



The League of Arab States
The Arab Center for
the Studies of Arid Zones and Dry Lands
(ACSAD)



The Annual Technical Report
For the Year 2015

Introduction

The Arab agricultural sector faces big challenges which are in the first place related to the climatic changes and resources scarcity (lands and water) under the increasing demand of food.

Driven by the tasks undertaken by the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) and represented by finding solutions to the problems faced by this sector, ACSAD has persisted, in spite of the current circumstances, on implementing its annual work plans at the highest pace; the information presented in this report is a practical proof for its achievements during the year 2015.

The Arab Center (ACSAD) has continued the implementation of strategic and developmental projects in most Arab countries reflected especially in the projects of: creation of highly productive and environmental stress-tolerant wheat and barley varieties, conservative agriculture system dissemination and application, wheat crop productivity improvement in the Arab countries, rangelands rehabilitation and development and production expansion and development of fruit trees appropriate to arid zones. It has also continued its work on the projects of: drought impacts alleviation in the Arab region, studies of sand storms, sand dunes fixation and sand encroachment control, degraded lands rehabilitation and saline and waste water uses in agriculture.

Moreover, ACSAD has paid a special attention to the implementation of vital water projects especially the projects of: Arab water security, coastal water basins management, rainfall harvesting, adaptation with climatic changes in the Arab countries, modern techniques use in water resources management and non-conventional water resources use expansion.

In the field of Arab livestock development, ACSAD has implemented the projects of genetic improvement and production care of sheep and goats in the Arab countries, development of embryo transfer and artificial insemination techniques use for small ruminants, camel production development and agricultural residues fodder processing.

Thus, ACSAD has taken the responsibility of utilizing all its potentials and expertise to deal with the crucial issues that hinder and threaten the Arab agriculture. This has been done by adopting scientific methods and constructive ideas within a research institutional environment based on building Arab capacities and finding the best strategies, policies and optimal applicable solutions that are capable of developing the Arab agricultural production; both in quantity and quality, and facilitating ultimately the increase of Arab national income.

Allah is the Arbiter of Success

Prof. Dr. Rafik Ali Saleh
Director General

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Plant Resources

During the year 2015, the Plant Resources Department continued the implementation of /28/ strategic and developmental projects, in addition to the implementation of /10/ scientific studies, researches and experiments. The implementation of these projects, studies, researches and experiments was distributed among the following Arab countries:

The Hashemite Kingdome of Jordan, the Tunisian Republic, the Democratic People's Republic of Algeria, the Kingdom of Saudi Arabia, the Syrian Arab Republic, the Sultanate of Oman, the State of Palestine, the State of Kuwait, the Lebanese Republic, the Arab Republic of Egypt, the Kingdom of Morocco, the Islamic Republic of Mauritania and the Republic of Yemen.



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

1-Cereal program:

This program aims at improving the cereal crops productivity, especially wheat (hard and soft) and barley, increasing their productive capacity under the Arab arid and semi-arid areas conditions and developing the cultivation of sorghum and millet crops due to their food and feeding importance and highly drought-tolerance.

2-Conservative agriculture program:

This program encourages farmers in the Arab countries to adopt the conservative agriculture system. It aims at improving the crops productivity, the farmers' income and the irrigation water management and alleviating the severity of drought as a result of climatic changes. It also aims at building the Arab agricultural institutions' capacities in the field of sustainable agricultural production and increasing the awareness of researchers and technicians towards the positive effects of this system from the environmental, economic and social points of view.

3-Development of fruit trees appropriate for arid areas program:

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

4-Palm trees development in the Arab countries program:

It aims at developing and taking care of date palm trees in the Arab countries through the service processes, picking up process improvement, palm integrated insects and diseases control and extension activities promotion.

5-Rangelands and forestry resources rehabilitation and development program:

It aims at surveying and inventorying the pastoral vegetation cover, identifying the grazing systems, cycles and seasons, rehabilitating the degraded pastoral areas, collecting, evaluating and classifying the pastoral varieties and selecting the environmental stress- tolerant genetic types to be multiplied and distributed among the Arab countries.

It also aims at establishing genetic banks and mothers' fields for the pastoral species that have a good feeding value and high adaptive capacity, in addition to studying the pastoral plant vegetation changes and preparing plant and pastoral maps.

6-Biodiversity conservation program:

It aims at documenting the biodiversity in the Arab region by inventorying, collecting and documenting the plant varieties that grow in the arid and semi-arid environments, establishing data bases and producing qualitative atlases that meet the requirements of specialists in the related research and developmental programs.

It also aims at supporting other programs with the genetic resources of economically important plants and coordinating among Arab countries to implement the CBD convention and Cartagena Protocol for Biosafety.

***Implemented Projects of
Plant Resources Department***

Creation of Highly Biotic and Abiotic Stress-Tolerant and Highly Productive Wheat and Barley Varieties

Project objective:

The project aims at developing and enhancing the productivity of small cereal crops (hard wheat, soft wheat and barley) in a way that ensures the achievement of food security and sustainable agricultural development of the Arab agricultural system components.

Project site:

The Hashemite Kingdom of Jordan, the Republic of Tunisia, the Democratic People's Republic of Algeria, the kingdom of Saudi Arabia, the Republic of the Sudan, the Syrian Arab Republic, the Sultanate of Oman, the Republic of Iraq, the State of Palestine, the State of Kuwait, the Lebanese Republic, the State of Libya, the Arab Republic of Egypt, the Kingdom of Morocco, the Islamic Republic of Mauritania and the Republic of Yemen.



Project progress:

- During the agricultural season 2014-2015, several genetic resources of hard wheat, soft wheat and barley crops were evaluated, including 1200 entries from some Arab countries and specialized regional and international organizations, in addition to ACSAD's breeds that are used in the experiments of preliminary productive efficiency, Arab production efficiency and control fields. As a result of this evaluation, 460 genetic resources of the three crops were selected to be tested later in the various breeding stages aiming at reaching the promising breeds.
- (644) hybrids that contained /4508/ families and breeds were evaluated; of which /582/ hybrids, containing /3928/ families and breeds, were selected. The evaluation and selection processes will be continued during the different isolated generations aiming at introducing the successful breeds from the fifth generation to be used as promising ones in the preliminary productive efficiency experiment.
- (210) successful crossbreeding processes of selected parents for hard wheat, soft wheat and barley crops were selected at a rate of 70 hybrids/ crop.
- The number of hard wheat, soft wheat and barley breeds, tested in the first year of the preliminary production efficiency experiments, amounted /94/ breeds during the season 2014-2015. These breeds were compared to the best local control plants cultivated in "Ezra'a-Syria" and "Kafrdan-Lebanon" stations. As a result, /60/ promising breeds were selected to be tested for a second year in the season 2015-2016 and introduced later into the Arab productive efficiency experiments.
- The number of ACSAD's varieties of hard wheat, soft wheat and barley that were adopted in the Arab countries amounted /22/ ones distributed as the following:

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

ACSAD's hard wheat varieties adopted in the Arab countries

Variety/breed	Country	Given name	Year of adoption
ACSAD 65	Syria	ACSAD 65	1985
	Jordan	ACSAD 65	1985
	Morocco	ACSAD 65	1985
	Lebanon	Tel Amara 1	2010
	Iraq	ACSAD 65	-
ACSAD 357	Libya	Bhouth 107	
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

ACSAD's soft wheat varieties adopted 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
	Algeria	Mouna	2013
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

ACSAD's barley varieties adopted 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

Project of Crop Agricultural Systems in Rainfed Areas

Project objective:

Study some agricultural techniques that affect the cereal crops productivity in the arid and semi-arid areas, identify the best ones and introduce some new agricultural systems that achieve integration and balance between animal production and plant production. This project pays a special attention to ACSAD's newly created varieties and breeds by identifying the appropriate agricultural techniques and transferring them to the farmers' fields to be applied.

Project site:

The project preliminary experiments activities are conducted in the research stations of ACSAD. When the final results are reached, they are directly communicated to the interested Arab countries.

Project progress:

- A study on the effect of the salinity different salinity levels on the productivity of (soft wheat, hard wheat and barley) was conducted. The initial results showed some varieties' tolerance towards salinity at its highest level (150) m mol/liter. These varieties are soft wheat (ACSAD 899), hard wheat (ACSAD 357) and barley (ACSAD 60, ACSAD 68, ACSAD 176, ACSAD 1182 and ACSAD 1420). The study will be continued next season to confirm the results.
- A study on various genetic types for 10 varieties of hard and soft wheat under the high temperature stress conditions was conducted. The initial results showed the presence of a significant difference for the temperature rise and the increase of accumulative temperature rate during the different growth stages (first date 687.65/m°- second date 859.5/m°- third date 1115.5/m). The hard wheat variety (ACSAD 1105) and the soft wheat variety (ACSAD 901) predominated by 23% and 18.5% respectively on the three dates. The study will be continued next season to confirm the initial results.
- An experiment was implemented to evaluate the performance of (10) varieties of sorghum (green forage green sorghum) which are: Egypt 6, Giza 113, red Jazan, white Jazan, Mayo, Veteray, Bodelly, Jioui, Biufuel and Fello. The initial results showed the superiority of Veteray, red Jazan and white Jazan varieties in terms of dry material generation. The study will be continued next seasons to confirm the initial results.
- Quinoa crop was introduced and cultivated during the season 2014-2015 aiming at evaluating its adaptation with the semi-arid environments. The study will be continued next season to confirm the initial results.



Project of Multiplication of Wheat and Barley Promising Breeds and Varieties Seeds

Project objective:

Multiply the seeds of ACSAD's varieties and breeds of hard wheat, soft wheat and barley. The multiplication is conducted basically at ACSAD's research stations under the rainfed agriculture conditions. ACSAD, by this project, provides the required seeds quantities while conserving at the same time the seeds purity by conducting the mechanical and genetic refinement processes during the growth season and the later sieving, sterilization and storing processes.

Project site:

The multiplication activities are conducted at ACSAD's research stations and the seeds are then shipped to the interested Arab countries.

Project progress:

/123/ varieties and breeds of hard wheat, soft wheat and barley were multiplied and /253/ kg of seeds were sent to /15/ Arab countries as promising breeds and hybrids to be cultivated during the agricultural season 2015-2016 as illustrated in the following table:



Wheat and barley seeds quantities that were sent to the Arab countries to be cultivated in the agricultural season 2015-2016

Country	(Seed quantity (kg
Jordan	25
Tunisia	14
Algeria	27
Saudi Arabia	12
Syria	35
Sudan	27
Iraq	12
Sultanate of Oman	12
Palestine	12
Kuwait	12
Lebanon	14
Libya	12
Egypt	25
Morocco	12
Mauritania	12
Total	253

Sorghum Bicolor Development and Improvement Project

Project objective:

The project aims at increasing the Arab farmer's income through developing and enhancing the sorghum bicolor productivity in the Arab countries, providing national programs with the improved genetic material and raising the Arab technical staff efficiency.

Project site:

The multiplication activities are conducted at ACSAD's research stations and the seeds are then shipped to the interested Arab countries.

Project progress:

The executive plan of the project during the years 2014 and 2015 included several activities as follows:

- Cultivate /25/ families of different isolated generations of which /10/ families were selected based on morphological and productive characteristics and lab test.
- Evaluate /50/ genetic types, select the superior ones and introduce them into the various breeding programs. The Arab countries were provided with the following /23/ genetic types of superior productive characteristics: Ezra'a 3, Ezra'a 5, Ezra'a 7, Ezra'a 63, Ezra'a 66, Ezra'a 67, Kharabo 115, Tel Abiad G1, Baladi 4, Shalakh 6 (Syria), Dorado 9, Giza 15, Giza 113, Egypt 5, Egypt 9, Egypt 11, Veteretay, Mayo (Sudan), Omani (Oman), Biufuel, Jioue and DjodiLwans (Mauritania).
- Introduce and evaluate /13/ new genetic types of sorghum bicolor and /3/ genetic types of millet from the General Commission for Scientific Agricultural Research in Syria and Agricultural Research Center in Egypt. This activity was conducted under the experiments of "observation lines"; the result of which was the selection of /7/ genetic types of sorghum bicolor and /1/ genetic type of millet (ICSV-700) based on morphological characteristics and environmental adaptation.
- Provide the Technical Institute for Extensive Cultivations in Algeria and the National Center for Agriculture and Livestock Research in Saudi Arabia with /20/ genetic types under the Arab productive efficiency experiment.



Biological Techniques Researches and Studies Project

Project objective:

The project aims at identifying the genetic print and genetic relativity degree of ACSAD's hard wheat, soft wheat and barley varieties and breeds and protecting ACSAD's property rights in terms of the produced genetic varieties, breeds and materials.

Project site:

ACSAD's experts work on the genetic and molecular studies implementation according to the project plan at the advanced biological techniques lab in the Arab Center (ACSAD).

Project Progress:

ACSAD's experts have conducted lab studies and analysis for more than /600/ different samples (soil-fodder-milk) through scientific researches and experiments on: wheat crop response to big elements fertilization, conservative agriculture, olive pruning residues use in sheep feeding and evaluation of some soils' appropriateness for agricultural use in a way that serves ACSAD's projects according to the research plans.



Special Developmental Projects in the Arab Countries

Project of Wheat Production Improvement in the Arab Countries:

The project aims at improving wheat crop productivity in the Arab countries under the irrigated and rainfed agriculture conditions, supporting food security projects in the region and providing improved high-quality seeds of ACSAD's high-productive breeds and varieties to the Arab countries benefitting from the project; these countries are the following: Jordan, Tunisia, Algeria, Saudi Arabia, Sudan, Syria, Iraq, Lebanon, Libya, Morocco and Yemen. The project has actually started in the season 2008/2009, as /135/ tons of ACSAD's improved seeds were distributed among the Arab countries. The project is implemented in cooperation with the Islamic Development Bank.

Project of Strategic Crops Productivity Improvement in the Islamic Republic of Mauritania:

The project aims at inventorying and collecting the crop genetic resources of (wheat, barley, maize, sorghum bicolor, millet and beans), in addition to introducing ACSAD's breeds and varieties of hard wheat, soft wheat and barley, evaluating their performance in the target local environments, selecting and multiplying the most adaptive and productive genetic types, establishing a genetic breeding and improvement program for these crops and training the national technical staffs on the principles of seeds collection, conservation and multiplication by traditional ways.

The project is implemented in cooperation with the National Center for Agricultural Research and Agricultural Development (CNARADA) and Islamic Development Bank to improve the a.m crops productivity in the Islamic Republic of Mauritania. The necessary procedures for extending the project life time were taken in the season 2014/2015 to complete the procurement process of field and lab equipment and supplies.

Project of Wheat and Barley Superior Varieties Creation and Dissemination in the Democratic People's Republic of Algeria:

The project aims at evaluating the performance of ACSAD's high-productive and qualitative breeds and varieties desirable in the Algerian local environments aiming at adopting the superior ones and identifying the morphological, physiological and bio-chemical mechanisms that are genetically related to the productive efficiency and adaptation with the target environments.

Project of Wheat Seeds Multiplication in the Northern State of the Republic of Sudan:

Within the framework of the technical cooperation with the Ministry of agriculture in the Republic of the Sudan, ACSAD has prepared a project for multiplying 30000 tons of wheat seeds in the northern state to cultivate 200000 ha in the Republic of Sudan. It is coordinated with the Sudanese side to provide the necessary financing from the Islamic Development Bank.

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

-Under the decisions of ACSAD' Executive Council and General Assembly concerning calling for continuing the technical and technological support necessary for rising up the Palestinian agricultural sector, ACSAD has worked on implementing the executive technical program with an amount of USD /150000/. The program includes three important projects which are the following:

- 1-Multiplying the promising breeds and varieties of wheat and barley from ACSAD's adopted varieties.
- 2-Providing the Palestinian National Center for Agricultural Research with a number of sheep and goat semen straws to be utilized in the artificial insemination and livestock development processes.
- 3-Providing the necessary support and expertise in the rainfall harvesting field by establishing water harvesting wells in some regions of Palestine.

- /75/ kg of the season 2013/2014 and /12/ kg of the season 2014/2015 from ACSAD's promising breeds and varieties were sent to Palestine, and a workshop on the progress of the wheat and barley productivity improvement project, during the seasons 2013-2014 and 2014-2015, was held on 20/08/2015.
- The evaluation results for the season 2014-2015 showed the superiority of a number of ACSAD's breeds which will be continued to be evaluated during the season 2015-2016.
- Due to the project success and full implementation, the project has been repeated in other Palestinian areas with a new budget.

Wheat Crop Productivity Improvement by Applying Conservative Agriculture System in the Islamic Republic of Mauritania

Project objective:

The project aims at improving the wheat crop productivity average in the area unit in a way that ensures the achievement of food security and disseminating the conservative agriculture system as an alternative agricultural system to the traditional agriculture aiming at rehabilitating the degraded agricultural lands and improving their productive properties in line with the sustainable agricultural development requirements.

Project site:

The project is implemented in cooperation among ACSAD, Food Security Support Program, National Center for Agricultural Research and Development in the Islamic Republic of Mauritania (CNARADA) and the Islamic Development bank. The aim is to improve wheat crop productivity by applying conservative agriculture system in Al-Sdoud area in the Islamic Republic of Mauritania.

Project progress:

The Arab Center ACSAD, in coordination with the Mauritanian side and the Islamic Development bank, is following up the procedures of providing the necessary supplies, equipment and inputs for the project implementation.



Project of Selection of New Varieties of Palm Seed Breeds in Some Arab Countries Kingdom of Saudi Arabia-Syria-Egypt

Project objective:

The project aims at selecting new palm varieties with high specifications, multiplying them, disseminating their cultivation, circulating and publicizing the project results among the Arab countries and establishing genetic banks in the target countries suitable for studies and experiments implementation, in addition to reapplying the project in other Arab countries.

Project site:

Kingdom of Saudi Arabia-Syrian Arab Republic-Arab Republic of Egypt.

Project progress:

The project period is /4/ years starting from the year 2011. A certain number of high quality seed breeds was identified from every country participating in the project. These breeds were scientifically evaluated and reviewed to know the number of their available cuttings, procure them and cultivate them in the genetic banks established in each participating country aiming at multiplying these selected superior cuttings.

There are good indicators for the results reached so far in the three participating countries, as the data shows that there is /30/ new promising breeds of date palm trees that compete Arab superior varieties in the Arab and international markets and have a high marketing capacity. A workshop for evaluating the reached results will be held as soon as the project final report is finalized.

Due to the project success and the reached positive results, ACSAD's General Assembly has issued a **decision stipulating the following:**

- 1-Support ACSAD's exerted efforts in continuing the implementation of the palm development and re-search project in (Saudi Arabia-Syria-Egypt) and expanding it to include other interested countries, and cooperate and coordinate with research and development centers in the Arab countries that are developed in this field.
- 2-Request their excellences, the Arab Ministers of Agriculture, to support the financing of the project by the Arab and regional institutions and funds.

Following ACSAD's General Assembly, a project proposal entitled "land and vertical palm trees orchards service processes development for production increase and quality improvement in the Arab region" was prepared and referred to the Arab countries. National coordinators were appointed for the project and the first meeting was held during the period 24-26/8/2015 at ACSAD's office in Cairo with the participation of /11/ Arab countries:

The Hashemite Kingdom of Jordan, the Republic of Tunisia, the Democratic People's Republic of Algeria, the Kingdom of Saudi Arabia, the Republic of the Sudan, the Syrian Arab Republic, the Republic of Somalia, the State of Palestine, the Arab Republic of Egypt, the Islamic Republic of Mauritania and the Republic of Yemen. The project document and budget were agreed upon in this meeting; which date was considered the project inception date.



Project of Development of Fruit Trees Appropriate for Arid Areas in the Arab Countries

Project objective:

The project aims at developing the cultivation of drought-tolerant fruit trees in the Arab countries, identifying the appropriate varieties and breeds to extend their cultivation, establishing mothers' nurseries and fields for the drought-tolerant varieties in the target countries and qualifying and training the technical staffs and farmers in the Arab countries on the techniques of drought-tolerant fruit trees cultivation and care.

Project site: The Democratic People's Republic of Algeria- the Republic of Lebanon.

Project progress:

- Within the framework of cooperation with the Democratic People's Republic of Algeria in the implementation of "drought-tolerant fruit trees service project", a training course on "drought-tolerant fruit trees service" was held for the Algerian national staffs participating in the project in the Algerian capital during the period 17-23/10/2015.

The course concentrated on the trees of olive and pistachio in terms of their economic and food importance, getting acquainted with the most important varieties, the know-how of mothers' nurseries and fields establishment, the seed and vegetative multiplication methods, the know-how of productive fields cultivation and establishment and the followed service operations including pruning, breeding, bearing fruits, irrigation, fertilization, ploughing and control of insect and fungi pests that infect both types of trees.

- For the purpose of implementing the project activities in the Republic of Lebanon, a nursery for forestry seedlings and fruit trees was finalized in Kamed Al-Lowz area- the West Beka'a. This nursery has become ready for producing rooted olive cuttings estimated at no less than /20/ thousand seedlings annually. The nursery will be capable of producing grafted trees of pistachio and almonds after grafting the seed seedlings in the nursery.



Project of Fruit Trees Seedlings Production Extension for Meeting Arab Countries Demands

Project objective:

The project aims at producing the plant material of healthy reliable fruit trees varieties and breeds (seed and grafted seedlings- rooted cuttings- grafts- seeds) with a genetic content capable of tolerating the severe environmental conditions, providing Arab countries with a reliable genetic material to establish mothers' fields and green belts, qualifying the Arab technical staff and improving seedlings production and multiplication methods.

Project site:

The Arab Center (ACSAD) has allocated a productive research station for producing olive trees (AL-Bouka station- Lattakia) with an annual production capacity of 100 thousand seedlings of Arab "oil and table" varieties that will be distributed among the Arab countries.

Project progress:

- /50000/ olive rooted cuttings of Al-Kaisi, Trilia, Sorani and A'ajeizi varieties were sent to the Iraqi Ministry of Agriculture on 23/1/2015.
- A request of about /40000/ rooted olive cuttings of Sorani variety and /15000/ olive seedlings of Sorani variety were sent to the Kingdom of Saudi Arabia during the years 2014-2015.
- /7/ varieties of pistachio and /6/ varieties of almonds at a rate of /15/ seedlings /variety in addition to a number of figs seedlings were sent to the Desert Research Center in the Arab Republic of Egypt at the beginning of February 2015. Another package of hundreds of fruit trees has been also prepared to be sent to the Democratic People's Republic of Algeria, the Kingdom of Saudi Arabia, the Lebanese Republic and the Arab Republic of Egypt.

Consignments of fruit trees program during the year 2015

Country	Number-Quantity (kg)	Item	Variety
Algeria	10 kg	Different varieties	Pistachio seeds
Iraq	50000	Rooted olive cuttings	Al-Kaisi - Trilia - Sorani - A'ajizi
Saudi Arabia	40000	Rooted olive cuttings	Sorani
	15000	Olive seedlings	
Lebanon	50000	Olive seedlings	Sorani
	1000	Rooted olive cuttings	A'ajizi
	100	Olive seedlings	Sorani - Jaba'a - Tansh - Kaisi - Khaddiri
	40 female seedlings 10 male seedlings	Pistachio seedlings	A'ashouri - Batouri - A'alimi - A'ajami
	84	Almond seedlings	Nobles Altra - Forna - Dafada'ai - Ouja - Texas - Shami Fark - Feranis
	8 kg		Pistachio seeds
	15 kg		Almond seeds
	16 kg		Pistacia atlantica seeds
Egypt	180 female seedlings 30 male seedlings	Pistachio seedlings	A'ashouri - Batouri - A'alimi - A'ajami - Kithar- Mater
	210	Almond seedlings	Nobles Altra - Forna - Dafada'ai - Ouja - Texas - Shami Fark - Feranis
	10	Pistachio seedlings	

Project of Conservation of Tolerant Wild Fruit Tree Resources

Project objective:

- Benefit from the genetic stock of the wild fruit trees resources in the programs of genetic breeding and improvement and creation of pest-resistant and environmental stress-tolerant pests varieties.
- Develop the national and regional technical expertise in the field of genetic fruit trees resources and qualify the local specialized staffs in the field of all the different types of fruit and forestry afforestation.

Project site:

The genetic complex of Gellin- Syria (one of ACSAD's research stations specialized in fruit trees).

Project progress:

The Arab Center (ACSAD) conserves and uses some wild fruit trees resources for the development of arid zones at its genetic complex in Gellin.

The most important studied wild trees are:

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



Scientific Researches and Studies at the Research Stations

1-In the field of olives:

"Characterization of cultivated olive varieties at the genetic complex of Gellin".

Research site:

The genetic complex of Gellin –Syria (one of ACSAD's research stations specialized in fruit trees).

Activities progress:

- For the purpose of completing ACSAD's work plan concerning characterization of olive cultivated varieties at the genetic complex of Gellin amounting /100/ local, Arab and international varieties and breeds, characterization research results of some European olive varieties ,introduced under the rainfed and supplementary irrigation agriculture conditions at the research station of Gellin, were published during the year 2015. The research was conducted to characterize the following varieties: conservelia, amygdalolia (Greece), besholin and tansh (France), frantoiw (Italy) and belady (Spain).
- The study results showed the superiority of the supplementary irrigation agriculture treatment over the rainfed agriculture treatment for most of the studied varieties in terms of most of the studied characteristics; the most important of which were: the budding rate (7.22% for the rainfed agriculture and 16.97% for the supplementary irrigated agriculture) and the oil rate based on the dry weight (30.88% as an average for all varieties for the rainfed agriculture and 45.64% for the irrigated agriculture). The results were reverse concerning the oil rate based on the wet weight.
- Upon studying the relativity tree based on the studied drought standards, the studied varieties were classified into two groups; the first group was more drought-tolerant and included the varieties of conservelia, besholin, frantoiw and belady (Spain) at a relativity distance of 10.863 while the second group was less drought-tolerant and included the varieties of amygdalolia and tansh at a relativity distance of 4.548. The relativity distance between the two groups was 18.144. As a result, it is recommended to disseminate and cultivate the varieties that are more drought-tolerant in the Arab countries with dry conditions.
- A study is conducted on the germination growth power of pistachio, almonds and olives seeds on different dates and when sprinkled with the hormone of "Aljbrin" to accelerate their growth and grafting process. Thus, seeds of pistachio, almonds, olives and pistacia atlantica were cultivated on early dates starting from the fifth month at a rate of one cultivation/two months in the year 2015. The result showed that the pistachio seeds germination rate exceeded 90% and the almonds germination rate was about 70% (with seedlings growing well for both), while the olives and pistacia atlantica seeds did not germinate on the same date taking into consideration that the treatments with sulfuric acid were used. Another cultivation processes will be conducted on other dates later and the study is still going on.

