Performing the success of an innovation: the case of smallholder drip irrigation in Burkina Faso

Jonas Wanvoeke\textsuperscript{a}, Jean-Philippe Venot\textsuperscript{ab}, Margreet Zwarteveen\textsuperscript{ac} & Charlotte de Fraiture\textsuperscript{d}

\textsuperscript{a} Water Resources Management Group, Wageningen University, the Netherlands
\textsuperscript{b} UMR G-EAU, IRD, Institut de Recherche pour le Développement, Montpellier, France
\textsuperscript{c} Water Governance Group, UNESCO-IHE Institute for Water Education, Delft, the Netherlands
\textsuperscript{d} Land and Water Development Group, UNESCO-IHE Institute for Water Education, Delft, the Netherlands

Published online: 13 Feb 2015.

To cite this article: Jonas Wanvoeke, Jean-Philippe Venot, Margreet Zwarteveen & Charlotte de Fraiture (2015): Performing the success of an innovation: the case of smallholder drip irrigation in Burkina Faso, Water International, DOI: 10.1080/02508060.2015.1010364

To link to this article: http://dx.doi.org/10.1080/02508060.2015.1010364

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the “Content”) contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing,
Performing the success of an innovation: the case of smallholder drip irrigation in Burkina Faso

Jonas Wanvoeke*, Jean-Philippe Venot, Margreet Zwartveen and Charlotte de Fraiture

*Water Resources Management Group, Wageningen University, the Netherlands; UMR G-EAU, IRD, Institut de Recherche pour le Développement, Montpellier, France; Water Governance Group, UNESCO-IHE Institute for Water Education, Delft, the Netherlands; Land and Water Development Group, UNESCO-IHE Institute for Water Education, Delft, the Netherlands

(Received 28 August 2014; accepted 19 January 2015)

Over the last 15 years, smallholder drip irrigation has gained almost unanimous popularity as an effective tool to achieve the combined goals of sustainable water use, food security and poverty alleviation in the developing world. Based on a study in Sub-Saharan Africa, this article shows that this popularity does not stem from what the technology does in farmers’ fields, but is the result of the concerted efforts of a number of key spokespersons to align it with the projects and interests of a variety of actors, including development agents, researchers, NGO staff and pilot farmers.

Keywords: actor-network theory; development; innovation; smallholder; Sub-Saharan Africa

Introduction

About 15 years ago, Water International published an article entitled ‘Drip Irrigation for Small Farmers: A New Initiative to Alleviate Hunger and Poverty’ (Postel, Polak, Gonzales, & Keller, 2001). The article applauded the emergence of a new range of drip irrigation systems specifically targeting smallholder farmers. It articulated the expectation that these new systems ‘could form the backbone of a second green revolution, this one aimed specifically at poor farmers in Sub-Saharan Africa, Asia, and Latin America’ (p. 3). The article’s optimism was importantly fed by first experiences of non-governmental organizations such as International Development Enterprises (iDE) with the promotion of these small, low-cost irrigation technologies in South Asia (Bangladesh, India and Nepal).

Since then, initiatives aimed at promoting smallholder drip irrigation have indeed ‘travelled’ to Sub-Saharan Africa (Andersson, 2005; Van Leeuwen, 2001; Woltering, Ibrahim, Pasternak, & Ndjeunga, 2011; Woltering, Pasternak, & Ndjeunga, 2011). Almost all studies published to date that document these travels share Postel et al.’s optimism regarding the promises that smallholder drip irrigation holds. Although acknowledging the multiple obstacles and constraints that (may) impede widespread adoption and use by smallholder farmers, most reports and articles agree, in principle, that the dissemination of smallholder drip systems is a promising idea. This agreement is anchored in the belief that the technology – the smallholder drip system – is itself intrinsically good, a goodness that is attributed to its technical design characteristics: affordability, small size and infinite

*Corresponding author. Email: jonas.wanvoeke@wur.nl

© 2015 International Water Resources Association
expandability (Polak, 2008), coupled to notions of efficiency and productivity that are associated with drip irrigation systems in general (Venot et al., 2014).

