arab Center (ACSAD) has established scientific and technical cooperation linkages with several scientific research centers, agencies and commissions such as: the German Agency for International Cooperation (GIZ), the Federal Institute for Geosciences (BGR), the French Development Research Institute (IRD), the Agricultural Science University in Slovakia, Aachen University in Germany, Xinjiang Institution for Dry environment Science and Technology in China (XAEST), Humboldt University, the International Institute for Plant Feeding in Germany, The Catalanian Forest Institute, the Overseas Scientific Study Center in France, Universities of Lund and Uppsala in Sweden and the University of London-Imperial Faculty. The purpose of this cooperation is to seek the application of modern and developed methods in the implementation of its projects and transfer and localization of technologies that are appropriate for the Arab region climate.

Second: Knowledge Management and Localization Program

In the year 2017, ACSAD has taken important measures to develop the electronic structure and digitalism use by developing and providing the necessary knowledge tools for the different activities in coordination with the Knowledge Management and Localization Program, the Information Technology Unit and the specialized departments. The following has been achieved in this field:

-Update ACSAD's website data in both Arabic and English languages in a way that reflects all the developments in ACSAD's work fields (like adding information on the new research stations).

-Supply the Informatics Network at ACSAD's new premises in Al-Sabboura and provide the premises with a high speed optical Internet (20Mbps); ready to increase till (100Mbps) when necessary. The website has been provided with the Internet management application (pfsense) to ensure the optimal use of the Internet and protect the local network from passing through.

-Ensure the participation in the best software and applications of "Accunetix" to protect ACSAD's website from passing and breaking through.

-The preparation of an electronic gateway was completed in coordination with the Agriculture and Water Journal to allow for searching for the published articles of the journal through certain data (title in Arabic and English languages/researcher's name/abstracts) or certain key words. The gateway will be operated under ACSAD's website as soon as the journal finishes data preparation.

-The work on the preparation of an application for the subprogram of "Small Ruminants Genetic Improvement and Care in the Arab Countries" is undergoing in coordination with the Animal Wealth Department. It is expected to start its operation at the end of March 2016.

-The content of scientific articles at ACSAD's website is always enriched in cooperation with all technical departments.

The Arab Center

-The preparation of a new design for ACSAD's website has started according to the most recent program tools and recommendations. This will make searching the website easier, smoother and adaptable with all kinds of devices (computers+ smart devices), and will take into consideration all the requirements of security and protection.

-Provide technical support and maintenance for all internally-invested software and hardware, as all operations of technical support and maintenance were carried out by IT unit so quickly with the provision of the necessary financial support.

Human Resources Development and Technology Transfer

Human Capacity Building Program

The Arab Center (ACSAD) has paid a special attention to human capacities building in the field of Arab agricultural development. It has sought to continuously develop the research stations and training centers, modernize and develop the necessary equipment and supplies in a way that complies with the most recent scientific techniques and contribute to the Arab staff training by transferring, localizing and developing the knowledge that is appropriate to the sustainable agricultural development conditions in the arid and semi-arid areas. This is reflected in the organization of training courses, seminars and scientific conferences that have contributed and are still contributing to the human capacity building of Arab staffs to enable them to get acquainted with the most recent theoretical and practical scientific updates aiming at creating the desired technical and technological changes in a way that contributes to the support and achievement of the Arab food security.

In the year 2017, ACSAD organized /29/ training courses and scientific meetings and /82/ extension seminars; in which more than /2500/ technicians and experts participated.