Region: Western Asia

Case and region	Issue	Type of tool	Description	Economic and financial benefits	Environmental benefits	Social /poverty alleviation benefits	Governance changes	Scaling up and relevance for developing/ transition countries	Concerns
(1) Vertical Farms and a Hydroponic Future? **Western Asia** *Sources:* *css.escwa.org.lb/ICTD/1441/2-1E.pdf* *http://www.qnfsp.gov.qa/home* *http://www.gardenguides.com/90426-hydroponics-dubai.html* *http://www.acdivoca.org/site/ID/Lebanon-Hydroponic-Sector-Development-Lebanon* *http://naturalstandard.com/demo/demo-eg-hydroponicfarming.asp* *http://www.gardenguides.com/90426-hydroponics-dubai.html*	Agriculture	Water technology	Hydroponics is an environmentally friendly technology that uses soilless culture technology to grow plants using balanced nutrition. By 2009, in the Arabian Gulf states, there were many ongoing projects. In 2008, Qatar established the Qatar National Food Security Programme (QNFSP) to reduce its reliance on food imports and thus develop hydroponics farming. The development of hydroponic agriculture in the ESCWA region is not limited to the Gulf States. Lebanon is currently piloting a hydroponic initiative in the high-value fruits, vegetables and flowers sector with the aim of improving the livelihoods of rural producers in rural parts of Lebanon through green income opportunities.	For the same amount of water, one hectare of hydroponics farm can produce 200 to300 Tons of vegetables per year, which is about 5 to 10 times the yield of open field crop farming. In the United Arab Emirates, companies such as Emirates Hydroponics Farms began marketing food products, with greenhouse space reached 10,000 m^2 by 2009. Some hydroponic farms in the UAE are already producing for export. Mirak operates 200 acres of hydroponic greenhouses producing 3500 tonnes (3858 tons) of strawberries, lettuce, peppers, tomatoes and roses annually. More than 65% of production is exported to Japan, Singapore and Europe. Mirak expects to expand to 1000 acres.	Because the water is recycled, this results in considerable savings, as Hydroponics Farms use $1/20^{th}$ the amount of freshwater used by a regular farm, and result in lower nutrient cost, and much lower runoff pollution.	The program will build the capacity of smallholder producers and small and medium-sized enterprises to access and interpret market intelligence and strengthen value chain linkages.	The Lebanon hydroponic initiative project is implemented through an partnership that involves ACDI/VOCA, Arc-en-Ciel, the René Mouawad Foundation, the Hariri Foundation, the Safadi Foundation, USAID in cooperation with national chambers of commerce for industry and agriculture in the Bekaa as well as in the north and south of Lebanon.	It has been suggested that countries around the world that have been unable to adequately grow fresh produce may use hydroponic farming as a potential way to increase production despite unfavorable traditional growing environments.	Start-up costs for a hydroponic farming facility are generally equivalent to that of a traditional farming facility. As a result, current farm landowners may be unwilling to convert to hydroponic systems. Hydroponics requires higher energy costs and equipment expense than traditional farming methods. Labor costs are similar to traditional farming as hydroponic systems require frequent overseeing of the nutrient delivery system and pH levels. Technical understanding of the plant's requirements for specific nutrients during specific growth phases requires learning and practice. In the event of an extended power outage, potential catastrophic loss of entire crops may occur with any of the active delivery systems.
(2) Reform of the urban water supply and sanitation sector in Yemen **Western Asia**	Cities		The reform is supported financially and technically by several international players including the GIZ, World Bank, the Embassy of the Kingdom of the Netherlands (EKN). The reform has dramatically reshaped the UWSS sector shifting power away from a central authority	Most LCs were able to achieve full recovery of operation and maintenance costs. Some were also able to recover the electro-mechanical depreciation.		Water supply coverage rates increased from 47% in 2002 to 71% in 2007, and sanitation coverage rates increased from 25% to 52%.	The reform program has dramatically reshaped the UWSS sector. By 2008, 95% of the urban populations is served by the decentralized UWSS utilities that includes		Full cost recovery is still not achieved mainly attributed to the substantial cost of capital investment and very low ability to pay due to widespread poverty.