The widespread positive interest in this technology in development cooperation circles stands in stark contrast with what happens in Sub-Saharan farmers’ fields. To give just the example of the main project discussed in this article, the African Market Garden (AMG) project distributed 500 drip kits in Burkina Faso (Dittoh, Akuriba, Issaka, & Bhattarai, 2010), reaching at least as many farmers. In 2012, only one of these farmers was still using a drip irrigation kit. Since the first experiences of AMG in Burkina Faso in 2003 and for all the successive projects that have been promoting drip afterwards (Tables 1 and 4), we observed that drip kits had been used only on experimental or demonstration sites established by promoters (NGOs, projects, etc.) and that the farmers involved are generally considered pilot farmers. As Kulecho and Weatherhead (2005) described in a study on smallholder drip irrigation in Kenya, pilot farmers stopped using the technology when external support from projects ended. These observations, however, have done little to dampen the enthusiasm of the various development actors. Projects involving the technology abound, including in Burkina Faso (Table 4). Rather than prompting scepticism regarding the promise and the success of the technology, disappointing results tend to be interpreted as indicating weaknesses in dissemination, a lack of support services or farmers’ inability to properly operate and use the technology.

This article proposes a different analysis of the fate of smallholder drip systems in West Africa, explaining how it has been positioned as a promising and successful technology regardless of what happens in farmers’ fields or users’ perspectives on this technology. Drawing on actor-network theory (Akrich, Callon, & Latour, 1988; Latour, 1987), it argues that the resonance that smallholder drip irrigation has acquired among a broad range of development actors mostly does not stem from what it does in farmers’ fields. Instead, it is the result of a carefully designed and staged promotional campaign by people (key spokespersons) believing in the (potential of the) technology. The active efforts of these key spokespersons have generated widespread interest in (and support and funding for) the technology from a broad coalition of actors by aligning it with a diversity of interests, projects and discourses. We provide a detailed historical analysis of this campaign on the basis of the trajectory of the AMG programme (and of its offshoots). The AMG was the first large-scale initiative aimed at promoting smallholder drip irrigation systems in the West African context.

After some theoretical background in the next section, the third section provides some information on smallholder drip irrigation in general, and more specifically on the AMG. The fourth section identifies the actors (individuals and organizations) who have actively worked to generate enthusiasm (funds and support) for smallholder drip irrigation systems and the AMG – and describes the multiple strategies they used to do so.

**Shaping the success of technologies: some theoretical insights**

Our explanation for the continued ‘success’ of smallholder drip irrigation is theoretically anchored in the practice-based theory of innovation proposed by Akrich, Callon, Latour, and Monaghan (2002a, 2002b). In contrast to ‘classical’ innovation analyses, their innovation theory does not ascribe the success or failure of a technology to its ‘intrinsic’ properties (the diffusion model) but instead looks at technologies in context to suggest that innovations are only taken up if they manage to interest more and more actors; this is what they call the “model of interessement” (Akrich et al., 2002a, p. 203).
This model postulates that for different actors to become interested in a technology, the technology needs to be translated to fit different contexts, interests and discourses. Callon and Latour (1981, p. 279) defined translation as “the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force”. Translation theory was originally developed as a framework to reveal that ‘scientific facts’ are built through networks, hence shedding light on the underpinnings of controversies that surround these ‘facts’. Latour (1987) broadened the scope of translation theory to the analysis and socialization of tools and machines. Since then, scholars have applied this theoretical framework to study the creation, acceptance and success of various devices (Dreveton & Rocher, 2009; Johansson, 2012).

Callon (1986) outlines four stages in the process of translation of a technology: problematization, interessement, enrolment and mobilization. Problematization refers to the articulation of a problem on the basis of observations or experiences drawn from the ‘real world’. A main actor (spokesperson) articulates a problem (s)he is interested in addressing and that ‘talks’ to a broader network, and establishes her or himself as an indispensable resource in solving the very problem (s)he formulated. Intersettement refers to a series of actions and strategies through which the actor who formulated the ‘problem to be solved’ aims to stabilize the identity, and identify and trace the potential role, of other actors. Here, the main actor (the spokesperson) aims to make her or his immediate interest (in solving the problem (s)he articulated) a ‘shared concern’. Akrich et al. (1988) suggest that the success of the process of interessement (which they call “the art of interessement”) in building a support network strongly depends on the choices made regarding the recruitment of representatives and intermediaries who interact and negotiate to shape and transform the innovation until it finds its ‘market’. In their view, the fate of innovation, but also its content and chances of success, importantly rest on the choice of these individuals or organizations, as these have a key role in ‘translating’ the innovation so that it is adapted and adopted by other actors, who will then become allies. In this article, we show that the spokesperson has not just created interessement; he has played a central role throughout the four stages of the translation model. Enrolment, or the establishment of a wider supporting coalition, follows, through a process of coercion, seduction, or consent. The spokesperson seeks to engage a series of stakeholders so as to form a stable network of alliances. Callon (1986) highlighted that this phase is characterized by multilateral negotiations, power grabs or ruses; it enables the art of interessement to come to fruition. Mobilisation finally occurs as the proposed solution gains wider acceptance in an ever larger network.