The annual vegetative growth rate
and the leaf surface size of the studied varieties

Variety		Annual growth rate (cm)			Leaf surface size (cm ²)		
		Rainfed Agriculture	supplementary irrigation	ξ.ρA	Rainfed Agriculture	supplementary irrigation	ξ.ρA
Conservelia	Greece	13.75	17.62	15.69 ^{ab}	6.247	8.667	7.457 ^a
Amygdalolia		12.12	22.00	17.06 ^a	5.845	8.813	7.329 ^a
Besholin	France	11.75	13.00	12.38 ^{ab}	4.287	8.445	6.366 ^c
Tansh		10.37	10.38	10.38 ^b	5.360	9.560	7.460 ^a
Frantoiw	Italy	12.55	16.62	14.59 ^{ab}	4.487	9.553	7.020 ^{ab}
Belady	Spain	8.38	24.00	16.19 ^a	5.447	8.015	6.731 ^{bc}
		11.49 ^b	17.27 ^a		5.279 ^b	8.842 ^a	
LSD 0.05	A	5.107			0.5536		
	B	2.949			0.3196		
	A×B	7.223			0.7829		

Fruit size and weight of the studied varieties

Variety		Fruit weight (g)				Fruit size (cm ³)		
		Rainfed Agriculture	supplementary irrigation	Σ.ρA	evaluation	Rainfed Agriculture	supplementary irrigation	Σ.ρA
Conservelia	Greece	2.56	7.00	4.78 ^b	high	2.00	5.50	3.75 ^b
Amygdalolia		4.15	4.21	4.18 ^b	High	3.59	4.10	3.84 ^b
Besholin	France	1.73	2.91	2.32 ^c	Medium	1.77	3.20	2.48 ^{bc}
Tansh		4.46	4.85	4.65 ^b	High	2.33	4.60	3.47 ^{bc}
Frantoiw	Italy	0.66	2.62	1.64 ^d	Low	1.40	3.13	2.27 ^c
Belady	Spain	7.91	11.95	9.93 ^a	Very high	7.83	11.07	9.45 ^a
3.58 ^b		5.59 ^a	5.59 ^a			3.15 ^b	5.27 ^a	
LSD 0.05	A	0.655			1.292			
	B	0.378			0.746			
	A+B	0.926			1.828			

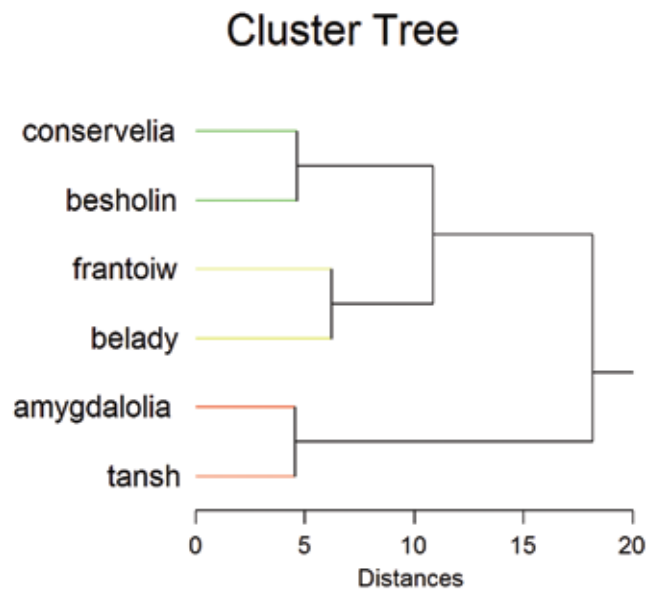
The oil rate based on the wet and dry weight of the studied varieties

Variety		oil rate based on the wet weight (%)			oil rate based on the dry weight (%)		
		Rainfed Agriculture	supplementary irrigation	Σ.ρA	Rainfed Agriculture	supplementary irrigation	Σ.ρA
Conservelia	Greece	25.10	17.60	21.36 ^b	36.75	51.76	44.25 ^a
Amygdalolia		24.21	20.37	22.30 ^a	35.15	52.80	43.97 ^a
Besholin	France	18.85	18.05	18.45 ^c	27.87	48.45	38.16 ^c
Tansh		20.57	16.42	18.50 ^c	34.36	47.34	40.85 ^b
Frantoiw	Italy	23.07	19.70	21.39 ^b	32.67	42.94	37.81 ^c
Belady	Spain	11.87	9.54	10.71 ^d	18.49	30.55	24.52 ^d
		20.61 ^a	16.95 ^b		30.88 ^b	45.64 ^a	
LSD 0.05	A	0.880			2.256		
	B	0.508			1.303		
	A×B	1.245			3.191		

Some drought standards of the studied varieties

Variety		Chlorophyll A	Chlorophyll B	Water content %	Leaf water content %	Water deficiency %	Leaf's dry material rate %	Glucose	proline
Conservelia	Greece	1.0533 ^a	0.4600 ^a	93.53 ^a	60.87 ^d	5.14 ^a	39.13 ^{ab}	35.20 ^b	55.37 ^b
Amygdalolia		0.7700 ^c	0.3033 ^{cd}	85.26 ^{abc}	67.15 ^{bc}	14.74 ^b	32.85 ^c	34.20 ^b	23.91 ^d
Besholin	France	0.9133 ^b	0.3533 ^{bc}	92.76 ^{ab}	59.78 ^d	6.57 ^a	40.22 ^a	31.10 ^{bc}	66.84 ^a
Tansh		0.5000 ^d	0.2333 ^d	84.74 ^{bc}	71.37 ^{ab}	15.26 ^b	28.36 ^d	50.23 ^a	25.80 ^d
Frantoiw	Italy	0.7767 ^c	0.3233 ^{bc}	83.54 ^c	64.61 ^{cd}	14.79 ^b	35.39 ^{bc}	24.10 ^c	44.90 ^c
Belady	Spain	0.9600 ^{ab}	0.3967 ^{ab}	93.71 ^a	73.08 ^a	5.29 ^a	25.59 ^d	23.97 ^c	40.69 ^c
LSD 0.01		0.10518	0.08595	8.194	5.195	5.739	3.933	8.486	8.926

Upon studying the similarities and differences among the studied varieties based on some drought standards as illustrated in the following chart, it is shown that the studied varieties are divided into two groups:



Relativity tree of European varieties based on some studied drought standards

- The first group is more tolerant and includes two sub-groups; the first sub-group includes conservelia and besholin varieties with a relativity distance of 4.621 and the second sub-distance includes frantoiw and belady varieties with relativity distance of 6.215.
- The second group is less drought-tolerant and includes amygdalolia and tansh varieties with a relativity distance of 4.548. The relativity distance between this group and the first group is 18.144.

The study will be continued next years to cover all the cultivated varieties at this complex, as the data of the specifications of these varieties that are studied under Gellin station conditions have been entered into the electronic data base. The work will be continued also concerning entering the data of the Arab and international varieties that are not cultivated at this complex by using the reference studies available in the books, journals and Internet so that the data base is used by those interested in this information.



Frantoiw variety - Italy



Amygdalolia variety - Italy

F2-In the field of pistachio:

"Study of the germination growth power of pistachio, almonds and olives seeds on different dates and when sprinkled with the hormone of "Jebralin" to accelerate their growth and grafting process"

Research site:

Bouqa research station-Lattakia (one of ACSAD's research stations).

Research progress:

Seeds of pistachio, almonds, olives and pistacia atlantica were cultivated on early dates starting from the fifth month at a rate of one cultivation/two months in the year 2015.

The result showed that the pistachio seeds germination rate exceeded 90% and the almonds germination rate was about 70% (with seedlings growing well for both), while the olives and pistacia atlantica seeds did not germinate on the same date taking into consideration that the treatments with sulfur acid were used. Another cultivation processes will be conducted on other dates later and the study is still going on.



Collection, Conservation and Production of Pastoral Plant Genetic Resource Seeds for Arab Rangeland Rehabilitation Project

Project objective:

Several pastoral plants varieties, types and breeds have been vulnerable to negative reverse environmental conditions (drought, salinity, high temperature, overgrazing, wood cutting and fires...etc), the reason that led to the entire absence of some varieties from the Arab environments and the risk of extinction for others. Therefore, the main objective of the project is represented in providing the appropriate plant varieties seeds, developing and conserving the arid and semi-arid areas in the Arab region and collecting, conserving and multiplying the seeds of the genetic resources.

Project site:

The Algerian Republic- the kingdom of Saudi Arabia- the Syrian Arab Republic- the Republic of Iraq- the Lebanese Republic.

In the Democratic People's Republic of Algeria:

1-Rangelands rehabilitation in the Algerian steppes project:

- The project aims at developing pastoral areas, increasing breeders' income, contributing to the economic development, controlling lands degradation, achieving the optimal use of rainfall, raising the pastoral vegetation cover productivity and developing wild life, in addition to training the national technical staffs and activating the local communities role in lands degradation control and rangelands management.
- The results of establishing a reserve in the site of "Ben Hamed" at an area of 4500 ha of *Cladium-mariscus* and *Artemisia* rangelands are monitored and followed-up.
- ACSAD's experts held a meeting with the Algerian side in March 2015 in which the project progress phases were discussed and the Algerian side was asked to send the plant measurements readings to be analyzed by ACSAD and to finalize the results.
- The protection results at Al-Doum site showed the appearance of new important plants, the renewal of long-life varieties and the appearance of important species such as: *Reaumeriaarvensis*, *Stipa parviflora*, *Plantagoalbicans* and *Helianthemum* sp.
- The project implementation period has expired and ACSAD has implemented all its obligations according to the agreement.

2-Desert rangelands development and productive capacity raising project:

- Within the framework of the desert rangelands development and productive capacity raising project, an executive schedule was set out and agreed upon during the joint technical committee meeting held during the period 21-27/3/2015 and a field trip was conducted in the study area.
- The regions of Dbeish, Nfousa municipality and Warqla state were identified and selected for research experiments.
- Implement a training course in the field of pastoral nurseries management and establishment during the period 1-4/2/2015, in which 9 Algerian technicians working in the project participated (as the photo attached).
- Establish a mothers' field at an area of 1 ha in Dbeish region.
- Establish a mothers' field at an area of 0.5 ha in the campus of Warqla university.

In the Kingdom of Saudi Arabia:

Project of Degraded Rangeland Rehabilitation in Al-Jowf Area-Wadi Al-A'amar:

The project aims at controlling the pastoral lands degradation, rehabilitating these lands with the appropriate pastoral species and improving their productivity. The area of the project is /5000/ ha of which /1000/ hectares are allocated for rangeland rehabilitation. The project is implemented in cooperation between the Ministry of Agriculture and ACSAD.

In the Syrian Arab Republic:

- ACSAD's experts have worked during the year 2015 on collecting the seeds of *Medicago arborea* and *Poterium sanguisorba*, as /400/ bags of each were cultivated at Bouqa research station in Lattakia to be transferred and cultivated later at Kherbet Ghazi and Al-Sinn stations that were established by ACSAD in 2015. Also, an area of /5/ donums is prepared to be cultivated with the *Alosmam* plant (at Al-Sinn station) which is considered one of the important and drought-tolerant pastoral species in the Arab region.

- ACSAD's experts have brought some pastoral species from the Algerian Republic to be multiplied at ACSAD's research stations.
- The seedlings of *Medicagoaborea*, *Poterium sanguisorba* and *Acacia salicina* were transferred from ACSAD's station in Bouqa-Lattakia to Ezra'a research station and cultivated in the rangeland- allocated field.
- The Arab countries were communicated to participate in ACSAD's projects under the rangelands and forestry resources program; these projects were:
 - 1-Integrated data base establishment for Arab rangelands conservation and development.
 - 2-Endangered and rare species survey and inventory project.
 - 3-Sands creeping areas cultivation project.

In the Republic of Iraq:

Project of Al-Hammad Basin Development in Iraq:

The project was implemented in cooperation with the Iraqi Ministry of Agriculture at an area of /600000/ ha. The studies and surveys of the Al- Hammad basin are always updated to combat the big degradation in the northern and southern steppes, rehabilitate rangelands and identify the pastoral settlement zones for establishing a pilot project. The executive plans were prepared and fully completed and the developmental studies and work plan representing the future vision for Al-Hammad basin development strategy were also prepared. The studies covered the following issues: water resources- lands and water use-plants studies- livestock- economy and planning. Moreover, /14/ training courses for /76/ technicians of the project staff were implemented.

- The final meeting of the project experts from ACSAD and the Iraqi Ministry of Agriculture was held in Beirut in December 2015, where the project work results were evaluated.
- The technical reports and investment plans for all the project components (soft copy) were submitted to the Iraqi side on 15/3/2016 for getting acquainted and giving comments and remarks.

In the Lebanese Republic:

- Pastoral area rehabilitation and a forestry pastoral nursery and a pastoral mothers' field establishment project:
- The project aims at rehabilitating a pastoral area, establishing a forestry pastoral nursery and a pastoral mothers' field and developing the qualifications of the technical staffs. The target pastoral area to be rehabilitated was identified as a pilot project area in which the appropriate techniques in this field are applied in an area of /50/ donums in Kafrdan region. The agreement was signed and the implementation schedule was prepared. It is coordinated with the Lebanese side to start up the project implementation.



Project of Inventory of Multi- Purpose Tree and Shrub Species and Enhancing their Role in Local Communities' Income Sources Support

Project objective:

The project aims at surveying the promising and multi-purpose tree and shrub species in the forest and rangeland areas, setting up the appropriate plans for collecting and multiplying the multiplication units and studying the role of these species in the contribution to the micro projects establishment and local communities' income support.

Project site: Arab countries.

Project progress:

- The established plan of the project was implemented; as ACSAD's experts have worked on collecting the seeds of a number of promising and multi-purpose tree and shrub species such as: *Salvadora persica*- *Prosopis cineraria*- *Jatropha glauca*- *Acacia salcina*- *Colutea cilicica*.
- /138/ and /60/ seedlings of *Acacia salcina* and *Colutea cilicica* respectively were germinated at ACSAD's station in Lattakia and /5/ donums were prepared at both of Kherbet Ghazi and Al-Sinn stations with the aim of establishing mothers' fields for multi-purpose shrub species.
- Collect the seeds of some important species for desert areas such as: *Retama* (350 g), *Orach* (250 g) and *Artemisia* (50 g).



Biodiversity Conservation Project and International Convention on Biodiversity Implementation Follow-up

Project objective:

The project aims at investing the agro- biodiversity genetic resources in the food and medicine production programs, documenting and exchanging the available information on biodiversity components in the Arab arid and semi-arid zones, contributing to the eco-systems rehabilitation in a way that conserves the biodiversity in the disturbed environments, cooperating and coordinating among the Arab countries in the field of implementing the International Convention on Biodiversity and Cartagena Protocol for Biological safety and building national capacities in the field of biodiversity conservation and management.

Project progress:

- Coordinate among the Arab countries for implementing the International Convention on Biodiversity and Cartagena Protocol for Biosafety.
- Prepare a progress report on ACSAD's biodiversity program during the year 2015 and submit it to the Housing and Environment administration at the League of Arab States' headquarters through the Arab team responsible for environmental agreements.

- Due to the importance of following-up the problem of the invasive species in the biodiversity strategic plan for the years 2011-2020- decision 10/2- objective (9) stimulating that: " by the year 2020, the exotic invasive species will be identified, prioritized and subject to monitoring or controlling and the necessary procedures for preventing their introduction and spreading will be taken", ACSAD has prepared a research project on the invasive plants. The importance of the project is represented in the fact that the invasive species are one of the most important biological factors endangering the biodiversity of the natural and agricultural eco-systems (forests, rangelands....etc.).

As for the natural eco-systems, these species affect negatively the growth and spread of the local species and lead gradually to their disappearance and thus substituting their areas, in addition to their harmful impact on the public health due to their harmful chemical materials (several aqua plants in Syria and Egypt) and housed harmful animals and insects (mesquite plant in Sudan and UAE). For the agro ecosystems, the invasive species affect negatively the agricultural crops productivity and lead to the yield decrease and thus affecting negatively the per capita income (Caveleagni folium Solanum in Aljazeera in Syria). The project aims at establishing a data base for the invasive species by communicating with the local coordinators at the Arab Center (ACSAD) in the Arab countries, inventorying the invasive species in the Arab Region, identifying the most endangering species on the natural and agricultural eco-systems and developing a map for the most harmful invasive species in the Arab region, taking into consideration the necessity of updating this map every year or every several years to monitor the movement of these species, forecast their spread through time, reach the best solutions and methods to control their risk, investigate the potentials of their economic utilization (fertilizers, fodders and timber industries) and prepare a manual for the most important invasive plants in the Arab countries to get acquainted with them and their different physiological phases and introduce their damages and the best methods for controlling their spread.



Project of Medical and Aromatic Plants Study in the Arab Region

Project objective:

Based on the resolution of ACSAD's executive council in its session "36" held during the period 12-13/4/2009 in Libya, the study of the medical plants prevailing in the Arab region was confirmed and the potential of utilizing them scientifically in a serious attempt to conserve these precious plant species with therapeutic characteristics and economic value was prioritized. Accordingly, an endangered aromatic medical plant called "Iris unguiculariscretensis" and present in the mid-coastal region was selected. This species has been subject to a huge pressure of man recently.

The project aims at enumerating the places of the spread of "Iris unguiculariscretensis" in Syria, identifying the optimal conditions for its growing and evaluating the current actuality of its situation.

Project site: The Syrian Arab Republic.

Project progress:

-ACSAD's experts have worked during the year 2015 on identifying the spread locations of this plant in the Syrian coastal region, as the Iris unguiculariscretensis plant was explored through field visits covering several sites. As a result, the main sites were identified and the "Iris unguiculariscretensis" plant was considered present when /5/ colonies at least were discovered in the identified site.

-The necessary forms were designed after being tested for the five sites and they are currently reviewed and data-filled to be analyzed later.

In a parallel context, followin ACSAD's interest in the projects of sustainable development, desertification control, biodiversity conservation and local community's livelihood standards raising, a decision was made on the study of some multi-purpose natural timber species in Syria; as the eastern Mediterranean region is rich with the tree and shrubs species that present several services and benefits to the environmental system and the local community. However, there is a big lack of the available information on some species, the reason that reflects negatively on their utilization (overuse or non-sustainable utilization). Thus, it is very necessary to get accurate scientific information on these species in their flora and their multiplication methods, services and benefits and to formulate proposals that can be used in the management and optimal utilization of such species.



Studies and Researches

The Experiment of ACSAD's Barley Variety (ACSAD 1420) Response to the Conservative Agriculture in Comparison with the Traditional Agriculture at Ezra'a Research Station

ACSAD's experts have worked on conducting the experiment during the season 2014-2105 in the field previously cultivated with Vicia crop in the agricultural rotation of the year 2013-2014.

The statistical analysis results showed the presence of differences as illustrated in the table below. The increase of the biological yield, upon maturity, leads to the grain yield increase as a result of the processed dry material quantity increase available for the crop during the critical advanced stages of the plant life time. This is apparent specifically for the plants that have an efficiency in the distribution and transfer of the photosynthesis process outputs towards the relatively big parts of the plant; the fact that leads to the increase of the grown grain quantity and thus to that of grain yield especially when the water is available during the grain filling stage. This explains the increase of the biological and grain yields under the conditions of the conservative agriculture which plays an important role in improving water productivity and thus conserving the soil water content during the advanced stages of the plant life time.

عنوان الجدول

Agricultural System	Weight of one thousand of grains (g)	Biological yield (kg.ha ⁻¹)	Grain Yield
Conservative agriculture	41.75	4734.33	2118.33
Traditional agriculture	38.74	3963.67	1603.00
Average	40.24	4349.00	1860.67
LSD (5%)	1.44	516.66	307.14
CV (%)	3.41	7.44	9.23



Barley crop (ACSAD-1420) under the conservative agriculture system (grain filling stage)



Barley crop (ACSAD-1420) under the traditional agriculture system (grain filling stage)

Publication of a Study Entitled «Natural Biological Enemies Investigation in the Palm Orchards and Identification of their role in Controlling the Prevailing Pests»

The study aims at diagnosing the natural biological enemies in the date palm environment; as the field work was implemented in the palm cultivation areas in Syria (Palmyra, Deir Ezzor and Al-Boukamal) and the following was achieved in the study:

- Identify the insect parasitoids for the pests that prevail in the date palm environment.
- Identify the insect predators for the pests that prevail in the date palm environment.
- Isolate and diagnose the pathogenic nematodes for the insects that prevail in the date palm environment.
- Multiply and release the pathogenic nematodes in the fields.
- Survey and classify the species of the Predaceous Mites parasite that prevail in the palm crown and trunk.
- Isolate and diagnose the pathogens for the insect pests that prevail in the date palm environment.

Study on the Selection and Evaluation of Some Male-Palm Varieties under the Arid and Semi-Arid Zones Conditions

The research was conducted in the Arab Republic of Egypt where the field trials were implemented in the season of 2014 and included the following:

First: The morphological characteristics: The trunk- the palm fronds characteristics- the premature fruits specifications- the pollens specifications.

Second: The crop specifications and the fruits properties: The natural characteristics- the chemical characteristics.

Research Project on the Infection Evaluation and the Effect of the Palm Tree Age and Trunk Height on the Presence of Rhynchophorus ferrugineus in Some Date Palm Varieties under the Arid and Semi- Arid Conditions

The research is conducted in the Arab Republic of Egypt and includes:

- 1-Study the Rhynchophorus ferrugineus numbers fluctuation and set up collecting pheromone traps to study the insect number fluctuation over the year and the relation of its outbreak with the environmental factors (temperature and humidity) in the sea oasis region.
- 2-Evaluate the Rhynchophorus ferrugineus infection degree for some palm varieties, as some varieties of the sea oasis region were selected to study the Rhynchophorus ferrugineus infection degree and the readiness of these species for infection with this pest.
- 3-Study the infection place height (the infection place on the trunk), as a number of palm trees were selected to know the infection place height.

Study entitled "Inventory and Diagnosis of Agricultural Pests Infecting Palm Trees and their Biological Enemies in Syria"

The study was conducted in the palm orchards of Palmyra, Deir Ezzor and Al-Boukamal. It aims at investigating and diagnosing the agricultural pests that infect palm trees and their biological enemies.

Seven pests were reported in the study areas: Batrachedra amydraula Meyrick and McGregor in the palm orchards of Palmyra, Deir Ezzor and Al-Boukamal; Parlatori ablanchardii Targioni in Palmyra, Deir Ezzor, Al-Boukamal and Al-Raqqa; Bergevin Ommatissus lybicuc, Arenipses sabella Hampson, Phoenicooccus marlatti Cockerell and Silverestri Microcerotermes diversus in Al-Boukamal only and Ram. Rao Asterolecanium phoenicis in Deir Ezzor. As for the biological enemies reported in this study, /8/ natural enemies were identified in the palm tree flora in the study sites; /6/ of which are predators belonging to Coleoptera

and Neuroptera insect classes and Chrosopidae and Coccinellidae species and /2/ of which are parasitoids belonging to Hymenoptera class and Aphelinidae family (one is an internal parasitoid "Prospottella sp." and the other is external one "Aphytis sp.).

Field Study of Some Life Characteristics of *Ommatissus Lybicus* Bergevin in Al-Jala'a Palm Oasis in the City of Al-Boukamal-Syria

The results showed the presence of two generations for the insect; summer and winter generations and the difference of the stages' period for each one (the summer generation stages period is shorter). The sex distribution rate of the insect and the eggs mortality percentage were different according to the insect generation. The main factor responsible for the eggs mortality of the both generations was the infertility of the eggs. Also, the first age insects mortality percentage was different according to the generation type; as the mortality rate was higher for the winter generation. The final rate of the summer generation number increase was 1.032 times in comparison to 1.016 times for the winter generation.

Study on Identification of the Most Important Biological Enemies for *Ommatissus Lybicus* Bergevin Insect in Al-Jala'a Palm Oasis in the City of Al-Boukamal-Syria

The following table illustrates the most important biological enemies for the *Ommatissus Lybicus* Bergevin insect in the study area:

Scientific name	Class	Family	Biological enemy
<i>Chrysoperla carnea</i> Stephens	Neuroptera	Chrsopidae	Predator
<i>Coccinella undispunctata</i>	Coleoptera	Coccinellidae	Predator
<i>Coccinellas eptempunctata</i>	Coleoptera	Coccinellidae	Predator
<i>Chilocorus bipstulatus</i>	Coleoptera	Coccinellidae	Predator
<i>Chilocorusnigricans</i>	Coleoptera	Coccinellidae	Predator
<i>Exochomus quadripustulatus</i> L.	Coleoptera	Coccinellidae	Predator
<i>Rhyzobius</i> sp.	Coleoptera	Coccinellidae	Predator
<i>Scymmus</i> sp.	Coleoptera	Coccinellidae	Predator
<i>Nephus bipunctatus</i>	Coleoptera	Coccinellidae	Predator

Study on the Life Cycle and Seasonal Activity of *Batrachedra amydraula* Meyrick Insect in Al-Jala'a Palm Oasis in the City of Al-Boukamal-Syria

The research aims at studying the life cycle and seasonal activity of *Batrachedra amydraula* Meyrick insect and identifying the number of the insect generations in Al-Jala'a oasis in Al-Boukamal. The study showed the presence of three generations in addition to the fact that the insect had an autumn hibernation at the stage of a full-grown larva inside a cocoon in the palm fronds and leaves. The hibernation period was about /5/ months.

Scientific Research on one of the Invasive Plants that Threaten the Arab Region Entitled: *Ailanthus altissima* (Miller) Swingle Dynamics at Selected Sites

The research aims at studying the dynamics of "*Ailanthus altissima*" spread by identifying several selected sites where the following is conducted:

- Study the different growth indicators of "*Ailanthus altissima*" (the relation between the diameter and height, the plant length, the dendrites).
- Study the growing renewal through the trunk dendrites (its growing and the dendrites number).
- Study the speed of this species prevalence by identifying the annual increase in the colony trunk.
- Reach the best and optimal methods to control the risk of this species.
- Provide a data base for the invasive plants at the Arab Center (ACSAD).

The readings for the "Ailanthus altissima" have been taken and the work is continued on data analyzing and results production.

Cooperation with the Arab Countries and International Organizations

- Cooperation agreement between the General Commission for Agriculture and Fishery Affairs in the State of Kuwait and ACSAD:

The agreement aims at implementing a group of activities in the fields of rangelands and forestry resources to rehabilitate natural rangelands, survey and inventory the prevailing plant species, increase plant diversity and rangeland productivity and train the technical staff working in this field in the state of Kuwait. It is coordinated between the two sides to start up the implementation.

- Activate cooperation with ICARDA for exchanging genetic resources, as /362/ of barley, hard wheat and soft wheat breeds were received to be cultivated during the agricultural season 2015/2016 at ACSAD's research stations of AL-Jammasa (Tartous) and Ezra'a (Dara'a).
- Activate cooperation with CYMMET for exchanging genetic resources, as /812/ of hard wheat and soft wheat breeds were received to be cultivated during the agricultural season 2015/2016 at ACSAD's research stations of AL-Jammasa (Tartous) and Ezra'a (Dara'a).
- Sign a cooperation agreement with "the JIC genetic resources bank" in the UK for exchanging genetic resources, as /16/ genetic materials of wheat and barley were received.
- Sign a cooperation agreement with the factory of NIAB; the John Bingham Laboratory, in the UK.
- Sign a cooperation agreement with ICRISAT for exchanging genetic resources of sorghum bicolor and millet crops.

Cooperation with Arab Scientific Research Centers and Universities

ACSAD is continuing its cooperation with a number of scientific research centers, universities and commissions, as the Faculty of Agriculture of AL-Mouthanna University in the Republic of Iraq was provided with samples of /6/ soft wheat varieties (Sham 6, Sham4, Bhouth6, Bhouth4, Salmouni and Florans Oror) for studying purposes. Moreover, ACSAD also cooperates with the Syrian General Commission for Scientific Agricultural Research, as the performance evaluation of several of ACSAD's hard wheat, soft wheat and barley promising breeds, which are superior in the Arab Productive efficiency experiments, is conducted in extensive testing fields. The varieties are cultivated in several environmentally-different sites in Syria and compared with the local cultivated ones.

The evaluation results during the season 2014-2015 showed the superiority of a number of ACSAD's breeds on which evaluation process will be continued during the season 2015-2016.

The superiority of ACSAD's soft wheat breed (ACSAD 1133), which is yellow rust disease-resistant and high productive, was confirmed by the Syrian General Commission for Scientific Agricultural Research and the variety was adopted as an improved breed in Syria under the name "Douma 6" during the year 2014.

Also, within the cooperation framework with the Faculty of Agriculture at Damascus University, mutated barley breeds resulting from the crossbreeding and treatment of two varieties (Furat 1 and A'arabiAswad) with three doses of Gama radiation were evaluated. The experiment was conducted during the season 2013/2014 in two sites: Ezra'a research station-Syria and Kafrdan research station-Lebanon. The initial results showed the superiority of some varieties in terms of productivity and yield components over the local ones. The genes responsible for breeds qualitative and quantitative characteristics will be identified at ACSAD's lab for biological techniques and the study will be continued next season. As a result /5/ breeds were introduced in the initial efficiency experiments (first year) to evaluate their performance in comparison with the barley program components and /3/ breeds were used as hybrid parents during the season 2015/2016.

Publications

Under the framework of enriching the Arab Scientific Library, the following were achieved:

- A book on "olive tree and its cultivation techniques" was produced and distributed among the Arab countries.
- A book on "integrated pest management" was produced.
- A book on "pistachio tree and its cultivation techniques" is prepared, in addition to a manual on drought-tolerant fruit trees varieties and species which will be issued in 2016.

Lands and Water Uses

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

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

The program aims at monitoring and combating 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-Soil, Land and Mapping Studies Program:

This program aims at preparing soil, lands and mapping studies, as the land resources survey studies, particularly the lands and digital purpose mapping, are considered one of the most important elements that help in understanding the land resources components in the Arab region to establish a data base for natural resources in the region and assist the decision makers in the rational planning process, sustainable use of the limited and 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- Sustainable Management of Lands and Water Uses Program:

This program aims at developing an optimal management for lands and water and finding scientific techniques and improved 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.



***Implemented Projects of
Lands and Water Uses Department***

Study on Dust and Sand Storm Monitoring, Sand Dune Fixation and Sand Creeping Control

Project objective:

The project aims at conserving the environment and controlling 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.

Project progress:

The Arab Center (ACSAD) has achieved recently advanced scientific results as follows:

1- Project of Al-Hammad Basin Development in Iraq (lands and water use component):

The project is implemented in cooperation between ACSAD and the Iraqi Ministry of Agriculture aiming at achieving the comprehensive agricultural development of Al-Hammad basin region. The project includes the study of lands degradation for desertification control and creeping sands fixation. The most important activities implemented within this framework is the lands degradation study including the following activities:

- Analyze lands degradation forms and prepare tables for degradation types, reasons and severity degree.
- Prepare lands degradation map.
- Prepare the executive guidelines for sand creeping control.
- Prepare a typical project proposal document for sands fixation.
- Prepare and submit the final report to the Iraqi side.

2- Project of Sand Dunes Fixation Using Agricultural Drainage Water in Siewa Oasis in the Arab Republic of Egypt:

The project is implemented in cooperation between ACSAD and the Desert Research Center aiming at improving the environmental conditions and protecting the development areas from the sand creeping risks in the recent reclamation areas of Siewa oasis. The project implementation started in May, 2014 including:

- Study the natural characteristics of Siewa oasis (geographical site- biological characteristics- geomorphologic properties- climatic characteristics- water balance- sand dunes fixation characteristics).
- Identify and characterize the project site in Al-Shahayem area which is considered one of the areas highly exposed to sands creeping.
- Study sand dunes movement and direction and calculate sand movement and activity degree.
- Study vegetation cover, plant structure situation change and the adaptive behavior of the natural plants in the oasis and their role in decreasing sands creeping risks.
- Establish a nursery in the oasis for producing seedlings that are capable of adapting with sand dunes environment conditions.
- Provide the necessary infrastructure, like road shouldering at a width of 10 m between the highway and the site, construct a bridge on the drainage water channel, prepare a signboard for the project and conduct the leveling operations.
- Start up the application of mechanical and biological sand fixation actions for the creeping sands.
- Conduct a practical training on sand fixation for agricultural engineers and concerned agencies including investors, farmers and civil society organizations.



Project of Degraded Land Rehabilitation in the Arab Countries

Project objective:

-Monitor and evaluate land degradation processes, degraded lands rehabilitation and natural resources development in the affected areas and improve the livelihood standards of local community.

Project site:

The Hashemite Kingdom of Jordan, the Democratic People's Republic of Algeria, the Republic of the Sudan, the Syrian Arab Republic, the Republic of Iraq and the Arab Republic of Egypt.

1- Project of Rangelands Rehabilitation in the Algerian Steppe Area:

The project is implemented in cooperation between ACSAD and the Ministry of Agriculture and Rural Development in Algeria represented by the High Governorate for Steppe Development. It aims at developing pastoral areas, increasing the breeders' income and contributing to the economic development.

