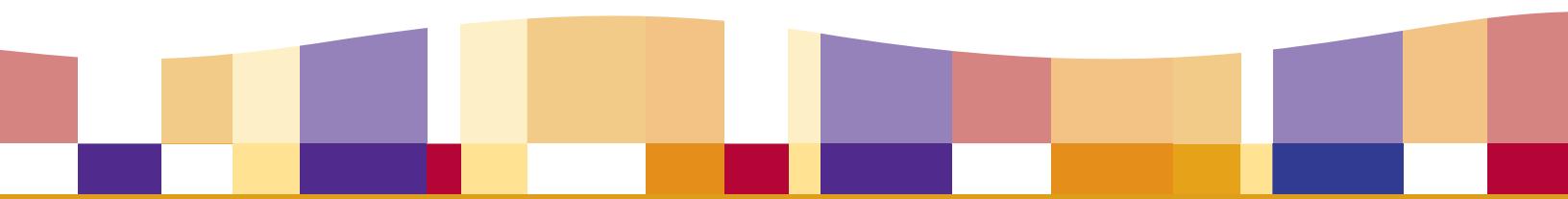


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ENERGY AND AGRICULTURAL TECHNOLOGIES
FOR WOMEN'S ECONOMIC ADVANCEMENT

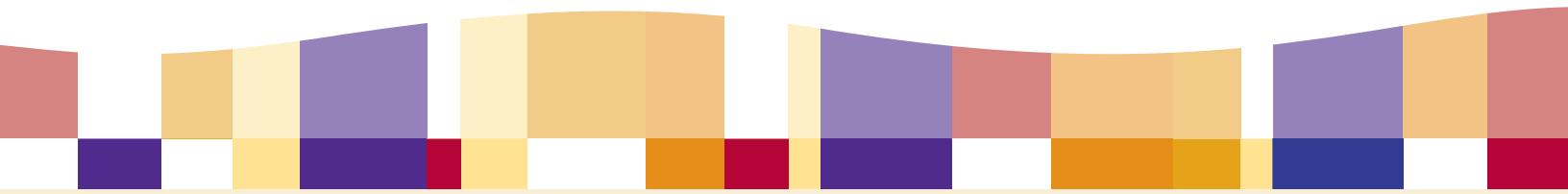


Kirrin Gill Payal Patel Paula Kantor Allison McGonagle



in*visible market

ENERGY AND AGRICULTURAL TECHNOLOGIES
FOR WOMEN'S ECONOMIC ADVANCEMENT



THE INTERNATIONAL CENTER

FOR RESEARCH ON WOMEN (ICRW)

Kirrin Gill HAS WORKED FOR MORE THAN 35 YEARS TO
Payal Patel EMPOWER WOMEN, ADVANCE GENDER EQUALITY
Paula Kantor AND FIGHT POVERTY IN THE DEVELOPING WORLD.
Allison McGonagle

ICRW WORKS WITH PARTNERS IN THE PUBLIC AND
PRIVATE SECTORS AND CIVIL SOCIETY TO CONDUCT
EMPIRICAL RESEARCH, BUILD CAPACITY AND
ADVOCATE FOR EVIDENCE-BASED, PRACTICAL
WAYS TO CHANGE POLICIES AND PROGRAMS.

A c k n o w l e d g m e n t s

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DESIGN: DO GOOD DESIGN

invisible market

ENERGY AND AGRICULTURAL TECHNOLOGIES FOR WOMEN'S ECONOMIC ADVANCEMENT

Technology has changed the way the world works and lives. But many of the world's poor, particularly women, have limited access to technologies that can help them enhance their economic opportunities.

There is tremendous opportunity in reaching this invisible market.

Women are the fastest-growing cohort of entrepreneurs and business owners in developing countries.¹ Energy and agricultural technologies, in particular, have extraordinary potential to improve their productivity and economic possibilities. In sub-Saharan Africa and South Asia, 70 percent or more of the labor force works in agriculture. And in both regions, women make up the majority of agricultural laborers.² Moreover, increased demand for these technologies translates into more customers, which improves chances that technology developers and distributors can raise revenues. Ultimately, this virtuous cycle creates both economic and social value for women, their families and their societies.

This paper focuses on what technology initiatives can do to take advantage of these business opportunities – providing women with the transformative power of technologies, while also strengthening their own business prospects. It builds on ICRW's landmark paper, entitled *Bridging the Gender Divide: How Technology Can Advance Women Economically*, which made the case for how technologies can create pathways for strengthening women's economic opportunities.³ Specifically, it showed how integrating the needs of women in the technology development lifecycle can trigger a chain of events that leads to economic advancement and, eventually, to wider social and economic benefits. It also identified the common characteristics and effective strategies of successful initiatives.

Our current research deepens this effort by examining how such successes can be scaled up and become more sustainable. Through a field-level investigation and interviews with experts, it identifies strategies to improve the scale and financial sustainability of technology initiatives that reach women. This paper examines how women's use of technology and their involvement

¹ Minniti, M. & Naudé, W. (2010). What do we know about the patterns and determinants of female entrepreneurship across countries? *European Journal of Development Research*, 22: 277-293.

² World Bank, FAO and IFAD. (2009). *Gender in agriculture sourcebook*. The World Bank: Washington, D.C.

³ Gill, K. et al. (2010). *Bridging the gender divide: How technology can advance women economically*. ICRW: Washington, D.C.

in the development and distribution of a technology can not only advance women economically, but also can benefit enterprise-based technology initiatives by expanding their markets and helping them to generate greater financial returns.

Potential of energy and agriculture technologies

We focus on the energy and agriculture sectors, primarily on renewable energy⁴ and irrigation technologies, because of the large existing gap in women's access to these technologies and the considerable potential these technologies have to positively affect women's economic prospects. Approximately 3 billion people around the world lack access to modern fuels for cooking and heating.⁵ For rural women, whose enterprises tend to be fuel and labor intensive,⁶ access to energy allows them to save time and resources and increase productivity. Irrigation infrastructure plays an especially critical role in supporting agricultural activity. Yet the majority of poor farmers in sub-Saharan Africa, especially women, lack access to irrigation infrastructure and technologies.⁷ Women are also less likely than men to adopt improved agricultural technologies.⁸ Enhancing women's access to critical agricultural inputs such as irrigation technologies can substantially boost their agricultural productivity and earnings.

Understanding the importance of these sectors, government, for-profit and non-profit actors are increasing investments in energy and agricultural technologies to support economic growth and development objectives, especially in sub-Saharan Africa. It is thus important to ensure that women benefit significantly from these efforts. Furthermore, governments and aid agencies increasingly recognize the interconnections among energy, water, food security and poverty reduction. Our research contributes to these efforts by providing lessons learned, insights and recommendations on how energy and agricultural technologies can improve the economic position of the poor, particularly rural women, who otherwise have limited or no access to modern energy services and irrigation infrastructure. In doing so, the paper aims to help encourage new and more successful investments in technologies that can also contribute to women's economic advancement.

⁴ Renewable energy is energy that comes from natural resources that are naturally replenished, such as wind, sunlight, hydro, biomass and geothermal heat.

⁵ UNDP and World Health Organization. (2009). *The energy access situation in developing countries: A review focusing on the least developed countries in sub-Saharan Africa*. UNDP and World Health Organization: New York.

⁶ Clancy, J. (2003). *Household energy and gender: The global context* (Briefing paper). Joint initiative of Intermediate Technology Development Group and the University of Twente, The Netherlands.

⁷ IFAD. (2001). *Rural poverty report: The challenge of ending rural poverty*. Oxford University Press. Kay, M. (2001). *Smallholder irrigation technology: prospects for sub-Saharan Africa*. FAO: Rome. Retrieved February 2012, from <ftp://ftp.fao.org/docrep/fao/005/y0969e/y0969e00.pdf>.

⁸ Peterman, A., Quisumbing, A., Behrman, J. and Nkonya, E. (2010). *Understanding gender differences in agricultural productivity in Uganda and Nigeria*. IFPRI Discussion Paper 01003. Retrieved January 2012, from <http://www.ifpri.cgiar.org/sites/default/files/publications/ifpridp01003.pdf>.

Reaching the invisible market

Despite their enormous potential, many technology innovations have not reached women, particularly women in developing countries, because their needs and interests are not considered. For example, women face numerous barriers to accessing and purchasing technologies due to their limited financial resources and decision-making power within households. In addition, the few international development efforts that have sought to address these barriers and promote technologies to women in low-income countries have been small scale and donor dependent, without means of cost recovery and necessary market links to be financially viable. However, in recent years, there has been an increasing shift toward technology projects with more enterprise-based approaches to create access to and deliver technologies tailored to the poor. These approaches are relatively nascent compared to the need for technologies,⁹ but great potential exists to strengthen their effectiveness and expand their reach, as well as to ensure that they engage and benefit women.

This research explores what it takes for technology initiatives to reach and economically benefit the invisible market of women through market-based strategies that have the potential for achieving scale and financial sustainability. It explores the perspectives and insights of energy and agricultural experts from around the world and investigates how a selection of programs takes women's needs into account and how the programs' efforts translate into economically advancing women and achieving business goals. Approaches to address women's needs are at an early stage in the initiatives we focused on. These efforts can still benefit from greater opportunity to capitalize on market potential by intentionally considering women as a distinct segment of users and as potential actors in the technology supply chain.

We also focus on how technology programs can achieve scale and financial sustainability (see Box 1). These considerations are especially salient for technology initiatives, given that they have important implications for the extent to which technology users among the poor are able to access technologies and benefit from them over time. It is critical for technology initiatives that aim to support the economic activities of the poor to reach and benefit large numbers of women and men. The greater scale a technology initiative reaches, the more opportunity it has for reducing the production costs of the technology and ensuring affordability for end users with limited resources. Traditional development approaches to promoting

⁹ Jeff Haeni, USAID (Office of Infrastructure and Engineering), personal communication, April 20, 2011.

technologies have often tended to rely on donor funds to subsidize short-term projects with no means of revenue generation. We examine initiatives that have achieved some degree of cost recovery and/or promote financially viable markets for technology products in order to help sustain operations over the long term.

Our research focuses on sub-Saharan Africa and Indonesia because of the large need for energy and agricultural technologies and the existence of innovative technology initiatives in these areas.

Specifically, our analysis examines how women economically benefit from accessing and using technologies and to what extent programs consider women in their efforts to design, distribute and market technologies. The lead institutions for these initiatives are International Development Enterprises (iDE), KickStart, Kopernik, Solar Sister and Tanzania Traditional Energy Development and Environment Organization (TaTEDO). We chose to study these particular initiatives because each has elements of a market-based orientation and a gender-responsive approach.

