Introduction

International Development Enterprises (iDE) is a non-profit organization dedicated to creating income and livelihood opportunities for poor rural households. With over 70 percent of the world's poorest people working as small-scale farmers[1], iDE uses agricultural irrigation water as an entry point to reach this population because access to irrigation water provides substantial yield increases compared to other inputs, such as improved seeds, pesticides, and fertilizer. Access to water effectively triples the number of growing seasons each year, while also allowing farmers to weather erratic rainfall and produce much higher yields than they could by relying on rain alone. Farmers who are able to grow crops during dry months — when production is normally impossible — can bring more lucrative produce to market. Thus access to irrigation enables families to move beyond subsistence poverty.

iDE's groundbreaking contribution to water resource development has been to bridge the gap between existing water technologies designed for large plots, and design and adapt such technologies to meet the needs and budget of small-scale farmers. The status quo in design innovation is to focus only on the wealthiest ten percent of the world's population. Since 1982, IDE has been identifying and developing technologies for the other ninety percent of the world's population. IDE's innovative irrigation systems and pumps are affordable for the rural poor and adapted to the conditions they face. These technologies enable small-scale farmers to access and store water more easily, and manage its use more efficiently. This has greatly increased access to water management technologies by small plot farmers, enabling 19 million people to earn more income and improve their livelihoods. As a result, over nearly 30 years, iDE's customers have increased their aggregate income by over $3 billion.

In order to bridge this design gap, iDE does the following:

1. iDE uses a Human Centered Design process, actively engaging with end-users to explore and identify insights before offering a solution.
2. Based on this feedback, iDE designs simple, easily manufactured water access and management technologies, making them both affordable and appropriate to small-plot farming. These solutions include pumps, drip irrigation, and multiple use systems that function profitably on small hectare farming plots.
3. iDE makes these technologies widely available to rural customers by building sustainable supply chains through the private sector. The majority of iDE products are manufactured locally and sold through local retailers. This creates several benefits, including increasing adoption among farmers, the sustainability of farm projects, and improved access to new technologies.

[1] Of the 1.1 billion people in the world who live on less than $1 a day, 800 million are subsistence farmers who earn their living on tiny plots of land, typically 2 hectares or less.. Source: *The Great Land Grab: Rush for World's Farmland Threatens Food Security for the Poor*, Oakland Institute, 2009.

iDE's outstanding success in promoting cooperation and sound management in the development and use of water resources by bridging this design gap to allow poor farmers to better manage their water resources impacts technical, economic, environmental, and social spheres.

Technical Sphere

The technological solutions that iDE develops address the agricultural irrigation needs of the rural poor. These solutions include well drilling, pumps, irrigation systems, water storage solutions, and multiple use systems that serve both irrigation and household water needs.

- **Manual well drilling:** After rain, the most convenient sources of water for irrigation are rivers and ponds. When these surface sources are seasonal or not easily accessible, groundwater becomes an important water source. Mechanically drilled wells are expensive and often not available for rural, small plot farmers. In many places wells are dug manually. However, they may have low yields or unlined walls may collapse. Where soil type, depth to groundwater, extraction needs and skilled labor are suitable, manual well drilling offers the best of drilled wells with the affordability of manual dug wells.
- **Pumps:** iDE's line of water lifting technologies includes the Treadle Pump, Hand Piston Pump, and the Rope Pump. The selection factors include affordability (price), depth to water, location of fields, amount of water required and method of water delivery to crops.
- **Irrigation systems:** Choosing the best irrigation method for crops depends on the reliability of water supply, the affordability of appropriate systems, the location of water, the type and quality of crops, and the topography of the site. Drip irrigation systems eliminate waste by directing drops of water through tubes directly to individual plant roots. Sprinkler systems offer similar benefits ground-cover crops lacking singular root systems.
- **Water storage solutions**: Water storage for small scale irrigation serves two primary purposes—to provide water continuity where water supply is uncertain and to provide pressurized supply to irrigation systems. Options include in-ground storage for larger tanks collecting water from low-flow or intermittent sources, such as rainfall runoff, springs, or water trucks or header tanks above ground that are smaller and generally filled at the time of irrigation.
- **Multiple-Use Systems** (**MUS):** MUS collects previously unused water run-off from fresh water springs, delivering it sources at the village level for both domestic and irrigation use. Because it is a community system, it requires cooperation to develop consensus sound water management.

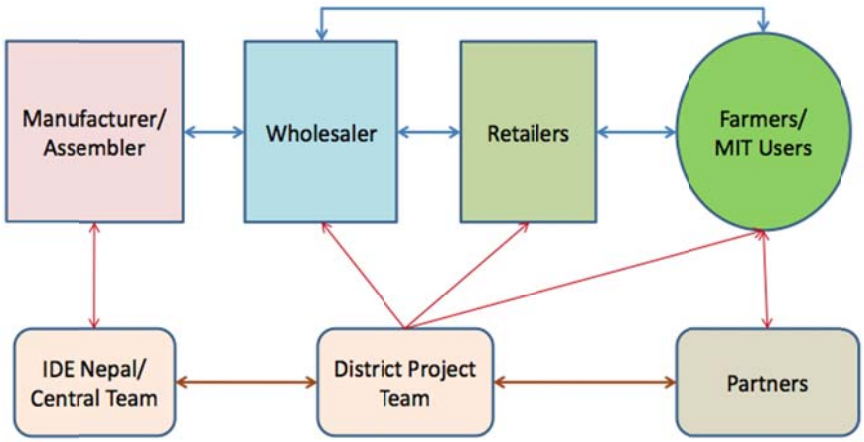
Essential to the development of these technologies is the close cooperation with partners to design and test the products, which results in a technically sound, locally adapted product able to bridge the aforementioned design and distribution gap. To develop the products initially, iDE partners with leading technology companies, such as ITT and IDEO. This collaboration enables iDE to draw upon their technical expertise while shaping the product's design to meet the needs of small-plot farmers. iDE often provides the field testing by connecting these firms with the farmers, often creating testing and demonstration plots that also serve to educate local farmers about the products and market their effectiveness.