Project progress:

During the years 2014 and 2015, the work started in the field sites of the project according to the following:

- In the site of Ben-Hamed at Ta'azamit municipality: Achieve a natural reserve at an area of 4500 ha of *Cladium mariscus* and *Artemisia* plants and implement pastoral cultivations at an area of 100 ha.
- In the site of Al-Retm plain at Al-Za'afaran municipality: Contribute to the sand dunes fixation process by mechanical and biological methods and cultivate the appropriate plants.
- In the site of Sabkhet Ain Al-Safra at Al-Za'afaran municipality: Collect local plants seeds and sow them directly after autumn rainfall for degraded lands rehabilitation.
- In the site of Al-Shabakeh at Bowerit Al-Ahdab municipality: Apply protection procedures, implement mechanical works for rain water harvesting (including establishing terraces and trenches accompanied with dikes and cut with grooves in reverse to the direction of water flow following contoured lines) and start up the cultivation of *Medicago araborea* and *Stipa Tenacissima* shrubs aiming at raising the environmental, developmental and extension awareness. A number of citizens participated in watching the efficiency of the mechanical works of water harvesting. Moreover, a joint meeting between ACSAD and High Governorate for Steppe Development was held in the Algerian capital to review project progress and continue the application of the project executive actions.

2- Project of Degraded Natural Resources Rehabilitation in Matrouh Governorate in the Arab Republic of Egypt:

It is implemented between ACSAD and the Desert Research Center aiming at presenting a pilot extension model for degraded lands rehabilitation.

Project progress:

- Select the project site in Om Ashtan and Al-Sanab valleys.
- Study the social and economic actuality in terms of population, labor force, construction, agricultural activity, livestock and grazing.
- Conduct chemical and micro-biological analysis of soil and water.
- Study the land, geological and water resources and vegetation in Om Ashtan and Al-Sanab valleys in addition to the most important aspects of the agricultural activity.
- Study climatic phenomena in terms of temperature, humidity, rainfall and winds.
- Prepare the basic and thematic maps for the project area.
- Start up the activities of water harvesting, desertification combat and degraded land rehabilitation.
- Dig a well for providing a fixed water resource and implement some agricultural development activities such as drip irrigation network establishment and provision of seedlings and seeds necessary for cultivation.
- Start up the activities of preparing an agricultural nursery for forestry and pastoral seedlings production.
- Monitor the project field activities by a joint team from ACSAD and the Desert Research Center experts.

3- Project of Green Belts in the Arab Word Regions:

For the purpose of implementing the resolutions of the Arab Summit and the Economic and Social Council, ACSAD has worked on implementing a project aiming at supporting Arab countries in the implementation of national and regional projects for green belts establishment, degraded lands rehabilitation and

vegetative plot increase in the Arab World.

Project progress:

- Coordinate with the national coordinators in identifying the green belts locations in each country and allocate them on maps and satellite images.
- Design and distribute data collection forms among the participating countries.
- Start up the information collection and the natural resources and local communities characterization process in the project sites.
- Prepare general technical reports on the natural resources situation in the participating countries.
- Set up a schedule for implementing the activities of the first phase of the project.
- Organize a training course on the project data collection for /13/ trainees of engineers working in the project in Syria.
- Organize the final meeting of the national coordinators in Beirut-Lebanon in December 2015 and agree upon the issuing of the project first phase technical report including the identification and characterization of green belts in the Arab countries and the general executive and annual plans for the project second phase.

4- Project of Desertification and Land Degradation Indicators Development in the Syrian Arab Republic:

The project is implemented in cooperation between ACSAD and the Ministry of Environmental Affairs in the Syrian Arab Republic based on the cooperation agreement signed between the two sides on 30 /5/ 2012 that contains the cooperation in the fields of desertification, drought and climatic change problems facing. The importance of this issue comes from the importance of the indicators being the easiest measurements for expressing the occurred change, characterizing the process responsible for desertification and lands degradation and identifying the degradation degree.

Project progress:

The project started in 2014 and its activities were completed in 2015 as follows:

- Develop integrated national indicators in line with the international standards to evaluate the desertification and land degradation process. The indicators included: lands resources indicators- water resources indicators- vegetation indicators- climate indicators- economic and social situation indicators- remote sensing indicators (adopting the NDVI measurement as an indicator for desertification and land degradation).
- Organize qualitative seminars for presenting all kinds of indicators with the participation of the concerned national institutions and discuss and adjust the indicators in a way that suits the participants recommendations. In the year 2015, two seminars were organized in which the indicators of lands resources and water resources were presented and discussed. The work is still continued to present the remaining indicators to the related and concerned institutions.



Project of UNCCD Recommendations and Activities Follow-up and the Related Arab Mechanisms Monitoring

Project objective:

The project is implemented by ACSAD being the officially- authorized agency 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 at supporting the implementation of the convention in the Arab countries, coordinating among them and unifying their approval towards it in coordination with the concerned Arab mechanisms in this field.

Project site: ACSAD and the Arab countries.

Project progress:

- The coordinating meeting of the UNCCD national focal points in the Arab countries to get prepared for the COP:

ACSAD participated in the meeting at the headquarters of the Secretary General of the league of Arab Leagues in Cairo on 4- 5/ 10/ 2015. In this meeting, ACSAD presented its vision on the green belts project in the Arab World regions as a step towards neutralizing the lands degradation in the Arab region and discussed the report and recommendations of the workshop on "Alignment and Implementation of NAPs" along with the UNCCD ten-years strategy which was held in Dubai-UAE in June 2014.

- The 17th session meetings of the joint committee for environment and development in the Arab region (JCDAR) and the 27th session meeting of the Arab Ministers responsible for environmental affairs: ACSAD participated in the 17th session meetings of (JCDAR) and the 27th session meeting of (CAMRE) which were held at the headquarters of the Secretary General of the league of Arab Leagues in Cairo during the period 14 -19 /11/ 2015. ACSAD's participation was reflected in the presentation of the technical reports and explanatory notes.

- The 12th Session Meeting of COP:

ACSAD participated in COP12 which was held in Turkey during the period 11- 27/ 10/ 2015. The participation was reflected in the attendance of all general and specialized sessions, the discussion of the presented issues and the coordination among the Arab countries to unify their positions towards the convention activities implementation especially concerning the lands degradation neutrality issue (LDN). A lecture was presented about ACSAD's experience in desertification control in a session organized and supervised by FAO on the margin of the conference activities.

- UNCCD Ten-Year Strategic Plan Objectives Implementation:

ACSAD continues through its projects and activities the UNCCD ten-years strategic plan objectives implementation; the most important of which are: improve the living standards of the affected areas' population, improve the eco-systems situation, raise awareness and education and build the national capacities. ACSAD's activities during the year 2015 concentrated on implementing the activities of the first operational objective reflected in raising the awareness and education and expressed by raising the number and size of the media activities organized on "desertification, land degradation and drought" and increasing the number of audience, addressed by the media through the awareness raising in the TV and radio programs:

- On the occasion of the International Day for Desertification Control, ACSAD participated in a radio program on environment and life. In this program, the desertification and land degradation issues were discussed.

-ACSAD participated in a radio program on "climatic change".

-ACSAD participated in a radio program on "desertification control activities".

-ACSAD participated in a TV awareness program on sand storms synchronizing the dust storm in the countries of the eastern Mediterranean in September 2015.



Land Degradation Monitoring and Evaluation in the Arab Region

Project objective:

This project represents one of the activities that ACSAD started to prepare aiming at achieving a long-term monitoring for land degradation in the Arab region. This comes under the framework of the recommendations of UNCCD Science and Technology Commission since the holding of Land Degradation Monitoring Forum in Bonn- Germany and the 9th session meeting of COP (COP9) in Buenos Aires- Argentina where ACSAD was charged with the mission of coordination and following-up among the Arab countries to activate the convention.

Project site: All the Arab countries.

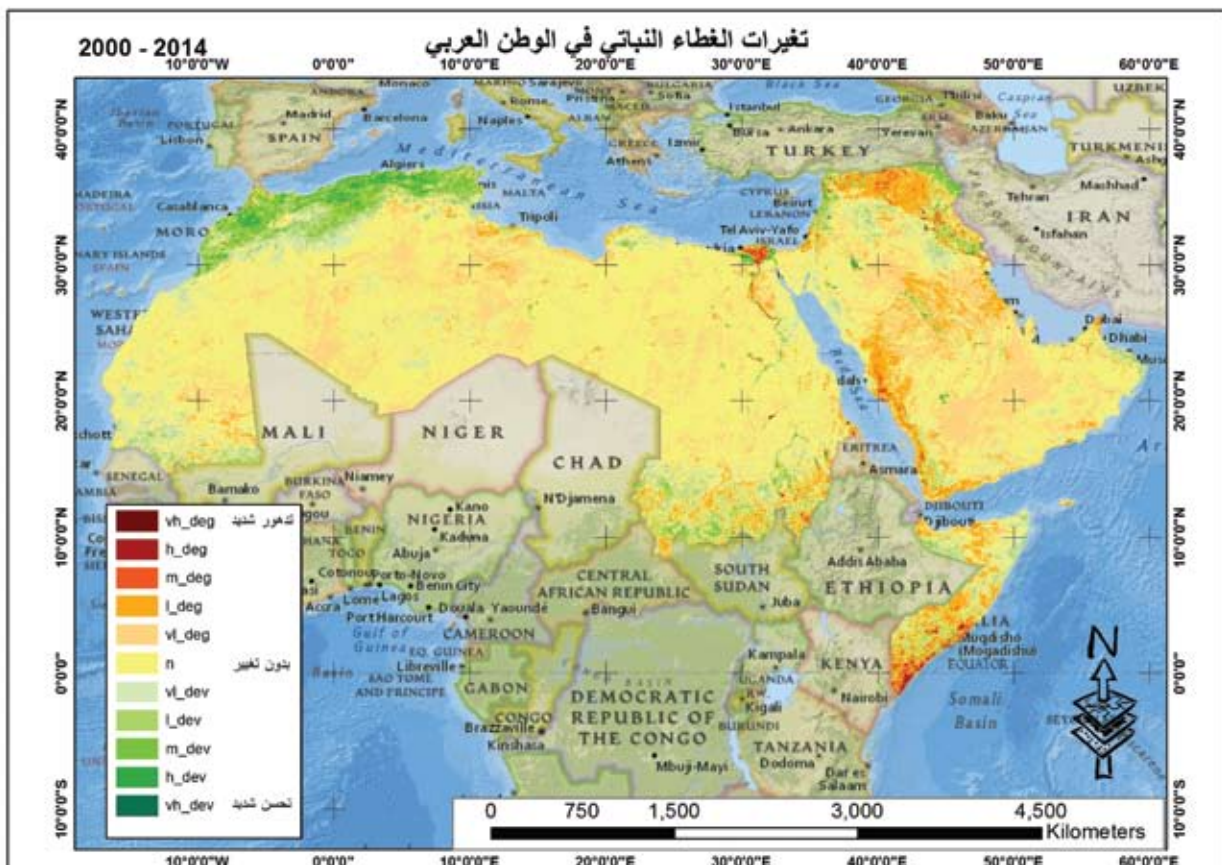
Project progress:

The most important achievements in this field can be summarized as follows:

Vegetation Degradation Monitoring in the Arab World:

The project aims at monitoring the situation of land degradation at the regional and national levels, linking land degradation policies, controlling risks affecting agricultural productivity, evaluating the degree, nature and type of land degradation and identifying the most endangered areas.

The satellite images analysis (MODIS 1k) results for the period 2000- 2015 showed (through studying the changes in the bio mass over the 15 years covered by the study) that the area of the vegetation changes as an indicator for degradation was about 387794115 ha (almost 28.93% of the total area) and that the human factor had a clear impact in accelerating the rate of lands degradation as a result of agricultural intensification and ground water depletion, in addition to drought that affected negatively the Mashreq region as illustrated in the map below.



Vegetation changes during the period 2000- 2011

Arab country	Area (ha)	Bright spots (ha)	%	Degraded areas (ha)	%
Jordan	8934200	1621429	18.14	2879094	32.22
UAE	8360000	643596.5	7.69	3795276	45.39
Bahrain	66500	14548	21.87	38939.85	58.55
Tunisia	16361000	6798319	41.55	5124669	31.32
Algeria	238174100	4191552361	17.59	7677882264	32.23
Djibouti	2300000	51746.27	2.24	2157749	93.81
KSA	214968999.9	12162681.86	5.65	139362972.3	64.82
Sudan	186581300	38537492	20.65	65703967	35.21
Syria	18518000	1420912.78	7.68	10327523.42	55.77
Somalia	63765700	17037595	26.71	34051394	53.40
Iraq	43831700	12974337.06	29.60	20476034.73	46.71
Oman	30950000	4499816	14.53	12120855.96	39.16
Palestine	622000	200525.94	32.24	63990.76	10.30
Qatar	1143700	114592.6	10.01	592243.8	51.78
Kuwait	1781800	127068.4	7.131	1285746	72.15
Lebanon	1040000	750926.8	72.20	195928	18.83
Libya	175954000	6329608	3.59	66655265.27	37.88
Egypt	99545000	8461298.515	8.49	34372380.39	34.52
Morocco	71255000	42564151.13	59.73	7996973	9.12
Mauritania	103070000	27330808	20.96	37580816	28.82
Yemen	52800000	5964764.56	11.29	27725648	52.51
Total	1340023000	208422809.8	15.55367406	387794115.3	28.93

Land Cover and Land Uses Mapping Project

Project objective:

The project aims at preparing lands uses maps to comply with the progress achieved in GIS and remote sensing techniques use, preparing lands and vegetation databases to reach the optimal lands use mapping, preparing the soil and cultivations maps for the purpose of establishing good agricultural plans and training Arab technical staffs on modern techniques.

Land Resources Studies in Al-Hammad Basin in Iraq (lands and water uses component):

The Iraqi Al-Hammad basin forms a part of the northern and southern steppes of the Republic of Iraq. It is a part of Al-Hammad basin which covers the borders areas among Jordan, Saudi Arabia, Iraq and Syria. ACSAD has previously implemented an integrated project in this basin during the period 1979- 1982.

The Iraqi Al-Hammad basin occupies an area of (3.32 million ha) of the area of Iraq. Mostly, this area is considered a part of the Arab arid steppe that is characterized by harsh climatic conditions and limited natural resources of which rangelands form the most important part (feeding of the pastoral animal sector, which is considered the natural base for the human existence, depends mostly on rangelands).

The actuality of the study area was analyzed and the desertification phenomenon, its reasons and control methods were monitored by using remote sensing and GIS techniques. Also, the study area's environment vulnerability towards this phenomenon was characterized and classified by developing desertification-sensitive mapping, monitoring the updates and providing the necessary recommendations for controlling this phenomenon under the research area's conditions. As a result, the final report of the study was presented to the Iraqi side.

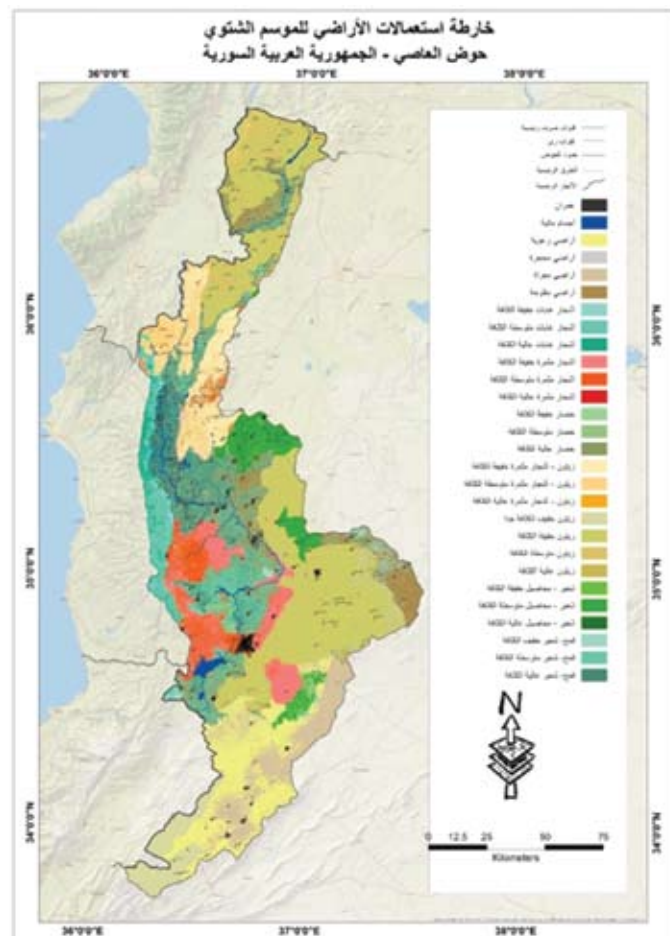
Vegetation Classification Mapping for Orontes Basin Area by Using Remote Sensing Techniques:

The main resources, including soil, plant and water, are considered the basic base for development. These resources, particularly water, are limited, the reason that requires the achievement of balance between man's demand and the available natural resources. The environment issue is considered one of the vital issues that concern the society after the issues of civilization development process, food and population increase. The environmental elements safety conservation from contamination and degradation and the necessity of reaching a balance among the different environment elements are very important, the reason that requires the use of various techniques.

The remote sensing technique was used in this study. This technique is considered one of the effective modern methods to study the natural resources (soil, water and vegetation cover) due to the vast area of the study site. Also, satellite images for the winter season 2007 were analyzed to survey cultivations and get acquainted with the crop types. Moreover, an image for the summer season 2011 was analyzed and the area of irrigated cultivations was calculated to be introduced into the water model.

Remote sensing images were used to trace the changes occurred in the area such as drought, soil degradation, desertification, erosion, drifting salinity and agricultural intensification. The aim was to use the results in getting acquainted with the general behavior of the area and knowing if there is a misuse of lands or water.

After identifying the vegetation density, a



non-supervised classification for finding "Spectral Classes" was conducted. These classes represented different landscapes. Clusters sites were identified automatically through this classification by using the "ISODATA" model which is a common way to get acquainted with the landscape patterns and get an idea on the varieties present in the study area. This classification was considered the initial one for the vegetation in the summer season, as an initial map consisting of /15/ classes was performed. These classes were linked with the initial agricultural survey sites in a way that gave us an idea on each class and its contents of plants and vegetation.

Also, the initial classification map of vegetation for the winter season was prepared, as an initial map consisting of /16/ classes was produced. These classes were linked with the initial agricultural survey sites in a way that gave us an idea on each class and its contents of plants and vegetation. After performing this process and intersecting the initial classification map with the field and topographic check points, the vegetation map for the winter season was produced and a manual for this map was prepared.

Vegetation cover types for the winter season May 2007
and the area and percentage of each type

Winter season vegetation	Total area (ha)	Total percentage (ha)
Water bodies	9319.87	0.532
Rangelands	128860.44	7.353
Stony areas	19534.57	1.115
Bare lands	128666.11	7.342
Ploughed lands	159488.08	9.101
Highly dense forests trees	65812.05	3.756
Highly dense fruit trees (grapes-almonds-pistachio)	159854.54	9.122
Highly dense vegetables	21821.07	1.245
Olives-highly dense fruit trees (pomegranate-cherries-figs)	158084.64	9.021
Highly dense olives	545899.79	31.152
Crops/barley-medium dense legumes	75878.00	4.330
Urban areas	238.21	0.014
Wheat-barley-highly dense	278916.18	15.916
Total	1752373.55	100.000

Vegetation cover types for the summer season July 2001
and the area and percentage of each type

Summer season vegetation	Total area (ha)	Total percentage (ha)
Water bodies	9319.87	0.532
Rangelands	128860.44	7.353
Stony areas	19534.57	1.115
Bare lands	128666.11	7.342
Ploughed lands	295751.2615	16.877
Highly dense forests trees	65812.05	3.756
Highly dense fruit trees	159854.54	9.122
Highly dense vegetables	97781.64	5.580
Olives-highly dense fruit trees (pomegranate-cherries-figs)	158084.64	9.021
Highly dense olives	546916.53	31.210
Crops/corn-beans-highly dense peanut	63660.53	3.633
Urban areas	238.21	0.014
Cotton-sugar beet-tobacco-highly dense potato	77893.17	4.445
Total	1752373.55	100.000

Monitoring Land Use Changes in Main Crops Areas by Remote Sensing Techniques in the Desert Areas of Algeria

Project objective:

Control the development of farmers' land utilization in the desert areas by using remote sensing and GIS techniques and train staffs on analyzing data and map preparation to be used by the decision makers for the purpose of achieving a sustainable lands management.

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

Project progress:

Within the framework of the cooperation agreement signed between the Ministry of Agriculture in Algeria and the Arab Center (ACSAD) concerning "Monitoring Land Use Changes in Main Crops Areas by Remote Sensing Technique in the Desert Areas" project, a meeting was held with the concerned agencies of the Desert Areas Development Governorate where ACSAD met the Algerian team head by Mr. Ismail Al-Zain, Director General of the Desert Areas Development Governorate in Algeria, who emphasized on the importance of continuing the implementation of the components activities of the project.

ACSAD also conducted a training course for the technical staff of the Desert Areas Development Governorate on "GIS principles and land uses changes mapping". Ten trainees participated in this course which included theoretical and practical lectures in addition to field tours .

On the margin of this training course, a meeting was held with the project national coordinator where some data was received and "LANDSAT" satellite images for the year 2015 were submitted to the Desert Areas Development Governorate.

Currently, the "LANDSAT" satellite images are analyzed, the physiographic units map is prepared and the "MODIS 250 M" satellite images are loaded to prepare the vegetation changes control and mapping archives.



Project of Planning for Drought Impact Mitigation Preparedness in the Arab Region

Project objective:

The agricultural development represents the most important part of the sustainable development process in the Arab World. The goal of this kind of development is man himself and the most important duty of this development is to ensure an agricultural growth that complies with the pressure of the population growth, the increasing demands and the necessity of conserving food security, taking into consideration that the Arab region is characterized by the diversity of the appropriate agricultural environments suitable for all kinds of cultivations and the diversity of the agricultural production, both the plant and animal ones, in a way that meets the demands of consumption, manufacturing and export.

The project aims at:

- Developing a national vision and strategy on controlling and monitoring disasters, identifying and classifying national risks including the slow natural risks (drought and other risks) and identifying in details the type of these risks and the endangered sectors.
- Establishing a national center for controlling natural disasters, enhancing early-warning systems, identifying hot and highly endangered areas, developing and activating drought early-warning systems, monitoring weather phenomena and their relations to climatic changes as a basic action preceding the preparedness action, motivating the use of remote-sensing techniques in the climatic and environmental factors control and observation systems, evaluating the lands and water natural resources and qualifying the necessary technical staffs on drought monitoring by using ACSAD's remote-sensing systems methodology. This methodology is recommended for circulation among government institutions concerned with drought monitoring (limited cost) and linking with the long-term drought monitoring "SPEI" index being the best international index that achieves a clear definition for drought in the rainfall and evapotranspiration study.
- Promoting and circulating the use of this methodology which was evaluated by the International Meteorological Organization and found to be an appropriate methodology for studying drought hazards and losses. This methodology was used in Africa, the Mediterranean countries and the Arab countries as a reference study for the International Hazards Assessment Report for the year 2013.
- Raising the awareness and participation concerning the adoption of Hugo framework implementation, drought risks control and preparation and presentation of periodical national reports on the progress achieved in the Hugo framework implementation.
- Supporting the participation of decision makers and senior officials in the meetings and discussions on disasters risks control especially drought, including the participation in training and knowledge seminars.
- Preparing emergent drought response plans.
- Enhancing institutional capacities for planning and implementing strategies and programs of adaptation with climatic changes and drought management and alleviation.

Project site: All Arab countries.

Project of Drought Monitoring and Agricultural Drought Risks Mapping in the Arab Region:

- The work is continued on monitoring agricultural drought by using remote sensing techniques including analyzing MODIS satellite images with a space capacity of 1/1 km by using the international index to calculate the vegetation condition index (VCI), temperature condition index (TCI) and vegetation condition index (VHI) as well as 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 ultimately.
- ACSAD also works on preparing the agricultural drought intensity, frequency and consecution maps in the Arab World in addition to the final drought risks map.
- ACSAD works on a long-term drought monitoring by using the SPEI index being the best international index that achieves a good definition for drought in the rainfall and evapotranspiration study.

Agricultural Drought Hazards Assessment by Using Long-Term Drought Monitoring SPEI Index in Africa, the Mediterranean and the Middle East Region:

- Through the financing of the secretariat of UNISDR (United Nations International Strategy for Disaster Reduction), and aiming at preparing a reference paper for the "Global Assessment Report on Disaster Risk Reduction 2015" by utilizing ACSAD's agricultural drought assessment framework, a study was

implemented on agricultural drought impacts assessment in Africa, the Mediterranean and the Middle East countries as well as the Latin America countries. The initial report was prepared and sent to the UNISDR secretariat to become a chapter in the GAR's report.

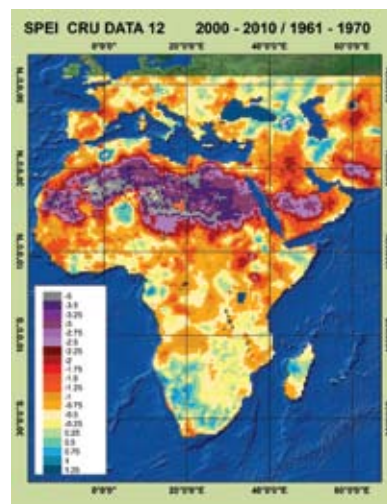
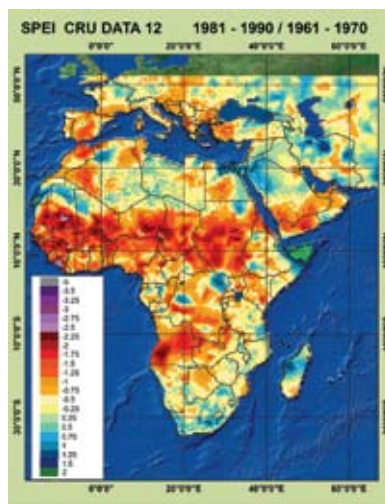
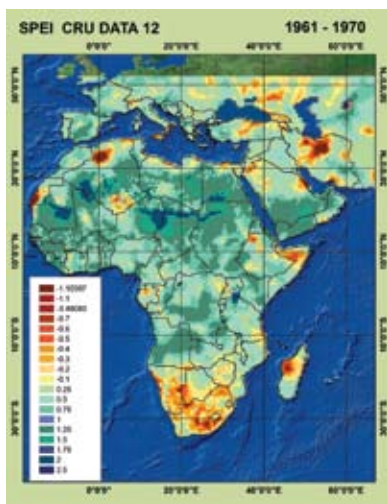
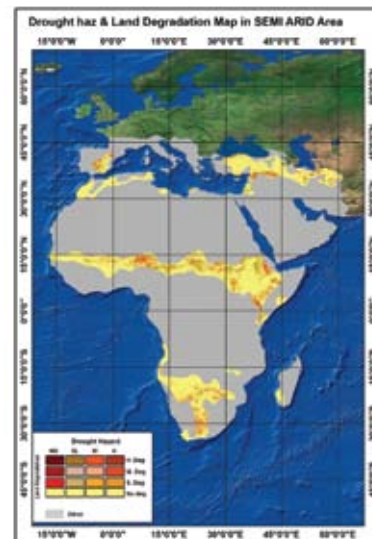
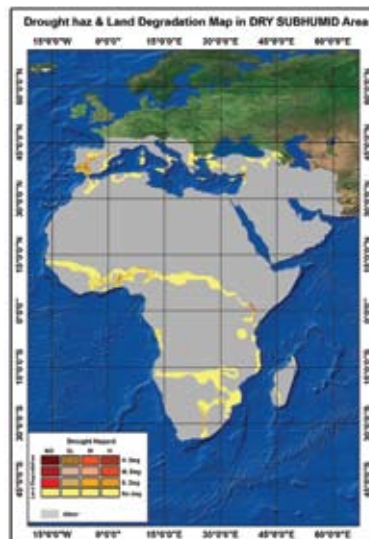
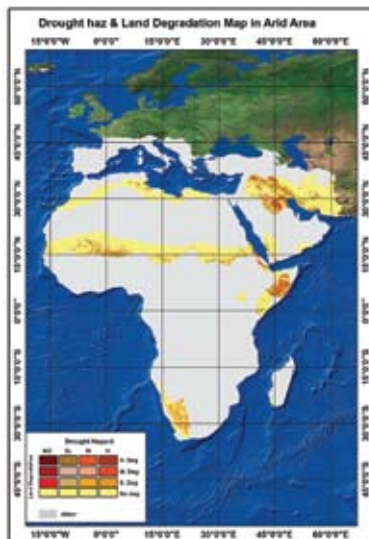
- The Global Assessment Report on Disaster Risk Reduction 2015, which ACSAD contributed to with a chapter on drought in the Arab region, has been issued.

Project of Drought Management in the Arab Countries (Syria, Jordan, Egypt and Lebanon):

- ACSAD has continued the application of an internationally new methodology which uses the satellite images of Vegetation Health Index system in drought monitoring.

- The cooperation is continued with the specialized centers in this field in the Arab World, including Drought Studies Unit in the Syrian Ministry of Agriculture, Agricultural Research and Extension Center in Jordan, the Central Plant for Agricultural Climate at the Egyptian Agricultural Research Center and the National Center for Remote Sensing in Lebanon. The aim is to:

- 1- Improve drought monitoring systems and early-warning systems and identify the most endangered areas by using modern approaches based on drought monitoring by remote sensing.
- 2- Emphasize the actions that should be taken to deepen and promote the concept of "preparedness" in the most endangered areas to alleviate drought risks.