Strategies that work

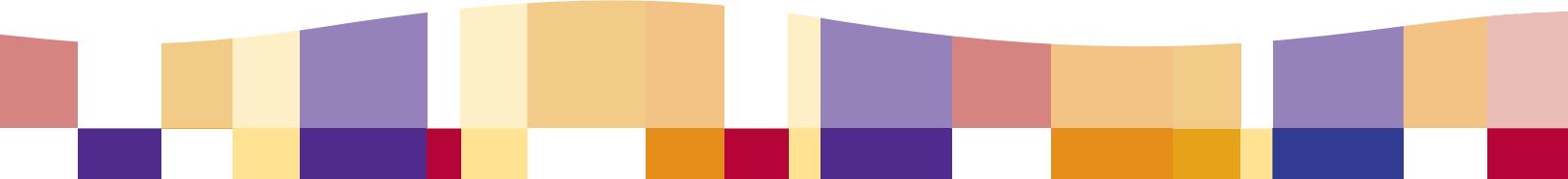
Overall, our analysis highlights promising practices and important lessons for technology initiatives and argues for increasing women's access to and use of technology, a win-win strategy that economically advances women while fostering financial sustainability through an expanded market base.

BOX 1

What are Scale and Financial Sustainability?

Scale involves *expanding* outreach. It can be achieved through increasing the population using, buying and benefiting from a technology, as well as by *diversifying* products and offering new products to existing clients.

Financial sustainability relates to the degree to which a program is able to *recover* the costs of developing and/or delivering technologies from its own earnings, thereby reducing the need for external funding or subsidies.



The following insights emerge from our research:

- **Technology initiatives can benefit women while advancing scale and financial sustainability.**

Almost all of the initiatives have provided opportunities for women to access and use energy and agricultural technologies to support their productive work, which can lead to higher earnings. For example, female-headed households in Ethiopia increased their net incomes on average by US\$268, or about 18 percent, since using treadle irrigation pumps from iDE.¹⁰ In the case of KickStart, treadle pump users, many of whom are women, have experienced on average a ten-fold increase in net farm incomes and as much as a four-fold increase in family incomes.¹¹ Women's participation as technology users also supports the scale and financial sustainability of technology initiatives, given that women's increased demand for and use of the various technologies have supported the ongoing expansion of the technology supply chains.

- **Marketing efforts that specifically reach women or increase women's demand for and community acceptance of women's use of technology are important.** For example, women are the vast majority of users for Kopernik's cookstoves; thus, it is very likely that employing female sales agents is a particularly effective strategy in addressing women's questions or concerns and promoting awareness about the product and its benefits to women buyers and users. Targeted marketing to women is also needed where men control family finances and typically make decisions about technology purchases, even if women are end users. This is the case for KickStart in Tanzania, where 94 percent of pump buyers are men, while women compose an estimated 70 percent of the users.

- **Engaging women within the supply chain, particularly in retail and marketing, has the potential to create meaningful options for women to earn additional income.**

When initiatives develop effective distribution channels via female sales agents, this helps increase demand for technologies and the reach of the initiatives among women. In addition, women economically gain through income-earning opportunities from their work in distribution and sales. However, the potential of such opportunities to generate viable and substantial sources of income for women depends on the amount and the consistency of the financial returns women are able to accrue over time.

¹⁰ IDE Ethiopia monitoring data provided to ICRW.

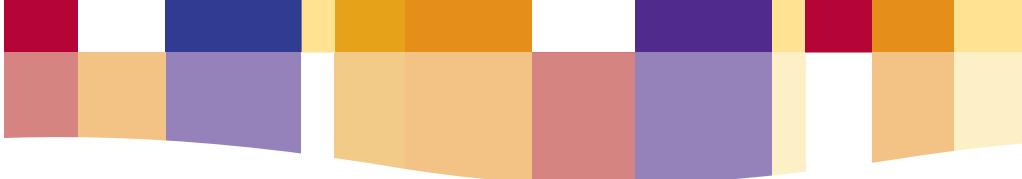
¹¹ KickStart 2010 Annual Report; gender-disaggregated figures are not available.

- **Focused efforts tailored to meet women's needs can enable women to purchase and benefit from technologies and generate results for initiatives and women.** Barriers such as lack of affordability and lack of understanding about technology use can be addressed through gender-responsive approaches and such complementary services as consumer financing and training. For example, KickStart recently addressed several constraints for women to buy pumps through financing and targeted marketing efforts. The payoff was an increase in pump sales among women from 9 percent of sales in 2007 to 18 percent in 2011.¹²
- **The technology initiatives have many of the necessary elements to establish financially sustainable, market-based supply chains.** These elements include critical start-up funding from donors, affordable technologies for which there is promising or sustained demand among potential consumers, marketing channels with the potential to expand, and built-in financial returns for supply chain actors. All of the initiatives examined intend to create financially sustainable technology supply chains over the long term, but given the fairly recent nature of most of the initiatives, it remains to be seen whether or not they will be able to do so.

Overview of the report

The following section outlines how technology initiatives can strengthen women's economic advancement, as well as their progress toward scale and financial sustainability. We then present the five technology initiatives, examining their strategies for developing and deploying technologies, as well as their current and potential opportunities to promote women's economic advancement. We conclude by synthesizing the key insights that the analysis of these technology programs yields. This forms the basis of our recommendations for how implementers and funders can effectively support technology development and distribution efforts in ways that meaningfully benefit women economically, and do so over the long run and at scale.

¹² KickStart Annual Report, 2011.



I. How Is Women's Economic Advancement Connected to the Scale and Financial Sustainability of Technology Initiatives?

How does technology actually work to help women economically? How do technology initiatives progress toward their aims to strengthen their scale and financial sustainability? And where do women fit in with these aims? This section of the paper examines these key connections. To do so, we look at the pathways technology creates for women's economic advancement (see Box 2). We then examine the mechanics of how technology initiatives go from the initial design of a product to developing a supply chain to distributing a technology to consumers, including women. We focus specifically on how initiatives scale up and enhance financial sustainability by stimulating demand and providing profit margins to enable their supply chains to function smoothly and expand. We also draw on the findings of our field research to examine the special gender-responsive approaches technology initiatives use to enable women and other customers with particular constraints to buy and successfully use their technologies.

Technology can promote women's economic advancement by improving the productivity and quality of women's work and generating new economic opportunities. In turn, women's increased use of technology can expand the scale of technology initiatives and thereby contribute to their financial sustainability.

BOX 2

Women's Economic Advancement & Technology

Women's economic advancement entails improving women's:

- Productivity, skills and business practices, which can all influence economic decisions
- Access to economic resources, and economic gains (e.g. increased profits, which can lead to improved livelihoods)

Technology can enhance women's economic advancement through two pathways:

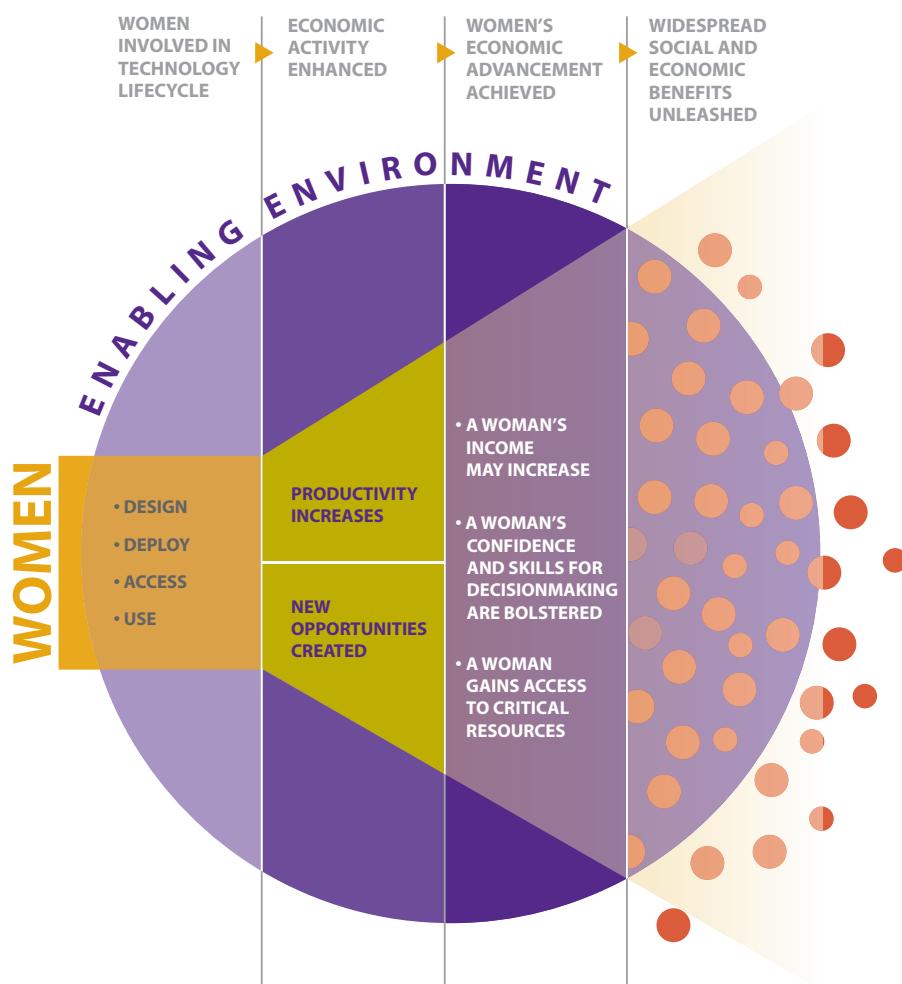
- (1) the use of technology to improve productivity in women's existing activities, and
- (2) the creation of new economic opportunities for women – for example, by marketing and selling technologies to others.

How does technology help to economically advance women?

When women are involved in the development and distribution of a technology and are able to access and use the technology, it triggers a positive chain reaction with widespread results (see Figure 1). This process opens up two key pathways to economic advancement for women: 1) increasing women's *productivity* in existing economic activities, and 2) creating *new economic opportunities* for women.

For example, technology that irrigates land used for agriculture can improve crop production and reduce the amount of time women must spend collecting water. Women can also gain access to new economic opportunities through technology by being engaged in the development and deployment of a technology as designers, producers, distributors or sales agents.