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Source: Zaragoza Conference Case Study Paper			to local agencies. Better customer services, more financial stability, and better protection of the least advantaged groups are some of the most positive outcomes of the reform initiative.			An affordable life line rate is charged on the first block or bracket of 5m3 to 10m3 to benefit the poor. The lifeline tariff assumes that the water and sanitation bill accounts for no more than 5% of the monthly household income of the poor and there are cross-subsidies from the higher block tariff. The average share of total monthly household expenditure on water is about 1.10%. 140 short training courses were implemented to enhance the technical capacity of the urban water supply and sanitation staff. It is estimated that ratio of professionals has increased from 10.8% in 2005 to 12.9% in 2007. Staff with technical background increased from 18% to 24.6% during the same period.	LCs, LC branches and autonomous UWSS utilities (AUWSSUs).		
(3) Jordan: Water Reuse and Recycling in Aqaba **Western Asia** *Sources:* *css.escwa.org.lb/ICTD/1441/2-1E.pdf*	Industry Cities	Water planning	Jordan has a large deficit in water resources, with a supply estimated at 780 MCM/year (Million Cubic Meters) while water demand, currently about 1,200 MCM/year, continues to increase. The Jordanian Government therefore plans to bridge this gap by improve the management of the water supply and improve wastewater treatment	The three treatment plants in Aqaba produce approximately 5 MCM/yr of reclaimed water, accounting for 25% of the total annual water supply of the city.	The company works to improve water use efficiency, thanks to automation and improved management, which have significantly helped to reduce water losses.	The major and direct beneficiaries from this project and its expansion are the farmers and the society, whose income, standards of living and economic status were remarkably elevated, thus almost reducing unemployment and	As part of its efforts at wastewater treatment and reuse, the Government established the Aqaba Water Company, which operates and manages five wastewater treatment plants in Aqaba, Wadi Mousa and the Ma'an	Long term positive impacts on groundwater have been demonstrated through reducing the rate of exploiting groundwater and conforming to the safe yields. Consequently, the successful	Public accessibility to the demo site in Aqaba for demonstration purposes presented a challenge. The demo site is in a decommissioned military site and military clearance is required to enter the site. Demo sites should be chosen with ease of access to the public as one of the

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http://www.aw.jo/eng/ *http://www.google.com/url?sa=t&source=web&cd=1&ved=0CCQQFjAA&url=http%3A%2F%2Fjordan.usaid.gov%2Fupload%2Ffeatures%2FJordan%2520Wastewater%2520Reuse%2520Case%2520Study.doc&rct=j&q=Jordan%3A%20Water%20Reuse%20and%20Recycling%20in%20Aqaba&ei=gTlzTt2LF8TF8QPFq7XEDQ&usg=AFQjCNEjv-0kHXgLOqQOy6sPM5daMIJ9kQ*			and reuse.			poverty.	Governorate. In Aqaba, institutional support is being provided to the Aqaba Special Economic Zone Authority (ASEZA) to establish the "Water Resources management Directorate" (WRMD) including a wastewater resources division to ensure the regulation and management of reuse activities in a sustainable and comprehensive fashion. In addition to this, a "Water Reuse Information Office" was established to form the base for a comprehensive communication and public awareness program.	implementation of this project in such arid parts of Jordan promoted the application of reclaimed water and encouraged the responsible governmental agencies to replicate this experiment in other areas and on a larger scale.	conditions with potential of changing the demo-site into a visiting center. Lack as well as inadequacy in policy and legislation regulating the use of wastewater was a challenge for the success of this project.