Project of Transferring Technologies of Saline and Brackish Water Uses to Farmers in Arab Countries

Project objective:

Develop a good and appropriate management of saline water use in the agricultural system and introduce alternative crops that can improve the farmers' income.

Project site: The Republic of Tunisia- the Republic of Algeria.

Project progress: The project implementation continued during the years 2014 and 2015 as several activities and researches were implemented according to the executive programs.

A-Tunisia:

This project is implemented in cooperation with the National Institute for Rural Engineering, Water and Forests Research within the framework of the cooperation agreement extended for the years 2013 and 2015. The implemented activities and studies during the years 2014 and 2015 can be summarized as follows:

Study the Electromagnetically Treated Saline Water Impact on Potato Crop:

The "Sponta" potato variety was cultivated during the year /2015/ at the "Bsharfesh" research station. The crop was irrigated with electromagnetically treated saline water with a salinity of about /4/ dS/m. The results were compared to that of irrigating with non-treated saline water and showed a yield increase of about 11% (25.7) tons/ha when irrigating with electromagnetically treated water in comparison to (23.2) tons/ha when irrigating with non-treated water, with a slight improvement in the tuber size estimated at about (45) mm.

The results also showed a significant decrease in the salinity of soil irrigated with electromagnetically treated saline water when compared to soil that is irrigated with non-treated water.



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

The work continued during the year 2015 on this crop aiming at studying some morphological characteristics and physiological properties of the quinoa crop under the effect of water stress of (100, 75 and 50 %) and irrigation water salinity of (40,25,10 and 1.25) dS/m, in addition to studying the water salinity effect on the germination of /5/ quinoa varieties. The results showed the following:

- A slight decrease in the length, width and leaf size when the water stress and salinity increase.
- The increase of chlorophyll rate when the water stress and salinity increase.
- The rise of some minerals and enzymes concentration in the leaves, trunk and seeds when the water stress and salinity increase.
- The two varieties of Ch.q.Wild and AMES 13761 showed the highest rate of germination and the best capacity of stress-tolerance up to (40 dS/m).



Study the Saline Water Irrigation Impact on the Growth and Productivity of Sesbania acleata:

The saline water impact on the germination of Sesbania aculeate seeds, under different levels of salinity

(0, 6, 18, 12 and 24) dS/m, was studied during the years 2014 and 2015. The results showed the following:

- The germination rate didn't exceed 22% at the highest level of salinity in comparison with 82% for the control plant.

- The root length was shorter when the salinity increased at the germination stage.

Also, the irrigation water salinity impact on the growth and nitrogen fixing efficiency was studied in the field under different levels of salinity (1, 6, 12 and 18) dS/m. The results showed the following:

- The growth decreased in most parts of the plant when the irrigation water salinity increased.

- The bacterial knots in the plant root mass decreased when the irrigation water salinity increased.

In general, the *Sesbania aculeata* plant resisted the irrigation water salinity up to 12 dS/m and maintained its growth, development and life cycle at the same time.

B-Algeria:

An explanatory and extension field day was implemented for a number of farmers on the saline agricultural drainage water use management in crops irrigation and the introduction of new salinity-tolerant crops appropriate for the area's conditions and climate.

A medium-size manual of /20/ pages supported with figures, pictures, tables and diagrams was prepared. The manual contained a summary on the results of all activities and experiments implemented in the different research stations of Al-Wadi and Warqala states and supervised jointly by ACSAD's experts and the Technical Institute over the four years of the project period (2010 -2014).



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

Project objective:

Identify the optimal management for agricultural systems that use this Type of non-traditional water and benefit from the sludge and treated water sources in the irrigation and fertilization of the different agricultural crops.

Project site: The Democratic People's Republic of Algeria- the Republic of Tunisia.

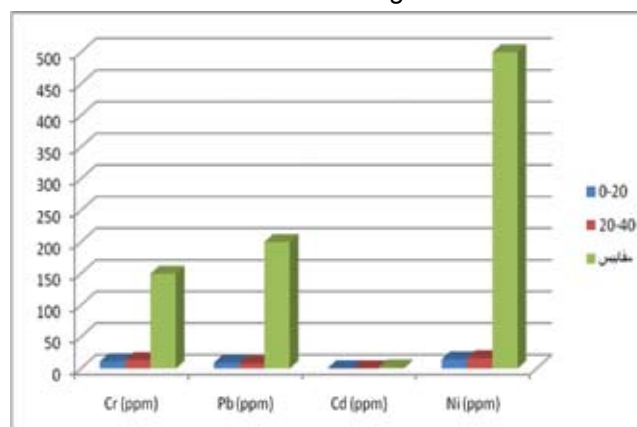
Project progress:

The project implementation continued during the years 2014 and 2015 in both of Algeria and Tunisia and the following agreed-upon activities were implemented according to the executive programs in each country:

1- Algeria:

This project is implemented in cooperation with the Algerian National Institute for Lands, Irrigation and Drainage in Telsman state where the treated water is available. The 2015 schedule included the implementation of several activities and researches as follows:

- Studying the treated water irrigation impact on the productivity and quality of new plant crops such as maize, sorghum bicolor and alfalfa. The lab analysis results during the year 2015 showed the concentration stability of some heavy minerals in the soil irrigated with treated water or ground water (within their normal concentration rate that is not reaching at all the contamination level).



- Monitoring periodically through the lab analysis the properties of the studied treated water of the treatment station in Telsman state, as the results showed that the treated water properties and characteristics fall within the international, Arab and local standards and measurements while the bacterial content varied from one season to another but was still within the acceptable limits. The results thus showed the capability of using this type of water in agricultural irrigation under a good management, high efficiency and for limited kinds of crops.
- Cultivating wheat crop and fertilizing it with sludge at a rate of (10 and 15) tons/ha respectively according to the recommended mineral fertilization content.

The figure below illustrates the wheat grain production average for the first season, while the table below illustrates the Cr and Pb concentration rate in both of the grain and straw for the sludge- fertilized wheat and the chemically fertilized wheat in comparison with the control plant:

Treatment type	Plant part	Cr, mg/kg	Pb, mg/kg
Control plant	Grain	0.99	1.093
	Straw	0.90	0.816
Chemical fertilizer adding	Grain	1.038	1.049
	Straw	0.87	0.819
Sludge adding (15 tons/ha)	Grain	1.043	1.046
	Straw	0.99	0.907
Sludge adding (10 tons/ha)	Grain	0.989	1.038
	Straw	0.950	1.056
Natural content (mg/kg)		5 >	30 >

2-Tunisia:

The project is implemented in cooperation with the National Institute for Rural Engineering, Water and Forests in Tunisia. The schedules for the years 2014 and 2015 included the implementation of several activities and researches as the following:

Study the Safe Agricultural Use of Treated Water in Agriculture:

The activities of this project continued during the years 2014 and 2015 in the areas of Nabel and Al-Sabbaleh- Burj Al-Tawil and Andalusia Castle where the treated water is available for irrigating some fodder crops like maize and sorghum bicolor and some fruit trees like citrus, olives and pomegranate. The results showed the following:

- A positive impact of treated water on the growth of corn plants in comparison with those irrigated with fresh water. This is due to the treated water content of nutritious elements necessary for plant growth (organic matter, nitrogen and phosphate).
- The results also showed a noticeable effect of the soil properties on the plants growth as the growth rate was the highest in the clay soil in comparison with the sandy soil. At the same time, the surface drip and sub-surface drip irrigation methods led to a better growth in comparison with the surface and sprinkle irrigation methods.

Study the Environmental Impact of the Treated Water Use on Soil and Plant:

This study is implemented in the area of Al-Sabbaleh- Burj Al-Tawil with the aim of studying the environmental impact of the treated water use on soil and plant, as this type of water has been always used in irrigating the cultivations in this area.

The study results for the year 2015 showed that /14/ million m³ of agricultural drainage water was drained during this year through the sub-canal and that this water was full of about 88 tons of salt and had various contents of heavy mineral elements. In general, the concentration of Fe, Ni, Zn, Mg and Cu was within the Tunisian standards for agricultural irrigation water, while the concentration of Pb and Co was beyond the Tunisian standard. As for the concentration of Cr and Co, It was always beyond the Tunisian standards.

Study the Safe Agricultural Use of Gray Water:

This activity has continued during the year 2015 through monitoring the properties and characteristics of gray water and soil irrigated with this type of non-conventional water and comparing the results to the Tunisian standards for agricultural purpose water. The results showed that the values of treated water acidity and salinity in addition to the concentration of some heavy minerals didn't exceed the allowed limit of the Tunisian standards, thus this type of non-conventional water showed the possibility of being used safely in agricultural irrigation.

Project of Soil Management to Maintain Soil Fertility and Improve its Productivity

Project objective:

Increase the productive capacity of soil, conserve its fertility and prevent its degradation by following the appropriate methods and techniques.

Project site: ACSAD's research stations.

Project progress:

Under this project, the following applied studies and researches are implemented:

Wheat Response to the Different Levels of Essential Fertilizing Elements and Organic Matter:

The study has been repeated at ACSAD's research station in Ezra'a at the field of one farmer in the area, in the winter seasons 2013- 2014 and 2014- 2015, with the aim of studying the impact of using various levels of NPK, with the presence of the organic matter, on the productivity of wheat crop as a rainfed cultivation.

The results confirmed ,for the third season, the wheat response to the level 75% of the recommended fertilizer quantity with the addition of the organic matter (10 tons/ha). The grain yield average amounted (1.77) tons/ha in comparison with (1.70) tons/ha for the level 75% without the organic matter, (1.68) tons/ha for the level 100% with the organic matter, (1.61) tons/ha for the level 100% without the organic matter, (1.72) tons/ha for the level 150% with the organic matter, (1.71) tons/ha for the level 150% without the organic matter, (1.57) tons/ha for the control plant with the organic matter and (1.51) tons/ha for the control plant without the organic matter, taking into consideration that the rainfall quantity was 244 mm. The results were the same at the farmer's field in terms of yield and response.



Study the Impact of Biogas Fertilizer on the Soil Fertility and Maize Production:

This field experiment has been repeated at ACSAD's research station of Ezra'a, Syria for the summer seasons 2014 and 2015 aiming at emphasizing the results of the previous seasons concerning the study of the impact of organic fertilizer resulted from the biogas production process at three levels (10=B1 tons/ha, 20=B2 tons/ha and 30=B3 tons/ha) in comparison with the level (20= M tons/ha) of manure, the recommended fertilizer (F) and the control plant (c). The impact was studied in terms of soil fertility and maize productivity, as the results showed that there wasn't any significant difference among the various used fertilizers (biogas fertilizer, manure and mineral fertilizer) in terms of their effect on the maize grain yield, while there was a significant difference between these types of fertilizers and the control plant. The productivity of maize when fertilized with the mentioned fertilizers was very close and ranged between 3.28 and 3.76 tons/h) against the productivity of the control plant which was 1.98 tons/ha.

Project of Transferring Biogas Technology to Arab Rural Areas Community

Project objective:

Disseminate the biogas production technique (animal and plant residues) in the Arab rural areas, conserve a clean environment and get a renewable energy namely the gas and a sub-product namely the natural fertilizer.

Project site: The Syrian Arab Republic - the Kingdom of Morocco.

Project progress:

Two biogas production units have been established during the year 2014 in Lattakia-Syria; the size of each is (22 m³) with a fermentation output tank (16 m³) and a gas output tank (3.5 m³). Each unit produces about (0.4 m³) of fermented organic manure (of which 8% is a dry material) and (8 m³/day) of gas.

Also, a bio-gas production unit has been implemented in the Agricultural Research Center in Tadleh Bani Mallal in the Kingdom of Morocco; the size of which is (70 m³) with a fermentation output tank (20 m³) and a gas output tank (10 m³).

In the year 2015, the project activities were limited to the maintenance and service operations of these units and the bio-gas production unit at ACSAD's research station of Ezra'a.



Animal Wealth

The Animal Wealth Department

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

1-Small Ruminant Care and Genetic Improvement in the Arab Countries Program:

The program aims at developing 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.

2-Development and Application of Artificial Insemination and Embryo Transfer Techniques in the Arab Countries Program:

The program aims at exerting 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 herds and the herds 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' herds in the Arab countries.

3-Camel Research and Development Program:

The program aims at improving 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 past 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-Azib research station) in order to train the Arab technical staffs and study the productive and reproductive performance of camel. This station and its facilities serve as a center for providing expertise and consultations to the Arab countries.



4-Fodder Sources and Animal Nutrition Development in the Arab Countries Program:

The program aims at implementing surveys on the traditional and non-traditional fodder resources in the Arab countries, benefiting from the relative advantage that some Arab countries enjoy in the fodder sources field, finding the appropriate fodder alternatives, improving and enhancing 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 using 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.

5-Inventory and Characterization of Animal Genetic Resources in the Arab Countries Program:

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 characteristics 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 an improved management and sustainable use types especially for the extinction-endangered local animal breeds that fall under the traditional production system and exist in poor environments. Under these actual circumstances, ACSAD has established the animal genetic resources inventory and characterization program.

***Implemented Projects
of Animal Wealth Department***

Project of Sheep Genetic Improvement and Care in the Arab Countries

Project objective:

Improve Awassi sheep productivity by the selection process at ACSAD's research stations.

Project site:

ACSAD's specialized research stations in cooperation with the cooperating research stations in the Arab countries.

Project progress:

ACSAD has recently achieved advanced scientific results in the field of genetic improvement as the following:

1-At the scientific research center's station in AL-Salamieh:

The reproductive indicators: The insemination rates were 100% , 100% and 98.4%; the birth rates were 86.7%, 91.7% and 85.6% and the twin- birth rates were 6.2%, 71.2% and 43.9% for milk, meat and bi-purpose herds respectively in the years 2014 and 2105.

The milk production indicators: The general daily milk production rate was 1312 g; the milk production rate for a period of 60 days was 88.9 kg; the total milk production was 237 kg and the flow of milk period was 182 days in the year 2014, while the total milk production rate for the year 2015 was 245.3 kg as illustrated in the table and figure below:

The general average of Awassi sheep ewes' milk production in the selected herd
at Al-Salamieh research center for the year 2015

Affecting factors		Studied indicators			
		Daily milk production (kg)	Milk production for the first sixty days (kg)	Total milk production (kg)	Flow of milk period (day)
General average		1.32	89.7	245.3	186
Production line	Milk line	1.41	90.7	266.1	189
	Meat line	1.21	88.3	220.2	182
	Bi-purpose line	1.37	90.0	255.6	186

The newborns' weight: As in the table below, it is illustrated that the weight average at birth was 4.54 kg; the weight average at weaning was 18.17 kg; the weight average at the age of 180 days was 38.21 kg and the growth rates were 213.14 g/day and 142.41 g/day for the "birth till weaning" period and for the "weaning till age 180 days" period respectively for the year 2015. The decrease in birth and weaning weight is due to the increase in the twins rate in the herd.

Newborns' weight average at different ages of Awassi sheep at Al-Salamieh research
center for the different production lines in the year 2015

Affecting factors		Weight at birth (kg)	Weight at weaning (kg)	Weight at the age of 180 days (kg)	Daily growth rate (g/day)	
					From birth to weaning (60 days)	From weaning till age 180 days
General average		4.50	17.2	38.21	196.5	142.41
Production line	Milk line	4.48	17.5	37.20	204.0	133.63
	Meat line	4.52	17.2	39.16	195.1	150.88
	Bi-purpose line	4.64	17.0	38.25	191.5	142.57



2-At ACSAD's research station of Wadi Al-A'azib:

The reproductive indicators: The insemination rate was 100%; the birth rate was 100%; the single- birth rate was 34% and the twin- birth rate was 66% for the year 2014. On the other hand, the mating rate was 95.3%; the single- birth rate was 69.6% and the twin- birth rate was 30.4% for the year 2015.

The milk production indicators: The daily milk production rate was 1 kg; the milk production rate for a period of 60 days was 85.5 kg; the total milk production was 167.4 kg and the flow of milk period was 165.7 days for the year 2014. On the other hand, the daily milk production rate was 1.138 kg; the milk production rate for a period of 60 days was 84.9 kg; the total milk production was 213.9 kg and the flow of milk period was 188 days for the year 2015.

Newborns' weight: The weight average at birth was 4.62 kg; the weight average at weaning was 19.41 kg; the weight average at the age of 180 days was 36.51 kg; the growth rates were 243.41 g/day and 172.72g/day for the "birth till weaning" period and for the "weaning till age 180 days" period respectively in the year 2014. On the other hand, the weight average at birth was 4.81 kg; the weight average at weaning was 18.45 kg; the weight average at the age of 180 days was 38.03kg; the growth rates were 214.67 g/day and 140.87g/day for the "birth till age 60 days" period and for the "age 60 days till age 180 days" period respectively for the year 2015.

3-At Ezra'a research station for Awassi sheep improvement and propagation:

The reproductive indicators: The insemination rates were 100% and 97.8%; the birth rates were 90.0% and 74.2% and the twin- birth rates were 22.4% and 34.8% for the milk and meat herds respectively in the year 2014. On other hand, the insemination rate was 100%; the birth rate was 92.0% and the twin- birth rate was 25.0% for the sheep herd in the year 2015.

The milk production indicators: The daily milk production rate was 1.40 kg; the milk production rate for a period of 60 days was 84.6 kg; the total milk production was 173.2 kg and the flow of milk period was 123.7 days for the year 2014. On the hand, the daily milk production rate was 1.579 kg; the milk production rate for a period of 60 days was 102.1 kg; the total milk production was 157 kg and the flow of milk period was 101.5 days for the year 2015.

Milk production indicators averages for Awassi sheep ewes at Ezra'a research station

Affecting factors	Studied indicators				Flow of milk period (day)
	Daily milk production (kg)	Milk production for the first sixty days (kg)	Total milk production (kg)	Modified milk production in 175 days (kg)	
General average	1.579	102.1	156.8	276	101.5
Milk line	1.615	104.5	158.8	283	101.7
Meat line	1.460	94.1	150.2	256	101.2



Newborns' weight: The results showed that the weight average at birth was 4.61 kg; the weight average at weaning was 22.77 kg; the weight average at the age of 180 days was 39.5 kg; the growth rates were 236.05 g/day and 161.2 g/day for the "birth till weaning" period and for the "weaning till age 180 days" period respectively for the year 2014. On the other hand, the weight average at birth was 4.75 kg; the weight average at weaning was 23.04 kg; the weight average at the age of 180 days was 43.5 kg; the growth rates were 263.4 g/day and 181.0 g/day for the "birth till weaning" period and for the "weaning till age 180 days" period respectively in the year 2015.



Project of Goat Care and Genetic Improvement in the Arab Countries

Project objective:

The project aims at the genetic improvement of goats by crossbreeding process between Shami goat breeds and the local goat breeds in the interested Arab countries such as Al-Barqi breed in Egypt, Al-Tohami breed in Yemen and the local goat breeds in Tunisia, Algeria and Libya.

Project site:

At the scientific research stations of ACSAD, at several research stations specialized in goat breeding and in the breeders' fields in the Arab countries as well.

1- Project of Goat Care and Genetic Improvement in the Arab Countries:

Project progress:

The Shami goat improvement and propagation project was established at Ezra'a research station in the year 1992. In the year 1993, the project started to select the superior animals to form the elite herd aiming at propagating it and disseminating its improved genetic structures in the Arab countries.

The most important results of its activities during the year 2015 were the following:

The reproductive indicators: The average of pregnant female percentage by natural mating was 96.50%, the birth rate was 95.64%, the single-birth rate was 15.8%, the twin-birth rate was 50% and the triple (and above) birth rate was 34.2% in the year 2014. On the other hand, the average of pregnant female percentage by natural mating was 97%, the birth rate was 96.1%, the single-birth rate was 26.6%, the twin-birth rate was 55.8% and the triple (and above) birth rate was 17.6% in the year 2015.

Milk production indicators: The daily milk production rate was 1994 g; the milk production rate for a period of 90 days was 231 kg; the total milk production was 387 kg and the flow of milk period was 195 days for the year 2014. On the other hand, the daily milk production rate was 2265 g; the milk production rate for a period of 90 days was 265 kg; the total milk production was 491 kg and the flow of milk period was 217 days for the year 2015.

Averages of Milk production indicators for Shami goats with different ages at Ezra'a research station for the year 2015

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	1808	194	405	398	224
3	2472	262	539	544	218
4	2587	299	546	569	211
+5	2244	308	469	492	209
Average	2265	265	491	499	217

Newborns' weight: The results showed that the weight average at birth was 3.88 kg; the weight average at weaning was 18.95 kg and the weight average at the age of 180 days was 23.32 kg for the year 2014. On the other hand, the weight average at birth was 3.96 kg; the weight average at weaning was 19.72 kg and the weight average at the age of 180 days was 27.16 kg for the year 2015.

The birth and weaning mass: The general averages for birth and weaning mass were 7.69 kg and 28.68 kg respectively for the year 2014. On the other hand, the birth mass for single, twin and triple and above deliveries was 4.79 kg, 8.07 kg and 12.20 kg respectively and the weaning mass for single, twin and triple and above deliveries was 20.50 kg, 35.47 kg and 55.31 kg respectively for the year 2014. As for the year 2015, the overall averages for birth, weaning and age 180 mass were 6.88 kg, 32.44 kg and 46.60 kg respectively. On the other hand, the birth mass for single, twin and triple and above deliveries was 4.56 kg, 7.78 kg and 10.30 kg respectively and the weaning mass for single, twin and triple and above deliveries was 23.33 kg, 36.04 kg and 45.33 kg respectively, taking into consideration that the 180 days- age mass for single, twin and triple and above deliveries was 30.00 kg, 53.29 kg and 69.67 kg respectively.

Mass average at birth, weaning and age 180 days according to the number of deliveries for Shami goats in the year 2015 at Ezra'a research station

Delivery type	At birth (kg)	At weaning (kg)	At age 180 days (kg)
1	4.56	23.33	30.00
2	7.78	36.04	53.29
+3	10.30	45.33	69.67
Average	6.88	32.44	46.60



2- Project of Sheep and Goat Productivity Improvement in Other Arab Countries:

The total number of ACSAD's improved Awassi goats distributed among the Arab countries during the period 2003-2012 was /799/ heads; of which /279/ heads were rams, /499/ heads were ewes, /21/ heads were weaning females and /500/ heads were for fattening purpose. On the other hand, the Arab Center (ACSAD) distributed during the period 1994-2015: /733/ improved heads of Shami goats (298 males and 435 females). Under this project, the most important implemented activities in the Arab countries for the years 2014-2015 can be summarized as follows:

Jordan:

The cooperation is continuous 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 and Al-Khnasri stations in addition to Al-Walla station of the Jordanian Ministry of Agriculture- National Center for Agricultural Extension and Research. In the year 2014, /600/ frozen semen straws were sent (of which /300/ straws were of Awassi sheep and /300/ straws were of Shami goat) to implement the project plan. A training course was also conducted for the Jordanian staff on "goat and sheep artificial insemination" at Al-Msheirfa agricultural station in Karak governorate in the year 2015. In general, the project implementation results show a considerable progress as follows:

A-At Al-Walla station:

The total milk average for goat herd is 190 kg; the



flow of milk period is 119.7 days and the daily milk production rate is 1.61 kg. Concerning the rates of weight at birth, weight at weaning and daily growth, they are 2.65 kg, 16.72 kg and 156.31 g/day respectively for.

B-At Al-Fajij station:

The rates of weight at birth, weight at weaning and daily growth are 4.57 kg, 20.47 kg and 265.12 g/day respectively for Awassi sheep.

Weight at birth and weaning for Shami goats according to the delivery's type and newborn's sex at Al-Walla station in Jordan

Item	Weight at birth (kg)	Weight at weaning (kg)	Daily growth rate (g/day)
General average	2.65	16.72	156.31
Average for males	2.66	16.55	154.36
Males/single delivery	2.56	17.66	167.78
Males/twin delivery	2.69	16.26	150.79
Males/triple delivery	2.72	15.67	143.83
Average for females	2.64	16.88	158.21
Females/single delivery	2.60	17.55	166.04
Females/twin delivery	2.66	16.77	156.78
Females/triple delivery	2.67	14.89	135.81

Weight at birth and weaning for Awassi sheep according to the delivery's type and newborn's sex at Al-Fajij station in Jordan

Item	Weight at birth (kg)	Weight at weaning (kg)	Daily growth rate (g/day)
General average	4.57	20.47	265.12
Average for males	4.58	20.63	266.12
Males/single delivery	4.60	20.72	274.02
Males/twin delivery	4.40	20.50	265.01
Average for females	4.56	20.39	265.67
Females/single delivery	4.58	20.52	265.63
Females/twin delivery	4.50	19.59	251.91

Tunisia:

In the years 2014 and 2015, the cooperation between ACSAD and the Republic of Tunisia has been enhanced in the field of small ruminants genetic improvement, as the Arab Center ACSAD has worked on the establishment of an artificial insemination laboratory in kairouan in the year 2015. 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). ACSAD has issued several scientific periodicals concerning the results.

Currently, the Arab Center ACSAD is implementing two new projects with Tunisia, namely "the optimal use and processing of agricultural residues project" through which Tunisia will be provided with a machine for processing agricultural residues and "decrease of camel newborns' mortality rate in some Arab countries project".

Algeria:

In reference to the executive program signed between the Arab Center ACSAD and the Ministry of Agriculture and Rural Development (represented by the Technical Institute for Animal Breeding) on 16/3/2011 in the field of goats development, a plan was set up for inseminating the local goat herds with Shami goat semen straws. Under this plan, /500/ straws of frozen semen have been sent.

During the year 2015, the results of planted-sponge and semen straws insemination of /85/ local goats showed that the pregnancy rate in the first season was up to %31.53 as illustrated in the table below:

Results of local goats Insemination with Shami goat semen straws in Algeria

Reproductive indicators	Result
Inseminated females' number	85 heads
Weight average at insemination	(28.00 (kg
Pregnant females' rate	31%
Newborns' number	16 heads
Mortal newborns' number	4 deliveries
Delivery rate	114.28%
Weight average at the age of 30 days	5.76 (kg)
Weight average at the age of 60 days	11.40 (kg)
Daily weight increase rate	106.87 g/day
Female newborns' weight average/single delivery	2.91 (kg)
Male newborns' weight average/single delivery	4.33 (kg)
General average of newborns' weight at birth	3.28 (kg)
Female newborns' weight average/twin- delivery	2.2 (kg)
Male newborns' weight average/twin- delivery	2.3 (kg)

Moreover, a training course and a workshop were implemented during the first quarter of 2015. Currently, the Arab Center ACSAD is implementing three new projects in Algeria, namely "the optimal use and processing of agricultural residues project" through which Algeria will be provided with a machine for processing agricultural residues, "decrease of camel newborns' mortality rate in some Arab countries project" and "study of camel grazing systems, breeders' income improvement and expertise exchange project".

Saudi Arabia:

The Kingdom of Saudi Arabia participates in the implementation of "decrease of camel newborns' mortality rate in some Arab countries project". Under the cooperation program between the Arab Center ACSAD and the Kingdom of Saudi Arabia in the field of small ruminant genetic improvement, ACSAD has sent /40/ heads of Awassi sheep and Shami goats (5 males and 15 females of Awassi sheep and 5 males and 15 females of Shami goats) in the year 2011. The improved breeds of Awassi sheep and Shami goats are monitored in coordination with the Ministry of Agriculture in Saudi Arabia.

Sudan:

-The cooperation has continued with the Republic of Sudan in the program of sheep and goats improvement by sending live animals and frozen semen straws of Awassi sheep and Shami goats.

-Currently, the Arab Center ACSAD is implementing two new projects in Sudan, namely "the optimal use and processing of agricultural residues project" through which the Republic of Sudan will be provided with a machine for agricultural residues processing and "decrease of camel newborns' mortality rate in some Arab countries project".



Available information on the productive indicators of the Sudanese Nubian goats at Al-Dankala

Productive indicators	Rate	Range
Age at the first delivery of the goat (month)	8.9 (first generation) 18.5 (second generation) 15.8 (third generation)	7.7- 9.3 (first generation) 16.3- 20.7 (second generation) 10.8- 20.7 (third generation)
Weight at birth for kids (kg)	2.8 (male) 2.5 (female)	1.5- 4.5 1.3- 4.0
Milk production at the age of 90 days (kg)	73.3 (year 2008) 55.6 (year 2009)	27.5- 118.5 23.2- 101.4
Kid's weight at the age of 60 days (kg)	7.4 (male) 6.2 (female)	3.5- 12 3.0- 3.5
Kid's weight at the age of 90 days (kg)	8.9 (male) 7.4 (female)	3.5- 15.5 3.0- 11.5

Syria:

1-Developmental Response to Alleviate Rural Poverty and Drought Impact in the Northern East Region of Syria:

- Led by its interest to achieve a comprehensive range of activities, The Arab Center ACSAD has extended its activities to include the crisis-affected areas in Syria, and due to its expertise in the implementation of development projects, ACSAD is cooperating now with ACF-Action Against Hunger Institution to implement the project of "developmental response to alleviate rural poverty and drought impact in the northern east region of Syria".
- The project aims at improving the income of households working in farming and animal breeding, increasing their capacity to adapt with climatic changes by improving their technical skills in livestock field, improving methods of animal product marketing (milk and meat) and diversifying income sources in the governorates of Al-Hasakeh, Al-Raqqa and Deir Ezzor through applying the conservative agriculture system for the benefit of /500/ households in the northern east of Syria.

Project progress:

Several training courses have been implemented during the year 2015 in the following fields:

A-In the field of animal health:

- Control internal and external parasites and the most important diseases transmitted by milk and its products.
- Conduct first aid activities to treat animal wounds, burnings, fractures and poisoning.
- Use animal bathes and conduct the necessary maintenance and safety measures.