FIGURE 1: How technology can facilitate the economic advancement of women



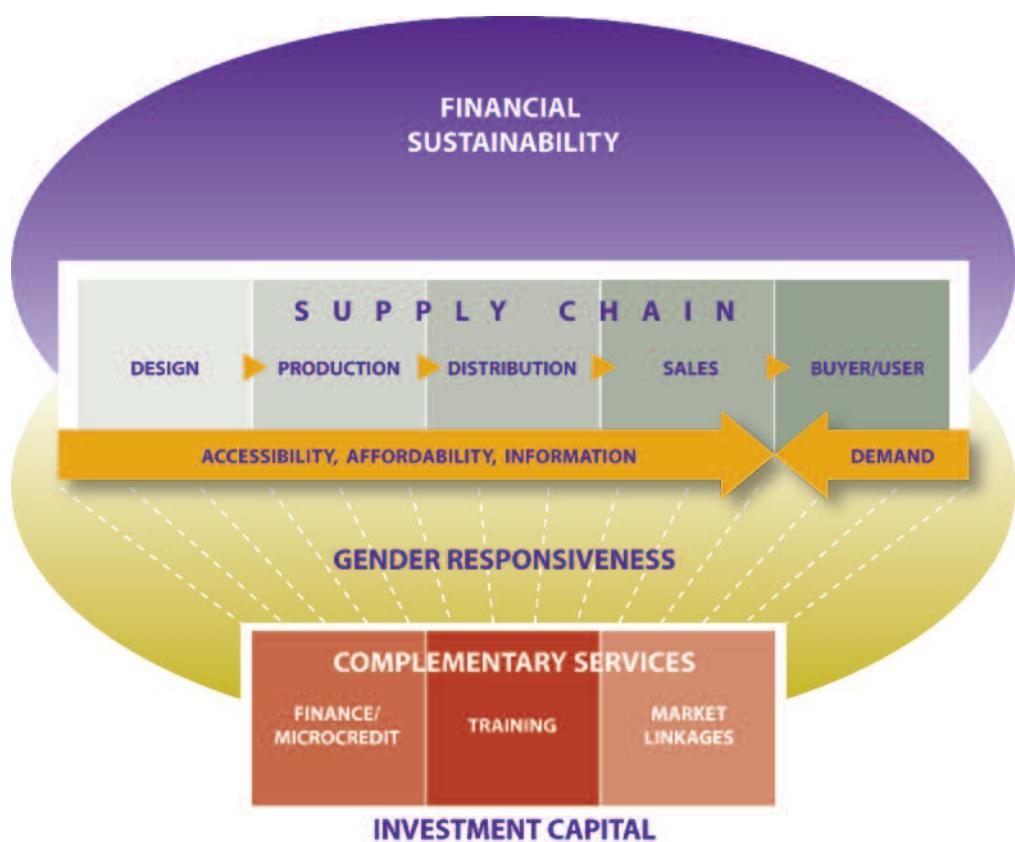
Both pathways afford women critical economic benefits: increased income, greater confidence, better decision-making skills and improved access to other assets and financial resources.

Women can then use their stronger economic position to invest in health care, education and entrepreneurial initiatives, transmitting social and economic benefits to their children, families and communities.

How can women's use of technology expand the scale of technology initiatives and thereby improve their prospects for financial sustainability?

Technologies must be affordable and meet the needs of users, including women, who make up 50 percent of the potential customer base. Therefore, inclusion of women is critical to successfully creating the market demand needed to make a technology viable for consumers, as well as to generate sufficient revenues for the businesses and institutions involved. Figure 2, which is based on our analysis of technology initiatives that reach women, illustrates how access to technology can be sustained through financially viable supply chains that are gender responsive.

FIGURE 2: Gender and Sustainability-Focused Supply Chain



Supply Chain

Technology initiatives need to expand their supply chains by generating increased demand, and producing and deploying more technologies to meet this demand. To help develop and expand the technology supply chain, lead institutions and other actors design, produce, distribute and market technologies to get them to potential buyers and users. To help ensure the *financial sustainability* of the supply chain, each actor along the chain makes a *profit margin* – the motivation for its participation – resulting in money flowing back along the chain from buyers/users to each actor in the supply chain. In some cases, these profit margins may also channel revenues back to the lead institution, thus enabling it to achieve varying degrees of cost recovery.

To expand *scale*, technologies must be affordable and meet compelling needs of potential buyers and users, including women. Thus, profit margins must be managed to ensure that there is a viable and sustained *demand* for the technology. This then enables technology initiatives to expand their production, distribution and marketing efforts, thereby enhancing consumers' access to technologies and, over time, scaling up technology sales. Scale can also be increased through diversification of a technology product to enable it to serve slightly different purposes, be available at different price points, and/or more effectively meet the needs and preferences of consumers. As the scale of technology uptake increases, there is greater potential for reducing the marginal costs at each stage of the supply chain and for achieving greater cost recovery, thereby strengthening financial sustainability.

Complementary Services

Various constraints may limit poor customers', particularly women's, ability to access and benefit from using technologies. These constraints include a lack of access to financial resources that make the technologies *affordable*; limited *information* about the availability of certain technologies, such as how to use them and how to maximize their benefits; and limited *access to markets* for selling value-added goods that can be produced by using technologies.

Our examination of technology initiatives reveals that these constraints can be overcome by providing various complementary services, which include:

- **Financial services/microcredit** to support consumers' ability to purchase technology products, as well as to enable other supply chain actors to make initial financial investments.
- **Training** in technology use and maintenance, or business and marketing skills to increase technology users' ability to utilize technologies and run businesses applying the technologies.
- **Market linkages** for technology users to facilitate the sale of technology-generated products, thereby enabling users to maximize the benefits and reduce the risks of investment in a technology.

When technology initiatives take a gender-responsive approach to considering women's needs and constraints and providing complementary services that help to generate demand (see Box 3), they can significantly increase women's interest in and ability to buy technologies and develop technology-related enterprises. Technology initiatives can also spur women's demand for technologies by providing women with income-generating opportunities within

the supply chain. For example, women's involvement in technology design can help to ensure that technologies are tailored to their needs. Women's engagement in distribution and marketing can help to encourage women's use of technologies by providing other women with more comfortable spaces within which to learn about technologies and discuss their particular concerns.

Thus, involving women as both users of technology and as actors in the supply chain can be critical to reaching and economically benefiting women, as well as to enabling technology initiatives to achieve greater scale and financial sustainability.

BOX 3

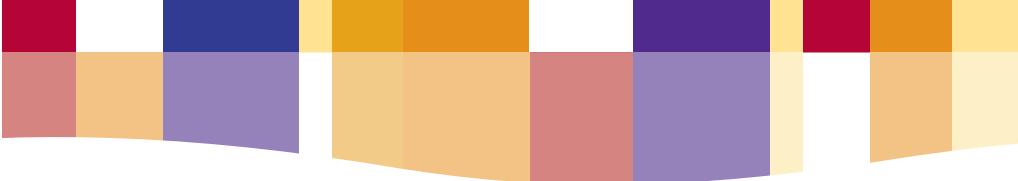
A gender-responsive approach to technology considers the needs and constraints of all potential users, including women. It addresses differences in the needs of men and women and in their access to and control over resources and decision-making, which helps to ensure that a technology can more effectively meet the needs of each potential consumer.

Elements of such an approach can include:

- Marketing strategies that take into account women's communication channels and how such channels can be tapped to deliver information about technologies to women
- Financing mechanisms that allow women to purchase technology products
- Training to increase women's ability to use technologies and run businesses applying the technologies
- Group-based approaches to strengthen women's negotiation skills, decision-making and other aspects of economic empowerment

Investment Capital

Investment capital plays a critical role in funding complementary services and developing technology supply chains aimed at the poor. The ways in which these capital sources are used to finance various phases of technology initiatives can greatly vary. Investment capital within technology initiatives or enterprises usually takes the form of: a) grants from traditional donors such as foundations, bilateral and multilateral agencies, and individuals, and/or b) low-interest, long-term loans from "patient" investors, such as social investment funds. The patient or social investor space has gained traction in international development efforts within the past decade, developing a greater focus on market-based approaches to support economic and technology-related interventions for low-income people. Patient investors act as intermediary investors that leverage grants and investment capital to provide early-stage enterprises with business development support, as well as subsidized seed and growth capital to strengthen their market potential and viability. E+Co was one of the pioneering social investors that focused on supporting small businesses in the renewable and clean energy space. The Acumen Fund is another prominent patient investor that makes larger investments in businesses within several areas, including energy, agriculture and water.



II. Energy and Agricultural Technology Case Studies

This research explores what it takes for technology initiatives to reach and economically benefit women through market-based strategies that have the potential for financial sustainability and scale. Within the broad areas of energy and agricultural technologies, we focus primarily on renewable energy and irrigation technologies, respectively. The case study analysis explores the approaches that different organizations take to delivering these technologies to poor women and men in sub-Saharan Africa and Indonesia. It investigates a select number of technology initiatives to determine whether they are deliberately considering women and how their efforts translate into economic advancement opportunities for women, as well as how to promote such business goals as achieving scale and recovering costs.

Case Study Methodology

We first used the following methods to identify promising energy and agricultural technology programs and enterprises, and to examine women's involvement, approaches to achieving scale and financial sustainability, and financing and investment strategies:

- A literature review of publicly available documentation, including academic literature, programmatic reports from research institutions and implementing agencies, articles, and websites of organizations implementing or financing relevant technology initiatives; and
- Key informant interviews with 13 development experts on energy and agricultural technologies from academic institutions, donor agencies, implementing organizations and social/patient investor groups

We then assessed a preliminary set of initiatives according to several key criteria (see Box 4). We selected initiatives as potential case studies if they met at least one of the criteria for both gender integration, and scale and financial sustainability.

BOX 4: CASE SELECTION CRITERIA

GENDER INTEGRATION

- Some focus on women, particularly as end users of a technology
- Intent or capacity to economically advance women
- Recognition of gender constraints to technology adoption/entrepreneurship
- Potential to economically advance at least hundreds of women

SCALE AND SUSTAINABILITY

- Business model geared toward market expansion (e.g. affordability, distribution & marketing)
- Mix of services to enhance users' ability to leverage the technology (e.g. business development, finance, skills training)
- Potential for some cost recovery across its supply chain, reducing reliance on donor funds

Based on these criteria, and on the willingness of organizations to participate in our research, we selected five main initiatives focused on either irrigation or primarily renewable energy technologies to examine as case studies.¹³ The lead institutions of these five technology initiatives and the specific countries in which we researched their programs are:

- 1. International Development Enterprises (iDE)- Ghana and Ethiopia**
- 2. KickStart- Tanzania and Kenya**
- 3. Kopernik- Indonesia**
- 4. Solar Sister- Uganda**
- 5. Tanzania Traditional Energy Development and Environment Organization (TaTEDO)- Tanzania**

In addition to these case studies, we also conducted field research on a distinct type of technology initiative – one that promotes a technology that works at the community level rather than at the individual or household level. Specifically, the NGO IBEKA helps establish community-managed micro-hydro power plants in Indonesia. While this study primarily focuses on case studies of initiatives that promote technologies for individual and household use, we also analyze IBEKA's efforts separately to highlight its promising approach to expanding energy access and some of its similarities to our other case studies (see Box 5 for IBEKA analysis).