We make use of this analytical framework to explain the trajectory of smallholder drip irrigation in Sub-Saharan Africa. Based on empirical evidence, mostly drawn from Burkina Faso, we show that the four phases of the innovation translation model do not take place one after the other; rather, they occur concomitantly and reinforce each other. Our contribution to the translation model notably lies in the identification of the strategies used by the spokesperson to co-opt and enrol other individuals or organizations that will contribute to building the legitimacy of his or her own project.

Smallholder drip irrigation and the African Market Garden

Drip irrigation is a method whereby small quantities of water drip directly onto the root zone of crops through a network of plastic pipes, valves, emitters or drippers, and ancillary devices. Research and development efforts on drip irrigation have long been
inspired by expectations that the technology would allow more precisely adjusting irrigation to crop water demands, improving water use and application efficiencies (van der Kooij, Zwarteveen, Boesveld, & Kuper, 2013; Venot et al., 2014). Irrigation scholars and professionals generally consider drip irrigation a more sophisticated form of irrigation as compared to, for instance, surface irrigation. Its use is commonly associated with modernization and progress, and with larger and wealthier farmers.

Drip systems for smallholder farmers in the developing world were first developed in the 1970s by a US-based company, Chapin Watermatics (Postel et al., 2001). Over the last 20 years, several other organizations, such as iDE, as well as the two major manufacturers of drip irrigation equipment, Netafim and Jain Irrigation Systems, have also engaged in efforts to design and disseminate smallholder drip irrigation systems meant to irrigate relatively small gardens in the developing world. Such initiatives are said to have had beneficial impacts at scale on smallholders’ livelihoods in South Asia in the early-to-mid 2000s (see e.g. Polak, Nanes, & Adhikari, 1997; Postel et al., 2001), which in turn has generated much enthusiasm regarding the prospect of drip irrigation in Sub-Saharan Africa. In the literature, various names are given to these smallholder drip irrigation systems: ‘low-cost drip system’; ‘low-pressure drip system’; ‘low-tech gravity system’.

For the sake of clarity, we will use the term ‘smallholder drip irrigation’ in this article. Depending on the size of the plot they can irrigate and the type of water storage, Postel et al. (2001) distinguished between three different types of smallholder drip systems, all referred to by the generic term ‘kit’: bucket kits, drum kits and family drip kits. Depending on the designer and manufacturer, smallholder drip systems have drip laterals 8–16 mm in diameter and are made of thick-tube, rigid polyethylene with in-line drip emitters, PVC, or flexible tape. Regardless of the system and the manufacturer, the principle is the same: the ‘drip kit’ operates under low pressure to irrigate a small plot, from a few square meters to a few hundred square meters.

The African Market Garden, described by its designers and promoters as an integrated horticultural production system, had the objective to improve the profitability of small farmers’ horticultural production in the Sudano-Sahelian region of Africa by means of drip irrigation, high-quality crop varieties and an adapted operation and management package (Woltering et al., 2011). The drip system used was the Family Drip System (FDS) designed by Netafim. It is a pre-packaged kit using rigid polyethylene pipes that are pre-fitted with advanced drippers and can be adapted to variable plot sizes (Huang, 2012). The typical system size ranges from 500 to 1000 m², and a complete FDS kit consists of four components: a water tank; a simple control head (valve); a filter; and the drip lines (Figure 1). Apart from the water tank, all the components of the kit are supplied in one box (Phocaides, 2007). The FDS is commonly seen as the most high-tech, high-quality and expensive option among all available smallholder drip irrigation systems on the market (Kay, 2001).

Deciphering success: the case of smallholder drip irrigation

Methodology

The analysis of the trajectory of the AMG that follows is based on an intensive literature review that included scientific articles, news clippings, blog posts and websites. The literature review was complemented with interviews with people involved in the development, promotion and dissemination of smallholder drip irrigation systems in Sub-Saharan Africa. Snowball sampling was used to identify individuals and organizations involved in the AMG and its multiple offshoots. Snowball sampling is a technique that enables gathering
data starting from the identification of a limited set of individuals who are knowledgeable on the topic of interest and in a position to identify others who could bring additional information on the same subject (Faugier & Sargeant, 1997). The first person we identified and interviewed was the former agricultural technician of the AMG project in Burkina Faso. From that interview, we built a web of contacts of individuals and organizations which had played a role in the AMG project and its multiple offshoots. We conducted a total of 15 interviews with people who had contributed to the design and implementation of the AMG, either as core team members or as associated partners. Interviews were performed in a semi-structured way, with a general interview guide and thematic questions.