B-In the field of marketing:

- Milk processing and quality control and milk collection and marketing process monitoring.
- Commercial processing and conservation methods of milk and its products, financial management principles, cost calculation of micro enterprises and income control and distribution among members.
- Follow-up the process of milk collecting and marketing by breeders.
- Hold the final meeting of the project of "developmental response to alleviate rural poverty and drought impact in the northern east region of Syria" on 25/5/2015.

2-Early Improvement of Crisis-Affected Households in Syria in Plant and Animal Sectors in the Governorates of Al-Hasakeh and Dara'a:

- Due to ACSAD's expertise and implementation of distinguished development project, ACSAD is cooperating with ACF-Spanish Action against Hunger Institution to implement the project of "early improvement of crisis-affected households in Syria in plant and animal sectors in the governorates of Al-Hasakeh and Dara'a" which aims at assisting the rural affected households by providing in-kind materials (fodder and veterinary medicines to their animals) and pesticides to control the pests and diseases of their crops as well as training the local staff supervising the project implementation.
- The project was implemented during the years 2014 and 2015. In the animal production field, /700/ kg of fodder barley and a kit of veterinary medicines were provided to /1782/ breeders and a number of technical staffs and breeders were trained in the fields of agricultural residues utilization and agricultural animals husbandry, veterinary care and feeding, in addition, the beneficiary breeders were provided with fodder rations for their agricultural animals (cattle, sheep and goats).

3-Livelihood Support of the Crisis-Affected Communities in Syria:

The project aims at improving food security by supporting the livelihood of the crisis-affected people in Syria through the Swiss Development Agency(SDC) financing. The project is implemented by ACSAD in cooperation with the Syrian Ministry of Agriculture and Agrarian Reform in the governorates of Al-Hasakeh and Dara'a over a two-year period and two phases starting in April 2015. The aim is to help beneficiaries to reach better livelihood standards, provide water for house-use purposes and irrigation and increase food assistance in the areas of the project. The experts of ACSAD's animal wealth department contributed to this project by conducting a training course on "animal production" to the field managers and extension technicians in the two governorates. In this term, the field team implemented periodical training sessions to raise the beneficiaries' knowledge and information in this field.



Iraq:

1-Awassi Sheep and Shami Goat Genetic Improvement by Line selection and Cross-breeding:

The data analysis results of Iraq, concerning Awassi sheep and Shami goat breeds sent by ACSAD to Iraq, show that the total milk production averages for local Shami goats, Cyprus Shami goats and local goats is the following: for goats that produce between 100-200 kg of milk, it is 145 kg, 157 kg and 127 kg respectively; for goats that produce between 200-300 kg of milk, they are 245 kg, 252 kg and 200 kg respectively; for goats that produce over 300 kg of milk, they are 396 kg, 459 kg and 296 kg respectively. The weights at birth for local Shami goat, Cyprus Shami goat and country goat are 2.62 kg, 2.66 kg and 2.0 kg respectively, while the weights at weaning are 17.96 kg, 19.19 kg and 14.1 kg respectively.

- The Arab Center ACSAD implemented a workshop for presenting its expertise in the Republic of Iraq during the period 2-6/2/2015 in which experts from ACSAD, including an animal production specialist, have been participated.
- ACSAD also implemented two training courses for the Iraqi technicians during the period 30/5-4/6/2015 in Lebanon in the fields of small ruminant artificial insemination and agricultural residue processing for small ruminant feeding.

2-Project of Al-Hammad Basin Development Study in Iraq (livestock component):

The project started in the year 2011 and aimed at identifying the productive properties of livestock sector, characterizing the productive nature, evaluating the current condition of production and herd management means, identifying means of feeding, health care and productive marketing, establishing a livestock development plan and training technicians of Al-Hammad basin.

Kuwait:

For the purpose of implementing the signed agreement between ACSAD and the General Commission for Agricultural and Fishery Affairs on 25/5/2010 in the field of Al-A'aredi goat production and improvement, /30/ heads of Awassi sheep and Shami goats (5 males and 10 females each) and /1200/ straws of Awassi sheep frozen semen had been sent in the year 2011. At the same time, /55/ heads of Awassi sheep and Shami goats (5 males and 25 females of Awassi sheep and 5 males and 20 females of Shami goats) were prepared to be sent in the year 2015.

The cooperation has continued with the Ku-



waiti side to evaluate the research results. The following table illustrates the productive data of Al-A'aredi goats, Shami goats and hybrid goats (Shami x Al-Aar'edi) as the following: the birth rates are 143%, 150% and 200% respectively, the weights at birth are 3.4 kg, 3.3 kg and 3.5 kg respectively and the weights at weaning are 12 kg, 12.8 kg and 16.6 kg respectively. We can notice that there is a considerable improvement in the rates of birth, weight at birth and weight at weaning for the hybrid goats.

Comparison of productive data for Shami goats, Al-A'aredi goats and Hybrid goats (Shami x Al-A'aredi) at the Goat and Sheep Training Center in Kabad- Kuwait

Estimated items	Shami goat	Al-A'aredi goat	Hybrid goat (Shami x Al-A'aredi)
Goat number in the insemination complex	9	20	14
Number of delivered goats	4	14	6
Newborn number	6	20	12
Birth rate (%)	44.4	70	43
Newborn rate (kg)	150	143	200
Weight at birth rate (kg)	3.3	3.4	3.5
Weight at weaning rate (kg)	12	12.8	16.6

Lebanon:

The goat and sheep genetic improvement is implemented in cooperation with Tarbel station of Agricultural Research Service. For the purpose of supporting this project and activating the cooperation between the Arab Center ACSAD and the Lebanese Ministry of Agriculture, ACSAD has sent in the year 2015 improved live animals (26 heads of Shami goats) in addition to /600/ straws of frozen semen (300 frozen straws of Awassi sheep and 300 frozen straws of Shami goats).

Egypt:

The cooperation has continued with Egypt represented by Animal Production Research Institute through cross breeding of Awassi sheep and Shami goats, as live animals and semen straws of improved males were provided to the Egyptian side. The most important result of the project is the distribution of improved males of Awassi sheep and Shami goats among the breeders in the Delta and northern east coast region. Also, /1000/ straws of frozen semen (500 straws of Awassi sheep and 500 straws of Shami goats) were sent to the Desert Research Institute in the year 2014. Currently, the project of optimal use and processing of agricultural residues is implemented (as an agricultural residue processing unit will be sent to Egypt) and a survey on domestic and livestock sources in the northern west coast region is prepared.

Yemen:

The cooperation with Yemen is reflected in local goat and sheep breed improvement through the oriented-crossbreeding with improved Awassi sheep breeds and improved Shami goat breeds. This activity falls under the program of local breed development in the Arab countries by using frozen semen artificial insemination technique. Within the framework of the program of small ruminant care and genetic improvement, Yemeni technical staffs have been trained on modern techniques of productive performance raising, statistical analysis programs and sheep and goat herd management systems. Currently, the Arab Center (ACSAD) is implementing two new projects in Yemen, namely "the optimal use and processing of agricultural residues project" through Yemen will be provided with two machines for agricultural residue processing and "decrease of camel newborn mortality rate in some Arab countries project", in addition to a survey on extinction-endangered breeds in the Arab countries which is under implementation.



Project of Artificial Insemination Use Development in Small Ruminants

Project objective:

The project aims to contribute to the acceleration of the genetic improvement process of sheep and goat herds by collecting the elite males' semen in the core herd and disseminating them as can as possible in the cooperating stations and breeders' herds in the Arab countries within the framework of the exerted efforts to achieve the optimal utilization of goat and sheep superior breeds especially those genetically selected and improved in some Arab countries.

Project site:

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

Project progress:

- The production and distribution of semen straws increased during the year 2015 in the Arab countries, as ACSAD sent about /4200/ straws of Awassi sheep and Shami goats frozen semen to Tunisia, Algeria, Jordan and Lebanon and about /250/ heads of goats and sheep were inseminated in Syria. The total number of frozen semen straws sent to the Arab countries since the beginning of the project is about /30000/ straws as illustrated by the following figure which shows the distribution process progress of frozen semen straws in the Arab countries.
- Within the framework of artificial insemination project, ACSAD has cooperated with the General Commission for Agricultural Scientific Research in Syria to inseminate a part of the improved sheep and goat herd at some research stations by using fresh semen taken from the elite males at Ezra'a research station. The initial results show good rates of pregnancy and birth as a result of the use of this method. Currently, efforts are exerted to increase the number of stations and experimented animals in a way that contributes to the spread of the acquired advantage.
- In the years 2014-2015, about /10000/ straws of Awassi sheep and Shami goats were produced and stored to be prepared for sending to the interested Arab countries.
- The results of experimenting the use of artificial insemination method by fresh and frozen semen in the herd of one cooperating breeder with ACSAD showed an increase of birth rate (more than %60), and for the artificial insemination method by frozen semen, the rate exceeded %50. These results are considered very fruitful.
- Within the framework of local goat development project in Algeria, ACSAD has sent /600/ semen straws of improved Shami goat males during the year 2015 to be used in the genetic mixing plan aiming at improving the local goat productivity in Algeria.
- ACSAD has sent /3000/ straws of frozen semen of improved Shami goat and Awassi sheep to Tunisia in the year 2015 to be used in the genetic improvement processes of local breeds in Tunisia. Currently, ACSAD is preparing a laboratory for artificial insemination in Kairouan.
- Two PhD theses were prepared in cooperation with the Faculty of agriculture at Damascus University and Faculty of Veterinary Medicine at Hama University on "Low Density Lipoprotein Molecules Use-LDL in the semen freezing solutions of Awassi rams".



Project of Development of Embryo Transfer Technique Use in Small Ruminants

Project objective:

Increase the genetic improvement efficiency of goat and sheep herds, facilitate the transfer of genetic resources from selected animals among the different Arab countries as an alternative for live animals transfer and establish genetic banks (frozen embryos) to conserve the genetic resources of local breeds, particularly the extinction-endangered ones, in the Arab countries.

Project site: The Syrian Arab Republic (Ezra'a research station-ACSAD).

Project progress:

1-During the years of 2014 and 2015, preparing the results of this project in the form of scientific papers has been focused on especially concerning the test results of super ovulation and ovulation response to super ovulation hormones of Awassi sheep and Shami goats.

2-Currently, two scientific papers are prepared on ovulation response to hormone pFSH under super ovulation program of Awassi sheep and Shami goats. These papers will be published in the certified scientific journals.

3-Three training courses were implemented during the year 2015 as follows:

In Jordan, a training course for the technical staff of the Ministry of Agriculture (Al-Msheirfiah agricultural station) was held on the use of artificial insemination technique for goats and sheep.

- For Iraq, a training course for the technical staff of Iraqi Hammad basin project was held in Beirut.
- In Algeria, a training course was held in the Technical Institute for Animal Breeding on modern techniques use in local goat production development in Algeria.

4-A workshop was conducted for evaluation of local goat genetic improvement project in Algeria.

5-In the year 2015, several scientific papers were published in certified scientific journals on the following issues:

- Evaluation of low density lipoprotein use efficiency in salty dilute solution for freezing semen of Syrian Awassi sheep (Arab Journal for Arid Environments-ACSAD).
- Use of amino acid with LDL molecules in the semen dilute solution of Awassi rams (Arab Journal for Arid Environments- ACSAD).
- Evaluation of fertility capacity of Awassi sheep frozen semen in various dilute solutions (Arab Journal for Arid Environments- ACSAD).
- Use of different concentrations of low density lipoprotein to develop a new dilute solution for Awassi rams semen (Scientific Journal of King Faisal University).

6-Currently, two scientific papers are prepared on ovulation response to hormone pFSH under sheep and goat over-ovulation programs in Syria.



Project of Camel Production Development

The Arab center ACSAD has given a special attention to the camel production development project which is implemented in cooperation with the Arab countries in which camel forms an important part of its livestock. ACSAD has established a camel breeding and care station (Wadi-Al-A'azib research station) aiming at training Arab technical staff and studying camel productive and reproductive performance. The station and its establishments are considered as a center for providing expertise and consultations to the Arab countries.

Evaluation and Improvement of Camel Milk Production and Marketing in Some Arab Countries:

This project, which is implemented in cooperation with International Fund for Agricultural Development (IFAD), aims at increasing income, alleviating poverty and improving food security in the pastoral communities that raise camels in these countries. This is done by improvement and increase of camel milk production, optimal use of produced milk and development of processing and marketing processes. This project was implemented in three Arab countries, namely Algeria, Morocco and Sudan; they were provided with the necessary supplies including milk packaging and pasteurization units, fridges and units for fodder block processing, veterinary medicines and sterilizers.

The field survey of the project implementation showed the necessity of increasing the produced milk quantities, improving milk transport means and decreasing prices of marketed milk at distribution points, in addition to improving the progeny of milk producing camel breeds, developing milk preservation and pasteurization methods, providing fodder, improving pastoral sources for camel feeding, providing drinking water, developing milk packaging means and improving milk marketing mechanisms.

Survey of Camel Newborns' Mortality rates and Causes in Some Arab Countries:

Within the framework of ACSAD's interest in unifying Arab efforts in the field of camel development and research, the coordination meeting of the participating countries was held and the study was financed by ACSAD's budget and conducted in Tunisia, Algeria, Sudan and Yemen. Moreover, the study form was presented and adopted and the data was collected and statistically analyzed to get the final results.

Project of Camel Newborns' Mortality Rate Decrease in Some Arab Countries:

This project is considered one of the most important national projects. It is implemented over a period of two years by ACSAD's financing in six Arab countries namely; Algeria, Tunisia, Yemen, Saudi Arabia, Sudan and Mauritania. The project aims at getting acquainted with the factors that cause or contribute to camel newborns' mortality (pathogenic and non-pathogenic causes), identifying the economic importance of camel newborns' mortality to alleviate its impact on the target category, supporting, rehabilitating and raising the capacity of breeders, local technicians and staff working in the field of diagnosis of camel newborns' mortality causes in the participating countries of the project and preparing a treatment and preventive plan by using preventive immunities, following sound and healthy ways in newborns' breeding and care, decreasing camel newborns' mortality rates, increasing herd size and ultimately improving camel breeders' income, raising their living standards and decreasing poverty rates among them.

The first coordination meeting was held in Cairo during the period 27-28/8/2015 with the participation of the project national coordinators. The results of the survey on camel newborns' mortality rates and causes were presented and the required activities for implementation along with the activities schedule were discussed and adopted in this meeting.

Study Project of Camel Grazing Systems, Breeders' Income Improvement and Expertise Exchange in Algeria:

- The project implementation has started in the year 2015 and will continue for a period of 3/ years. It is implemented in cooperation between the Arab Center ACSAD, the Governorate of Agriculture Development in the Desert Areas and the Ministry of Agriculture and Rural Development in the Democratic People's Republic of Algeria. The project includes the following activities:

- 1-Characterize the actual situation of rangelands and camel sector.
- 2-Identify and utilize the investable natural resources in the field of camel optimal development.
- 3-Introduce modern techniques in the field of camel breeding and care (milking machine, camel products processing and fodder cubes use).
- 4-Reconsider the current camel breeding objectives.
- 5-Establish future plans for camel development.
- 6-Increase the efficiency and qualifications of specialized technical staffs.
- 7-Improve the financial and living conditions of breeders.

- During the year 2015, a field visit was conducted to the state of Warqala where the Governorate of Agriculture Development in the Desert Areas is located. Also, it was agreed with the Algerian side on the project work methodology, implementation schedule and the commitments of each side. The form draft of the survey, which would be conducted in seven highly populated desert states, was reviewed to get acquainted with the properties, characteristics and requirements of camel breeding in the Algerian desert areas.
- A training course was implemented for technicians responsible for collecting information and data for survey on properties, characteristics and requirements of camel breeding in seven states of the Algerian desert area states. Based on the results of this study, the necessary plan is set up to implement the required interventions for camel grazing systems development, breeder income improvement and expertise exchange in the camel breeding areas in the Algerian desert areas.



Project of Fodder Balance in the Arab Countries

Project objective:

The project aims at inventorying of local conventional and non-conventional fodder resources for each country separately, evaluating the livestock feeding requirements and the fodder gap, identifying fodder imports, their financial value and their capacity to cover fodder deficiency, identifying constraints and proposing the appropriate solutions.

Project site: All the Arab countries.

Project progress:

- The Arab Center (ACSAD) has implemented /13/ studies on fodder balance for each of: Jordan, Tunisia, Algeria, Sudan, Saudi Arabia, Syria, Sultanate of Oman, Qatar, Lebanon, Libya, Egypt, Morocco and Yemen. The fodder gap (fodder deficiency) in these countries amounted about /49/ million tons of dry material, /705/ billion mega joule of metabolic energy and /5.4/ million tons of digestive protein. The imported fodder quantities for these countries amounted /26/ million tons of dry material, /348/ billion mega joule of metabolic energy and /3.232/ million tons of digestive protein; all estimated at about / USD 5.5/ billion. The fodder gap will exceed this value when the studies for the remaining countries are finished, and thus the import size will be bigger and the expended amounts will be higher. These numbers and statistic will increase whenever the animal product demands and population number increase; which will lead ultimately to the increase of fodder gap.
- It is coordinated with the following countries (UAE, Bahrain, Iraq, Kuwait and Mauritania) for sending the forms after being filled appropriately with the required information.
- The fodder gap identification is still followed up through the fodder balance reports issued in the Arab countries and the imported fodder quantities and prices.
- Prepare an evaluation table for fodder imports, their nutritional value and the paid amounts for the countries that issued their fodder balance reports.



Project of Fodder Processing From Agricultural Residues and agro-industrial Residues and Improvement of Fodder food Value

Project objective:

Provide low-cost additional fodder resources, control environmental pollution, transfer and localize ACSAD's food value improvement techniques of agricultural residues and agro-industrial residues, raise the food value of agricultural residues and process them, alleviate the pressure on degraded rangelands, optimally use the residues and avoid waste, motivate countries and investors to establish fodder production projects, increase livestock production and breeders' income, create new job opportunities, control fodder import from abroad, utilize optimally conventional fodder, process conventional fodder with a part of the various types of residues (dry and wet, balanced and concentrated) and finally circulate the above mentioned procedures among breeders and help them to implement them.

Project site:

Due to the practical expertise of ACSAD, and for the purpose of implementing the recommendations of the 3rd Conference of Scientific Research and Agricultural Extension Officials in the Arab Region and the decisions of the Executive Council and General Assembly in this term, the Arab Center (ACSAD) has paid a special attention to the implementation of a national project on "fodder processing from agricultural residues and agro-industrial residues and improvement of fodder food value". Currently, it is coordinated with the Arab countries to start up the implementation.

Project progress:

- Prepare the final draft of the project of "Optimal Use and Processing of Agricultural Residues" by ACSAD's financing (ACSAD) and with the participation of four Arab countries which are: Tunisia, Sudan, Iraq and Egypt.
- Agricultural residue improvement machines have been manufactured for the advantage of the project of "Development Response to Alleviate Rural Poverty and Drought Impact in the Northern East Region of Syria", in addition to the manufacturing of a chopping, grinding and mixing machine, hand presses, two grinders, two fodder mixers and nine self-feeding feeders.
- Two agricultural residue machines were manufactured; one for Sudan (by the financing of General Commission for Investment) and the other for Tunisia (by ACSAD's financing).
- A training course was conducted for Iraqi technicians on "Technologies of Agricultural Residues Improvement and Processing as Fodders for Small Ruminants" in Lebanon during the period 23-27/5/2015.



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

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

Since its establishment, the Arab Center (ACSAD) continues its assistance to the Arab countries in the field of animal genetic resources conservation through:

In-situ propagation and conservation: By providing expertise to the Arab countries to establish stations for propagation, improvement and management of local animal genetic resources particularly the promising breeds, or Ex-situ propagation and conservation (embryos or frozen semen).

Within this framework, it was participated in the data documentation of the animal genetic resources form prepared by FAO which aims at getting acquainted with the local organizations activities in the field of local genetic resources conservation.

Study Survey on Animal Genetic Resource Situation in the Northern West Coastal Region of Egypt in Cooperation with Desert Research Center:

- A comprehensive form was prepared on all the activities related to animal genetic resources development in the northern west coast region of Egypt (production types, nutrition and care, veterinary services) and validity tests in terms of the resources' field applicability. In addition to that, a data base was prepared in line with the form data; an Egyptian technical staff was trained on using, filling and entering data; a field survey was conducted in five targeted sectors (Al-Njila, Matrouh, Al-Dabba'a, Al-Hamam and Brani) and finally 30 forms/sector were distributed for data analysis.
- The study recommends setting up appropriate technical plans for sustainable livestock management, proposing suitable service projects according to the results of livestock development field study and finding solutions for development constraints.

Study Survey on Extinction-Endangered Animal Genetic Resource Situation in the Arab Countries:

Based on the recommendations of the Third Conference of Scientific Research and Agricultural Extension Officials in the Arab Region entitled "Livestock Development in the Arid Zones and Sub-Arid Zones" which was held in Tunisia in the year 2013 to evaluate the current situation of genetic resources especially the extinction-endangered breeds in the Arab region (which requires conserving these resources in genetic banks by the interested Arab countries); and for the purpose of implementing the conference recommendation and the decision of the General Assembly in its 32nd session, the Arab Center (ACSAD) has prepared a form containing the international standards for extinction-endangered animals according to the animal species (the sheep and goat species are considered extinction-endangered if their number is less than /10000/ heads. On the other hand, the number should be less than /7500/ heads for cattle, camel and buffalo, /5000/ heads for horse family and /25000/ birds for chicken breed). The form also included the reasons that lead to this decrease, the actions taken by the country to protect the breeds from extinction (whether legal or legislative) and the local or international organizations involved with the protection. The forms were sent to all Arab countries and answers were received from some countries like Algeria, Jordan, Lebanon, Egypt and Oman; the answers of the remaining countries are awaited.



Survey Study on local Chicken Breeding in Some Arab Countries:

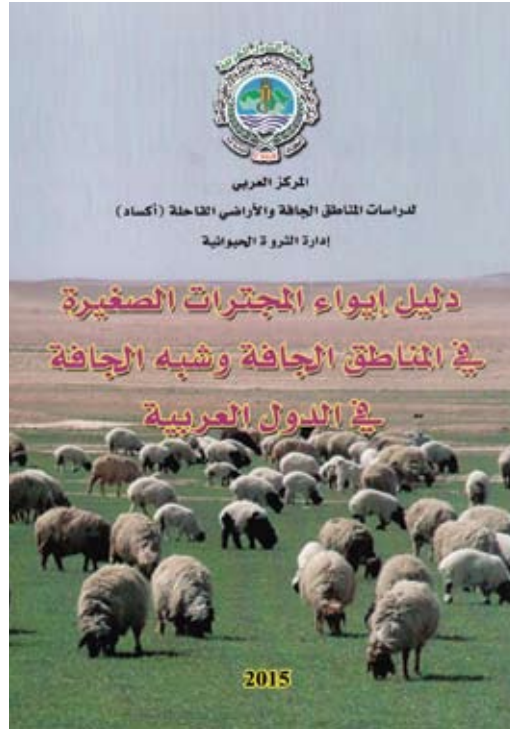
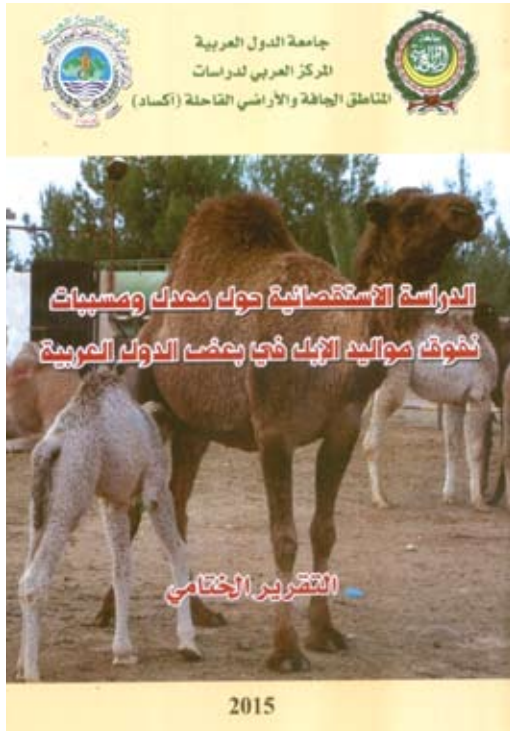
- The study aims at analyzing the actuality of local chicken breeding in some Arab countries to evaluate its productive capacity in a way that contributes to the raising of economic level of poor rural households and achievement of sustainable development. The study was conducted in cooperation between the Arab Center (ACSAD) and the Ministries of Agriculture in Jordan, Iraq, Lebanon,, Syria, Egypt and Yemen through designing a comprehensive form containing all service and economic components in the target countries and collecting data by specialized local teams.
- The study show that the number of local chicken (as a genetic resource) is in a constant decrease for several reasons; some of which are the following: the local chickens are not subject to genetic improvement programs and are not well cared for, fed and protected from diseases, in addition to the random mixing application and the importing of high- productive hybrid foreign breeds that are not capable of living under the breeding conditions as they are bred under intensive or semi-intensive breeding systems. The number of local chicken in Syria is /6.7/ million birds of which /3.9/ million laying birds; while it is about /1.4/ million birds in Yemen, /1/ million birds in Lebanon of which /20/ thousand birds are meat producing hybrid birds and /7.4/ million bi-purpose birds in Jordan. On the other hand, Egypt is considered the most Arab country that pays a special attention to the propagation and improvement of local chicken as its number amounts /71.7/ million birds of which most birds are bi-purpose ones.
- The study show the presence of /14/ local breeds in Egypt, /4/ breeds in Jordan (Al-Baladiyah, Al-Brahma, Al-Farouni and Al-Bakstani), /8/ breeds in Iraq (white, brown, black, striped, neck-bare brown, neck-bare white, Al-Baladi and Al-Brahma), /2/ breeds in Lebanon, /3/ breeds in Yemen (Al-Sahelia, Al-Jabaliah and neck-bare chicken) and /2/ improved breeds (Al-Mzarkash and black breeds) in addition to several hybrid local breeds in Syria. The study also show that 95% of country chickens are raised by traditional methods, 4% is raised in old barns and 1% in modern barns supplied with modern equipment. Most of the local breeds in the Arab countries are poor-productive in terms of eggs or meat, as the egg production ranges between 100-150 eggs/chicken/year, the egg weight is 30-45 g and the bird weight is 850-1700 g.



Publications

For the purpose of enriching the Arab scientific library, the following publications have been issued:

- Guide on small ruminant housing in arid and semi-arid zones in the Arab countries.
- Study survey on animal genetic resource situation in the northern west coastal region of Egypt in cooperation with Desert Research Center.
- Study survey on camel newborns' mortality rate and causes in some Arab countries.
- Practical guide on camel diseases diagnosis.



Water Resources

The Water Resources Department

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

Program of Integrated Water Resources Management:

This program aims at applying 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.

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.

Program of Water Environment Protection:

This program aims at evaluating the impacts of climate change and its extreme aspects on the fresh water resources in the Arab region, providing assistance in the preparation of alleviation and adaptation plans and policies at the national, regional and sub-regional levels and providing 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.



***Implemented Projects of
Water Resources Department***

Project of Arab Water Security

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):

Project objective:

- Present items of participatory executive projects for the Arab strategy for water security in the Arab region to face the challenges and future requirements of sustainable development (2010-2030) in a way that ensures the best management of available water resources, enhances the Millennium Development Goals (MDG) and protects water resources from contamination and depletion.
- 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 site: Arab Countries.

Project progress:

- Prepare an executive plan summary and an explanatory brochure in Arab and English languages to be presented to Arab and International organizations interested in the implementation of the included projects.
- Present the executive plan in its English version along with the summary and the brochure in the 7th session of the Arab Water Ministerial Council held in Cairo-Egypt during the month of May, 2015.
- Follow up the implementation of several projects on integrated water resources management within the framework of the Executive Plan of Arab Strategy for Water Security in the Arab Region. These projects are: the project of "Irrigation Efficiency Raising in the Arab Countries", the project of "Use of Integrated Water Resources Management Tools in the Development of Arab Countries' Capacities to Adapt with Climatic Changes for Issuing a Guide on Adaptation in Agricultural Sector" and the project of "Development of a Water and Climatic Data Base for the Arab Region".
- Contribute to the preparation of the regional track on water and energy issues to participate in the 7th session of the World Water Forum (WWF) in Korea.

2-Project of Integrated Water Resources Management to Achieve 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-Irrigation Efficiency Raising in the Arab Countries.
- 2-Study of Climatic Change and its Impacts on Water Resources in the Arab Countries.
- 3-Expansion of the Use of Non-Conventional Water Resources.
- 4-Integrated Approach Application in Water Resources Management.



Project of Irrigation Efficiency Raising in the Arab Countries

Project objective:

The project aims at finding applicable appropriate actions and tools in the Arab countries to improve water use efficiency for irrigation purposes.

Project site: the interested Arab Countries.

Project progress:

- Form a technical team in the Arab Center (ACSAD) to implement the project and follow-up its activities and interventions.
- Formulate a component of a project on raising irrigation efficiency, prepare the project terms of reference as well as reference studies on evaluation of the actuality of water use efficiency in all Arab countries and their experiences in this field and prepare a comprehensive study on water uses efficiency in irrigation to evaluate the situation of irrigation efficiency in the Arab countries.
- The first project workshop was held in Beirut in May, 2015 and attended by ACSAD's experts, Arab national coordinators from the Arab countries that participate in the project implementation (13 countries) and experts from the Food and Agriculture Organization of the United Nations (FAO), the International Center for Agricultural Research in the Dry Areas (ICARDA), the German Agency for International Cooperation (GIZ) and the Atomic Energy Commission of Syria (AESC).
- Based on the recommendations of the above mentioned workshop, the project document was modified and a new one was prepared including "terms of irrigation efficiency" to unify these terms and facilitate their use among the participating agencies in the project implementation. The two documents were sent to all concerned agencies.
- Receive reference studies on irrigation efficiency in the Arab countries participating in the project implementation.
- Get acquainted with the sent reference studies and start up the preparation of a comprehensive study on irrigation efficiency in the Arab countries.



