CAPITAL AND INNOVATION FLOW INTO A NEW GENERATION OF IRRIGATION TECHNOLOGIES

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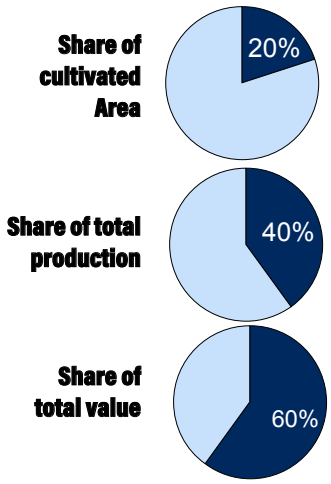
Agriculture is intimately linked with water availability challenges throughout the world. Overall, irrigation constitutes approximately 70 percent of the global withdrawals of freshwater for human purposes, with the fraction of total human water use even higher in large agricultural areas such as India, Pakistan, California, the Black Sea region, and Brazil.[1]

Yet, irrigation has always been part of the solution to achieve increased yields while optimizing the use of limited arable land. Currently, only 20 percent of the global cultivated area is irrigated, but that area provides 40 percent of the total production, and 60 percent of the total value of production[2] (see chart). Irrigation contributes to that increased value by providing soil moisture and the ability to meet the crop evapotranspiration required by plant growth processes, in environments where rainfall is not sufficient or consistent across the growing season. But more than just providing moisture, irrigation also de-risks the investment by producers into other inputs such as fertilizer, crop protection, and other land preparation – all of which increase the yield and crop value.

Irrigation has commanded increased attention in recent years from agricultural investors who are laser-focused on maximizing the return on land investments. As a result, both entrepreneurs and established equipment companies have stepped up the pace of innovation in the space. The recent acquisition of Netafim Ltd. by Mexichem – valued as the world's largest drip irrigation player at $1.9 billion – is evidence of the value-creation occurring in the equipment space. Both internal corporate investment and external venture capital also have been flowing to irrigation sensor and other software technologies in the irrigation space over the last five to 10 years.

Irrigation Today



Source: FAO

ADVANCES IN TECHNOLOGY

For the global water situation, the good news is that companies developing irrigation technologies have been on a rapid pace of innovation, and that gains enhanced by irrigation technology are indeed part of solving the global water challenge. Today's irrigation is definitely not your grandfather's irrigation, or even the irrigation of a generation ago.

The main types of irrigation are flood irrigation (also referred to as gravity irrigation), and pressurized irrigation (or modern irrigation), which is much more efficient in delivering water directly to the root zone of the crop. The total fraction of such "modern" irrigation nevertheless is still only about 6 percent of total irrigated area. While some innovations continue to improve the efficiency of flood irrigation, the lion's share of future efficiency gains will be in conversion to and improvement of pressurized irrigation.

The level of precision available in irrigation technology in 2017 is considerable, nearing the precision more associated with indoor horticulture systems. A few examples:

1. **Mechanized/pivot irrigation technology:** Center-pivot irrigation, consisting of a water source at a central point with a mechanized, rolling arm (with a radius of 150 feet to a half mile or more), has been a standard technology since being introduced in the Nebraska plains in the 1950s. Currently, mechanized irrigation constitutes about 5 percent of the total irrigated area globally. The large global U.S.-based center pivot manufacturers (Valley Irrigation, Zimmatic, and others), as well as other regional players (e.g. Fockink – Brazil) have significantly increased the application efficiency of these systems in the last two decades. Today, instead of sprinklers at the top of the moving pipe, drop hoses now allow for application at the base of the canopy at the level of the soil surface. Such precision is augmented by enhanced speed control of the center pivot to change the rates of application across the field. In addition, most systems now have the ability to control different packages of sprinklers, allowing center pivots to apply water as variable rate irrigation (VRI) to areas of different soil type or slope throughout the field. Both conventional irrigation equipment manufacturers and other specialists, such as navigation and software provider Trimble Inc., have made such VRI technology cost-effective in recent years.