(4) Lebanon: Reintroducing Adapted Plants for Water Saving **Western Asia** *Sources:* *http://www.escwa.un.org/information/publications/edit/upload/sdpd-10-tp3.pdf* *www.worldwaterweek.org/documents/WWW_PDF/2009/tuesday/K11/ESCWA-*	Agriculture	Water technology	Water conservation efforts can aim at re-introducing adapted plants for agricultural development. A 2004 project launched by ESCWA and the International Labor Organization (ILO) to create work opportunities and generate income by increasing the competitiveness of micro and small agro-industries in South Lebanon. Two pilot projects were established to produce honey and the herb *origanum syriacum* (known locally as "zaatar"), including a cluster of small-scale zaatar farmers in Bint Jbeil/Lebanon.	Due to improved harvesting, processing and marketing methods, this activity helped to create sustainable livelihoods through the cultivation of a perennial commercial crop that generated income for the local cluster of a five year period. This is an important issue in Lebanon where the agricultural sector accounts for an estimated 25% of the local economy and 45%	Given the onset of drought, drip irrigation and fertigation techniques were introduced to ensure water use efficiency during the propagation of seedlings under greenhouse conditions and in the area designated for cultivation by a local cluster of small scale farmers.	Zaatar cultivation is, therefore, appropriate for income diversification and the generation of supplementary income for rural households in South Lebanon. Indeed, farmers have some leeway in negotiating the best prices, as zaatar products are non-perishable. The development of quality standards and the promotion of biodiversity-conscious conservation measures	*Zaatar*, whether fresh or dried, is a common item in Mediterranean diets and is witnessing burgeoning consumer demand. As such, its cultivation presents interesting economic opportunities for farmers in selected ESCWA member countries.	These pilot projects were implemented by ESCWA with financial support provided by the ILO and the Arab Fund for Economic and Social Development (AFESD). Partnerships were also forged with World Vision International, the Association for the Development of Rural Capacities (ADR) and local municipalities to support the identification of cluster participants, the	Environmental constraints, the most critical being limited water availability; Legal and institutional constraints related to small plot sizes, inadequate public assistance programmes, lack of adequate local standards and limited research available about plant selection and improvement. Financial constraints related to the relatively high initial capital investment needed for

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Cherfane-Stockholm_PPT-Final-18Aug09.pdf				of local employment, and is particularly dominate in rural and remote areas.		for wild zaatar will support cultivation efforts, in order to meet market demand. This will enhance consumer receptivity to cultivated zaatar, while rotecting farmers and as such will favour the further expansion of the zaatar production chain and attract new investment to the sector.		delivery of training and technical assistance, the installation of equipment, and the establishment of a post-harvest processing facility. ESCWA continued to monitor progress and provide technical assistance to the beneficiaries of these pilot projects until 2010.	large-scale production, fluctuating water pumping costs based on fuel prices and limited farmer access to financing opportunities.
(5) Morocco: Expanding the Use of Traditional Methods of Farming **Western Asia** *Sources: css.escwa.org.lb/ICTD/1441/2-1E.pdf* *css.escwa.org.lb/ICTD/1441/5-1E.pdf* *http://www.fao.org/ag/agl/agll/drylands/index.htm* *ag.arizona.edu/oals/IALC/conference/Pres-pdf/brta1p1.pdf*	Agriculture	Water technology	In most areas, traditional custom sustains agricultural activities by defining inherited access rights based by one's location with respect to the source of water, and by the amount of water that can be abstracted with traditional extraction techniques. To increase their water use efficiency, farmers also rely on traditional techniques for the capture of any overflow freshwater.		Deployed on large scale, such techniques can help promote aquifer recharge, and therefore increase the total availability of freshwater supply. Farmers can further access this increased supply and use some of the better adapted modern technologies, such as centre-pivot irrigation and drip irrigation.	Traditional systems provides technically simple, inexpensive, and easily constructed with locally available materials solutions to meet rural inhabitants' needs.			Land use and rainfall interactions dictate soil erosion and sedimentation rates. The highest rates of sedimentation correspond to the watershed with the most intense land use (and least forest cover), but with the lowest rainfall, averaging 350 mm/yr.