**Problematization: drip irrigation for poverty alleviation**

Smallholder drip irrigation in Sub-Saharan Africa, and globally, is seen as an answer to a double problem statement. First, smallholders in the developing world are poor and highly vulnerable; they have not yet benefitted from technological advances in the field of irrigation (Postel et al., 2001). Second, water resources are scarce and increasingly unreliable; they need to be secured and used more efficiently (Rosegrant, 1997). Smallholder drip irrigation is presented as a solution to these two problems, in that (1) there is a wide scientific and development consensus that drip irrigation is a ‘proven technology’ that allows for efficient water use (of secured water supplies) and higher yields of vegetable and fruit crops that can be sold for a profit and generate income, and (2) small, low-cost drip irrigation systems that fit smallholder farm sizes and investment capacities exist and have been used in South Asia.

In addition to this high-level problematization in terms of poverty and environmental sustainability, smallholder drip irrigation is also presented as a way to reach another important development objective: the empowerment of women. Small drip systems would allow women to grow their own crops, on their own small plot of land, and decide what to do with the money earned from the vegetables produced (Shah & Keller, 2002).
**The art of interessement: a core network**

The year 2002 saw the first attempts of international development and agricultural research actors to promote smallholder drip irrigation systems in the West African region, and the beginning of a period when such initiatives started attracting much attention. (Until then, efforts of charitable organizations such as Chapin Living Waters and other NGOs aiming at supporting the use of such systems were limited in scope and had not been ‘brought to scale’.) This was linked to a convergence of interests of four major actors: Netafim (an Israeli company and the biggest manufacturer of drip irrigation equipment worldwide); the World Bank; IPALAC (the International Program for Arid Land Crops of the Ben-Gurion University of Negev); and ICRISAT (the International Crops Research Institute for the Semi-Arid Tropics). Netafim had long engaged in developing small-scale drip irrigation systems (targeting small Chinese greenhouses) and was looking for support from the Development Marketplace initiative of the World Bank to extend similar activities to the African continent, where smallholders traditionally irrigate vegetables with watering cans. IPALAC was set up in 1994 by an Israeli researcher named Dov Pasternak with the objective of transferring new crops to semi-arid regions, notably in Sub-Saharan Africa (interview with Dov Pasternak, 27 June 2013). ICRISAT engaged in promoting crop diversification in the region from the late 1990s onwards (http://www.icrisat.org/what-we-do/wit/wit_3/wit_3.htm). This convergence of interests created favourable conditions for Dov Pasternak to join ICRISAT in 2001. The institute would, in turn, host the IPALAC programme from its office in Niger and use it as a conduit to pursue its objective of agricultural diversification.

As an Israeli scientist involved in the field of irrigation, Dov Pasternak had close relationships with Netafim, and he convinced them that ICRISAT would be an interesting partner from the perspective of submitting a collaborative project to the Development Marketplace initiative of the World Bank. The project was funded in 2002 (at $250,000; Huang, 2012) and aimed at promoting date palm cultivation by means of low-pressure irrigation (interview with Dov Pasternak on 27 June 2013). A hundred FDS kits would be installed in Niger during the project. Unfortunately, no information is available on the results of this project or what happened to the kits since then.

At an organizational level, the involvement of ICRISAT, a research centre of CGIAR, provided scientific legitimacy to projects promoting smallholder drip irrigation and enabled harnessing support from international and bilateral funding agencies. At an individual level, the first intermediation of Dov Pasternak (between Netafim and ICRISAT) would soon be followed by others that would establish him as the ‘public figure’ and scientific guarantor of smallholder drip irrigation experiments in the Sudano-Sahel region of Africa. He, indeed, can be identified as a key spokesperson who played a very active role in the innovation translation process. He engaged in constant negotiations aiming at enrolling new actors in an ever-extending network of supporters.