2. **Conventional drip technology:** Drip irrigation technology, originally pioneered by Israeli companies and cooperatives, has been a technology especially suited towards orchards, vineyards, and other high-value crops such as vegetables. Currently, drip irrigation constitutes about 1 to 2 percent of the total irrigated area globally. Many drip irrigation components are commoditized plastic lines or PVC connections, but other components such as filters and in-line drippers have required more innovation. Recent advances over the last 10 years have led to large improvements in the uniformity and control over the rate of irrigation along the drip lines. For example, pressure-compensating drippers, pioneered by Netafim, help growers give consistent water and fertilizer needs across their fields by providing uniform flow rates even with elevation changes across a field.

3. **Soil moisture sensors and other sensors:** Soil moisture sensors provide information on the moisture actually available to the crop in the subsurface. Despite advances in irrigation application technology, using technology to actually time and plan irrigation has been slower to gain acceptance. Currently, only about 5 to 10 percent of irrigated fields have some type of soil moisture measurement, but new companies like AquaSpy of the U.S. are joining traditional players such as Sentek (Australia) to develop sensors measuring soil moisture at different depths. Many growers or their advisors will simply feel the soil to determine when to irrigate, but the top growers are finding they leave considerable profit on the table without having detailed knowledge of the current status of their crop and soil.

As irrigation is more than just providing water, another frontier for the soil sensor industry is to develop and integrate data streams for additional crop needs in the subsurface, and thus be able to couple irrigation prescription with fertigation prescriptions. Some companies, such as Hortau in Canada, are meeting these needs by coupling their subsurface soil-tension sensors with additional nitrogen sensing capabilities in the soil.

Cost is one factor that has limited grower adoption of sensor technology thus far. All companies are trying to lower the threshold for investment in soil-moisture sensing capabilities, with some startup companies – such as CropX of Israel and SensoTerra of the Netherlands – leading the way in driving cost for soil moisture sensors, in some cases making up to two to five sensors per field cost effective for growers.

4. **Controls and system integration:** Many of the system manufacturers have their own set of control technologies to start irrigation pumps, system drive-trains, and fertigation units (which directly inject nitrogen or crop protection products into an irrigation scheme). Additionally, startup companies such as WiseConn of Chile are able to link directly to the various components, and provide the grower or operator with a full suite of tools to manage the system remotely in a single, unified system.

5. Advanced irrigation scheduling and analysis: Finally, in addition to having the equipment and ability to irrigate efficiently, growers are now able to apply advanced crop analytics to actually know when and how to irrigate. Many equipment and sensor providers, including those mentioned above are starting to build out proprietary crop irrigation prescriptions that link with their equipment.

Alternatively, manufacturer–agnostic advisory software, such as CropMetrics in the U.S., can provide optimal recommendations by incorporating multiple data flows of actual soil moisture, recent irrigation history, soil information, and even precipitation and temperature forecasts. By following such advanced analysis, in many cases irrigation and associated energy costs can be reduced considerably. In commodity crops such as corn, such savings can determine whether a crop is profitable or not.

INVESTMENT OPPORTUNITIES

Many sources of capital are finding growth opportunities in the $6 billion irrigation equipment space. Real-asset investors also are deploying capital in modern irrigation systems to stabilize and increase returns for their holdings. Others may choose to invest in some of the emerging technology companies themselves. Private equity has participated via both traditional equipment companies as well as local irrigation services companies. For example, in addition to the Netafim transaction (sale by Permira), 2017 has also seen the merger of two private equity backed drip irrigation companies in Rivulis (FIMI) and Eurodrip (Paine Schwartz Partners)[3]. Even impact investors are able to help find and mobilize capital towards low-cost irrigation solutions for the 500 million small farmers of two hectares or less through groups like International Development Enterprises (iDE).

The frontier of irrigation is developing rapidly along with the rest of the agriculture sector. Increasingly, investors and entrepreneurs, and even downstream food players, are developing efficient irrigation as lever to maximize productivity and compete sustainably in resource-constrained environments.

ABOUT THE AUTHOR

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