Project of Study of Climatic Change and its Impact on Water Resources in the Arab Countries

Project objective:

- Being aware of the danger of climatic changes on the Arab region, especially in terms of water resources, the Arab Center (ACSAD) implements the above mentioned project to support the Arab countries' efforts in the development of policies and plans for adaptation with the expected climatic changes. The project is implemented with the participation of the United Nations Economic and Social Commission for Western Asia (ESCWA), the Swedish Metrology and Hydrology Institute (SMHI), the World Metrology Organization (WMO) and the German Agency for International Cooperation (GIZ) and the financing of the Swedish International Development Agency (SIDA).
- The project began in November 2010 as a regional initiative supported by the Arab countries, the League of Arab States and a number of UN organizations and Arab League organizations. The project implementation is scheduled to finish in the year 2016.

Project site: Arab countries.

Project progress:

- Study the climatic changes in the Arab region by using regional climatic models according to a number of different global emission scenarios such as RCP 8.5 and RCP 4.5 for three future periods of time: 2016- 2035, 2045- 2065 and 2081- 2100 successively. The Arab region outputs for the above mentioned range have been reached at a spatial resolution of 1/5/ km.
- The outputs of the previous scenarios have been processed by the Arab Center (ACSAD) and turned into maps by using the Geographical Information System (GIS). ACSAD is working now on analyzing these maps to explain the expected changes and creating maximum and minimum values for the studied climatic elements and the potentials of their change.
- Study the impact of climatic changes on water resources in the Arab region by using Hydrological models.

These models are used to simulate the relation between the rainfall and the surface flow and the relation between the ground and surface water and to identify the rate of evapotranspiration at the same time.

The following hydrological models have been selected for the project:

- 1-The hydrological model (HYPE): proposed by the Swedish Metrology and Hydrology Institute (SMHI).
 - 2-The hydrological model (VIC): proposed by the Swedish Metrology and Hydrology Institute (SMHI).
 - 3-The hydrological model (HEC-HMS): proposed by the Arab Center (ACSAD).
- Complete the application of the first and second hydrological models to identify the impact of climatic changes on the whole Arab region; as the climatic model outputs were used as inputs for the hydrological model and then the changes in the surface flow size and the evapotranspiration rate were identified.
 - Assess the water resources vulnerability and the economic and social impacts of the climatic changes in the Arab region. This phase was implemented in cooperation among the Arab Center (ACSAD), the United Nations Economic and Social Commission for Western Asia (ESCWA) and the German Agency for International Cooperation (GIZ). The sensitivity was estimated by dividing vulnerability into three component: exposure, sensitivity and adaptation.

Project of Integrated Approach Application in Water Resources Management

Project objective:

The Arab Center (ACSAD) has started the implementation of a project on development of a regional economic model for water management in the Jordan river basin entitled "Towards Concerted Sharing: Development of a Regional Economic Model for Water in the Jordan River Basin". This project represents a typical case study in the development of an integrated water management model of a joint water basin; a model which considers the economic- social aspect as a basic component in water management.

The project is implemented in cooperation among the Arab Center (ACSAD), the Jordanian University for Science and Technology, the American University in Beirut, the Jerusalem University in Palestine, as well as the World Food Study Center of Vrije University- Netherlands which serves as a coordinator for the project activities and interventions.

- Develop a model for integrated water resources management in the Jordan river basin that takes into consideration the social and economic aspects in the first place.
- Present a pilot case study for applying water resources management within the joint water basins.
- Disseminate modern techniques in economic water resources management.

Project site:

The Jordan river basin was selected for the project implementation due to its unique characteristics represented by the following:

- 1-It is a common basin among several countries (Syria, Jordan, Palestine and Lebanon).
- 2-The severe competition among the various sectors on the use of the available water resources.
- 3-The presence of a developed agricultural sector which is considered basic for the life of local communities.
- 4-The availability of conventional and non-conventional water resources in the basin.

Project progress:

- Prepare the required climatic maps for the study area and generate final climatic maps 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 two workshops and meetings of experts that were held in Beirut and Amsterdam, where the presented data by all agencies were compared to achieve harmony in data to be used in the model. Training was also conducted on the use of GAMS and GRCP programs used in the model and results were shown in the form of diagrams, tables and maps.
- Complete the mutual research on water establishments in the study area and produce the final report concerning that.
- Prepare a report on the role of women (gender report) in the water resources management in each of Syria, Jordan, Lebanon and Palestine in general, and the study area in particular, while concentrating at the same time on how to list this important component in the economic model that is planned to be built for water resource management within the framework of this project.
- Participate in a workshop for discussing the final phase of the economic model preparation and the future scenarios.
- Prepare a report on the response of all sectors towards the change in the quantity of the available water in the study area (agricultural, industrial and tourist sectors).



Applying Integrated Water Resources Management through using modern tools

Project: Applying modeling in groundwater resources management

1. Project: Expansion of wheat planting area using ground water resources in the Nile and the Northern State in Sudan water study department:

The project aims to assess and survey the available ground water data and information in the Nubian Sandstone basin, implement some hydro-geological survey, account the new drilled wells and update the old drills data, implement geophysical survey using the Vertical Electrical Sounding technique (VES), and interpretation of its results and finally determine the ground water promising areas in the targeted state.

2. Project: Developing ground water model for Akkar plain:

The project aims to use groundwater modeling to analyze the problem of groundwater levels rising in the study area caused by the expansion of agricultural activity, and to propose adequate solutions for better management of ground water resources. The achieved tasks were:

- Preparing a GIS-database for ground and surface water resources in the basin, and preparing the thematic maps needed for groundwater modeling.
- Preparing the ground and surface water budget, including the surface water use for irrigation. This showed that, the excess in irrigation from surface water is the main reason of groundwater levels rising.
- Modeling showed that, groundwater levels could be decreased by decreasing irrigation water amounts, and by applying continues pumping of groundwater. Pumping sites and amounts were also defined.
- Preparing the final technical report. The report analyzes the groundwater levels rising phenomena and includes the thematic maps and proposes adequate solutions to solve the problem.

3. Project: Groundwater modeling of Orontes basin:

The project aims to:

- Study and analyze the conceptual hydro-geological model, and show the main aquifers in the study area.
- Define the flow directions and the hydro-chemical composition of the groundwater in these aquifers.
- Prepare ground and surface water budget for the basin, and assess the natural groundwater reserves.
- Study the interaction between Orontes basin and the neighboring basins.
- Identify the promising areas for groundwater exploitation development in the basin.

Preparing the inputs data for the model:

These tasks were accomplished:

- Collecting and analyzing the hydro-geological survey data for the year 2012, where 3164 water points (130 springs, and 3134 wells) were checked. The total number of pumping wells was estimated of about 54548, for the different water use purposes. This enabled to estimate the groundwater resources in the basin:

1- Main water use sectors in the basin are agriculture sector (irrigation and fisheries), which consume 88% of the total use, and drinking and industrial sector which cover the rest 12%.

2- Repartition of total water consumption on monthly time base. The main pumping period, for irrigation purposes, was from May to August.

- Analyzing groundwater level fluctuation, and preparing the groundwater level maps for different periods during 1979 -2010.
- Studying groundwater recharge from rainfall based on previous studies carried on Orontes basin.
- Building a conceptual hydro-geological model for the groundwater aquifers, that represents the hydro-geological situation in the basin, recharge conditions and actual stresses on groundwater.
- Exporting the groundwater measurement points data, and the general site information.
- Acquiring and analyzing these data with the available database tools.

Linking between water GWD (Groundwater Database) and GIS

Building groundwater flow model

Preparation of model input layers:

- Geological structure and aquifers geometry were built of Orontes basin, by applying Rockworks software and using data from 300 observation wells and geological maps (scale 1/50000 and 1/200000) to build the geological model.

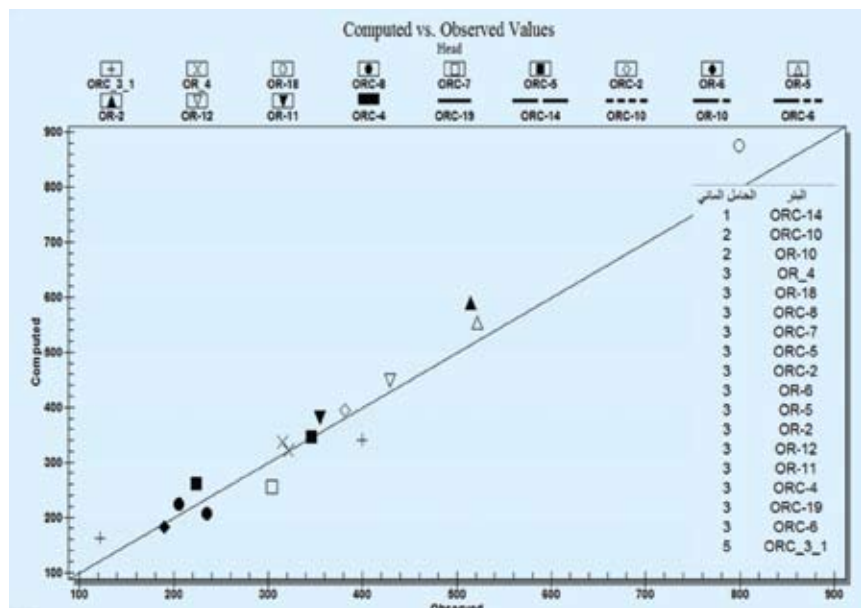
- Initial hydraulic properties layers for the different aquifers.
- Groundwater level contour maps for the main aquifers from Quaternary, Neogene, Neogene basalts, Paleogene and upper Cretaceous to be used in calibrating the model in the steady state.
- Groundwater pumping layers from the different aquifers in the steady state.
- Groundwater recharge for upper layers in accordance with geological outcrops of different aquifers.
- Boundary conditions layers, which describe the water exchange between Orontes basin and the neighboring basins (Aleppo, Badia, Barda & Awage and costal basins) and the international borders.

Set up of the model grid

The grid was built using GMS software on regular cell size base, assuming the continuity of water bearing layers within the study area. The grid consists of 359 line and 134 columns with cell size of 1×1 km². The cells situated within the water bearing layers where defined as active cells (about 17520 cells in the study area).

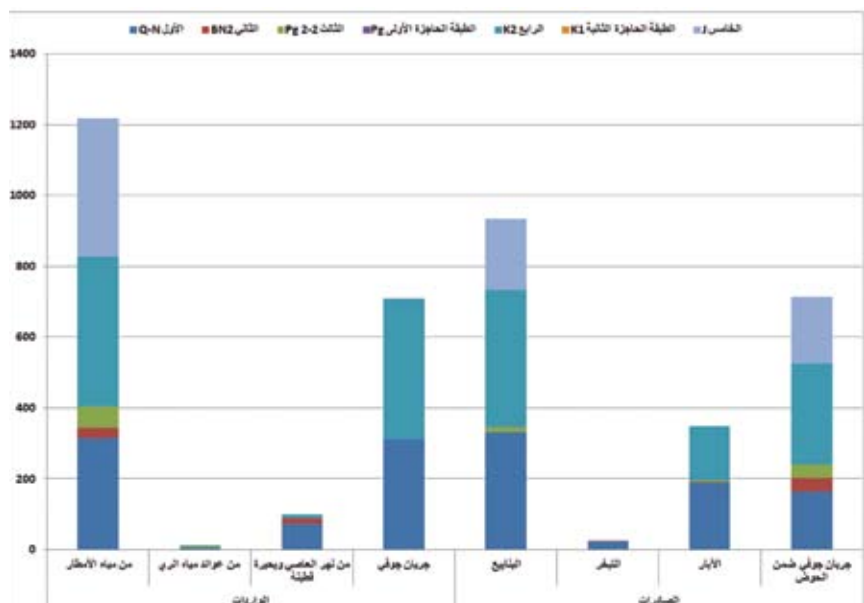
Model calibration:

The model calibration in steady state was carried out using 73 calibration points, out of them 18 exploration wells, 23 springs and 32 observation wells. The observation wells are drilled in the water bearing layers of Quaternary, Neogene, Neogene basalts, Paleogene and upper Cretaceous (Sinnamon Toron age). The calibration showed a Mean Residual-Head of 0.88m, Mean Absolute Residual-Head of 7.92m and a Root Mean Squared Residual-Head of 9.79m. Scheme of steady state model calibration (Series of exploration wells)



Model results for the steady state

The water budgets for different water bearing layers of Orontes basin was calculated using the model, the results showed that the main water incomes are from rainfall recharge, groundwater flow and the return flow from irrigation and seepage from Orontes river; while the water outcomes are discharge through springs, groundwater pumping, groundwater flow and evaporation from very shallow water table.



Project: Regional groundwater model for the coastal basin (Syria)

Project objective:

The project aims to build a groundwater model for the coastal basin in Syria and to estimate the groundwater budget in this basin. This project had been achieved by mathematical representation of the main water bearing and water confining layers, and the use of Modflow model. Different scenarios representing the actual exploitation plan in the basin were applied and the best scenarios to ensure sustainability of groundwater resources were chosen.

Project site: Syrian Arab Republic

Main achievements:

- Completion of interactive data base for the groundwater in the coastal basin, including hydrological, hydro-geological, climatic and water uses data. This database could serve as reference for all water studies in the basin including the current project on groundwater modeling. The concept of this database could be adjusted for any water basin in the Arab world.
- Preparation of a GIS database to be used in data input and preparing the base maps for the model building.
- Preparation, calibration and validation of the modflow model to test any virtual scenarios. The constructed model serves as an effective tool in groundwater management in the coastal area in Syria.
- Issuing a training tutorial about the model building, input data preparation and model output analysis by using the different software (ArcGIS, Visual Modflow, GMS).
- Estimating the groundwater budget for steady and transient state. Eight scenarios were previewed in accordance with the exploitation plan in the basin, to support the decision makers.
- Developing maps for expected groundwater level and the drawdown for all tested scenarios, this enables to carry on comparative analyses between scenarios and to choose the best ones.
- Preparing technical reports, including hydro-geological analyses, description of groundwater bearing layers, estimation of groundwater budget and defining of promising areas. These reports include also technical description of the mathematical model supported by base maps that show the flow directions and alternative exploitation plans for the current one proposed by the water administration in the area.
- Developing recommendations and criteria for the groundwater exploitation plan at both, district and whole basin level.

Project: Developing groundwater model for Damsarkho area – evaluating the impact of sea water intrusion on groundwater quality

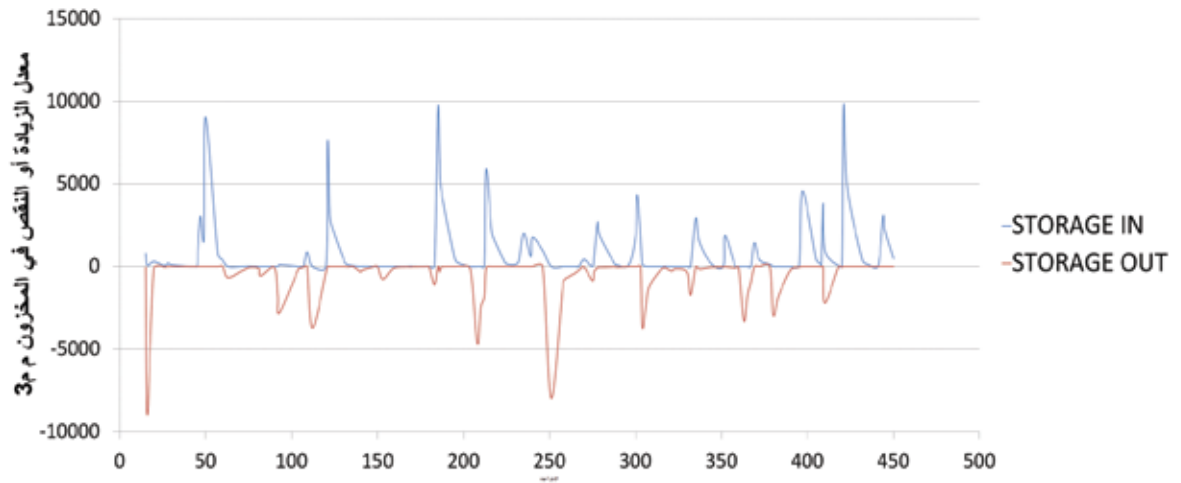
Project objective:

The project aims to assess the current status of sea water intrusion in Damsarkho area, by developing a hydro-geological model and defining the impact of the different proposed groundwater exploitation scenarios to choose the best ones.

Project site: Lattakia governorate, Syrian Arab Republic

Main achievements:

- Collecting data (Geological, Hydro-geological, Hydro chemical) about the study area.
- Building interactive database and checking the available information on the water points.
- Building Geo-Database for Damsarkho area, serves as a reference for the future water studies.
- Preparing a hydro-geological study for Damsarkho area.
- Developing a mathematical model for sea water intrusion in Damsarkho to serve as a base for the future hydro-geological studies.
- Running the model under different scenarios to predict the hydraulic response. These scenarios are;
 - 1) Keeping the same actual water pumping until 2020
 - 2) Duplicateing the pumping rate,
 - 3) Gradually reducing water pumping on a period of 10 years,
 - 4) Reduction of rainfall recharge by 20% per two years and finally,
 - 5) Maintaining the groundwater level at a depth of at least 50 cm from the soil surface.
- 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 assures a stability in groundwater head 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.
- Recommendations and criteria for groundwater exploitation in Damsarkho were made.



Daily ratio of increase or decrease in the groundwater reserve, during the calibration period in the steady state

Project of Rainfall Water Harvesting

Project of Al-Hammad Basin Development in Iraq:

Project objective:

Based on the wish of the Iraqi Ministry of Agriculture to cooperate with the Arab Center (ACSAD), the project aims at updating the studies and surveys conducted previously in the Iraqi Al-Hammad basin in order to face the big degradation that has occurred in the northern and southern steppes that constitute the Iraqi Al-Hammad basin.

Project progress:

Based on the discussions with the Iraqi delegation of the Ministry of Agriculture during its visit to the Arab Center (ACSAD), the two parties agreed on starting up the implementation of Al-Hammad Basin Development project in two phases:

Phase 1:

It aims at evaluating the current actuality and taking the necessary actions for constructing rainfall water harvesting establishments to develop the vegetation cover and provide a sustainable water source of ground water.

Phase 2:

It includes the evaluation of water resources in the whole study area and the identification of the promising areas in terms of water resource availability and utilization potentials.

During these two phases, the reports on surface and ground water resources have been prepared and have included the following:

The preliminary report on water resources (February/ 2013):

Following the contract which was signed between the two parties and aimed at analyzing the climatic study, updating information in the field of water resources (surface and ground) and setting up the necessary proposals for that, the available climatic data, studies and reports provided by the Iraqi side, in addition to the results of field surveys and well sites identification, have been evaluated and analyzed.



The second interim report (December/ 2013):

The preparation of this report aimed at updating the previously prepared study by the Arab Center (ACSAD), evaluating water resources in the main basins and identifying the means of surface water flow utilization. Under the framework of that, the report illustrated the potentials of sustainable ground water utilization in the promising areas of Al-Hammad basin in Iraq.

The final report (January/ 2105):

This report aimed at identifying the promising areas in Al-Hammad basin, in terms of surface and ground water resources availability to set up developmental plans for sustainable water resources utilization in the whole area of Al-Hammad basin, and preparing the appropriate proposals for that. Under the frame-

work of that, the necessary special-purpose maps were prepared, the hydrological or hydrographic basins were identified, the water resources, according to the followed methodology in the promising areas identification, were evaluated, and the situation of ground water was illustrated by identifying the geological carriers of ground water, their vertical and horizontal directions, and the change in their general geological properties that affects their hydrological state from one site to the other. In addition to that, a general evaluation of ground water was conducted and proposed areas for utilization were identified.

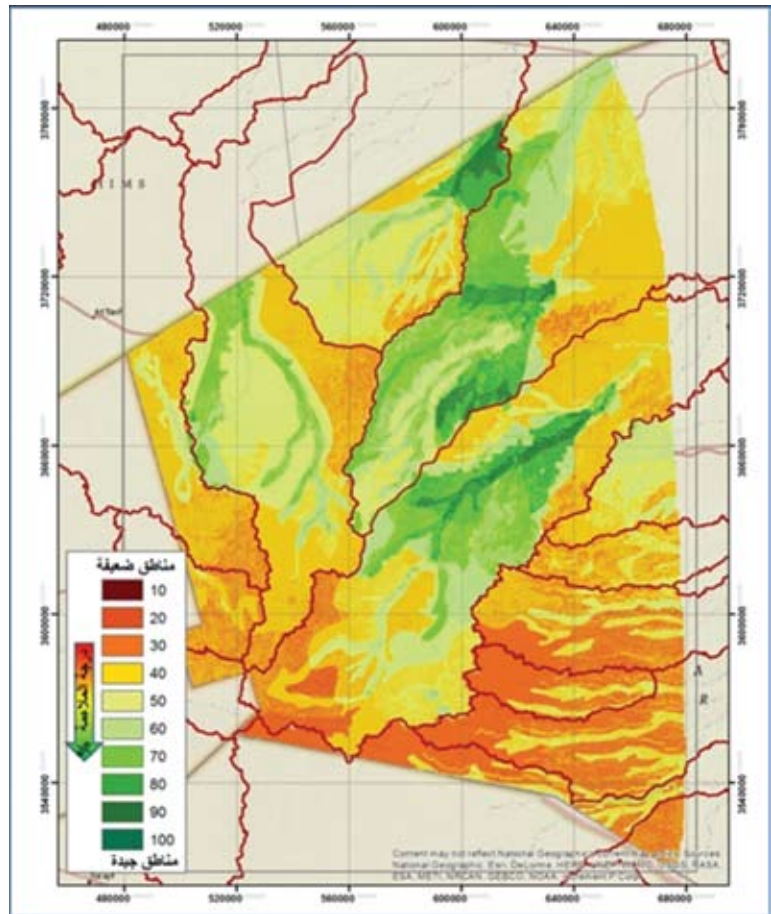
The study of dikes and aquifers:

The previous implemented dikes, aquifers and some other establishments were reviewed and the Iraqi side was provided with the technical opinion in this regard. Among the studied dikes and aquifers are: Zamlet Horan, Al-Aghri, Al-Hseirat, Al-Boua'aissa , Sad Kasser Altaf and Sad Kasser Ghleisan aquifer.

After that, certain sites, which proved to be economically and technically feasible for constructing water establishments, were proposed, taking into consideration the distribution of population according to the economic and social survey of Al-Hammad basin development. Among these sites are: Wadi Al-Herri site (2 aquifers and 2 dikes), Al-Retmi site (2 aquifers and 3 dikes), WadiA'amej site (2 aquifers and 2 dikes), Wadi Al-Walj site (2 aquifers and 1 dike), Sawsan village (2 aquifers and 2 dikes), Khabari Al-Khbbabsite(1 aquifer and 1 dike), Al-tabba'at site (2 dikes) and Wadi Horan site (3 aquifers and 1 dike).

Activities, training courses and field visits during the project implementation period:

- Participate in the periodical evaluation meetings of the project activities.
- Participate in scientific seminars and present lectures on the application of integrated management approach in Al-Hammad basin.
- Prepare and circulate scientific papers on "Comparability Analyses of the SPI and RDI Metrological Drought Indices in Arid Climatic Zones: Case Study of Al-Hammad Basin".
- Implement a number of training courses in the following fields:
 - 1-Implementation of water studies and supervision of digging.



- 2-Field survey activities.
- 3-The how-know of utilizing the flows of water resources.
- 4-Development of rainfall water harvesting establishments.

Conduct field visits that included the following:

- 1-Getting acquainted with the activities of Al-Hammad desert oasis project.
- 2-Conducting a field tour to the sites of dikes and aquifers implemented by the project management in Iraq (field visits to Al-Sawabb area).
- 3-Visiting Al-Anbar university and getting some research information on certain sites in Al-Hammad basin.
- 4-Visiting Al-Anwa'a climatic station in the city of Al-Akkashat.
- 5-Visiting the General Commission for Ground Water Wells Construction.
- 6-Organizing and participating in the final meeting of the experts of Al-Hammad Development Project in Beirut- Lebanon, 17- 20/12/2015, aiming at reviewing the technical reports that were prepared by ACSAD's experts based on the field studies and tours, agreeing on what is mentioned in the report after taking into consideration the remarks of the Iraqi side concerning the reports sent in September 2015 and getting acquainted with the technical plan of an integrated development program for developing the whole region and achieving the optimal and sustainable use of the natural resources in Al-Hammad basin. After reviewing the technical reports and the results reached during the life time of the project and discussing the above mentioned technical plan, they two sides agreed on the following:
 - The phase of updating the studies of Al-Hammad development project in Iraq is considered finished by the end of the final meeting on 17/12/2015 and ACSAD has been committed to its obligations according to the project agreement signed with the Ministry of Agriculture in Iraq.
 - The coordination is continued between the two sides in terms of the studies and researches.

The investment program for the project of updating the Iraqi Al-Hammad basin studies for the year 2016 has been developed. This program serves as a future work plan for rising up with the developmental situation of Al-Hammad basin in Iraq in a way that serves the sustainable development process and supports the local communities' income.

The hydrological study of Al-Hammad basin in Iraq aims at updating the previously conducted studies and surveys in the Iraqi Al-Hammad basin which is located among Saudi Arabia, Jordan, Iraq and Syria in order to face the big degradation in the northern and southern steppes of Al-Hammad basin, update information and knowledge in the field of surface and ground water resources, evaluate the present actuality and identify promising areas in terms of water resources availability and investment plans.

Proposed projects for implementation:

- Support of climatic and surface water observation networks.
- Construction of observation wells for supporting ground water observation network.
- Construction of aquifers and dikes in different areas of Al-Hammad basin in Iraq.
- Valley and rainfall water harvesting and spreading.
- Sand terraces establishment.
- Desert depression establishment.

Rainfall Water Harvesting in the Eastern Region of Syria:

This project is implemented in the crisis-affected areas in Syria in cooperation among the Arab Center (ACSAD), ACF-the Spanish Action against Hunger Institution and the Syrian Ministry of Agriculture. It aims at providing additional water sources for farmers in Al-Hasakeh, Al-Raqqa and Deir Ezzor governorates by applying rainfall water harvesting techniques.

The concerned targeted area suffers from the scarcity of water resources as the annual waterfall average amounts about 140 mm only and the ground water is characterized by its high salinity and big deepness. Therefore, this project was suggested for house-roof rainfall water harvesting to provide water for flock watering.

ACSAD's expertise in several Arab countries proved the potential of adaptation with the negative impacts of climatic changes, including drought, by using the different techniques of rainfall water harvesting.

The challenge faced by collecting rainfall water from the roofs of houses in the target area is that most houses are made of clay. To deal with this problem, it was suggested to establish a concrete layer over the roof with a thickness of 5 cm so that it would be possible to collect rainfall water.

Project progress:

- Hold meetings with the local communities, explain the proposed techniques and listen to their own

points of view.

- Select the buildings on which the rainfall water harvesting techniques will be applied in consultation with the local community. /22/ buildings have been selected to implement the harvesting process in the villages of Kherbet Al-Tamr, Al-Seiha and Al-Badiea'a.
- Construct a layer of concrete over the clay roofs and collection tanks made of reinforced concrete, and implement a pipe network to transport water from roofs to tanks.
- Develop a plan for controlling the water quality in the tanks and prepare a list of the necessary analysis.
- Develop a plan for maintaining the rainfall water harvesting establishments after installment.
- Identify an aquifer site for rainfall water harvesting located at 1.3 km away from Al-Tamr village. The area of the water pouring basin of this aquifer is 35 km².



Project of Optimal Utilization of Surface Water Resources-Water Harvesting, Management and Utilization in Al-Haqqar Area in Tamnratst State in Algeria

Project objective:

The project aims at the optimal utilization of surface water resources by applying the suitable water harvesting techniques, controlling floods to alleviate the negative impacts of climatic changes, ensuring sustainable development, training and rehabilitating technical staffs and raising the performance level in the field of analysis and observation.

Project site:

State of Warqala, Al-Haqqar area in Tamnratst, the Democratic People's Republic of Algeria.

The most important achievements:

- Collect the available climatic and water data and prepare maps and reports.
- Collect the available topographic maps for the study area by the side of the governorate and submit them to ACSAD in their digital form and in the form of compacted CDs.
- Identify the first formula of "DEM" by using the program of "Google Earth", conduct the images and topographic maps processing and extract the digital altitude model.
- Get several climatic data such as:
 - 1-Daily, monthly and annual climatic data of Tamnratst station over a period of /40/ years.
 - 2-Daily and monthly climatic data of Askarim station.
 - 3-Some water data of Tamnratst basin.
 - 4-Identify and locate the climatic stations at the study area on the site map.
 - 5-Prepare a list of surface and deep wells and identify some of their characteristics.
 - 6-Get the coordinates of the climatic stations in Tamnratst and several water establishments after conducting a field visit.

In terms of the maps and data analysis and processing, the following activities have been implemented:

- Start up the development of a data base, analyze and process the available data and maps to prepare



the first interim report on the knowledge situation and evaluate the current state of water resources in Tamnratst basin.

In terms of the conducted surveys and field visits, the following activities have been implemented:

- Identify and propose the site of hydrological parameters station as a site for the hydrometric station in Tamnratst basin.
- Conduct field visits and surveys in Tamnratst basin in coordination with the working team in Warqala governorate and get the coordinates of several hydrological stations, establishments and sites in Tamnratst basin.

Training course organization:

- Organize a training course on "Climatic and Hydrological Measurement Networks and Data Analysis and Processing" during the period 13-18/09/2015 in Warqala in which /10/ technicians and hydrology specialists participated.