**Enrolment: shaping a coalition and strategies to enlist allies**

**Building alliances**

Scaling up the activities conducted between 2002 and 2004 in Niger in the framework of the first AMG project funded by the World Bank required identifying other individuals and agencies that would support the idea of crop diversification through the means of smallholder irrigation. After a talk given at the World Summit on Sustainable Development in South Africa in 2002, Dov Pasternak managed to create such
interessement among Israeli diplomats operating in Sub-Saharan Africa and the staff of MASHAV (the organization responsible for the implementation of international collaboration at the foreign ministry of Israel). MASHAV would eventually fund several projects based on AMG principles, implemented through ICRISAT but also through other local NGOs (Table 1). In the same vein, the support of USAID for AMG principles and projects was triggered by a talk given by Dov Pasternak in their regional office in Mali (interview with Dov Pasternak, 17 June 2013). USAID found in smallholder drip irrigation a (potential) means to achieve its food-security and poverty-reduction goals. As more funding agencies came into play, various projects emerged in many countries of Sub-Saharan Africa (Table 1). These projects, however, shared the principles of the AMG and had been triggered by the same individual. The multiplication of initiatives and funding agencies and the wide geographical scope of these projects were instrumental in establishing smallholder drip irrigation as a ‘success’. After all, if so many organizations promoted it, it had to be good.

Using development discourses and recruiting pilot farmers

The AMG was presented as a holistic crop management package allowing crop diversification through the means of drip irrigation (Woltering et al., 2011). By presenting drip irrigation as a ‘success’ strategy, organizations like USAID and other funding agencies were encouraged to invest in similar projects. This was facilitated by the AMG’s ability to combinecrop diversification with food-security and poverty-reduction goals, making it an attractive option for funding agencies. The table below provides an overview of the projects based on African Market Garden principles in Sub-Saharan Africa.

Table 1. Smallholder drip irrigation projects based on African Market Garden principles in the Sahel region of Sub-Saharan Africa.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Project name</th>
<th>Funding agencies</th>
<th>Main implementers</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003–2008</td>
<td>Techno-Agriculture Innovation for Poverty Alleviation</td>
<td>MASHAV</td>
<td>NGO Ikamva Labantu</td>
<td>South Africa</td>
</tr>
<tr>
<td>2005–2008</td>
<td>African Market Garden</td>
<td>MASHAV, John Paul II Foundation</td>
<td>ICRISAT</td>
<td>Cape Verde, Mauritania, Senegal, Gambia, Guinea Bissau, Mali, Burkina Faso, Niger, Chad Senegal</td>
</tr>
<tr>
<td>2006–2013</td>
<td>Techno-Agriculture Innovation for Poverty Alleviation</td>
<td>MASHAV, government of Italy, government of Senegal</td>
<td>NGO Green Senegal</td>
<td></td>
</tr>
<tr>
<td>2007–2010</td>
<td>Solar Market Garden</td>
<td>USAID, SELF</td>
<td>SELF, ADESCO</td>
<td>Benin</td>
</tr>
</tbody>
</table>

Source: Interviews and literature review.
irrigation technology as a tool to achieve a broader goal and as one important element of an integrated agricultural development project, the promoters of the AMG harnessed the support of development agencies, for whom ‘integration’ had been a key word since the 1970s. Further, by adapting the initial FDS system of 500 m$^2$ and offering multiple options (80 m$^2$, 500 m$^2$, clusters and collective systems of more than 500 m$^2$; Woltering et al., 2011), the promoters of the AMG demonstrated the adaptability of smallholder drip irrigation to local conditions and to different types of farmers. This also contributed to making it attractive to development agencies and enabled recruiting ‘pilot farmers’ who, in turn, played a key role in harnessing support from international and bilateral agencies. Pilot farmers tested the AMG system on demonstration sites and were showcased as successful examples of drip irrigation in use during the many ‘field visits’ that were organized to these demonstration sites. About 1200 pilot farmers, extension agents, and NGOs personnel were trained on the use of drip irrigation systems in growing vegetables and fruits (ICRISAT, 2005). This was presented as evidence of success and proved central to enrolling new actors in similar activities.

**Experimental results and distribution numbers as ‘proof of success’**

Several scientific publications reported the success of smallholder drip irrigation in terms of water, time, and labour savings as well as increases in yields. These results were obtained on the experimental sites where the AMG was implemented (Mahamadou, 2005; Oumarou, 2008; Woltering et al., 2011). Such results, corroborated during many field visits organized for development agents but also for farmers, were widely circulated as evidence for the potential contribution of drip irrigation to improving food security and land use, increasing household income and reducing poverty (ICRISAT, 2005). But field visits and experimental results were also used by the AMG promoters and technicians to convince other organizations and individual farmers to stock up on drip irrigation kits. The number of drip kits distributed, in itself, quickly became an objective, even a measure of success, of the AMG project (regardless of whether the kits would actually be used by farmers). As put by a former technician of the AMG in Burkina Faso: ‘We were just distributing the drip kits, for free, to anyone, either to individuals or to organizations who requested it. We were not interested in where the kits would end up and whether they would be used’ (INERA technician, personal communication, 2012). ICRISAT (2006), for instance, presented the distribution of 2000 drip kits in nine Sahelian countries as a “Sahelian success”. Remarkably little has been reported on the actual use of these smallholder drip irrigation kits (Kay, 2001). Of the 2000 kits, 500 were said to have been successfully distributed in Burkina Faso, but little effort was made to see whether they were actually used (Dittoh et al., 2010).