After selection of the cases, we conducted phone interviews with program leaders, followed by field research. For each case study, the ICRW team spent two to three days at the main project site; in the cases of KickStart and iDE, researchers visited other sites as well to examine longer-standing efforts and women-focused strategies in order to draw greater insights on outcomes related to women's economic advancement over time. The data collection tools used in the field consisted of: 1) key informant interviews, 2) focus group discussions, 3) observation of program implementation and activities, and 4) a review of relevant program documentation. Key informant interviews and focus group discussions were conducted with two levels of participants: 1) organizational – program leaders, managers and implementers, and 2) women (and some men) entrepreneurs and/or employees who have used the energy or irrigation technology for economic activity.

Table 1 provides an overview of each technology initiative, including: technologies promoted, country, date established, aim of the institution and initiative, investment capital, and number of individuals reached.

The degree to which the five technology initiatives focus on women, and the level of scale and financial sustainability they have achieved, vary considerably. However, their experiences shed light on the challenges faced by technology initiatives in reaching low-income women and men, and on the types of strategies that can help to overcome them.

¹³ ICRW had intended to study technology initiatives led by private sector and non-governmental organizations; however, several for-profit technology enterprises declined to participate in the research. Thus, all five initiatives we examined were led by non-governmental organizations.

In the next section, we present brief overviews of each of the five technology initiatives. These overviews examine key elements of each initiative's gender- and sustainability-focused supply chain, namely the supply chain model, complementary services, financial sustainability, scale, gender focus and linkages with women's economic advancement. While most of the initiatives distribute many types of technologies, here we highlight the types of technologies that have the greatest potential for women's economic advancement, and on which we were able to conduct field research.

TABLE 1: OVERVIEW OF TECHNOLOGY CASE STUDIES

PROGRAM	Kopernik	TaTEDO	Solar Sister	KickStart	iDE
Technology (on which ICRW focused)	Fuel-efficient biomass cookstoves	Fuel-efficient cookstoves and baking ovens; solar dryers	Tanzania (active in a total of 3 countries)	Uganda (active in a total of 3 countries)	Tanzania, Kenya (active in a total of 4 countries with partner programs in an additional 14 countries)
Country (on which ICRW focused)	Indonesia (active in a total of 11 countries)	2010 - Overall and Indonesia	2010 - Overall and Uganda	1990 - TaTEDO [2000- SEECO & 2009- SEDC]	1991 - Kenya 2000 - Tanzania
Date Established					1982 - Overall 2009 - Ghana 2007 - Ethiopia
Aim of Institution/Initiative					Promotes the sale of low-cost irrigation technologies to rural farmers, using an integrated approach.
					Establishes distributors, sellers, and marketers to promote and sell low-cost irrigation pumps to farmers.
					Establishes distributors, sellers, and marketers to promote and sell solar lanterns to rural households.
					Portable, manually powered treadle and hip irrigation pumps
					Treadle, rope and washer irrigation pumps
Investment capital	Sources of funding: <ul style="list-style-type: none">• Donations from: bilateral aid agencies, foundations, NGOs, individuals, corporations, & others Budget: <ul style="list-style-type: none">• FY 2010: \$20,830,217• Overall: \$20,830,217• Ghana: \$526,790• Ethiopia: \$2,127,352	Sources of funding: <ul style="list-style-type: none">• Earned income through SEDC• Donations from: foundations, NGOs, individuals, corporations, & others Budget: <ul style="list-style-type: none">• FY 2011: \$9,585,000• Overall: \$9,585,000• Tanzania: \$2,343,000• Kenya: \$2,449,500	Sources of funding: <ul style="list-style-type: none">• Earned income through SEDC• Donations from: foundations, NGOs, individuals, corporations, & others Budget: <ul style="list-style-type: none">• FY 2011: \$1,289,520• Overall: \$1,289,520	Sources of funding: <ul style="list-style-type: none">• Earned income through SEDC• Donations from: foundations, NGOs, individuals, corporations, & others Budget: <ul style="list-style-type: none">• FY 2011: \$30,000• Overall: \$30,000	Sources of funding: <ul style="list-style-type: none">• Donations from: foundations, NGOs, individuals, corporations, & others Budget: <ul style="list-style-type: none">• FY 2011: \$630,000• Overall: \$630,000• Lombok, Indonesia: \$30,000
Individuals Reached (from beginning of project)					<ul style="list-style-type: none">• Tanzania: 47,449 buyers, of whom 2,847 (6%) are female• Kenya: 78,588 buyers, of whom 14,146 (18%) are female• Ghana: 300 buyers, of whom 67 (22%) are female• Ethiopia: 5,214 buyers, of whom 2,346 (45%) are female
					<ul style="list-style-type: none">• Indonesia: 400 cookstove buyers in Lombok, of whom an estimated 90% are female• 122,680 buyers of fuel-efficient baking ovens, of whom an estimated 70% are female• 212 buyers of solar dryers, of whom an estimated 60% are female
					<ul style="list-style-type: none">• From 2000 to 2009 Over 150 female sales agents• 1,572 buyers, of whom 1,179 (75%) are female
					<ul style="list-style-type: none">• 1,886,051 buyers of fuel-efficient cookstoves, of whom an estimated 70% are female

iDE

(International Development Enterprise)

An integrated approach to improving farmers' productivity through irrigation pumps

TECHNOLOGY/SERVICE:

Treadle, rope and washer irrigation pumps

COUNTRY:

iDE has operations in 11 countries across sub-Saharan Africa, Asia and Latin America. ICRW's research focused primarily on Ghana, while also examining aspects of pump distribution and sales in Ethiopia. iDE began its work in Ghana in late 2009.



AIM:

iDE seeks to improve the economic livelihoods of smallholder farmers by promoting access to low-cost irrigation technologies. iDE generates demand for low-cost irrigation pumps among farmers, and supports the creation of supply chains for the technologies, which are intended to become financially sustainable, independent of iDE.

SUPPLY CHAIN MODEL:

iDE plays a catalytic role in developing local supply chains for treadle pumps. It identifies and trains manufacturers, agro-dealer retailers and technicians who install the pumps – and forges linkages among them. iDE also helps to establish the prices at each stage of the supply chain. iDE trains local manufacturers on how to produce models of the treadle pump that it had developed and promoted earlier in Asia. The manufacturers finance the production costs and build the pumps based on orders, although iDE's goal is for manufacturers to eventually produce the pumps in advance of orders once there is sustained demand. iDE initiates marketing efforts for pumps by conducting demonstration events among farmer groups. Farmers can purchase the pumps from select local agro-dealers. As of May 2011, there were three local manufacturers and two local agro-dealers (including one woman) in Ghana. The agro-dealers place orders for the pumps with the manufacturers, who deliver pumps to dealers. Agro-dealers pay manufacturers 50 percent of the price of pumps up front, and the remaining half after selling the pumps to farmers at a price of about US\$60. This price also includes the fee for a local technician to install a pump on a buyer's land. In Ethiopia, where iDE began operations in 2007, in addition to local manufacturers and agro-dealers, there are 79 village-level marketing agents, including one woman, who help to promote the pumps among other farmers.

COMPLEMENTARY SERVICES:

iDE provides a full range of complementary services to support demand for its pumps. It trains lead farmers of farmer groups in agronomic and pest management techniques, and the lead farmers then train their

ENERGY AND AGRICULTURAL TECHNOLOGIES FOR WOMEN'S ECONOMIC ADVANCEMENT

members. iDE has forged partnerships with local microfinance institutions (MFIs) in Ghana and Ethiopia to provide farmers with access to low-interest loans to help them buy the pumps. The loans also provide farmers with a small amount of cash to purchase some additional inputs such as fertilizers and pesticides. Almost all of the farmers who have bought a pump in Ghana took out a loan to do so. In Ethiopia, iDE has offered marketing support to farmers to help sell their cultivated vegetables.

INVESTMENT CAPITAL:

iDE receives all of its financing from philanthropic and donor grants and does not aim to recover any of its own operating costs, either within the technology supply chain or in providing complementary services to farmers.

FINANCIAL SUSTAINABILITY:

iDE's role in the supply chain and in the provision of complementary services is intended to end over time. The goal is to create independent, financially sustainable supply chains that ultimately grow in response to local demand for irrigation technologies. Pump prices cover the costs of all sourcing, manufacturing and transportation, with profit margins for manufacturers (20 percent in Ghana) and agro-dealers (15 percent in Ghana). iDE's programs in Ghana and Ethiopia are fairly new, so financially sustainable supply chains have not yet been established.

SCALE:

In Ghana, women make up 67 of the 300 buyers of treadle pumps. In addition, other women have used pumps purchased by their husbands. In Ethiopia, to date, approximately 5,214 households, 45 percent of which are female-headed households, bought pumps. In Ghana, iDE recently began to market a more durable, portable version of the treadle pump that will be simpler to install. It has also been testing solar-powered irrigation pumps that it plans to market in the future. In Ethiopia, iDE sells a variety of pumps, including a rope and washer pump, at different price points ranging from US\$50 to US\$135.

GENDER FOCUS:

iDE has no explicit focus on promoting irrigation pumps to women farmers, though it seeks feedback on the pumps from both male and female farmers during pump testing and marketing. Women make up about 22 percent of pump buyers in Ghana and a greater proportion of pump users, though gender-disaggregated data on the latter are not available. The loans provided to farmers in Ghana seem to have enabled more women farmers to buy pumps. iDE has also created a few opportunities for women in its supply chains in marketing. More recently, iDE has been developing a global monitoring and evaluation system that will more systematically measure gender-related output and outcome data.

WOMEN'S ECONOMIC ADVANCEMENT:

Many women have improved their farm productivity by using iDE irrigation pumps, and some have considerably increased their income. In Ghana, some women farmers reported increased vegetable yields and production during the dry season during the first year of pump use; a few women earned higher earnings from the sale of these crops. According to data collected by iDE in Ethiopia, female-headed households have increased their net incomes on average by US\$268, or about 18 percent, since using the pumps as compared to an increase in average incomes of US\$347, or 14 percent, among male-headed households*. Few women are involved in the supply chains, though there could be meaningful opportunities for women's economic advancement. For example, in Ghana, a female agro-dealer has been able to earn higher revenues and expand her customer base since she began selling iDE's treadle pumps in her shop, partly due to the fairly high early demand for the irrigation technology among local farmers.

* iDE Ethiopia monitoring data provided to ICRW.

