Pilot Projects for Improved Water Availability and Quality

"The challenge of securing safe and plentiful water for all is one of the most daunting challenges faced by the world today…
Water is essential to survival. Unlike oil, there are no substitutes."
-UN Secretary-General Ban Ki-moon, addressing the 2008 World Economic Forum

The Challenge

Worldwide, water demand is rising in an environment where population growth and surface water contamination are on the increase and ground water levels are dropping. According to the United Nations (UN) estimates, nearly 20% of the world's population lives in areas where current water use is unsustainable and the UN predicts that by 2025, two out of three people will live in water-stressed conditions. The severity of the water crisis has prompted the UN to conclude that water scarcity will be the major constraint to world food security over the next few decades.

The Vision

Water, land, energy, climate, food, natural resources, and population trends are mistakenly considered separate challenges. Instead, the scarcity of water, land, and food provides a framework for better understanding their collective implications for socioeconomic development and world water and food security. The **Actionable Vision** (Task WA-08-01f of GEO), **addressing an integrated solution for water scarcity,** is global in all dimensions: it features science and technology applications and draws on extensive work done at local, regional, and international levels. Furthermore it promotes activities that will be immediately effective in providing water to those in need. It also is important that the solutions, once demonstrated in a pilot, are transferable to other regions and can be sustained over time.

A Demonstration of Water for Food Security and Health – Smart Water Harvesting

A compelling case can be made that sufficient experience has been gained over the last two decades to address the dominant issue of food security and climate change for subsistence farming in semi-arid regions.
Local water harvesting improves *reliable* agriculture productivity and water for family needs for areas:

- where there is sufficient rainfall, but with high temporal variation,
- where evaporation dominates the water cycle,
- where ground water contamination limits use of wells and in-ground storage,
- where there is insufficient capital and water for large-scale irrigation projects.

A water harvesting pilot project in Rajasthan, India focuses on smart irrigation that improves yield two to three times for stable crops, introducing horticulture for income security and employment generation, and domestic support of hygiene, women, and livestock at the household level.

GOAL

Food Security and improved sustainable livelihood in subsistence semi-arid environments through smart rain water harvesting and capacity building for the local farm population for adaptation to climate change impacts.

OBJECTIVES

- Expand capacity building of the farmers to strengthen, improve, and practice know-how for smart water harvesting, efficient use, water quality, and agricultural practices for assured production for human welfare, environmental sustainability, and adaptation to climate change impacts in semi-arid regions of India as an "actionable vision."
- Provide long-term sustainability of the project outcomes by empowering locals and expanding through the established Village Resource Centre.
- Apply at micro-level Earth observations in identification and modeling of smart rain water harvesting sites and their productivity in semi-arid regions for advancing subsistence agriculture, human welfare, environmental sustainability, and adaptation to climate change impacts. Provide methodologies/outputs through capacity building to local farmers and villages in a format for effective uptake and sustainability.

The Target Area

The target area is the village Melva and the surrounding cluster of villages of Rajasthan, India. The dominant economy is subsistence rainwater fed farming with an average household of five people and five cattle. The mean rainfall is 386 mm per year with a very high variability coefficient. Evapotranspiration is 1500-2000 mm per year or five times the precipitation. Ground water is 200 feet below the surface and its salinity makes it unsuitable for drinking. For consumption, people rely largely on the village pond, which is shared by domestic animals and wildlife, leading to health issues.

The Demonstration

A permanent demonstration and capacity building facility has been established by MGCS in Melva. An 1100 cubic meter water cistern for agriculture and a 200 cubic meter cistern for human consumption were built along with a training center. The cisterns contain an annual supply of water for a family of five. The first crops have been harvested and training is underway. The project includes advanced seeds and irrigation. The training center addresses end-to-end issues from use of Earth observation to agriculture to financing of farm innovation.

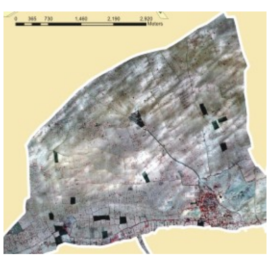
Above: Training Center and Cistern

Far Left: Village leadership commits to project

Middle: Villagers participate in planting

Earth Observations for Rain Water Harvesting in Semi–Arid Regions

The key goal of Earth observations (EOs) in the project is to develop and implement practical information for operational smart rainwater harvesting (SRWH) in semi-arid environments and adopting “more crop per drop” approaches. Characterizing areas for SRWH at a local scale has not been done systematically. EOs will provide accurate, up to date time series for selecting sites and monitoring operations. Site selection depends on many factors including rainfall, geological formations, soil type, current land use, hydrologic features, and the general socio-economic conditions. This information is integrated though a geographic information system to bring useful information to decision makers such as farmers and village leaders. Capacity building supports use and uptake of the information. Once the SRWH is implemented, EOs are used for monitoring the impacts at local and regional scales. For these applications, EOs include satellite observations, ground-based local weather observations, and in-field measurements using advanced technologies such as hyperspectral imagers.



Left: Satellite data shows water flow patterns in region

Center: Detailed satellite images used for operations planning

Right: Hyperspectral monitoring of crops

The Way Forward

Rain-fed agriculture deserves special attention from the international community. Making best use of available water and land requires a sustainable, repeatable, and scalable approach built on traditional wisdom and modern technology. Through GEOSS and science and technology collaborations, new capabilities are being adopted to move subsistence agriculture to a sustainable economic solution where use of advanced seeds and fertilizer can be justified because of the reliable availability of water through rainwater harvesting.

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