**Scientific publication as legitimation on the international stage**

Publication in academic journals served as another effective way to build the scientific legitimacy of the AMG and its multiple offshoots and played an integral part in harnessing the support of multiple actors. We were in a position to identify five peer-reviewed articles listed in the Web of Knowledge database that directly deal with the AMG or one of its offshoots (see Table 2).

What is striking in Table 3 is that four of these five peer-reviewed articles (and the large majority of the grey literature, not shown) documenting the AMG and similar initiatives have, among their authors, at least one person who was directly involved in the
implementation of these projects. Most of the articles conclude that smallholder drip irrigation has the potential to increase the profitability of vegetable gardening, enhance livelihoods and reduce poverty, on the basis of results obtained from experimental or demonstration sites, where farmers had access to much more support and advice than usual.

All these peer-reviewed articles are the results of research sponsored or implemented by drip kit producers or disseminators – people, that is, who were keen to make drip work. The publication of AMG articles in scientific journals has significantly contributed to the perceived legitimacy of smallholder drip irrigation and reinforced its recognition as a successful technology, creating further interessement and enrolling additional development and funding agencies in the innovation and dissemination process. Each of these actors found in the technology a means to achieve their own objectives.

### Intensive use of mass media

Scientific publications were not the only communication tool used to create interessement and enrol donors and development agencies. The AMG promoters also made intensive use of mass media to advertise the agronomic and economic performance of smallholder drip irrigation. The same pilot sites that served as a basis for collecting data for scientific publications also served for public shows where journalists from newspapers, radio, and public or private television companies reported on the AMG. We identified not less than 15 news cuttings or blog posts on the AMG wherein the major source of information was Dov Pasternak. All these reports focused on drip irrigation (rather than on the integrated horticultural management package of

<table>
<thead>
<tr>
<th>Article title</th>
<th>Journal, date of publication</th>
<th>Authors</th>
<th>Authors affiliation with AMG</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Market Garden</td>
<td>Encyclopedia of Water Science, 2003</td>
<td>D. Pasternak &amp; A. Bustan</td>
<td>AMG project leader and implementing staff</td>
</tr>
<tr>
<td>Smallholder Irrigation as a Poverty Alleviation Tool in Sub-Saharan Africa</td>
<td>World Development, 2012</td>
<td>J. A. Burney &amp; R. L. Naylor</td>
<td>AMG project research associates</td>
</tr>
<tr>
<td>Intensification and improvement of market gardening in the Sudano-Sahel Region of Africa</td>
<td>Chronica Horticulturae, 2006</td>
<td>D. Pasternak, A. Nikiema, D. Senbeto, F. Dougbedji, &amp; L. Woltering</td>
<td>Project leader and project implementers</td>
</tr>
</tbody>
</table>
the AMG) and its potential to alleviate hunger and poverty and improve food security. In the
same way, the large majority of videos available on the web were staged during the imple-
mentation phase of the AMG project and its offshoots, featuring people (researchers and
farmers) who had been directly involved in project activities and demonstration sites. They
provide testimony of the potential of drip irrigation to increase yields.

Mobilization: the network extends.

We turn here to the last phase of the innovation translation model, that of mobilization: the
wide extension of the network of individuals and organizations revolving around a parti-
cular innovation. To do so, we focus on Burkina Faso, for which we have more information,
but the same processes have probably been at play in other countries of Sub-Saharan Africa.

In the mid-to-late 2000s, ICRISAT coordinated smallholder drip irrigation initiatives in
Sub-Saharan Africa by partnering with other international research centres (such as the World
Vegetable Center or AVRDC) and, perhaps more significantly, with national agricultural
research organizations. In Burkina Faso, this was the Institut de l’environnement et recherches
agricoles (INERA). Since 2010, other actors have taken centre stage, with smallholder drip
irrigation moving from the ‘research’ to the ‘development’ field. This is largely because the
national government saw initiatives involving smallholder drip irrigation as offering a

