

The Great Potential of Micro-Irrigation Technology for Poor-Rural Communities

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Introduction

Earliest kind of micro-irrigation systems (MIS) appeared in Australia in the late 1940s thanks to the diffusion of polypropylene tubing, a new, versatile and economic material for that period. The equipment for drip irrigation was hence perfected in Israel during the 1960s and since then has spread all over the world. In recent years there have been efforts to enhance MIS productivity of land and water and products quality as well; in particular, the automation in drip irrigation (use of microcontrollers, sensors, embedded systems, etc...) permits a more efficient control and monitoring of all activities concerned with MIS [1-3]. The benefit deriving from the adoption of MIS are evident in comparison with traditional irrigation methods, i.e. flood and sprinkler irrigation, although in the latter there have been research efforts in recent years [4-8]. Anyway in drip irrigation water losses occurring through evaporation and distribution are completely absent since these systems are able to supply water directly to the crop root zone [9,10]. Nevertheless, the MIS implementation configures itself as a poor-friendly technology, demonstrating to have a positive social impact. The great majority of poor rural settlements are located in dry areas, in which the livelihoods depend mainly on rain-fed agriculture since people both the population has to cope with water scarcity and poor soils. In this way, MIS can potentially overcome in exploiting the small amounts of water available in order to increase agricultural productivity. Also, in addition to "delivering water in right place and at the right time" MIS can be used to efficiently feed soils with fertilizers and bio-products; for instance, the adoption of MIS in Israel in 1996 permitted to save approximately 50% of nitrogen and phosphorus pentoxide and 65% of potassium oxide [11].

Case Studies

MIS in Maharashtra, India

The Maharashtra State located in the western part of India and characterized by a relevant water scarcity, has been involved in a MIS-based government program over nine years from 1986 to 2005. State government provided economic subsidies to rural farmers, concerting also with equipment manufactures in order to stimulate the MIS-related market expansion. In 2003 the total surface exploited by MIS reached around 300'000 ha; the main crops cultivated were banana, grapes and sugarcane. With refer to the existing traditional irrigation systems, the implemented MIS has shown a mean increasing in productivity for banana, grapes and sugarcane of, respectively, 29%, 19% and 23%. Also, with respect to the flood method irrigation MIS has permitted to save the 37% of water. Empirical evidences demonstrated how MIS reduces the cost of cultivation and the crops productivity: the lower energy expended and the reduced labor

required by a MIS has a direct effect on the overall cost of production and therefore the profit level is found to be higher than that of non-MIS adopters. In Maharashtra the pay-back period did not exceeded two years [9,12-14].

The SCAMPIS project in Guatemala, India and Madagascar

Scaling-up micro-irrigation systems (SCAMPIS) was a three-year project from 2009 to 2012 implemented by the NGO International Fund for Agricultural Development (IFAD) in different areas in Guatemala, India (Orissa State) and Madagascar, all of them characterized by high presence of poverty and considerable water scarcity and poor soils. The amount of subsidies provided by a group of large-scale food retailers in partnership with IFAD varied ranging from 50% and 90% with respect to the equipment price. For the 30'000 farmers who putted on use a MIS the food security was improved and in a second moment they were also able to earn incomes by selling surpluses: the micro irrigation systems installed allowed to increase growing tomatoes productivity in Guatemala, India and Madagascar of, respectively, 45%, 564% and 119% and such effect was supported also by a longer cropping season observed, that was a result of both MIS and natural fertilizers used. The average water saving for the whole project amounted to 46% and the average reduction of time spent irrigating was 65% [15]. Even in this case one can consider a short time-span for the payback period for the investment cost in MIS equipment (less than 2 years) but a certain share of income required by the retailers must be taken into account.

Concluding Remarks

Surprisingly, MIS are not yet so much diffused in Africa, although several preliminary studies in recent years have kept on evidence the big opportunities related to potential drip irrigation installation in Southern, Sub-Saharan and Eastern Africa [16-18]. In these areas, although MIS can be locally perceived as opportunity in terms of better agricultural production, better income, reduction of risks and, in general, able to generate benefits for poor rural communities, there seem to be lacks of research about the use of low-cost irrigation systems and the suitable management techniques in general from rural communities; but the search of feasible solutions for rural poverty have to continue, even resorting at field researches, never excluding local policy support. In fact, MIS may represent a solution for millions of people still affected by food insecurity. Under the technological point of view it represent a very good fit between available resources and agricultural results maximization and, on the other hand, it does not require any hi-tech field to grow up nor a relatively high know-how: indeed, from the user-side perspective, MIS are available in a range of small potentially expandable packages, relatively simple to use, and require limited skills to design and maintain. The main obstacle related

to the MIS spread is related to the relatively high cost of equipment for farmers. This barrier could be easily overcome by public subsidies, being an affordable investment for government agencies; otherwise, since investment costs are payable in one or two seasons, even monetary loans can be considered.

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