KickStart

Making technology simple for the poor to buy, use and maintain

TECHNOLOGY:

Treadle and hip irrigation pumps

COUNTRY:

KickStart has operations in Burkina Faso, Kenya, Mali and Tanzania with partner programs in an additional 14 countries. ICRW's research focused primarily on Tanzania, while also examining some aspects of pump distribution and marketing in Kenya. KickStart began operations in Kenya in 1991 and in Tanzania in 2000.

AIM:

KickStart's mission is to get millions of people out of poverty quickly, cost-effectively and sustainably. It does this by promoting sustainable economic growth and employment creation through a five-step technology development process: identify opportunities, design products, establish a supply chain, develop the market, measure and move along.

SUPPLY CHAIN MODEL:

KickStart aims to make its irrigation pumps accessible to the poor by ensuring they are affordable and easy to operate and require few replacement parts. KickStart plays an integral role in its product supply chain by connecting the technology manufacturer to the distributors, linking the distributors to dealers and marketing pumps through KickStart sales representatives. While KickStart's pumps are produced in China to maintain low production costs, they are designed by Kenyan engineers. KickStart collects feedback from local male and female users of the pumps in order to provide input on pump design. In Tanzania, KickStart's products are distributed through 20 private distributors and 240 dealers. Even though KickStart does not control the terms through which distributors and dealers work (e.g., installment plans, etc.), it does set the price for the pumps and determines profit margins.

Furthermore, KickStart trains the distributors and dealers on how to keep track of their sales, set goals and track progress. KickStart Tanzania markets its pumps through ten regional sales managers and 50 sales representatives, who conduct demonstrations at markets and at dealers' stores, distribute flyers, conduct radio broadcasts and more. The Super MoneyMaker Pressure Pump, a foot-pedaled pump, sells for approximately US\$102, and the lighter MoneyMaker Hip Pump, which resembles a large bicycle pump and is operated by using the arms and hip/thigh, sells for about US\$60. Both of the pumps are portable and do not require any special training or installation.

COMPLEMENTARY SERVICES:

KickStart customers generally pay for the full cost of the pump at purchase, except in two areas of Tanzania where KickStart has a pilot loan program. In Kenya, KickStart also developed a Mobile Layaway scheme to enable poor customers, particularly women, to send small amounts of money through their mobile phone to KickStart to contribute to the purchase of a KickStart pump. KickStart provides a one-day training workshop to dealers and distributors every year. It also provides a five-day training workshop to sales representatives twice a year. The best sales representatives win prizes, such as a motorcycle, and dealers get monetary incentives for submitting completed information sheets on customers who purchase the pumps for KickStart's monitoring efforts.

INVESTMENT CAPITAL:

In FY2010, about a third of KickStart's total budget came from revenues earned from pump sales, while the remainder was supported by foundation, corporate and individual grants.

FINANCIAL SUSTAINABILITY:

KickStart aims to develop a sustainable supply chain in which all partners, including itself, earn a profit margin. However, KickStart has not yet generated profits from its pump sales due to exchange rate changes, inflation, increases in pump prices in China, increased costs of freight, new duties and stiff competition.

ENERGY AND AGRICULTURAL TECHNOLOGIES FOR WOMEN'S ECONOMIC ADVANCEMENT

In 2011, KickStart sold its pumps at cost and covered all its operating costs through donor funding in Tanzania. However, it plans to make a 20 percent price differential on its next pump, the MoneyMaker Max, a high-end pump. Regardless of KickStart's success at cost recovery, distributors and dealers earn a profit margin on all pumps sold. In Tanzania, KickStart sells the Super MoneyMaker Pump to the distributor at cost (bundled with all of the parts); the distributor earns a 6 percent profit margin by selling the pump to the dealer; and the dealer sells the pump to the end user at an 8 percent margin.

SCALE:

To date, KickStart has sold over 47,449 pumps in Tanzania, of which about 2,847 (6 percent) were purchased by women. It has sold 78,588 pumps in Kenya, of which about 14,146 (18 percent) were purchased by women. KickStart currently distributes two unique irrigation pumps and expects to release a third type of pump, the MoneyMaker Max, in 2012.

GENDER FOCUS:

KickStart had no explicit gender focus in Tanzania before 2011. Today, women are involved in several stages of the supply chain in Tanzania: they provide feedback on the design of the pumps after purchase; a few women are distributors and dealers of the pumps; and they are users of the pumps for their agricultural production. Women are rarely purchasers of the pumps, suggesting that men still retain primary control over key household expenditures. In fact, about 70 percent of KickStart pump users are female in Tanzania, while about 94 percent of buyers are male. KickStart has had difficulty retaining female sales agents in Tanzania and no longer has any women involved in marketing. However, in Kenya, 25 percent of KickStart sales agents are female. In Tanzania, KickStart collaborated with research partners to conduct gender studies related to pump use, which highlighted the fact that female farmers have less mobility and access to information than male farmers.

As a result, KickStart now uses SMS to communicate with women and targets its marketing materials to women (e.g., pictures of men and women working together). In dealer trainings, KickStart emphasizes how to engage women farmers and promotes the low-cost, lighter hip pump. In Kenya, KickStart's longer-term focus on women has involved more pump demonstrations on women's land and partnerships with women's groups, as well as female marketing agents and its mobile phone layaway program, all of which have helped increase the proportion of females buying pumps.

WOMEN'S ECONOMIC ADVANCEMENT:

Women users of the pumps have benefited from greater crop productivity and increased income. According to KickStart, the pumps increase average farms' net incomes by almost ten-fold across all the countries where KickStart operates.* In Tanzania and Kenya, KickStart has created more than 107,000 new farm enterprises, of which about 14,400 are run by women. A few women also gain income through sales as wholesale distributors and retail dealers and, in Kenya, through employment opportunities as sales representatives of the pumps.

* KickStart 2010 Annual Report; gender disaggregated figures are not available.



Solar Sister

Direct marketing of solar lanterns to provide renewable energy to rural populations while economically empowering women

TECHNOLOGY/SERVICE:

Micro solar lanterns (and other micro solar products)

COUNTRY:

Solar Sister's primary operations are based in Uganda, with programs also in Rwanda and Sudan. ICRW focused its research solely on operations in Uganda. Solar Sister was established in 2010.

AIM:

Solar Sister aims to reduce energy poverty while providing women with new economic opportunities. Through a direct sales network, deliberately made up of women, Solar Sister enables women to earn income from selling solar products to people in rural areas. The solar products, in turn, provide a clean, safe form of light. They also allow families to save money that they would otherwise spend on kerosene to light traditional lamps.

SUPPLY CHAIN MODEL:

Solar Sister uses a direct marketing system made up of Solar Sister Entrepreneurs (SSEs), who are the primary marketers and sales agents of solar lanterns and other solar products in rural areas. Solar Sister is integrally embedded within the supply chain: it sources, distributes and markets the solar products. It also serves as the critical link between the technology manufacturers and sales agents. The solar products are designed by international manufacturers (Barefoot Power and d.light). The products are either fully manufactured and assembled abroad (d.light) or manufactured abroad and assembled in a local warehouse in Uganda (Barefoot Power). The SSEs provide feedback from male and female customers on the functionality and design of the technologies

to Solar Sister, which relays this information to the manufacturers. Solar Sister leverages women's existing networks to recruit its SSE sales force. Solar Sister initially identifies an "anchor woman" in a new region. This woman then connects Solar Sister to other interested and well-networked women in the area. As of August 2011, there were over 150 SSEs, of whom 99 percent were female. Solar Sister provides SSEs with their first solar lantern inventory primarily on consignment. Once an SSE has sold her first inventory of lanterns, she repays Solar Sister the revenues minus her margin, and she can order additional lanterns to sell based on customer demand. The inventory is provided by Solar Sister on a rolling loan basis so the SSE is able to start up a business and earn income from the start, without requiring access to external sources of capital or taking on debt risk. The price paid by end users for Solar Sister's solar products ranges from US\$24 for the most simple lantern, to US\$52 for the more complex solar system with multiple light bulbs, and mobile phone and radio charging capabilities. The SSEs are organized through a network of Team Leaders (each responsible for ten to 15 SSEs), Regional Coordinators (each responsible for up to ten Team Leaders) and a Project Coordinator (responsible for the four Regional Coordinators). Both the Project Coordinator and the Regional Coordinators are Solar Sister staff members. Orders are placed and products are distributed first through the Project Coordinator to the four Regional Coordinators, then to the Team Leaders, and finally to the SSEs.

COMPLEMENTARY SERVICES:

Solar Sister trains SSEs in using the solar technologies. It also trains SSEs in business and marketing tactics, including how to successfully market products through existing networks to create a sustained demand for more and different solar products. Solar Sister helps SSEs overcome financial barriers to becoming sales agents by providing the working capital for the inventory of technologies. As SSEs gain experience and demonstrate potential for further enterprise development, Solar Sister provides additional opportunities by linking them with additional training, such as technical training provided by the technology

manufacturers, and financing resources, such as pilot loan programs, so they can grow their businesses.

INVESTMENT CAPITAL:

Solar Sister receives funding primarily from corporate, foundation, NGO and individual grants. Additionally, Solar Sister has received one working capital loan from a social enterprise investment group to help with initial start-up costs. Solar Sister also earns revenues from the sale of solar products.

FINANCIAL SUSTAINABILITY:

Solar Sister earns revenues from selling solar products to SSEs at a price that is 15-20 percent greater than the price at which it purchases them from the manufacturer. Solar Sister uses this money to partially cover its operating costs; Solar Sister currently covers 15 percent of its operating costs with these revenues. However, Solar Sister aims to achieve greater financial sustainability as it expands its reach and achieves economies of scale. The SSEs also earn a 10 percent profit margin on each product sold.

SCALE:

As of August 2011, Solar Sister had sold solar products to 1,572 end users, of whom 1,179 (75 percent) were female. Solar Sister currently has an inventory of 13 different types of solar products.

GENDER FOCUS:

Solar Sister has an explicit focus on women. Not only does it involve women in almost every stage of the technology supply chain (except for production), but its organizational mandate is to engage and empower women. Solar Sister's product distribution mechanism is centered on women's existing networks.

WOMEN'S ECONOMIC ADVANCEMENT:

Solar Sister offers women the opportunity to earn income by becoming an SSE. Active SSEs earn an average of US\$48 a month, which, when annualized, is equivalent to 50 percent of the average per capita income in Uganda. However, the extent and consistency of income earned over time are yet to be determined. SSEs are not always active.