| Table 3. Smallholder drip irrigation: supporting coalition and rationales. |
|--------------------------|--------------------------|--------------------------|--------------------------|
| Actors               | Terms of the problem                   | Terms of interesement                              | Measure of success                  |
| Drip irrigation       | Entering the African market           | Selling equipment                               | Number of drip kits sold           |
| manufacturers         | Contributing to poverty alleviation via science and technology for crop diversification | Demonstrating effectiveness in experimental plots; scientific publications | Publications in the scientific literature; media coverage; number of farmers trained |
| Research organizations|                                         |                                            |                                        |
| Donors and            | Alleviating poverty in a sustainable and gender-friendly way; developing a market-and business-oriented agricultural sector | Demonstrating how World Bank funding (and ideology) contributes to poverty alleviation | Number of drip kits distributed and number of farmers reached |
| funding agencies      |                                         |                                            |                                        |
| (World Bank,          |                                         |                                            |                                        |
| USAID, etc.)          |                                         |                                            |                                        |
| NGOs and other        | Alleviating poverty in a sustainable and gender-friendly way | Demonstrating how their activities (often measured by number of kits distributed) contribute to lifting farmers out of poverty | Number of drip kits distributed and number of farmers reached |
| implementers          |                                         |                                            |                                        |
| Governments           | Modernizing smallholder farming and alleviating poverty | Demonstrating how activities lead to rural development | Number of funded projects; number of drip kits distributed; number of farmers trained |
| Farmers               | Reducing poverty and vulnerability to external shocks | Free inputs and extension; international exposure; status as pilot farmer. | Training received; free hand-outs (seeds, fertilizer, pipe) and advice |
potential contribution to its food-security agenda, while NGOs and drip irrigation manufacturers saw in smallholder drip irrigation a conduit to pursue their own goals (see Table 3).

There are important overlaps between the research and development networks that help explain the speed of the mobilization process. For instance, the ‘micro-irrigation’ officer of the IFAD-funded governmental project PIGEPE was a former INERA technician trained by Dov Pasternak. Also, iDE, which had a long experience of promoting smallholder drip irrigation in the Asian context (Polak et al., 1997; Postel et al., 2001), has now become a central player in Burkina Faso. iDE activities are largely funded by agencies which earlier supported the AMG initiatives, such as USAID and the Swiss Agency for Development and Cooperation (Tables 1 and 4).

Conclusion
This article has described the processes through which a widely shared consensus was created on the validity and legitimacy of promoting smallholder drip irrigation systems as a means to meet a wide number of development goals. Telling the story of smallholder drip irrigation through the theoretical innovation model of interessement, this article has shown that the enthusiasm for this technology can be largely traced back to the relentless efforts of one particular person, an Israeli scientist. With missionary zeal, he engaged in strategic efforts to convince funders, researchers and many others of the many benefits of the technology, creating a network of support for its dissemination.

A systematic and independent review of the use and impact of drip irrigation kits in Sub-Saharan Africa is lacking. Drip irrigation is widely regarded as a success despite a lack of data on its (un)sustained use in farmers’ fields. Our field work provides evidence that in Burkina Faso AMG drip kits are no longer in use. In the 10 years that separate our study from the moment they first ‘hit the field’, these drip kits might have been in use with positive impact on farmers, but this is difficult to assess, because tracing the beneficiaries (villages and farmers) of these kits is a challenge. In-depth analysis of current projects implemented in Burkina Faso reveals that the kits are seldom used by rural farmers for food, poverty, or water savings. Instead, farmers’ engagement with the technology is short-lived, and their interest in it mainly stems from the side benefits that come with the project of which drip irrigation is one element (Wanvoeke, Venot, & Zwarteveen, 2015). Such observations make it doubtful that AMG drip kits were used with significant positive impacts even at the height of the project – something that was hinted at by several people we interviewed who had been involved in the AMG project in Burkina Faso. Hence, rather than from what it actually does in the field, the technology obtained its status as a ‘success’ through a professional and carefully crafted promotional campaign, legitimized by scientific results obtained in experimental or pilot fields. Through this campaign, smallholder drip irrigation has come to be seen as a technology that is potentially instrumental in simultaneously meeting a large number of objectives. It is associated with poverty alleviation and improvements in nutrition, food security and agricultural productivity; with economic growth and women’s empowerment; with water conservation, environmental protection and adaptation to climate change. Through these associations, smallholder drip irrigation thus acquired properties that allowed it to attach itself to a wide coalition of actors, including development agents, researchers, NGO staff and some pilot farmers. These actors find in smallholder drip irrigation a way to meet their own goals: social entrepreneurs looking for good causes to support; drip irrigation manufacturers looking for new markets; development organizations looking for ‘best practices’ they can use to convince funders; etc. (Table 4).
In comparison to the innovations described by Akrich et al. (2002a, 2002b), what is remarkable in the case of smallholder drip irrigation is that the success of the technology appears largely unrelated to whether and how end-users appreciate it. The act of translation in this particular case is one between the technology and the ‘development sector’, rather than between the technology and end-users. As most actors agree on the potential and promises of the technology, studies that report dissemination, adoption and use challenges are taken as calls to reiterate (and adjust) past efforts. Actual practices (or the lack thereof) by farmers have thus become secondary to the imagery of success that surrounds the technology.