Economic Sphere

iDE's technological solutions target some of the world's most difficult populations to access: the rural poor living isolated from urban areas. In large part, this population is so disadvantaged because of their geographic location, which makes communication, access to utilities such as electricity and water, and transportation very difficult. iDE's model is designed to work in just such an environment. iDE works to build local supply chains that connect local manufacturers, wholesalers, and local retailers to markets in remote villages and towns so farmers may purchase the technologies.

iDE's distribution model is structured to increase the size of the local economy that manufactures and sells its technology. Additionally, by increasing small-scale farmers' yields, these interventions increase their purchasing power, thereby also growing the local economy. This increased economic growth translates to an increase in job creation, a critical component to poverty alleviation. A 2010 USAID study[2] found that a five-year project led by iDE in Nepal created 169,000 direct jobs resulting from increased farming activity as well as value chain enterprises and 61,000 additional jobs when accounting for multiplier effects.

Fundamental to iDE's approach in building supply chains is fostering cooperation between each connection. At a project's outset, the organization works closely to build a local network of manufacturers, wholesalers, and retailers (see diagram below) trained in iDE's products. It also conducts outreach to the consumers of the equipment through demonstration plots in targeted geographic areas.



[2] Winrock International and iDE/Nepal for USAID/Nepal. (2010) *Jobs in Agriculture: Nepal Smallholder Irrigation Market Initiative (SIMI).*

The establishment of these supply chains is significant because it enables isolated farming areas to access technology to develop and manage water resources in a responsible manner long after iDE funding has ended. This approach builds a sustainable business model around the production, distribution, and sale of water management technology. The local production and distribution of the technology ensures that knowledge about the product is transferred to the target area. iDE's equipment is designed to be affordable for rural smallholder farmers, but leaves room for members of the supply chain to add a small margin, enabling them to also generate a profit. Additionally, since a variety of local manufacturers become involved, the technology can be reproduced by other manufacturers and sold locally, thereby benefitting the local economy.

Environmental Sphere

iDE's work has a strong environmental component. The technologies that iDE promotes, including pumps and drip irrigation systems, are designed to enable the rural poor to more sustainably use and manage the natural land and water resources they depend on. In contrast to other technologies, such as diesel pumps, iDE products use water less intensively. In particular, iDE's drip irrigation systems are highly efficient in managing water usage, which leads to less pesticide run-off into the water table, less erosion, and lower incidences of flooding. Even farmers using iDE's treadle pumps generally consume lower levels of water than those using diesel pumps, by nature of the fact that the pumps are manual and users do not pump more than what they need.

The success of these initiatives is predicated on iDE's cooperation with local farmers. Working through local organizations and retailers, iDE provides training and technical assistance on the use of its technology. This collaboration builds local knowledge on managing water usage and empowers small-plot farmers to access water resources in a responsible way.

In most dryland farms, most rainwater is lost to evaporation and runoff and only 15-30% of rainfall adds moisture to plant roots and aids in crop production. iDE's drip irrigation systems eliminate water waste by directing drips of water directly to individual plant roots allowing nearly 90% of the water delivered to be used by the plant.

Studies in many countries show that drip irrigation reduces water use by 30-70% and increases yields by over 50%. Since only one percent of the world's irrigated lands now use drip and other high-efficiency irrigation methods, the potential for water conservation through the spread of drip irrigation is monumental. In Nepal, over 13,500 drip systems were sold to smallholder farmers between 1997 and 2004. In Zimbabwe, drip systems are used in schools, orphanages, village community gardens, and smallholder farms. From January 2002 – March 2005 alone, 15,258 drip systems were sold in Zimbabwe through iDE. Sales of drip systems continue to flourish, as do the farmers, families, and communities that utilize them.

Social Sphere

The social impact of the responsible development of water resources is tremendous. By providing small-plot farmers with low cost access to water for agricultural use, and profitable links to markets for their surplus produce, these farmers can immediately double their income. This dramatic increase in income creates economically stable communities and provides farmers with life-altering choices. Higher household incomes, particularly among the very poor, have a substantial impact on education and health outcomes.

Education: Families with extra income often spend that money to send their children to school. Providing access to water closer to home also reduces the water-fetching burden that afflicts many girls, providing them with more time in which to study.

Health: Many of the water management technologies developed by iDE indirectly improve the health of farmers and their families. Family nutrition often improves as the diversity of vegetables grown allows families to consume a wider variety of food and rely less heavily on staple crops. This diversity provides critical vitamins and micro-nutrients. Furthermore, produce which is not consumed at home can be sold at market, increasing income which can be used to purchase additional food. The additional income can also be used to purchase medicines and visit health facilities.

The health impact is most notable where iDE has provided drip irrigation for kitchen gardens for those affected with HIV/AIDS. In addition to the nutritional and income benefits described above, the drip-irrigated kitchen gardens allow affected individuals to irrigate with minimal labor, a critical effort savings for those who suffer from severe fatigue.

iDE has been successfully promoting cooperation and sound water resource management for nearly 30 years to a large, underserved market that previously had little access to water resource management technologies and knowledge. The result has been the creation of powerful solutions to fight poverty through innovative water use and management.