This may be due in part to limited market reach, and the fact that once solar lantern sales in an SSE's area reach a saturation point, her opportunities to earn income may diminish. To help counter market saturation, Solar Sister has begun to provide SSEs with new solar product lines to sell. Women also gain new opportunities to earn income as users of solar lanterns because most of the solar lanterns can charge cell phones, which owners typically rent out to their neighbors. Additionally, women interviewed reported indirect economic benefits from solar lantern use since they do not have to spend time and money searching for firewood or purchasing kerosene. Families experience about a 30 percent reduction in fuel expenses when they replace kerosene with solar light. And since they spend less time collecting firewood and have light at night, they have more time to engage in income-generating activities. While evidence is only anecdotal at this stage, some SSEs also pointed to increased confidence in their interactions and negotiations with others, greater pride in their new role in the community, and more intra-household bargaining power as a result of their work as SSEs and increased income.

TaTEDO

(Tanzania Traditional Energy Development and Environment Organization)

Creation and promotion of renewable energy technologies for income generation

TECHNOLOGY/SERVICE:

Fuel-efficient cookstoves, fuel-efficient baking ovens and solar dryers

COUNTRY:

TaTEDO was established in Tanzania in 1990.

AIM:

TaTEDO seeks to increase access to sustainable, modern energy technologies in marginalized communities. TaTEDO produces, promotes and trains users on a variety of renewable energy technologies. These technologies are intended to provide entrepreneurs with a new income-generating opportunity and/or to enhance their productivity in current income-generating activities.

SUPPLY CHAIN MODEL:

In 2000, TaTEDO created one of its “for-profit” arms, SEEKO (Sustainable Energy Enterprises Company), which manufactures and sells cookstoves and baking ovens. In 2009, it created its other “for-profit” arm, SEDC (Sustainable Energy Development Center), which conducts research, trainings and consultancies and has a demonstration center that showcases a variety of TaTEDO’s technologies. TaTEDO and its private sector arms are primary actors in all stages of the supply chains for the energy-related technologies. Through its collaboration with SEDC and SEEKO, TaTEDO designs new technology products. Some technologies, such as cookstoves and baking ovens, are manufactured by SEEKO at its local factory and then marketed and sold either directly at the SEEKO office, in a rural shop that sells TaTEDO products, or through TaTEDO’s promotional activities in communities.

There are approximately 35 workers in

SEECO’s factory, of whom 15 are female. Seventy percent of its sales are made directly at the SEEKO office, and 30 percent are made through TaTEDO’s marketing activities. The baking ovens cost approximately US\$125 each and the cookstoves’ costs range from US\$30 to US\$40. In some cases, TaTEDO teaches rural groups how to manufacture cookstoves to sell them in their communities. In 2009, a total of 395 (199 male and 196 female) village technicians were trained in stove construction. The cookstoves constructed by these technicians cost approximately US\$35. In other cases – for example, solar dryers – TaTEDO first promotes the technology and then its technicians install it for the customer. Depending on the size, these solar dryers cost anywhere from US\$188 to US\$565. TaTEDO markets all of these technologies in rural communities through demonstrations, radio promotions, flyers and word of mouth.

COMPLEMENTARY SERVICES:

TaTEDO and its research and consultancy arm, SEDC, also provide training and support to end users and potential buyers of its energy technologies. The training is aimed at existing or would-be entrepreneurs and focuses on



technology operation as well as enterprise skills, such as identifying marketable products that can be made using the technology, product pricing and accounting. TaTEDO also assists entrepreneurs in finding and linking them to markets in which they can sell their products. TaTEDO provides financial support to some technology buyers through occasional, partial subsidies on the technology products and installment plans. In addition, TaTEDO has linked some potential entrepreneurs to a loan fund to help them purchase the technology product.

INVESTMENT CAPITAL:

TaTEDO's operating costs are covered primarily through philanthropic funds contributed by foundations, NGOs, individuals and corporations. SEECO also obtained a working capital loan from a social investor to support its start-up.

FINANCIAL SUSTAINABILITY:

TaTEDO's for-profit arms, SEDC and SEECO, intend to generate enough revenue to allow TaTEDO to be financially sustainable. However, only 20 percent of TaTEDO's operations are currently supported by SEDC's profits. SEECO covers 80 percent of its own operating costs through its sales and has not yet made sufficient profits to contribute to TaTEDO.

SCALE:

From 2000 through 2009, TaTEDO sold 1,886,051 fuel-efficient cookstoves (for which an estimated 70 percent of buyers were female) and 122,680 fuel-efficient baking ovens (for which an estimated 70 percent of buyers were female), and installed 212 solar dryers (for which an estimated 60 percent of buyers were female). TaTEDO is constantly expanding its product inventory to include new models of cookstoves, baking ovens and solar dryers, as well as many other energy technologies.

GENDER FOCUS:

There is currently no explicit gender focus in TaTEDO's programs. While women's engagement is primarily as end users, they are also involved at some other phases of the product supply chains. Women work in the SEECO factory and serve as individual



technicians who manufacture the stoves and ovens. Women among TaTEDO's and SEDC's staff serve as trainers on the use of the solar dryers and baking ovens and business skills.

WOMEN'S ECONOMIC ADVANCEMENT:

TaTEDO's technology products have allowed women to be more productive in their existing income-generating activities (e.g., baking bread to sell at the market), and have saved women time in their domestic responsibilities such as cooking, which can free up time for new income-generating activities. Additionally, the solar dryers and baking ovens, in particular, provide women the opportunity to engage in new entrepreneurial work. For example, some women entrepreneurs work both individually and in groups to bake cakes or bread and to dry fruits and herbs to sell in the market. Women in one solar dryer cooperative reported that as a result of increased productivity, higher-quality products and enhanced skills, their incomes increased between 5 percent and 80 percent. One particular baking oven partnership experienced so much demand for its baked products that within six months of purchasing its first baking oven, it saved enough money to buy a second oven to keep up with customer orders.

Kopernik

Initiating demand for improved cookstoves through local women's groups

TECHNOLOGY/SERVICE:

Fuel-efficient biomass cookstoves

COUNTRY:

Kopernik implements technology projects in about a dozen countries in Asia and sub-Saharan Africa. ICRW's research examined Kopernik's fuel-efficient biomass cookstove project in Bojonegoro, Indonesia, and Lombok, Indonesia. Kopernik's cookstove project began in Bojonegoro in late 2010 and in Lombok in late 2011.*

AIM:

Kopernik seeks to make affordable energy and health technologies accessible to rural communities. It raises funds via an Internet-based platform for technology marketing and distribution projects that are implemented by local partner organizations.



SUPPLY CHAIN MODEL:

Kopernik initiates linkages between various technology supply chain actors to help buffer their risks in purchasing and marketing new technologies to the rural poor. It works with its local NGO partners to devise implementation strategies for purchasing and distributing cookstoves to users, and also provides them with operational support during the early phases of marketing. Kopernik identified a local Indonesian engineer, who has designed various models of fuel-efficient cookstoves, and a manufacturing plant in Indonesia where the cookstoves are produced. Kopernik also linked the manufacturer with PEKKA, its local NGO partner in Lombok. PEKKA works with Kopernik to generate demand for cookstoves and other technologies through demonstration "fairs" for rural villagers. The NGO also works with existing local women's groups to identify sales agents who help to promote the cookstoves to other women. As of March 2012, there were 50 women sales agents in Lombok. PEKKA and the rural women sales agents collect orders for cookstoves, which cost about US\$12, and send orders to Kopernik, which purchases cookstoves in bulk from the manufacturer. PEKKA then acts as a distributor; it receives the cookstoves on consignment from Kopernik and delivers them to the local sales agents, also on consignment. The sales agents then distribute the cookstoves to buyers and collect payment.

COMPLEMENTARY SERVICES:

Kopernik trains buyers and users on how to operate the cookstoves. It also trains sales agents in marketing and bookkeeping. To help customers finance the purchase, Kopernik and PEKKA offer a deferred payment installment plan. The frequency of payments is determined by the women's groups. In addition, PEKKA provides an inventory of cookstoves on consignment to women sales agents, which enables women with limited start-up capital to market cookstoves without having to purchase them first.

INVESTMENT CAPITAL:

The majority of Kopernik's financing comes from foundations, corporations and individuals through its online marketplace platform.

In the Lombok project, Kopernik also recovers a small percentage of its operating expenses from the sales commissions it earns from the cookstove manufacturer.

FINANCIAL SUSTAINABILITY:

Kopernik seeks to facilitate supply chain development until there is sustained demand for the cookstoves, and PEKKA is able to independently assume responsibilities for the purchase, distribution and marketing of the products. Kopernik and PEKKA each earn revenues from the price differential between what they purchase the technologies for and the returns that are channeled back through the supply chain, from end users to women sales agents, to PEKKA and to Kopernik. Kopernik benefits from a 10 percent price differential, and the local PEKKA group benefits from an approximate 7 percent price differential. These revenues will help both organizations partially recover their costs. The women sales agents receive a commission of about 7 percent on each cookstove sold.

SCALE:

As of January 2012, a total of 400 cookstoves had been sold in Lombok. While gender-disaggregated data are not collected, Kopernik estimates that about 90 percent of the cookstove buyers are women.

GENDER FOCUS:

Kopernik targets women since they are the primary users of cookstoves. Kopernik works with PEKKA with the explicit aim to leverage existing rural women's groups in order to target women users and create economic opportunities for women in marketing the cookstoves. Kopernik and PEKKA also try to ensure that feedback from women users of the cookstoves is sent to the engineer to help inform future design modifications.

WOMEN'S ECONOMIC ADVANCEMENT:

ICRW's interviews with women cookstove users in Bojonegoro provide important insights about the types of economic benefits women can derive from using the cookstoves. Some women who were interviewed said that the improved cookstoves were more fuel-efficient than the traditional wood stoves they had



been using; the use of biomass enabled them to save on fuel costs and/or time spent on gathering wood. These women also appreciated the fact that the cookstoves produce less indoor smoke. Some of these women have been using the stoves for home-based, income-generating activities such as cooking cassava chips and meatballs, which they sell locally. In the manufacturing workshop in Indonesia, about a dozen women, half of the production workforce, are employed in building and assembling cookstoves. Women sales agents in Lombok have only recently begun to promote the stoves, so it is too early to know how significant or effective this income-earning opportunity will be for them.

* ICRW conducted its primary field research in Bojonegoro and collected secondary data from Kopernik on the Lombok cookstove project. ICRW recently learned that Kopernik ended its cookstove marketing efforts in Bojonegoro and instead promotes water filters there. This case study analysis focuses on the Lombok project, and also draws from primary data collected on the Bojonegoro project. For example, data on the Bojonegoro project's implementation strategies are used to assess the identical approach of the Lombok project.