Project of Water Resources Management in Irrigated Areas by Using Modern Techniques

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

This project is implemented within the framework of cooperation between the Arab Center (ACSAD) and the Desert Research Center in Egypt. It aims at developing a pilot developmental model for one of Al-Qassabeh basin valleys; a region that has relatively a limited amount of rainfall. This is done through:

- Studying the soil and water resources and suggesting techniques for rainfall water harvesting.
- Developing the pastoral vegetation cover and introducing new varieties of horticultural crops.
- Increasing the efficiency of water resources in a way that reflects positively on the local community's living standards and improves the environmental conditions.
- Studying the potential of expanding the applications and outcomes of this model to other valleys in the basin, especially the valleys of the northern west coast of Egypt and other similar regions in the Arab countries.

Project site:

Al-Qassabeh basin/ Bajoush- the northern west coast region- Matrouh.

Project progress:

- Collect the previous studies on the available water resources and the development potentials in the northern west coast and the study area (Al-Qassabeh/ Baoush).
- Conduct field tours to make sure of the information, investigate the development potentials, select the work sites and get acquainted with the local community and its requirements.
- Prepare the nursery for cultivating pastoral plants and horticultural crops to be used in the development program of the region.
- Cultivate /15/ thousand seedlings of Australian orchard and about /370/ seedlings of new horticultural varieties sent by ACSAD.
- Purchase a hydrometric station to measure the surface flow rate in one of the valleys that represents the study area.
- Select the work area as an extension model that can be repeated in other areas of Al-Qassabeh basin/Bajoush and other water basins in the northern west coast of Egypt.
- Conduct field surveys and studies and other office and testing activities including:
 - 1-Natural vegetation cover.
 - 2-Soil properties.
 - 3-Topographic, geomorphologic and hydrological studies of Al-Qassabeh basin/ Bajoush.
 - 4-Climatic data analysis of the study area.
- Technical committee and leadership committee meetings.
- Collect previous studies on the resources and development potentials of the northern west coast in general and Al-Qassabeh area/Bajoush in particular.

Field tasks:

Seven field tours have been conducted to the work site aiming at:

- Investigating the area of Al-Qassabeh basin/ Bajoush in terms of the geographical site, physical properties, population activities and the followed systems in water resource conservation....etc.
- Reviewing the data and information of the basin valleys in terms of the area, borders and local names of these valleys.
- Conducting the field surveys of soil properties, vegetative cover and hydrological establishments to get acquainted with their characteristics and dimensions...etc.
- Cultivating and monitoring the horticultural plants received by ACSAD and the pastoral shrubs in the nursery of the sustainable development center.
- Conducting interviews with the area's population to get acquainted with their livelihood conditions, developmental requirements and the potentials of their participation in the project activities implementation.
- Preparing a nursery for plant care.
- Cultivating pastoral shrubs and horticultural seedlings.
- Cultivating the horticultural plants sent by the Arab Center (ACSAD).
- Purchasing and installing a system for measuring the water balance in AbouJrouf valley to get acquainted with the available water potentials for development in the region.

The typical site selection:

A number of field visits have been conducted in the valleys of Al-Qassabeh basin/ Bajoush to get acquainted with their morphological characteristics and population activities, in addition to several interviews with the local community. In the light of the above mentioned visits and interviews, it was agreed on Sakhr valley as a typical site for study.

Conducting of surveys and field, laboratory and office studies:

A number of surveys and field, laboratory and office studies have been conducted concerning the valleys of Al-Qassabeh basin/ Bajoush in general and the valley of Sakhr in particular. **These surveys and studies included the following:**

Topographic and hydrological surveys of Al-Qassabeh basin/ Bajoush:

The actions taken regarding Al-Qassabeh basin can be summarized in the following points:

A-Identify the geographical site and area of Al-Qassabeh basin/ Bajoush.

B-Conduct the photo scanning of these maps to turn them from hard copy to digital copy.

C-These maps have been corrected or subject to engineering conversion by using ArcGIS program to get maps with known geographical dimensions.

D-Conduct the digital processing for the contours and the elevation points of the topographic maps.

E-Convert the elevation points and contours into a digital elevation model (DEM) at an accuracy of 5 m 5 x m by using "ArcMap Interpolation Tool".

F-Analyze the digital elevation model to detect the water tracks inside the basin. Based on that, /14/ main valleys and other tiny water tracks have been detected.

G-Conduct field visits to the study area to find out its actual situation and check out its borders.

H-Study the soil properties in the area of Sakhr valley.

I-Collect, process and analyze the climatic data of Al-Qassabeh basin/ Bajoush.

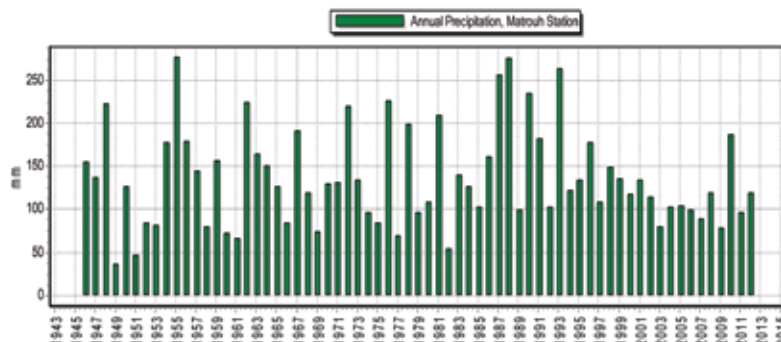
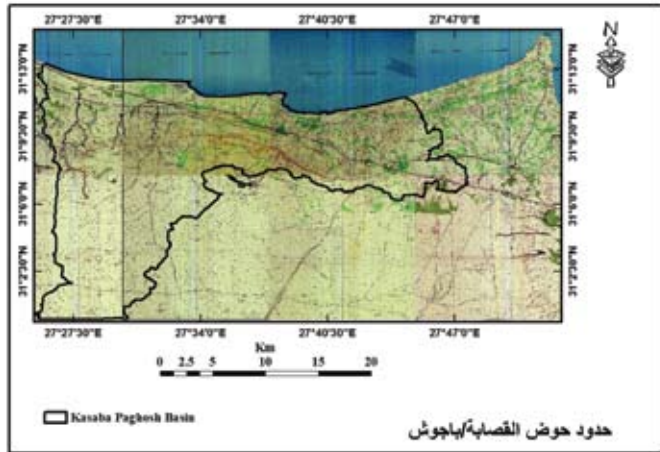
J-Evaluate the basin characteristics and the water intake in the basins in terms of the geo-morphological and hydrological studies.

K-Prepare the first interim report.

Project of Establishment of a Model for Developing the Valleys of the Northern West Coast Region in Egypt:

-The cultivations in the northern west coast region of Egypt are characterized by low productivity and instability due to several reasons; the most important of which is: rainfall scarcity, fluctuation and incompliance with the critical periods of the plant growth. Under such circumstances, rainfall water harvesting techniques are considered very important in saving additional quantities of water to be used in meeting a considerable part of water requirements for rainfed cultivations in the critical periods.

-This project was implemented in cooperation between the Arab Center (ACSAD) and the Desert Research Station in Egypt. It aimed at setting up a model for developing the valleys of the northern west coast region of Egypt; in particular the valleys of Halak Al-Dabea'a and Hashem.



Project of Preparation of an Annual Report on the Available Water Resources:

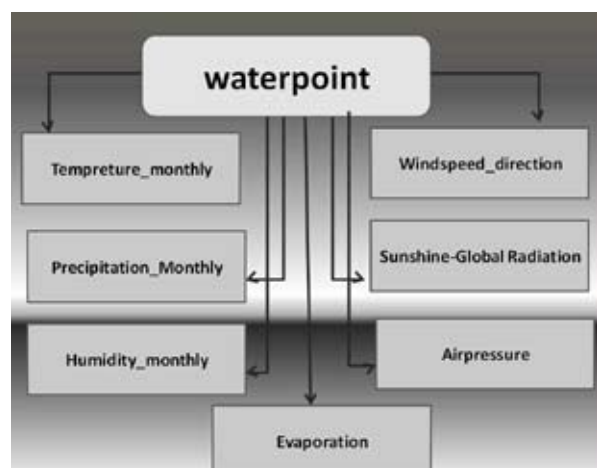
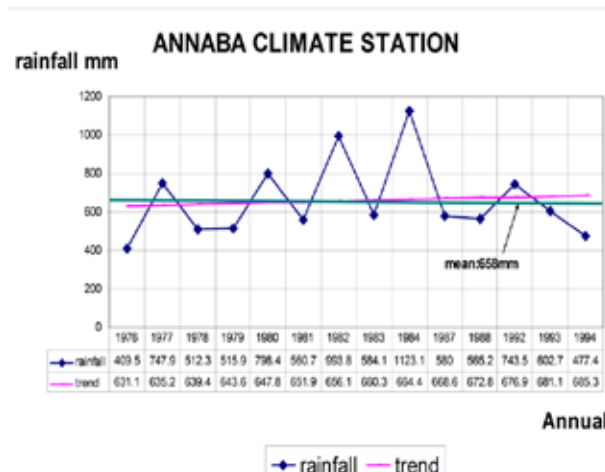
Project objective:

It aims at establishing a data base for available water resources in the Arab countries and updating it regularly to serve the sustainable development process and provide the necessary information and data to ensure the success of two projects namely; the project of study of climatic change impacts on water resources in the Arab region and the project of establishment of a joint water data base in the Arab region to help the decision makers in the process of water resource management.

Project progress:

The current program for water resource data bank has been developed in a way that it has become able to manage and process a number of data bases for different countries and water basins, as each data base represents a separate water basin. The current program can deal with all water basins and link among the different data of the basins or countries to intercross and collect the information from the data bases of the different countries and water basins. In general, it can be used in any country or for any basin instead of the previous data bank that used to deal with only one data base for connection. The illustrated screen below can be entered by pressing on the location of the required basin's country in the map which will lead to the appearance of the screen of the required country or basin and then to the screen of the data of the selected country or data base. By this process, the following can be done:

- Import the daily data of the climatic stations, rivers and springs.
- Import the data of the pumping experiments.
- Export the water points data to the GIS programs.
- Import the water data of the Arab countries, especially the climatic data, and direct it into the base.



Project of Adaptation with Climatic Changes in the Arab Region

1-Project of Vulnerability Assessment of Water Resources in the Arab Region and its Economic and social Impact:

This phase was implemented in cooperation among the Arab Center (ACSAD), ESCWA and GIZ, as an integrated methodology was developed for studying the vulnerability of the Arab region in the sectors of agriculture, water, environment, infrastructure and population. At the beginning, the vulnerability study standards were developed for each sector and then the necessary data were collected and the special-purpose maps were prepared by using the GIS. These data were evaluated by special committees in which experts from the Arab countries had participated.

Project objective:

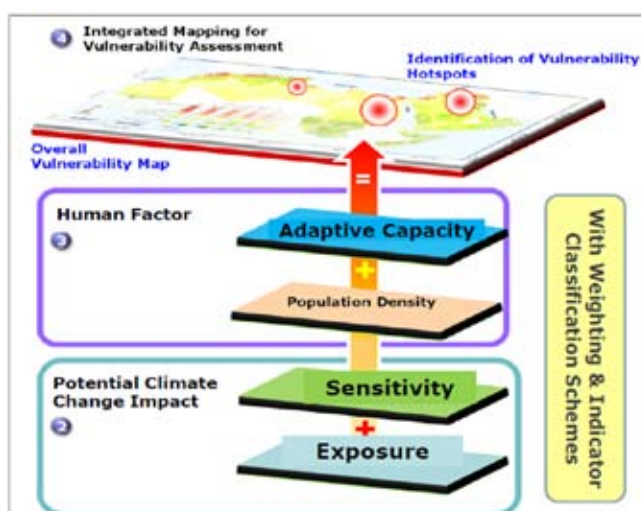
Identify the most vulnerable areas to climatic changes (the hot spots) in the Arab region in the sectors of water, agriculture, environment and infrastructure by using the Geographical Information System (GIS).

Project site: All the Arab countries.

Project progress:

• The Arab Center (ACSAD) has played the role of the main executor of vulnerability indicators maps in terms of providing the necessary information from the world data bases and then reviewing and improving it. For the purpose of that, the Arab Center (ACSAD) has prepared several maps at the Arab region level in two forms; the first form represents the real value of the indicator and the second one represents the vulnerability classification of the indicator. Of these maps are the following:

- The map of the actual irrigated areas.
- The map of the rainfed areas.
- The map of the areas prepared for irrigation.
- The map of the vegetation degradation for the period 2000- 2011.
- The map of the most flood- endangered areas.
- The map of the livestock distribution (goats, sheep and cattle) for the year 2005.
- The map of the forest cover degradation for the year 2000- 2013.
- The hydrological map.
- The digital elevation map (DEM 90 m) and the ArcGIS map.
- The vegetation cover map.
- The map of soil distribution and classification for the year 2014.
- The map of dam distribution with the actual storing capacity of each dam.
- The map of the areas supplied with dams.



• On the other hand, the Arab Center (ACSAD) has participated in the achievement of the weighing process which was used to classify the importance of indicators by using the (1-10) range; as /1/ would mean “less important” and “10” would mean “very important”. These weights were entered into the geometric aggregation equation and represented the participation of ACSAD in the development of a questionnaire that was distributed among experts in the fields of environment, climate and water from most Arab countries, in addition to /15/ experts from ACSAD who participated also in answering the questions of the questionnaire.

• The Arab Center (ACSAD) also participated in the preparation of a training guidebook on the “Integrated Vulnerability Assessment Methodology” which was distributed among all Arab countries, in addition to its participation in all periodical meetings and workshops organized up to date in the framework of the project of “Assessment of Vulnerability of the Arab Region to Climatic Changes”.

• The proposed methodology was tested in Tunisia where detailed data were available. Based on this assessment, the methodology was modified and a training manual was prepared to explain the work method in details. The manual will be at the disposal of the Arab countries so that they can apply the proposed methodology at the country level. The Arab Center (ACSAD) also cooperates with ESCWA in the application of this methodology on the whole Arab region.

2-Project of Sea Water Intrusion Control in Al-Hazemieh Region- Beirut:

Project objective:

The project aims at implementing a detailed study on the potential of mitigating the phenomena of sea water intrusion and ground water balance decrease by using the artificial feeding of ground water. The region of Al-Hazemieh in Beirut has been selected based on the suggestion of the Ministry of Energy and Water in Lebanon. The project is implemented in cooperation among the Arab Center (ACSAD), GIZ, the Ministry of Energy and Water in Lebanon and the American University in Beirut.

Project site: Beirut- the Republic of Lebanon.

Project progress:

- Build an integrated data base for hydrological, hydro-geological and climatic information and water use information in the region of Al- Hazemieh. This data base is considered as an important reference for all kinds of potential hydrological studies in the region.
- Analyze and characterize in details the actuality of water uses in Al- Hazemieh region by utilizing the field survey data and statistical analysis techniques.
- Implement a field survey for the quantity and quality of the surface water and rainfall water to evaluate the surface water resources.
- Conduct a detailed hydrological study for the region and develop a conceptual model that expresses the conditions of ground water storing and movement in Al-Hazemieh region. This helped in calculating the ground water balance.
- Study the different choices for mitigating this phenomenon including: water deficiency decrease, sanitary drainage water treatment, rainfall water harvesting, surface water outflow increase by dike using and water pumping inside deep ground wells.
- Prepare an integrated technical report describing sea water intrusion in Al-Hazemieh region in Beirut, Lebanon and illustrating the potentials of controlling this phenomenon with the necessary tables, figures and diagrams.

3-Project of Development of Arab Countries' Capacities to Adapt with Climatic Changes by Using Integrated Water Resource Management Tools:

Project objective:

The Arab World is considered one of the most suffering countries of the world in terms of water resource scarcity. Its lands are considered highly sensitive to the climatic changes. The Arab region is vulnerable to severe climatic changes more than any other region in the world; the reason that requires a double effort to deal with these changes in terms of the impact evaluation and the alleviation and adaptation mechanisms identification. The project aims at developing the capacity of institutions in the Arab countries to adapt with the climatic changes by using the tools of integrated water resource management in a number of main sectors (agricultural, health, economic and population sectors) through the preparation of a guidebook for adaptation in each one of the above mentioned sectors.

Project site:

The project is implemented in cooperation among a number of partners; namely: 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 Center (ACSAD), the Arab Countries Water Utilities Association (ACWUA), the World Health Organization/the Regional Center for Environmental Health Action (WHO/CEHA) and the German Agency for International Cooperation(GIZ).

Moreover, /22/ Arab countries are involved in the project implementation through the participation of experts, technicians and administrative officers from the water and agriculture sectors in training workshops that rehabilitate them to become capable of training on using the manual and utilizing it in the decision making process.



Project progress:

The project has been prepared to be implemented in several phases as illustrated in the executive diagram below. Currently, the Arab Center (ACSAD) is implementing a manual for adaptation in the agricultural sector for the years 2015-2016 through joint effort between the Water Resources Department and all other departments of ACSAD on one hand and the German Agency for International Cooperation (GIZ) on the other. The Arab Center (ACSAD) has also participated in the experts meeting that was held in the headquarters of ESCWA in Beirut where the components of the guide and the suggested training materials by ACSAD were discussed, the remarks were taken into consideration, all necessary modifications were made and the manual was finalized before the holding of the training course.

The manual was translated into Arabic and the training course was held and attended by representatives of a considerable number of the Arab countries. The training was conducted by ACSAD's experts on the use and utilization of the manual.

All the remarks were taken from the participants and other participating agencies, and the final modifications were made in the manual to be finalized before its official issuing.

4-Project of Evaluation of Climatic Change Impact on the Productivity of Some Agricultural Crops in the Arab Region:

Project objective:

The project is implemented in cooperation among the Arab Center (ACSAD), the Food and Agriculture Organization of the United Nations (FAO), the German Agency for International Cooperation (GIZ) and the United Nations Economic and Social Commission for Western Asia (ESCWA). The aim is to study the impact of the climatic changes on some main agricultural crops in the following regions:

- Governorate of Karak in Jordan: the crops of wheat and barley have been studied.
- Orontes basin in Lebanon: the crops of eggplant, potato and corn have been studied.
- The northern Delta region in Egypt: the crops of wheat, corn and cotton have been studied.

Project site: the Hashemite Kingdom of Jordan, the Lebanese Republic and the Arab Republic of Egypt.

Project progress:

•The climatic change impact on the agricultural crops has been identified by using the mathematical model (Aqua Crop) that was developed by FAO to study the relation between water and crop productivity. The project can take the climatic changes into consideration by modifying the data inputs of maximum temperature, minimum temperature, rainfall and CO₂ concentration of the atmosphere according to the studied climatic scenarios.

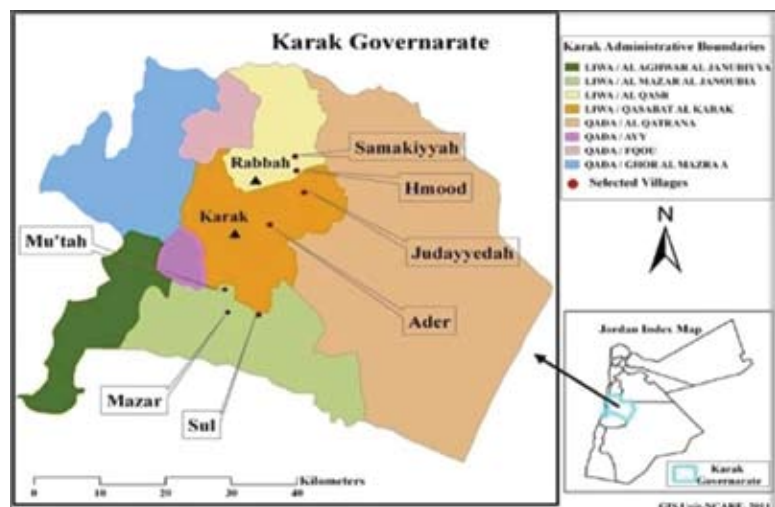
The work methodology included the following stages:

- Collecting the measured climatic data of the three study areas for a period not less than /10/ years.
- Identifying the climatic changes of temperature and rainfall according to different global emission scenarios (RCP8.5 and RCP4.5).
- Collecting the data of soil, irrigation and field management for the target study areas.
- Calibrating the mathematical model by using the control plants to get acquainted with the productivity of the studied crops.
- Identifying the climatic change impact on the crop productivity, growth period and water requirement by using the mathematical model (AquaCrop).

The studied climatic scenarios:

The study has taken the following climatic scenarios into consideration:

- The high emission scenario (RCP8.5).
- The medium emission scenario (RCP4.5).



The results of the study showed that according to the worse scenario (RCP8), the rainfed wheat crop productivity in the governorate of Karak in Jordan would decrease by about 5% in the mid of the current century (2046-2065) and 55.3% in the end of the century due to high temperature and annual poor rainfall average. This decrease in the wheat productivity would be much lesser if the CO₂ concentration was taken into consideration.

The results of the study also showed that according to the worst scenario the potato productivity in the Orontes basin region in Lebanon would increase by about 5% in the mid of the current century and about 11% in the end of the century. Similarly, this decrease would be much lesser if the CO₂ concentration was taken into consideration.

In the northern Delta region in Egypt, the corn productivity would increase by 1.5% in the mid of the current century and 9% in the end of the century. The study also showed that the increase in temperature would lead to the decrease in the crop growth period and water requirement.

5-Project of Expansion of Non-Conventional Water Resources Use:

This project aims basically at providing the scientific and knowledge base for expanding the use of all types of non-conventional water resources in the Arab region to provide more water resources that meet the future requirements and control water deficiency.

6-Project of Agricultural Drainage Water Reuse to Adapt with Climatic Changes in Egypt:

Project objective:

- Conserve the sustainability of surface water resources through the joint utilization of surface irrigation canal water and agricultural drainage water and ensure the protection of natural resources at the same time in the study area.
- Provide an extra water resource which can cover the water deficiency in summer season, particularly in the areas located at the end of Al-Mishawieh irrigation canal including the study area of Al-Mahmoudieh.

Main Achievements:

- The area of Al-Mahmoudieh, as an area suffering from water deficiency and located at the end of one of the irrigation canals in the governorate of Al-Bheira in the north of Egypt, has been selected as a study area in coordination with the Ministry of Irrigation and Water Resources and the German Agency for International Cooperation GIZ.
- Study the typical site in terms of collecting, analyzing and processing the necessary data to install a mobile pump and use it in mixing the water of the agricultural drainage with the Nile river water for irrigation purposes.
- Study several potentials for pumping the water of drainage canal into the irrigation canal to reuse the agricultural drainage water. The choice of installing a mobile pump during the water deficiency period (the three months of summer) has been selected provided that environment-friendly pumps that depend on solar energy would be used at the field level taking into consideration the activation of the role of "local water use associations" in the target area.
- Purchase a mobile pump (which was used in the last season for the benefit of farmers) and conduct the monitoring activities including samples taking and analysis.



Economy and Planning

Economic and Planning Department

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

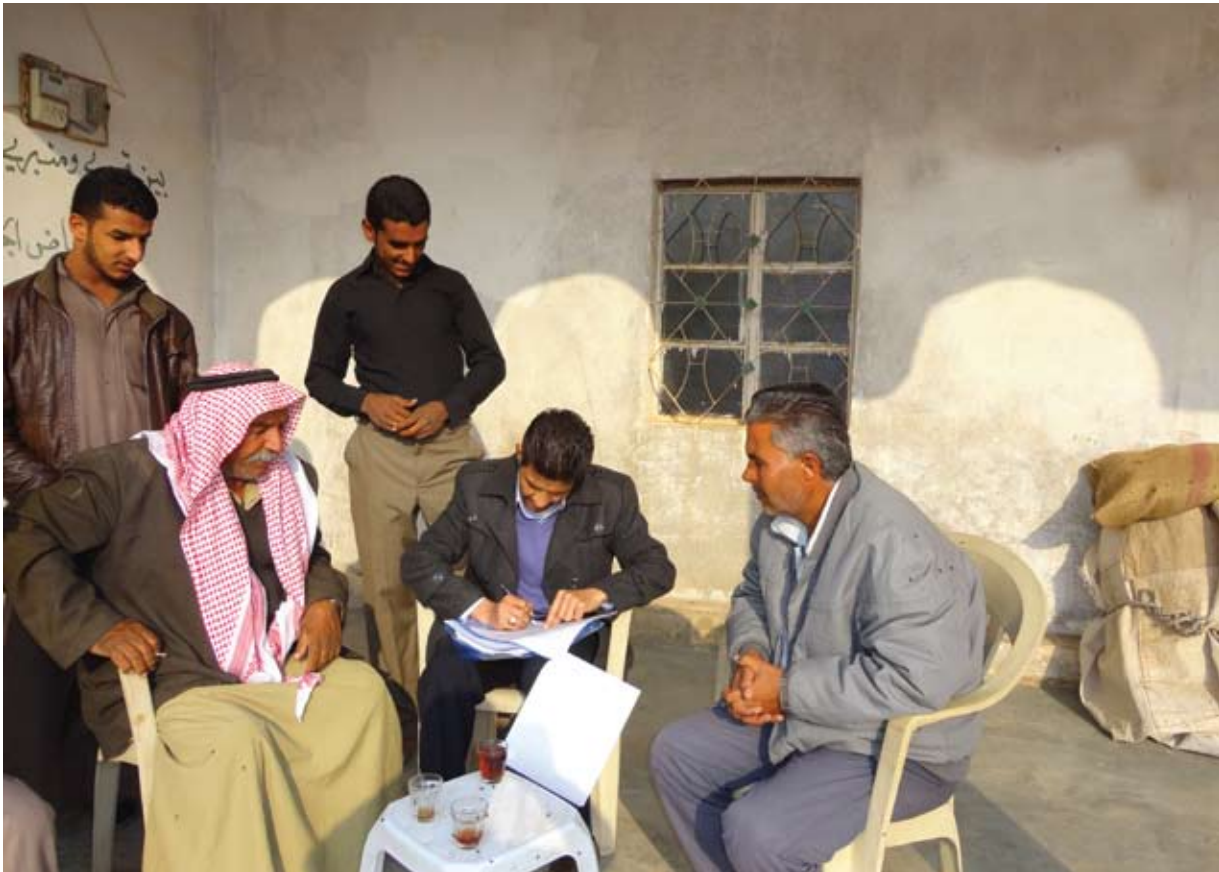
1-Economic and Social Studies Program:

This program aims at:

- Solving 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.
- Implementing economic feasibility studies for the results reached by the conducted researches and technical-economic feasibility studies for the implemented pilot developmental projects.
- Disseminating the research results and developed techniques based on national economic basis and developing rural woman.

2-Knowledge Management and Localization Program:

This program aims at achieving 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.



***Implemented Projects of Economic and
Planning Department***

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 progress:

1-Study of Rangeland Actuality and Development Tools in the Arab Countries (Jordan, Algeria, Syria and Oman):

This study has been issued in the year 2015 and has recommended the unification of Arab efforts through cooperation between the Arab center (ACSAD) and national research centers for the purpose of protecting rangelands and organizing their utilization with the local community's participation, especially in terms of desertification issue. The study has confirmed the importance of paying a special attention to the scientific research and concentrated on the economic importance of the rangelands and the necessity of finding out the appropriate methods and tools for their development. Through its work, the Arab Center (ACSAD) has found several procedures that could be followed to achieve natural rangelands development. The study has also reached certain proposals and recommendations for improving rangeland and facing their degradation reasons and has confirmed the great importance of the participatory approach and the role of women in sustainable rangeland development.

2-Identification of the Economic Importance of Genetic Improvement of Local Sheep and Goat Breeds in the Arab Countries:

For the purpose of implementing ACSAD's plan for the year 2015 -2016, the final stage for the preparation of a study on "Identification of the Economic Importance of Genetic Improvement of Local Sheep and Goat Breeds in the Arab Countries" is under implementation for the purpose of evaluating the activities of ACSAD's research stations that have been conducted for long years in the fields of genetic improvement and productive and reproductive characteristics improvement of sheep and goats, measuring the impact of genetic improvement on the production increase of meat and milk, studying the economic reflection of the achieved production increase and studying the genetic improvement feasibility to set up recommendations that comply with the objectives of the study in lighting up the role of ACSAD in the field of breed improvement and dissemination in the Arab countries.

3-Technical and Economic Study on Treated Water Uses in the Arab Countries (under implementation):

Following ACSAD's plan for the years 2015 and 2016, this study is currently implemented to get acquainted with the actuality of the treated drainage water in the Arab countries, its use as a non-conventional water source for irrigation and its importance, characteristics and treatment methods. The study also aims at studying the efficiency and economic and environmental aspects of irrigation with treated brackish water and its impact on the agricultural crops productivity, the role of ACSAD's projects in this field in several Arab countries and the technical and economic dimension of using developed techniques in these projects. Two forms have been prepared (one for the producer and the other for the consumer) to collect data on the impact of using this type of water by the producer and the consumer of agricultural products irrigated with this type of water.



Project of Agricultural Extension Development in the Arab Countries

Project objective:

- Enhance the exchange of experts and coordination and cooperation among the Arab extension systems.
- Transfer ACSAD's research results to the beneficiaries including farmers and breeders.
- Conduct applied extension researches in the Arab countries and corrective studies for the agricultural and rural development projects especially those that include an agricultural extension activity.
- Train the Arab staff in the fields of agricultural extension, concentration on participatory approach process and the provision of consultation services.

Project site: All the Arab countries.

Project progress:

1-Developmental Response to Alleviate Rural Poverty and Drought Impact in the Northern East Region of the Syrian Arab Republic:

• The Arab Center (ACSAD) has worked recently on the access to the crisis-affected areas to participate in alleviating the suffering of the rural community and contribute to the mitigation of damages resulted by the crisis. Within this framework, the Arab Center (ACSAD) is implementing the activities of a project on "Developmental Response to Alleviate Rural Poverty and Drought Impact in the Northern East Region of the Syrian Arab Republic" in cooperation with the Spanish Action against Hunger-ACF.