(6) Palestine:	Agricult	Water	In Palestine, the lack of land and	The soil used in those	The food grown on	This "food close to fork"		Those living in tightly-	

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Rooftop Farming for Water and Soil Conservation **Western Asia** *Sources:* *css.escwa.org.lb/ICTD/1441/2-1E.pdf* *http://socserv.mcmaster.ca/kubursi/ebooks/water.htm* *http://electronicintifada.net/content/without-land-gaza-farmers-grow-crops-roofs/4873* *http://www.greenprophet.com/2010/12/rooftop-garden-middle-east/*	ure	technology	water is a particular concern, particularly in the Gaza strip. An example is Beit Hanoun, where much agricultural land has been destroyed repeatedly by the Israeli army. There, farmers deprived adapted by developing rooftop farming to feed their families, and grow species that can be used year round.	rooftop gardens is improved with foods scraps and other organic matter, which also acts as fertilizer and further improves productivity. Roof farming also helps to reduce air pollution, keeping the city cool during hot summers and warmer during cold winters.	those rooftops is often rainfed, which further contributes to water saving in an arid area where most of the water is abstracted from an increasingly polluted groundwater.	approach can also help support the raising rabbits and chickens, a valuable source of protein for a population that depends on aid for 80 % of its food supply. In this manner, the use of rooftop farming has allowed local farmers to leverage their traditional knowledge with new technologies and techniques, and may improve their competitive edge for the time where the current conflict situation has abated. Home-grown food projects like rooftop gardens, and raising rabbits and chickens on the roof help combat the severe poverty of Gaza's 80 percent food-aid dependent population.		packed refugee camps or overcrowded towns but with access to a roof can potentially stave off malnutrition and at the same time generate a small income. These benefits are clearly transferable across the Middle East region and urban agriculture can play an important role in strengthening the resilience of cities and their populations against the impacts of climate change.	
(7) Saudi Arabia: Leveraging Traditional Knowledge at King Abdullah University of Science and Technology (KAUST) **Western Asia** *Sources:* *css.escwa.org.lb/ICTD/1441/2-1E.pdf*	Industry	Water technology	In Saudi Arabia, the KAUST campus situated on the western coast near Jeddah was designed to be environmentally friendly from its inception. Its design relied in part on the energy-efficient traditional design of Arab houses, and implemented new technologies of water metering and recycling.	In an adaptation of traditional design, two solar towers create a passive pressure difference and continuous breeze along the shaded courtyards, thus making them comfortable more than 75 percent of the year, thus reducing total demand for air conditioning and water.	Inside buildings, water use is reduced by about 40% as compared to baseline designs, due to the use of waterless urinals, ultra-low flow lavatories, and low-flow showers. Across campus, storm water management is such that groundwater infiltration is promoted, with 100% of average annual	Make a positive contribution to their communities, improve comfort for building occupants.	Several hundred HOK people in 11 different offices on three continents contributed to the project.	The university is demonstrating new ways to build in the region and promoting responsible stewardship of the environment.	The design team responded to a set of extraordinary challenges. In the context of an extremely hot, humid climate, they were asked to create a low-energy, highly sustainable project. The team was challenged to create a contemporary work of architecture that would resonate with the global scientific community while being firmly rooted in local Saudi culture. Finally, they were asked to design an

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http://www.kaust.edu.sa/about/sustainable/sustainable.html *http://www.e-architect.co.uk/saudi_arabia/kaust_thuwal.htm* *http://www.architizer.com/en_us/projects/view/king-abdullah-university-of-science-and-technology-kaust/717/*					rainfall runoff captured and treated. KAUST's Waste Water Treatment Plant (WWTP) treats 100% of the wastewater generated by the campus, and the resulting output is recycled through Installed irrigation systems that reduce consumption by more than 50% of estimated needs.				institution of the highest physical quality at a historically unprecedented speed from conception to completion in just three years.