BOX 5

IBEKA

HARNESSING COMMUNITY-BASED ENERGY TECHNOLOGY TO SPUR ECONOMIC DEVELOPMENT

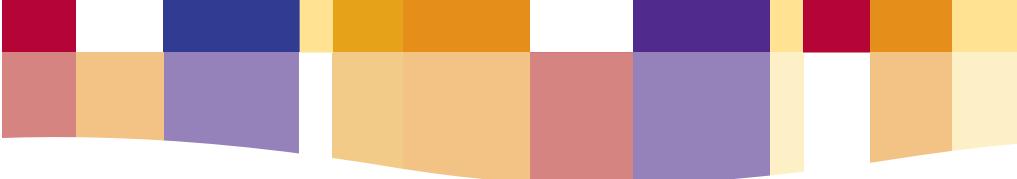
The Indonesian non-governmental organization IBEKA implements a different approach to expanding technology access for low-income rural communities. Rather than promoting technology products for use by individuals and households, as the five main case studies examined do, IBEKA helps communities to harness the benefits of a technology. Specifically, it helps establish community-based micro-hydro power plants that generate electricity in rural villages. IBEKA's micro-hydro power plants across Indonesia generate electricity to directly power homes and businesses in local villages, and/or establish connections to the formal electricity grid so that communities can sell generated electricity to the state utility company.

WORKING TOWARD SCALE AND SUSTAINABILITY

Like the other case studies, IBEKA's initiatives aim to strengthen scale and financial sustainability. One of IBEKA's projects, the Cinta Mekar power plant, was established in 2004 and utilizes a revenue-sharing model between a private company and a community group. The power plant was established through a partnership with IBEKA, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), a local industrial equipment manufacturing company (PT HIBS) and a community cooperative – the Mekar Sari Cooperative. The power plant generates electricity that it sells to the state utility company. The Mekar Sari Cooperative and PT HIBS jointly own the power plant and share the profits. While IBEKA's micro-hydro power plants rely largely on donor funding (e.g., from bilateral and multilateral agencies, corporate foundations) to cover construction costs, IBEKA seeks to help establish more micro-hydro plants similar to Cinta Mekar that have greater potential to achieve financial sustainability. IBEKA has been attempting to create more joint ventures with private companies to create revenue-sharing models for micro-hydro plants that can generate larger amounts of energy. These plants would utilize a more enterprise-based approach, relying on private sector investment to fund the construction, and in which financial returns from the sale of electricity would be channeled back to both the private investors and community groups.

DELIVERING ECONOMIC BENEFITS TO WOMEN

Also like our other case studies, the Cinta Mekar micro-hydro plant helps economically advance women, while strengthening its efforts toward scale and sustainability. In the Cinta Mekar micro-hydro plant, the Makar Sari Cooperative is financially managed by local women leaders. ICRW interviews with these women and other cooperative members revealed that women's engagement at this level likely shaped the fact that the cooperative reinvests the majority of its profits from electricity sales to provide microcredit to cooperative members who are local entrepreneurs (many of whom are female), and to subsidize electrification in the poorest households that lack access to it. Household electrification has in turn enabled some women in the village to increase their productivity in home-based entrepreneurial work (for example, by using electric instead of manual sewing machines) and by selling refrigerated goods to customers in the kiosks they run. Microcredit provided to women micro-entrepreneurs has also enabled some women to establish or expand their microenterprises.



III. Key Findings:

What are technology initiatives doing to economically advance women in a financially sustainable manner and at scale? What could they do better?

Overall, our analysis highlights promising practices and important lessons for technology initiatives and argues for increasing women's access to and use of technology, a win-win strategy that economically advances women while fostering financial sustainability through an expanded market base.

1. Technology initiatives can benefit women by advancing scale and financial sustainability.

Women are benefiting from the technology initiatives examined as both technology users and as actors in the technology supply chain. Almost all of the initiatives have provided opportunities for women to access and use irrigation and energy technologies to support their productive work. Technologies such as irrigation pumps and solar dryers appeal to women because they enable them to increase productivity in existing economic roles and expand or improve production of value-added goods. For example, since using iDE irrigation pumps, women farmers have been able to increase their agricultural yields. As a result of successfully marketing increased quantities of crops, in Ethiopia, female-headed households have increased their net incomes on average by US\$268, or about 18 percent.¹⁴ In the case of KickStart, pump users, many of whom are women, have experienced on average a ten-fold increase in net farm incomes and as much as a four-fold increase in family incomes.¹⁵ Similarly, electricity generated from IBEKA's micro-hydro power plants has allowed some women engaged in home-based enterprises to enhance their productivity, and to offer a wider range of products to customers (e.g., refrigerated beverages). In turn, improved productivity and expanded production can lead to increased earnings for women.

In all of the initiatives, women are involved in entrepreneurial and employment capacities within various stages of the supply chain: production/manufacturing (TaTEDO, Kopernik), distribution (KickStart, Solar Sister) and the most common opportunity, marketing (Solar Sister, KickStart, iDE, Kopernik). Solar Sister, for example, has recruited more than 150 Solar Sister Entrepreneurs, who distribute and sell solar lanterns to their networks and communities. The early evidence seems to indicate that women's participation in technology supply chains, whether it is deliberately sought out or not, helps to expand the potential customer base of technologies, particularly among women. In the IBEKA Cinta Mekar project, women are managers of the micro-hydro power plant. This involvement not only has the potential to empower these women, but it has also contributed to the reinvestment of profits from the plant in services such as microcredit that have supported local women entrepreneurs.

¹⁴ iDE Ethiopia monitoring data provided to ICRW.

¹⁵ KickStart 2010 Annual Report; gender-disaggregated figures are not available.

Expanding the customer base for technologies is especially important given that scale and financial sustainability are intrinsically linked, and that all of the initiatives seek to continually expand the number of technology buyers and users. Women's increased demand for and use of the various technologies have supported the ongoing expansion of the technology supply chains. In fact, women now make up a large part, and sometimes the majority, of technology users for all five initiatives. Women compose over 75 percent of Solar Sister's 1,500 users of solar lamps and an estimated 50 percent of KickStart pump users in Tanzania.

All the initiatives could benefit from a more gender-responsive approach, which would further strengthen progress toward the organizations' aims. This approach would recognize that reaching women users and involving women in technology supply chains are critical for scaling up technologies for the rural poor. Women are among their key customers, and as women's demand increases, so does the potential for scale and cost recovery of their initiatives.

2. Although the technology initiatives use a variety of marketing approaches to reach potential users, there is room to more effectively target women.

The five technology initiatives utilize creative marketing strategies that include engaging individual and group-based sales agents to promote technologies within rural areas through their networks, technology demonstration events and radio advertisements. Most of these efforts target potential male and female customers equally or in the same ways.

Technology programs tend to focus on households and assume that all members within them benefit in the same way, or look at female and male users, buyers or entrepreneurs as independent individuals. However, this does not reflect realities of intra-household negotiations, which are influenced by social norms and power dynamics among members. Men often make decisions about technology purchases and control family finances, even if women are end users. In Tanzania, 94 percent of KickStart pump buyers are men, while women compose an estimated 70 percent of the users. In such cases, expressed demand for technologies among women may not translate into realized demand since female users often have little control over household spending.

Our analysis highlights the importance of marketing efforts that specifically reach women or increase women's demand for and community acceptance of women's use of technology. Solar Sister and Kopernik are examples of initiatives that have an explicit focus on women in their marketing efforts. Solar Sister specifically aims to create a marketing network made up of women sales agents. It recruits them from local women's groups and expects them to tap their existing social networks to sell solar lanterns. Solar Sister Entrepreneurs (SSEs) are trained on the concept of solar energy, how to use the solar lanterns, marketing and sales techniques, and record-keeping. In this way, SSEs gain important skills and knowledge to enable them to market products to customers, particularly female buyers, and to enhance their income-generating capacity.

Kopernik's cookstove initiative in Lombok, Indonesia also seeks to create opportunities for women as marketing agents. Kopernik's implementing partner works with existing women's cooperatives. Women group members are able to become sales agents who promote and sell cookstoves in their local villages. The implementation of the project began relatively recently, so the structure of these marketing opportunities for women is still in development. However, given that buyers of the cookstoves in these villages have overwhelmingly been women thus far, it is very likely that employing female sales agents is a particularly effective strategy in promoting awareness about fuel-efficient cookstoves and their benefits (both economic and health-related) to women buyers and users, and in addressing their specific questions and concerns.

3. Creating economic opportunities for women in the technology supply chain can benefit both women and technology initiatives, but attention must be paid to ensure that women's incomes are adequate and consistent.

The technology initiatives that engage women within the supply chain, particularly in retail sales and marketing, benefit both women and the technology initiative itself. When initiatives develop effective distribution channels via female sales agents, this helps increase demand for technologies and the reach of the initiatives among women. In addition, women economically gain through income-earning opportunities from their work in distribution and sales. In some instances, women's participation within the supply chain has also begun to create opportunities for them to experience various forms of social and economic empowerment, such as increased confidence and self-efficacy as a result of participating in women's groups or economic cooperatives or promoting technology products to their communities.

However, women's participation in the supply chain can be limited because they are not actively recruited or traditional gender norms in some contexts may restrict their participation in the types of livelihood activities that require traveling. In addition, the potential of such opportunities to generate viable and substantial sources of income for women depends on the amount and the consistency of the financial returns women are able to accrue over time. In fact, across the initiatives we examined, there is considerable variation in the economic returns women earn from these positions. In some instances, market saturation can occur quickly, especially with a limited number of technology products and small sales markets. This would substantially diminish sales agents' economic returns over time. For Solar Sister, an SSE's sales region is geographically limited and she is able to offer her customers only a few different types of solar lanterns. Therefore, over time, once solar lantern sales in an SSE's area reach a saturation point, her opportunities to earn income may diminish. To help proactively counter market saturation, Solar Sister has begun to add new solar product lines. In addition, Solar Sister may need to manage entrants of new SSEs to minimize market area overlap. It could also expand beyond market areas defined primarily by women's social networks in order to increase the viability of women's sales activities and the scale of the overall initiative. This may require strategic efforts to reduce the constraints on women's mobility that are related to gender norms and domestic responsibilities. Similar issues are also salient for sales agents in other technology initiatives.

4. Complementary services and other gender-responsive approaches can overcome constraints women may face in accessing technologies and yield positive results.

A number of barriers can undermine women's demand for technology as well as their ability to use technology and engage in technology initiatives. Women may not be able to afford the technology, lack understanding on how to use it or have limited access to markets to sell goods that can be produced with the technology. But these constraints can be addressed through such complementary services as consumer financing, training and market linkages and through other gender-responsive marketing.