• Concerning the economic-social component, an analytical study on the value chain of milk and its products has been implemented in the governorates of Al-Hasakeh, Al-Raqqa and Deir Ezzor. The studied sample has included /100/ beneficiaries of livestock breeders in the project villages to identify the marketing chain of animal products, identify the effective elements in this chain, get acquainted with the basic constraints for marketing processes and provide appropriate visions and solutions for the problems.

• The study has reached a set of recommendations that contribute to the development of the area and the achievement of the project overall objective by implementing the following:

• Supervising the implementation of three income-generating micro enterprises in each of Al-Hasakeh, Al-Raqqa and Deir Ezzor for processing dairy and cheese products where the beneficiaries were provided with the necessary supplies to establish a workshop for collecting and processing milk (dairy and cheese products) according to sound scientific principles and provide direct- selling outlets to the consumer in a way that ensures an additional value for the product and the beneficiaries of the project.

• Preparing the rules of procedures for managing the income-generating enterprises by the participatory approach. These rules of procedures should identify the responsibilities and obligations of each beneficiary and the know-how of management and profit distribution.

• Implementing training courses on marketing issues for the technicians and beneficiaries of the project; /6/ courses on small enterprises establishment, /6/ courses on financial analysis, and /6/ courses on milk and its products processing at a rate of /2/ courses in each field/governorate during the years 2014 and 2015.

• Designing the final survey form for the final economic-social study of the project and collecting data. The data then has been analyzed and the final report has been prepared.

Implementation of the project economic-social study:

For the purpose of identifying the benefits achieved by the project for the beneficiaries, the final survey has been conducted after completing the implementation of all the project components in order to:

- 1-Identify the changes achieved in the social and economic characteristics of the project beneficiaries.
- 2-Identify the impact of the project activities on the production and productivity of the breeders and



farmers.

3-Get acquainted with how far the recommended modern techniques by the project have disseminated among farmers and breeders.

The final survey has targeted 60% of the project beneficiaries (83 farmers and 138 breeders) and the study has reached two sets of conclusions; the most important of which are the following:

First-The target community of conservative agriculture:

1-Most of the farmers (83%) have achieved an increase of about 30% in their production and a decrease of 20% in the production cost due to the adoption of conservative agriculture system. The total net monthly income of the beneficiary has increased by 33.8% at the end of the project.

2-The number of farmers who own tractors, harvesters, agricultural equipment and water tanks have increased by 11.3%, 8.3%, 5.9% and 10.9% respectively.

3-The holdings of sheep and lambs have increased by 30.8% and 77.8% respectively.

4-The cultivated area with wheat crop has increased by about one hectare and the seeding rate has decreased by about 50% at the time of the final survey, while the cultivated area with barley has increased by more than 50% and the seeding rate has decreased to 32 kg/ha.

5-The lentil revenue has increased by more than 40% and the seeding rate has decreased to 28 kg/ha.

6-All farmers have applied the agricultural rotation at the time of the final survey; most of them (76%) have adopted the legumes-cereals rotation.

Second-The target community of animal production:

1-The average of animal number/breeder has increased during the project period by 16%.

2-The agricultural machinery and equipment possession (including trucks, tractors, water tanks, trailers and motor cycles) has increased by 19.3%, 16.9%, 23% and 40.8% respectively.

3-The deficit in fodder (barley) and wheat has decreased by 21.5% and 14.4% respectively. On the other hand, the deficit in concentrated fodder including wheat, barley, corn and bran has decreased by 24.9%, 70%, 60.8% and 34.7% respectively.

4-The rate of breeders who present vitamins to their flocks has increased from 34.7% (at the beginning of the project) to 88.4% (at the end of the project).

5-The rate of breeders who present concentrated fodder to their ewes and rams during the mating season has increased to about 93% at the end of the project.

6-The rate of breeders who feed their flocks according to the extension experts' advices has increased from 30.4% to 80.5%.

7-The economic and social conditions of breeders has improved well and very well during the project period by 34.5% and 7% respectively. On the other hand, the rate of poor and very poor breeders has decreased by 33.8% and the annual net income has increased by 73%.

2-Project of Early Improvement of the Crisis-Affected Households Conditions in the Plant and Animal Production Sectors in the Governorates of Dara'a and Al-Hasakeh:

- The project was implemented in cooperation with the Spanish Action Against Hunger organization (ACF) and financed by the Swiss Agency for Development and Cooperation (SDC). It aimed at contributing to the interventions of emergent cases, providing livelihood means earlier to the crisis-affected population in the agricultural sector in Syria and improving its economic situation. The project was implemented in the governorates of Dara'a and Al-Hasakeh.

- The project was entirely implemented and the aim of the study was to identify the most important economic and social characteristics of the breeders and farmers at the beginning of the project so that the data would be a base for the project impact evaluation. The study has reached several conclusions identifying the economic and social actuality of the beneficiaries; the most important of which are the following:

- The project has played a big role in helping the vegetable farmers to face their productive problems by providing them with the necessary agricultural pesticides and some irrigation equipment in a way that



helps them to maintain the productive process. 82% of the interviewed farmers said that their income had increased by more than 15% as a result of the use of the agricultural inputs and that their skills and knowledge on the integrated vegetables management had improved as most of them (70%) had attended the extension activities of the project.

- The project has helped the livestock breeders to maintain their few numbers of animals, which are considered the probably the only source for their livelihood, by providing them with the necessary fodder, veterinary medicine and training and thus improving their income and protecting them from poverty. The project has increased the sheep holding rate by 36% as the holding size has increased from 11 to 15 heads/household and the project has conducted training for more than 90% of the beneficiary women.

3-Project of Livelihood Support for the Crisis-Affected Communities in Syria- SDC:

- The project aims at providing and improving food security for 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.
- Several activities have been implemented including the following:
 - 2000 beneficiaries have been selected for the project, of which /1000/ are beneficiaries from Dara'a governorate and /1000/ are beneficiaries from Al-Hasakeh governorate (500 beneficiaries of farmers and 500 beneficiaries of breeders for each governorate).
 - A field survey has been conducted in both governorates to make sure of the beneficiaries' compliance with the selection standards. Also, a preliminary survey has been conducted to identify the economic and social actuality of the beneficiaries and their necessary requirements in addition to the ways that can be followed by the project to help them. These surveys have reached the following conclusions:
 - The average age of the target cereal farmer is about 50; most of them belong to middle-size families (about 7 members), depend on rainfed agriculture, own small holdings (less than 2 hectares) that generate income of no more than 122000 SYP annually and cultivate their land with wheat which yields no more than 2115 kg/ha in Dara'a and 1550 kg/ha in Al-Hasakeh. The surveys have also shown that the rate of beneficiaries attending training activities in the cereal production field is only 12%; most of them are suffering from high cost of production inputs, lack of fertilizers and seeds.
 - The average age of the target breeder is about 50; most of them belong to small-middle size families (about 6 members) and all of them depend on animal production as a main source for income (a small holding of only 10 heads of sheep generating an amount of 89800 SYP annually). They depend on fodder barley in feeding their animals and the woman plays an important role in animal breeding but doesn't attend any kind of training in this field. The data has shown that the most important problem of the breeders is the lack and high cost of fodder.
 - Identify the suppliers of veterinary and agricultural materials and contract with them.
 - Distribute a quantity of 300 kg of hard wheat seeds that is sieved, sterilized and adopted by the Ministry of Agriculture and Agrarian Reform for each beneficiary from the agricultural component (1000 beneficiaries in both governorates) in addition to a kit of agricultural inputs.
 - Distribute a quantity of 500 kg of fodder barley for each beneficiary from the animal production component (1000 beneficiaries in both governorates) in addition to a kit of 11 necessary veterinary medicines for each breeder.
 - Implement 25 water harvesting units for 25 beneficiaries; as the water roof-harvesting has been adopted as a model for rainfall water harvesting for the beneficiary households.
 - Implement a training course for the field, technical and extension managers in the two governorates in the plant and animal production sectors.
 - Select 6 veterinary agents in the two governorates to attend a training course in the fields of animal care and animal diseases diagnosis. The trainees have been provided with veterinary kits that contain a set of necessary veterinary medicines and tools.
 - The field team has 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.



4-Project of Emergent Support for the Crisis-Affected Households in the Fields of Food Security and Water in Syria:

•The project has started in April 2015. It aims at contributing to the provision of emergent assistance and early improvement of agricultural producers in the governorates of Dara'a and Al-Hasakeh by improving the agricultural and water conditions of the crisis-affected community in Syria.

•Several activities have been implemented including the following:

•2000 beneficiaries have been selected for the project; of which /1000/ beneficiaries are from Dara'a governorate and /1000/ beneficiaries are from Al-Hasakeh governorate (500 beneficiaries of breeders, 250 beneficiaries of cereal farmers and 250 rural women for the home garden component in each governorate).

•Several field surveys have been conducted in both governorates to make sure of the beneficiaries' compliance with the selection standards and identify the economic actuality of the beneficiaries and their necessary requirements in addition to the ways that can be followed by the project to help them. These surveys have reached the following conclusions:

- The average age of the plant production beneficiary is about 53; most of them belong to small-middle size families, depend on rainfed wheat agriculture with an average yield of about 1900 kg/ha and own small holdings (less than 2 hectares) of which only the half is cultivated and generates an annual income of 100000 SYP. The surveys have also shown that the most important problem of the beneficiary is the lack of fuel, fertilizers and seeds and the high cost of agricultural inputs.
- The average age of the target breeder is 48; he has about 7 children and depends on animal breeding as a main source for his income (a small holding of about 9 heads generating an amount of 128000 SYP annually). Most households have been forced to sell a part of their flocks to purchase fodder for the remaining flocks. The surveys have shown that most breeders depend on fodder barley (which they buy from markets at a high cost) in feeding their animals and that the rural woman plays an important role in animal breeding but doesn't attend any kind of training in this field. Moreover, the most important problem of the breeders is the lack, high cost and low quality of fodder.
- Most women benefiting from the house gardening component depend on irrigated vegetables cultivation in small areas (as a main source for their income estimated at 60000 SYP annually). They have not attended any kind of training in the field of vegetable cultivation in spite of their active role in the production process. The data has shown that the most important problem that the target woman faces is the high cost of vegetable seeds and the lack of fertilizers, pesticides and agricultural tools.
- Identify the suppliers of veterinary and agricultural materials and contract with them.
- Distribute a quantity of 300 kg of hard wheat seeds that is sieved, sterilized and adopted by the Ministry of Agriculture and Agrarian Reform for each beneficiary from the agricultural component (500 beneficiaries in both governorates).
- Distribute 500 agricultural baskets on the rural women, each basket contains a set of vegetable seeds (spinach, cucumber, lettuce, squash, cabbage, cauliflower, tomato, spinach beet and parsley) and agricultural equipment (leveling comb, shovel, water tube and green house nylon for covering the seedlings).
- Distribute a quantity of 500 kg of fodder barley for each beneficiary from the animal production component (1000 beneficiaries in both governorates).
- Implement a training course for the field, technical and extension managers in the two governorates in the plant and animal production sectors.
- The field team has implemented about /25/ training sessions in both governorates to raise the awareness of the beneficiaries in the fields of animal and plant production sectors and home gardening.



The Fourth Conference on "Development of Scientific Research and Agricultural Extension in the Arab Countries"

For the purpose of implementing ACSAD's plan and the resolutions of Executive Council and General Assembly, the fourth conference on "Development of Scientific Research and Agricultural Extension in the Arab Countries" was held in the Arab Republic of Egypt during the period 12 -13 /3/ 2015 under the title of "Development of Wheat and Barley Cultivation in the Arid and Semi-Arid Areas".

The conference has discussed the working papers of the Arab Center (ACSAD) and the country papers of the participating delegations of /11/ Arab countries. The papers have addressed the problems faced by wheat and barley cultivation in the Arab region, the ways for developing this cultivation and the necessity of unifying Arab efforts to face the constraints of this development.

At the end of the conference, the participants have agreed on the following proposals and recommendations:

- Enhance cooperation and coordination between the agricultural research centers in the Arab countries which are interested in wheat and barley cultivation and the Arab Center (ACSAD) in the field of development of wheat and barley cultivation.
- Encourage the Arab countries to develop strategies for wheat and barley cultivation development.
- Urge the Arab countries to increase the cultivated areas with ACSAD's superior created varieties.
- Authorize the Arab Center (ACSAD) with the mission of establishment of an Arab data base for the scientific research results and outputs in the field of wheat and barley cultivation development.
- The agricultural research centers are committed to send the results of the annual experiences for these two crops, provided that the experiences should be real and accurate.
- The meetings of agricultural research officials are continued to be held periodically provided that the scientific research official and the agricultural research official from each country are invited.
- The fifth conference on "Development of Scientific Research and Agricultural Extension in the Arab Countries" will be held in the year 2017 under the title of "Desertification Combat and Control in the Arab Countries".



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.

Activities:

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

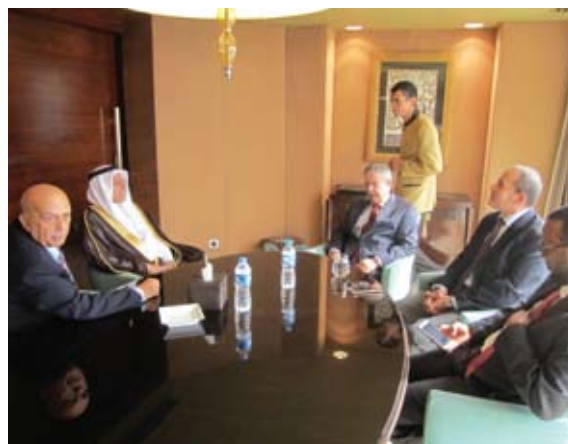
The Arab Center (ACSAD) has established cooperation relations with all Arab countries through bilateral agreements with the Ministries of Agriculture, Environment and Water in these countries under its annual work program. The Arab Center (ACSAD) is implementing its activities in more than (17) member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



Program of Knowledge Management and Localization

The Arab Center (ACSAD) has maintained its commitment to the development of 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:

- Complete the preparation and implementation of ACSAD's website in English language.
- Complete the preparation of a database for invasive plants and post it on ACSAD's website in Arabic language.
- Establish an electronic gate, in coordination with the Arab Journal for Arid Environments, for the essays that are published in the journal.
- Currently, an electronic gate is prepared, in coordination with the Agriculture and Water Journal, for the essays that are published in the journal.
- In coordination with the Animal Wealth Department, the database of animal diseases in the project of "Developmental Response to Alleviate Rural Poverty" is still under experimental investment.
- In coordination with the Water Resources Department, several modifications have been implemented on the water basin databases including the following:
 - 1-Link directly the database with the Geographical Information System GIS.
 - 2-Develop the "dams" database, calculate the intake and consumed quantities of the dam water automatically, list the calculations in the database, activate the possibility of data import and provide new reports as outputs.
 - 3-Build a program for water data processing to serve as inputs for the mathematical models.
 - 4-Build a program for calculating water balance by the data output of the mathematical model.
 - 5-Present the database of the "Annual Report on the Available Water Resources in the Arab Countries" in the workshop that was held in Beirut with the attendance of the countries participating in the project. The database has been adopted and the work has been launched to provide the necessary data and implement several modifications suggested during the workshop.
 - 6-Implement the modifications that are required for the water basins database and provide the entire technical support for the project. Several new programmatic tools have been established also based on the request of the departments.
- Update constantly ACSAD's website in a way that reflects the recent state of ACSAD's programs, projects and activities.
- In cooperation with the technical departments, the work has been started to prepare the content of the scientific essay's paragraph at ACSAD's website, which has started to appear progressively on the website in the year 2015.
- Provide technical support and maintenance to the programmatic supplies and equipment that are internally invested; as most technical support and maintenance operations have been implemented by the information technology staff who has achieved the maximum response and saved the financial cost of technical support and maintenance.
- Start up the implementation of the technical and programmatic studies concerning the proposal of "Electronic Archive System" for ACSAD's knowledge content.

Conferences and Seminars

- Participate in a workshop organized by the Higher Commission for Scientific Research of the Ministry of Higher Education in Syria under the title of "Scientific Research Outputs Marketing and Investment" where the Arab Center (ACSAD) has participated with three posters on the most important stories of ACSAD's success in the recent years.
- Participate in the Arab Woman Conference under the Developmental Agenda of 2015- 2030 which was held in Cairo during the period 29 /11- 1/ 12/ 2015. An intervention by ACSAD was presented in this conference under the title of "Some Successful Stories of the Arab Center (ACSAD) in the Field of Rural Woman Empowerment in the Arab Countries"; and a session was head by ACSAD under the title of "Arab Woman, Oceans and Biodiversity".
- Participate in the 38th conference of IFAD Governing Council in Rome- Italy during the period 17/ 2/ 2015. A meeting was held with the officials of IFAD where certain projects were proposed to be implemented in cooperation between the Arab Center (ACSAD) and IFAD; and discussions were held to enhance the mutual cooperation in the field of sustainable rural development.

Publications

Within the framework of ACSAD's purpose to enrich the Arab Scientific Library:

A study has been issued under the title of "Study of Rangeland Actuality and Means of Development in the Arab Countries". This study is considered the first reference on rangelands in Arabic language.

***Human Resource Development and
Technology Transfer***

The issue of transferring the scientific technology and knowledge which are appropriate to the Arab environmental conditions is considered one of the main pillars of ACSAD's strategy. This pillar depends mainly on the development of human resources working in the fields of development and environment in the Arab arid and semi-arid areas by organizing training courses and exchanging expertise and experiences through scientific seminars and conferences.

In the year 2015, the Arab Center (ACSAD) could organize /21/ training courses in all of its work fields; in which /232/ technicians participated from all Arab countries, and /45/ scientific meetings; in which more than /250/ experts and technicians participated to exchange expertise and transfer scientific results.



Implemented Training Courses:

- Training course on “Use of Artificial Insemination Technique for Sheep” implemented at ACSAD’s headquarters during the period 25-29/1/2015 for /9/ trainees from the Ministry of Agriculture and Agrarian Reform in Syria.
- Training course on “Improved Milk Processing, Quality Control Standards and Milk Preservation Techniques” implemented in Deir Ezzor during the period 2-5/2/2015 for /21/ breeders benefiting from ACF project in Deir Ezzor.
- Training course on “Geographical Information Systems” implemented in Beirut during the period 7-11/3/2015 for /2/ officers from Water Resources Department in ACSAD.
- Training course on “Use of Artificial Insemination Technique for Sheep and Goats” implemented in Jordan during the period 28/2-4/3/2015 for /10/ agricultural engineers and veterinarians from the Ministry of Agriculture in Jordan.
- Training course on “Use of Modern Supplies to Monitor Soil Humidity and Salinity” implemented in Tunisia during the period 11-15/5/2015 for /17/ trainees of agricultural engineers from the Ministry of Agriculture in Tunisia.
- Training course on “Use of Artificial Insemination Technique for Small Ruminants” implemented in Lebanon during the period 29/5-4/6/2015 for /5/ agricultural engineers from the Ministry of Agriculture in Iraq.
- Training course on “Techniques of Agricultural Residue Improvement and Processing as Fodders for Small Ruminants” implemented in Lebanon during the period 29/5-4/6/2015 for /5/ agricultural engineers from the Ministry of Agriculture in Iraq.
- Training course on “General Relations, Social Morals and Protocols” implemented at ACSAD’s headquarters during the period 4/4-5/7/2015 for /30/ trainees from the Arab Center (ACSAD).
- Training course on “Emergent Support in the Fields of Food Security and Water for the Crisis-Affected Households in Syria” implemented at ACSAD’s headquarters during the period 27-30/7/2015 for /6/ trainees from the project field team (ACF) in the governorates of Dara’a and Al-Hasakeh.
- Training course on “Livelihood Support for the Crisis-Affected Community in Syria” implemented at ACSAD’s headquarters during the period 27-30/7/2015 for /6/ trainees from the project field team (ACF) in the governorates of Dara’a and Al-Hasakeh.
- Training course on “Animal Health Care and Animal Disease Diagnosis and Treatment” implemented at ACSAD’s headquarters during the period 6-10/9/2015 for /3/ trainees from the project field team (ACF) in the governorates of Dara’a and Al-Hasakeh.
- Training course on “Geographical Information Systems and Land Use Change Mapping” implemented in Algeria during the period 13-17/9/2015 for /10/ trainees from the Ministry of Agriculture and Rural Development in Algeria.
- Training course on “Climatic and Hydrological Measurement Networks and Data Analysis and Processing” implemented in Algeria during the period 13-17/9/2015 for /10/ trainees from the Ministry of Agriculture and Rural Development in Algeria.
- Training course on “Remote Sensing Techniques” implemented at ACSAD’s headquarters during the period 13/10-3/12/2015 for /7/ trainees from Water Resources Department in ACSAD.
- Training course on “Modern Technique Use in Local Goat Development” implemented in Algeria during



the period 17-24/10/2015 for /10/ trainees from the Ministry of Agriculture and Rural Development in Algeria.

- Training course on “Agricultural Service Operations of Drought-Tolerant Fruit Trees” implemented in Algeria during the period 17-23/10/2015 for /7/ trainees from the Ministry of Agriculture and Rural Development in Algeria.
- Training course on “Filling and Use of Field Survey Form” implemented in Algeria during the period 28-29/10/2015 for /16/ trainees from the Governorate of Agricultural Development in Algeria.
- Training course on “Gender Issue” implemented at ACSAD’s headquarters on 4/11/2015 for /11/ trainees from the team of the project of “Livelihood Support for the Crisis-Affected Community in Syria-ACF”.
- Training course on “Safe Use of Treated Water and its Solid Residues (sludge) in Agriculture” implemented in Damascus (Directorate of Agricultural Extension) during the period 15-18/11/2015 for /35/ trainees from the Directorate of Agricultural Extension in the Ministry of agriculture and Agrarian Reform in Syria.
- Training course on “Fodder Processing from Crops and Plant Residues for Agricultural Animal Feeding” implemented at ACSAD’s headquarters during the period 22-23/11/2015 for /4/ trainees from the team of the project of “Emergent Support in the Fields of Food Security and Water for the Crisis-Affected Households in Syria”.
- Training course on “Satellite Images Interpretation” implemented in Italy during the period 13-20/12/2015 for /8/ trainees from the Water Resources Department.



Scientific Meetings:

- Participate in the “Annual Conference of International Fund for agricultural Development- IFAD” held in Rome during the period 16-17/2/2015.
- Experts’ meeting under the workshop of “Building an Economic Model for the Optimal Management of Water Resources in the Jordan River Basin” held in Beirut during the period 23-26/2/2015.
- “First Coordinative Meeting of National Coordinators of the Project of Green Belts in the Arab Regions” held in Lebanon during the period 24-25/2/2015.
- “4th Conference for Scientific Research and Agricultural Extension Development in the Arab Region- Development of Wheat and Barley Cultivation in the Arab Region” held in Cairo during the period 12-13/3/2015.
- “Coordination and Start up Meetings of the Project of Study of Camel Grazing Systems, Breeders’ Income Improvement and Expertise Exchange in Algeria” held in Warqala state in Algeria during the period 22-26/3/2015.
- “First National Conference for Animal and Poultry Breeding and Diseases” held in Hama during the period 19-22/4/2015.
- Meeting to discuss the roles of the potential partners in the project of “Water and Food Security Enhancement and Capacity Development in the Arab Region” held in Beirut during the period 31/3-1/4/2015.
- Participate in the “First National Conference of Animal and Poultry Breeding and Diseases” held in Hama during the period 19-22/4/2015.
- Meeting to discuss the “Draft Agreement of Water Resources in the Arab Countries and Means of Arab Water Rights Protection” held in Cairo during the period 28-29/4/2015.
- Workshop on “Sustainable and Integrated Water Management in the South of the Mediterranean” held in Beirut on 6/5/2015.
- Participate in a lecture entitled “ACSAD’s Expertise in the Field of Agricultural Residue Processing and Use in animal Feeding” in the Conference of “New Visions in Sustainable Housing” held in the campus of Al-Ba’ath university during the period 11-12/5/2015.
- International conference on “Integrated Management of Water and Soil Resources in Dry areas under Climatic Changes” held in Tunisia during the period 11-14/5/2015.
- Workshop on the project of “Irrigation Efficiency Raising in Arab Countries” held in Lebanon during the period 19-20/5/2015.
- “5th Consultative Governmental Meeting to Complete the Study of the Project of Framework Agreement on Shared Water Resources among the Arab Countries” held in Cairo during the period 23-26/5/2015.



- Participate in the “20th Technical Conference of Arab Agricultural Engineer Union” held at the Syndicate of Agricultural Engineers in Damascus during the period 24-26/5/2015.
- “12th Meeting of Consultative Scientific Technical Committee of Arab Water Ministerial Council and Meeting of Leadership Committee of the Regional Program on Adaptation with Climatic Change in Water Sector in the Middle East and North Africa” held in Cairo during the periods 24-26/5 and 28/5/2015.
- Workshop on “Monitoring of Building and Calibration of an Economic Hydrological Model for Jordan River Basin” held in Netherlands during the period 30/5-14/6/2015.
- Participate in a seminar on the “Use of Remote Sensing Techniques in the Field of Land Degradation and Agricultural Drought Monitoring” held in Egypt during the period 6-11/6/2015.
- Workshop on the project of “Climatic Change Impact on Water Resources in the Arab Region” held in Beirut during the period 7-10/6/2015.
- Participate in a workshop on “Presentation of Preliminary Draft of the Guide of Adaptation with Climatic Changes” held in Beirut during the period 11-12/6/2015.
- “Consultative Meeting within the Framework of the Project of Climatic Change Impact on Water Resources in the Arab Region” held in Beirut during the period 2-3/7/2015.
- Participate in the lectures of the staff of the work teams of the projects of “Emergent Support in the Fields of Food Security and water for the Crisis-Affected Households in Syria” and “Livelihood Support for Crisis-Affected Communities in Syria” held at ACSAD’s headquarters in Damascus during the period 27-30/7/2015.
- “Final Meeting of the Project of Artificial Feeding of Ground Water to Control Sea Water Intrusion in Al-Hazemiah Region” held in Beirut during the period 9-10/8/2015.
- Workshop on “Methodology of Track Selection and Information Collection of Green Belt Project in Syria” held at ACSAD’s headquarters on 11/8/2015.
- Participate in a workshop on “Utilization of Olive Pruning Residues as a Proposed Solution for Fodder Shortage and High Cost Problems” with a lecture entitled “ACSAD’s Experience Results in the Field of Utilization of Olive Pruning Residues in Animal Feeding” held in Syria (Lattakia) on 27/8/2015.
- “National Coordinators Meeting of the project of “Camel’s Newborn Mortality Decrease in Some Arab Countries” held in Cairo Office- ACSAD during the period 27-28/8/2015.
- Workshop on “Future Horizons of the Project of Awassi Sheep Genetic Improvement in Syria” held in Syria (Lattakia) during the period 13-14/9/2015.
- “Statistical Coordination Committee Meeting” held in Cairo during the period 30/9-1/10/2015.
- Workshop on “Modern Techniques Use in Local Goat Development” held in Algeria during the period 17-24/10/2015.
- Workshop on the occasion of “Arab Environment Day” held at ACSAD’s headquarters on 19/10/2015.
- “8th International Conference on Water Security and Environment Protection: a Guarantee for Food Security and Sustainable Development” held in Istanbul during the period 19-22/10/2015.
- Workshop on “Activation of Regional Cooperation Approach in Water Consumption Issues: Water Productivity and Drought Management in agriculture” held in Cairo during the period 27-29/10/2015.
- “12th Meeting of Sectorial Cooperation among the League of Arab States , the UN and their Specialized Agencies” held in Cairo during the period 28-29/10/2015.
- Workshop on “Desertification Combat and Water Harvesting in the Arab Region” held in Tunisia during the period 2-4/11/2015.
- “Technical Committee Meeting of the Initiative of Climatic Risk Association” held in Egypt (Nasr City) during the period 10-11/11/2015.
- Participate in the meeting of the Directorate of Agricultural Extension in the Ministry of Agriculture and Agrarian Reform, held in Damascus on 11/11/2015.
- Meeting to discuss the learnt lessons of the project of “Adaptation with Climatic Changes ACCWAM”



held in Cairo during the period 24-26/11/2015.

- Participate in the meeting of the General Commission for Agricultural Scientific Research in Syria to develop a strategy for restoring the flock of Marj Al-Krem center, establish the improvement lines (milk, meat and bi-purpose lines), approve the research plan of GCSAR and discuss the possibility of participating in the researches. The meeting was held in Syria on 25/11/2015.
- “Consultative Meeting on Non-Conventional Water Resources in the Arab Region” held in Cairo during the period 29/11-1/12/2015.
- Participate in the conference of “Arab Woman in the Development Agenda for the Period 2015-2030” held in Cairo during the period 29/11-1/12/2015.
 - Participate in a workshop on “Damascus Ghouta Soil Mapping” held in Tunisia during the period 1-3/12/2015.
 - Meeting to discuss the draft of a joint project with the Tunisian side under the title of “Unification of Scientific Terms in the Livestock Field in the Arab Region” held at ACSAD’s headquarters on 10/12/2015.
 - “2nd Coordinative Meeting of National Coordinators of the Project of Green Belts in the Arab Regions” held in Lebanon during the period 15-16/12/2015.
 - Experts’ meeting of the project of “Al-Hammad Basin Development in Iraq” held in Lebanon during the period 16-20/12/2015.
 - Participate in the meeting of genetic resources conservation in Syria entitled “Preliminary Assessment of the Current Conditions Impact on Plant and Animal Genetic Resources in Syria” held in the Ministry of Agriculture and Agrarian Reform in Damascus on 15/12/2015.
 - Participate in a meeting to discuss the disputed items of the project of “Framework Agreement on Shared Water Resources among the Arab Countries” held in Cairo during the period 16-17/12/2015.