This study holds important lessons for policy makers. First, there is a need for in-depth independent evaluation of drip irrigation projects that reflect the perspectives of smallholders and not only of the promoters of the technology. Second, there is a need to acquire a deeper understanding of how different actors understand and measure what makes the success of a technology before investing in or supporting any technological package. Public campaigns, websites, news stories and experimental results indeed do not necessarily reflect smallholders’ perspectives, which should remain the guiding principles of any development intervention.

**Funding**

This research was supported by the Netherlands Organisation for Scientific Research (NWO) [grant number 313-99-230] in the framework of the MVI project Drip Irrigation Realities in Perspective.

**Notes**

1. AMG project data are not publicly available, and different sources contradict one another. For instance, Dittoh et al. (2010) report that 500 drip kits were distributed in Burkina Faso, while interviews and the notes of former AMG technicians in charge of the distribution of drip kits in
Burkina Faso tend to indicate that only half this number would actually have been distributed. In 2012, field visits in the villages that had been indicated to us as ‘AMG target villages’ by former project technicians allowed us to note the absence of sustained drip irrigation use in nearly all sites.

2. The farmer is Hadj Lansane Sawadogo, from Ouahigouya. He said he was still using the drip kit AMG provided him. However, the kit he is using may not be the one from AMG. Since then, this farmer has received support and other drip kits from other programmes and organizations promoting smallholder drip irrigation.

3. The term ‘smallholder’ requires clarification because it means different things to different people. For this article, ‘smallholder’ is synonymous with ‘small-scale’ or ‘small farms’ (often less than 2 ha), privately owned and under the complete control of the farmer with little or no input from external government resources.

4. The Development Marketplace initiative (https://wbi.worldbank.org/developmentmarketplace/) of the World Bank was set up in 1998 to provide start-up funds to (social) entrepreneurs to develop, and bring to scale, their innovative ideas.

5. Dov Pasternak was not the only public face of smallholder drip irrigation. Paul Polak, founder of iDE, played a similar role in Asia.

References


low-cost micro-irrigation: A case study from Kenya. *Irrigation and Drainage Systems, 19*(2),
179–188. doi:10.1007/s10795-005-4419-6


Mahamadou, O. S. (2005). *Diffusion des systèmes d’irrigation goutte-à-goutte dans la zone péri-
urbaine de Niamey et dans la région de Dosso au Niger.* (Mémoire de Fin de Cycle), IPR/IFRA,
Katibougou, Mali.

NETAFIM. (2008). *Sustainable irrigation: Climate change in arid zones & other challenge.* Paper
presented at the Climate Change Conference of the United Nations Framework Convention on
Climate Change (UNFCCC), Poznań.

l’arrosage manuel sur la production de la laitue en zone sahéli souadienne du Niger*
(Mémoire de Fin de Cycle). Katibougou, Mali: IPR /IFRA.

Agriculture Organisation (FAO).

CA: Berret-Koehler.


0250860108686882


irrigation development.* Paper presented at the Regional seminar on Private Sector participation
and Irrigation Expansion in sub-Saharan Africa, Accra.

van der Kooij, S., Zwarteveen, M., Boesveld, H., & Kuper, M. (2013). The efficiency of drip
agwat.2013.03.014

private sector.* Paper presented at the Regional Seminar on Private Sector Participation and
Irrigation Expansion in Sub-Saharan Africa, Accra.

Venot, J. P., Zwarteveen, M., Kuper, M., Boesveld, H., Bossenbroek, L., Kooij, S. V. D., … de Fraiture,
C. (2014). Beyond the promises of technology: A review of the discourses and actors who make drip
irrigation. *Irrigation and Drainage, 63*(2), 186–194. doi:10.1002/ird.1839

projects: Farmers’ logics in engaging with drip irrigation projects in Burkina Faso.
Manuscript submitted to *Society and Natural Resources.*

drip irrigation and hand watering for vegetable production in the Sahel. *Agricultural Water

of a low-pressure drip irrigation system for smallholders in the Sudano Sahel. *Irrigation and
Drainage, 60*(5), 613–621. doi:10.1002/ird.610