KickStart recently addressed women's constraints to buying pumps, which produced a payoff in increased pump sales among women. In 2011, just as ICRW was conducting its field research, KickStart Kenya initiated several strategies specifically aimed at increasing women's demand for pumps and their ability to buy them. To address the fact that female farmers travel less than male farmers, it instituted several strategies. One strategy was to travel to women's farms to demonstrate its pumps, to recruit women sales agents to help attract more women buyers and to develop partnerships with women's groups. Another strategy addressed women's limited financial resources by starting a payment program to enable even very poor female farmers to buy pumps by making small payments over time via their mobile phones, until they had enough money to purchase a pump. As a result of these efforts, the number of women buying pumps in Kenya has increased to 18 percent of sales in 2011, up from 9 percent in 2007.¹⁶

Women may also lack the confidence, negotiating skills and bargaining power to become entrepreneurs using or selling technologies. Gender-responsive approaches, such as creating and leveraging women's networks, can strengthen their skills, decision-making and self-efficacy. These strategies can also expand technology distribution and sales.

Solar Sister's network-based approach and collaboration with women's groups have given SSEs a strong network and sense of community, strengthening their self-efficacy, negotiation skills and other aspects of economic empowerment. As a result of working with a community of SSEs and earning income through solar lantern sales, some SSEs experienced increased confidence in their interactions and negotiations with others, greater pride in their newfound role in the community and more intra-household bargaining power. Additionally, some SSEs who served as Team Leaders or Team Accountants reported having gained valuable new leadership skills. Solar Sister also directly benefits from its network-based approach through a rapid expansion of its solar lantern sales.

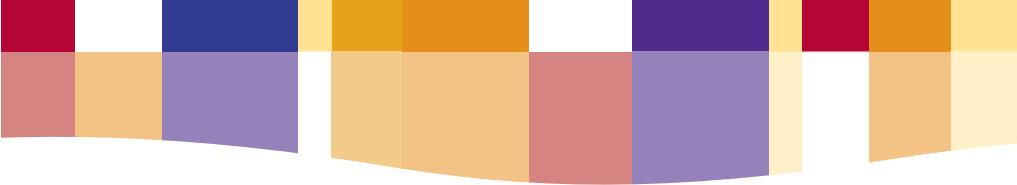
¹⁶ KickStart Annual Report, 2011.

5. The technology initiatives have many of the necessary elements to establish financially sustainable, market-based supply chains.

All of the lead institutions receive funds for at least half of their budgets through donor grants. Two of them, Solar Sister and TaTEDO, have also successfully sought patient capital to finance their start-up costs. The lead organizations use these sources of external investment capital to support their work to identify and create opportunities for local entrepreneurs and businesses to engage in new technology supply chains that deliver technologies to rural customers. They also use these funds to help generate demand for technologies, which in turn helps to strengthen the scale and financial viability of the supply chains. All of the initiatives examined intend to create technology supply chains that will become financially sustainable over the long term. Given the fairly recent nature of most of the initiatives, it remains to be seen whether or not they will be able to establish market-based supply chains over time. However, most of them have in place many of the necessary elements to do so, including affordable technologies, promising or sustained demand for technologies among potential consumers, marketing channels with the potential to expand and built-in financial returns for supply chain actors (although profit margins for some actors in several technology initiatives may not be sufficient over the long term).

Within these initiatives, donor and social investor funding provides critical, early support to the technology product development and distribution efforts. Technology and development experts interviewed for this research also supported the notion that donor financial support is almost always needed to help technology initiatives with poverty reduction aims make a transition to greater commercial viability, by helping lead institutions and start-up enterprises to overcome initial economic risks and meet early capital costs.¹⁸ Social investors provide a growing source of funds for development and technology initiatives, which the initiatives we investigated had not fully leveraged.

¹⁸ Jeff Haeni, USAID (Office of Infrastructure and Engineering), personal communication, April 20, 2011; Ellen Morris, Sustainable Energy Solutions, personal communication, October 14, 2011.



IV. Conclusion and Recommendations:

How can we best approach the interlinked goals of scale, financial sustainability and women's economic advancement?

Energy and agricultural technologies that meet the needs of poor women in developing countries present great business opportunities for technology developers and marketers. Women are the fastest growing cohort of entrepreneurs and business owners in developing countries.¹⁹ Enabling them to access technologies that support their economic activity offers significant prospects for developing an invisible market of technology users, thereby helping technology initiatives establish a larger consumer base for their products. However, as our research suggests, this potential has yet to be fully tapped. Gender-responsive approaches are at a nascent stage in the initiatives we focused on. These efforts can still benefit from greater opportunity to capitalize on market potential by intentionally considering women as a distinct segment of users and as potential actors in the technology supply chain.

The following recommendations aimed at program implementers, donors and policy makers provide direction on how to strengthen scalable and sustainable technology interventions in ways that can economically benefit both women and technology programs.

1 **Gender responsiveness must become a core practice** in initiating and scaling up technology initiatives in order to achieve scale and sustainability, while ensuring that women stand to gain economically. To do this, program implementers should:

- Conduct **structured market research and analysis** prior to and during technology design and promotion activities. Doing so enables organizations to assess demand for technology among women and men and to identify how technologies, as well as the development and delivery models, can more effectively meet women's specific needs.
- Determine how to create **viable and meaningful economic opportunities** for women in the supply chain. Actively recruiting and encouraging women's economic participation along the supply chain can create greater potential for reaching a larger, more diverse customer base and generating sustained demand for technologies. But doing so requires recognizing and considering the trade-offs between creating sufficient profit margins or salaries for women (and men) in the chain to encourage their sustained participation and ensuring product affordability for end users.

2 **Complementary services that help consumers access and use technologies should be tailored to ensure that women can benefit from them.**

- To enable women to more readily buy technologies, programs should explore **financing** options that would be appropriate for poor women, who often have limited ownership of property or other economic assets. Consumer financing is often a missing element of technology

¹⁹ Minniti, M. & Naudé, W. (2010). What Do We Know About the Patterns and Determinants of Female Entrepreneurship Across Countries? *European Journal of Development Research*, 22: 277-293.

distribution efforts targeted to the poor. A lack of financial assets often precludes many would-be customers, specifically women, from purchasing technologies. Appropriate components of financing schemes may include installment plans, provision of technology products on consignment, low-interest loans, tailored loan repayment terms, and low or no collateral requirements.

- **Training** should be focused on developing women's technical skills to use the technology, as well as marketing, business and record-keeping skills, which women may not have previously acquired.

3 Complementary services should also be designed in ways that facilitate the pathways to women's economic advancement:

- To help increase women's productivity in existing or new economic activities, complementary services can help to **strengthen market linkages** for the products/services women create through the use of the technology; for example, these services can facilitate connections between women producers and market buyers.
- To create new economic opportunities for women in the supply chain, training can help to **improve the skills** women need to successfully engage within supply chain activities, while financing options can reduce the initial economic risks women need to take on by participating in the chain.

4 Technology development efforts that seek to economically advance women must **recognize the buyer/end user distinction** when marketing technologies. Men often make decisions about technology purchases and control family finances, even if women are end users. Thus, expressed demand for technologies among women may not translate into realized demand if female users have little control over household spending.

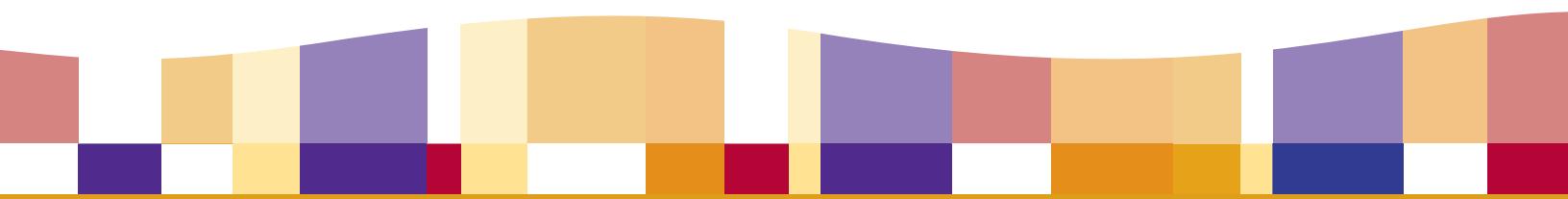
- In order to better reach women, technology initiatives need to be sensitive to this distinction both in their marketing strategies and in developing wider initiatives that **can help to enhance women's bargaining power and income control**. Such initiatives might include promotional efforts that **generate knowledge and acceptance of women's use and control of technology products**. For example, marketing materials and sensitization events could depict the positive economic gains to families from enabling women to purchase and use technologies for their productive work.

5 **Demand generation** efforts should appeal to larger numbers of female users by targeting marketing and awareness-raising efforts at women, as well as men, and making clear the potential economic benefits of using technologies. Additionally, implementing organizations should leverage the successful experiences of women's use of technology as examples for what can be achieved. Marketing efforts should emphasize what women can gain from technology, focus on the spaces where women are most likely to be found and intentionally engage female sales agents in order to provide female role models and attract female users.

- 6** Technology development and distribution initiatives must **measure their efforts** to reach women and address their constraints in accessing and using technologies for their economic advancement.
- Effective monitoring and evaluation are needed to help initiatives assess program strategies and their impact on women's economic advancement. At a minimum, lead and partner agencies need to monitor their outreach efforts to women, the number of women buying and using technologies, and the economic benefits they are gaining from technology use. Periodic studies to understand women's needs and constraints related to technology access and use may also help initiatives effectively tailor their strategies.
- 7** Patient investors and donors should attempt to **create networks** that enable technology investees and enterprises to exchange knowledge and best practices on achieving scale and economically advancing women. Entrepreneurs, particularly women, engaged in technology-related businesses can greatly benefit from a network to access mentorship and learn about business successes and challenges other entrepreneurs have faced.
- 8** In order to ensure that self-employed women are able to access and effectively use the powerful tools of technology, there needs to be **an emphasis on economic empowerment**, in addition to economic advancement.
- Technology initiatives should consider creating networking groups for women engaged in the supply chain. Such groups could serve as a mechanism to promote women's solidarity, as well as a platform for delivering training to women on new skills related to entrepreneurship or leadership. In this way, technology initiatives may be able to help promote empowerment outcomes for women such as increased confidence and decision-making, which can strengthen their ability to take full advantage of technology-related economic opportunities and benefits.

We have the opportunity to make smarter investments in a field with extraordinary potential to improve the lives of women and communities around the world. With more careful attention to program strategies, energy and agricultural technologies can dramatically change women's economic productivity, options and status, benefiting their families and strengthening local businesses and economies. Equally important, strategies that consider women's unique needs and preferences present clear gains for technology initiatives as well. However, technologies are not silver bullets. To be successfully adopted, they must be part of a supply chain intervention tailored to local contexts and the needs of potential users including women. So while we do not offer an easy solution, we point a thoughtful way forward to tremendous rewards. The payoff – for communities and economies, as well as for women and technology initiatives – is far too great to be ignored.



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