(8) Saudi Arabia: Desalination using solar energy desalination at King Abdul-Aziz City for Science and Technology, Saudi Arabia **Western Asia** *Sources:* *http://www.kacst.edu.sa/en/about/media/news/Pages/news49.aspx* *http://www.escwa.un.org/information/pubaction.asp?PubID=978* *http://www.dlr.de/tt/Portaldata/41/Resources/dokumente/institut/system/publications/Trieb_CSP_for_*	Industry Cities	Water technology	Desalination using renewable energy resources in under study in various parts of the region in view of improving the sustainability of the water sector and ensure access to freshwater resources to meet basic needs over the long term. A national initiative for water desalination using solar energy has been launched at the King Abdul-Aziz City for Science and Technology, which is situated in the northern area of Riyadh.	One of the main objective of this initiative to desalinate seawater at a cost of less than 1.5 Saudi Riyals per cubic meter compared to the current cost of desalination of seawater by thermal technology which is in the range 2.5 to 5.5 Saudi Riyals per cubic meter, and desalination by Reverse Osmosis which is in the range 2.5 to 5.5 Saudi Riyals per cubic meter for a desalination plant producing 30,000 cubic meters per day. The cost of generated electricity by the new technology of solar photovoltaic will be less than 30 Halalah per kilowatt-hour.	Increase temperature through solar heating and thus reduce energy needs.	Building a desalination plant with a capacity of thirty thousand cubic meters per day to meet the needs of one hundred thousand dweller of Al-Khafji City by construction of a solar energy facility with a capacity of 10 megawatts and a reverse osmosis plant by utilizing the developed technologies.	The Ministry of Finance, the Ministry of Water & Electricity, Ministry of Commerce and Industry and Saline Water Conversion Corporation (SWCC) are participating in this initiative with KACST.	These new technologies can be implemented across Saudi Arabia and around the world.	The particular concerns and attitudes of different energy and water stakeholders have impeded regional planning and implementation of policies and regulations for ensuring sustainable consumption and production of natural resources in an integrated manner. Concentrating solar power offers a sustainable alternative to fossil fuels for large scale seawater desalination. It can help to solve the problem, but market introduction must start immediately in order to achieve the necessary freshwater production rates in time.

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Desalination-MENAREC4.pdf *http://www.gizmag.com/ibm-solar-powered-desalination/14760/*									
(9) The Syrian Arab Republic: The Importance of Rainfed Farming **Western Asia** *Sources:* *css.escwa.org.lb/ICTD/1441/2-1E.pdf* *www.fao.org/world/syria/gcpita/pubs/policystudies/farming_system_tec_report/farming_system_tec_report_en_89-120.pdf*	Agriculture	Water technology	There have therefore been recent efforts to leverage traditional knowledge to help overcome some of the instability of rainfed farming, particularly in areas with relatively good annual rain fall. Those techniques include the construction of terraces over sloped terrain, or expanding the use of stone vegetative contours in gently sloping areas.		An advantage of rainfed farming is that it remains an eco-friendly agricultural practice that does not increase burdens on water resources and that can help alleviate soil degradation and causes none of the problems of salinization that often result from irrigation farming. Both techniques can prevent soil erosion and increase water retention. Traditional techniques have been used to promote the use of vegetative cover along slopes or near the boundaries of rainfed fields. More ancient techniques have been rediscovered, such as ancient Qanats that collected runoff water from slopes and channel them to feed shallow groundwater and	It remains necessary to continue to promote agriculture based on rainfed farming practices as essential to sustain livelihoods for small-scale farmers and communities that have already been internally displaced due to the unsustainable agricultural practices of the past.	•One of the objectives of pricing policies of regulated crops (wheat, cotton, barley and sugar beet) is to achieve a stable, reasonable farm income and has been a long instrument in agricultural policy of Syria similar to many OECD countries. Farmers eagerly grasped these stabilizing possibilities, even though the income supporting effect of the pricing policies are in reality only partly achieved due to administrative procedures for the delivery of cotton and wheat to the Establishments.		Small (poor) farmers devote a major share of their production to home consumption (especially wheat, vegetables, and dairy products, the former through burgul and wheat flour). Hence, independently of the official wheat price is, small farmers income generates relatively low benefits compared to better-off farmers. Poor and medium farmers have many similarities, in that they form the casual agricultural labour force in this sub-system; therefore, they usually suffer from low income levels in combination with high income variability, i.e. both households are vulnerable, even though to a different degree. In the rainfed farming system, water scarcity has caused the cropping pattern to be rather simple (compared to that of the irrigated sub-system), as farmers have fewer cultivation options. Water scarcity causes the crop yields to be low.

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					wells.				Such a constraint results in very low-income levels for the majority of people, even though some cultivate barley (a regulated price crop).