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**The Diffusion of Small-Scale Irrigation Technologies in Ethiopia  
Stakeholder Analysis Using Net-Map**

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## INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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## ABSTRACT

Small-scale irrigation (SSI) provides great benefits to farmers in terms of increased yields and profits, better food and nutrition security and greater resilience to climate shocks. Ethiopia has high potential for expanding SSI and has invested considerably in this area in recent years. Despite these investments, several challenges to further expansion of irrigation technologies remain. Different stakeholders in the country play important roles in overcoming these barriers to further scale technologies for SSI. This paper explores institutional arrangements for the diffusion of small-scale irrigation technologies by mapping the landscape of key actors involved, their interconnections, and their influence. This paper draws on an analysis of stakeholder data collected through two participatory workshops in Ethiopia, one at the national level and one at the Oromia regional level, using the Net-Map approach. Results show the dominance of government actors in the diffusion of SSI at both the national and regional levels, while most private sector and NGO actors remain in the periphery. Participants in both workshops highlighted the need for increased financing services to support the adoption of SSI and measures aimed at increasing the supply of high-quality irrigation equipment, such as modern water lifting technologies. One notable difference between the national and regional results was that at the regional level, farmers, and to some extent traders and input suppliers, were considered to be more influential in the diffusion of irrigation technologies, while they were considered marginal actors at the national level.

**Keywords:** Small-scale irrigation, Net-Map, Ethiopia, scaling

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## **Introduction**

Small-scale irrigation (SSI) is rapidly expanding in Ethiopia with high potential for further increases in irrigated area. Around one million hectares are economically and biophysically suitable for small-scale irrigation, particularly in areas near Lake Tana, the Great Rift Valley as well as the Amhara, Oromia, and SNNPR regions (Worqlul et al. 2017). This includes potential for irrigation using solar pumps, which could cover 9 percent of irrigated and 18 percent of rainfed land in the country (Schmitter et al. 2018). Around 6 million people could directly benefit from this expansion of small-scale irrigation, through improvements in yields and profits (Xie et al. 2018, 2014, Giordano and de Fraiture 2014, Burney, Naylor, and Postel 2012; You et al. 2011), better food and nutrition security (Passarelli et al. 2018, Baye et al. 2019, Aseyehgn, Yirga, and Rajan 2012), and greater resilience to climate shocks (Mekonnen et al. unpublished).

Despite evidence of the multiple benefits of irrigation, several challenges to further expansion of irrigation technologies remain. These include constraints to uptake of technologies by farmers (Haile et al. unpublished), lack of inclusivity of women, the poor and other marginalized groups (Bryan and Garner 2020, Theis et al. 2018; Lefore et al., 2019), and environmental risks, such as increasing water scarcity and contamination (Xie et al. 2014). Expansion of small-scale irrigation, therefore, requires careful, participatory planning to minimize environmental tradeoffs and raise awareness of water resource use. It also requires promoting more inclusive adoption of technologies for small-scale irrigation by addressing supply chain constraints, providing access to supporting services, like credit and information, improving access to output markets for irrigated produce, and designing and disseminating technologies that meet the needs of different farmers, including women.

Different stakeholders in the country play important roles in overcoming these barriers, including private irrigation equipment suppliers, farmer cooperatives and cooperative unions, microfinance institutions that provide financing services to smallholder farmers (albeit highly capacity constrained to disburse loans for irrigation equipment), and government agencies that provide information, complementary inputs and incentives for farmers to adopt irrigation technologies. Assessing the extent to which these stakeholders currently perform these roles is important to identify ways to more effectively scale technologies for SSI. So far, there is little prior work that systematically documents important actors in the irrigation equipment supply chain in Ethiopia, their interlinkages, and influences on one another. This paper tries to fill that the gap by exploring institutional arrangements for the diffusion of small-scale irrigation technologies in the country. By mapping the landscape of organizations involved in promoting the expansion of irrigation technologies, their interconnections, and their influence, it is possible to identify bottlenecks and changes needed to accelerate diffusion of small-scale irrigation. This paper draws on an analysis of stakeholder data

collected through two participatory workshops in Ethiopia, one at the national level and one at the Oromia regional level.

## **Background**

The Government of Ethiopia (GoE) aims to ameliorate the challenges of rapid population growth and the effects of climate variability on agriculture through a series of irrigation investments, as indicated in successive five-year plans, such as the Sustainable Development and Poverty Reduction Program (SDPRP), the Plan for Accelerated and Sustainable Development to End Poverty (PASDEP), and the Growth and Transformation Plan (GTP I and II). The latest figures indicate that the total amount of land under small-scale irrigation is estimated to have grown from almost 1.5 million hectares during GTP I to 2.0 million<sup>1</sup> hectares total (MoANR, MOWIE and ATA 2016). GTP II aims to further extend land irrigated by small-scale schemes by an additional 1.75 million hectares and ensuring that 80% of farmers have at least one source of water for irrigation (NPC 2016).

Investments target high potential areas and high-value crops, such as horticultural crops, to maximize the returns on irrigation (The Federal Democratic Republic of Ethiopia 2016). Research on small-scale irrigation in Ethiopia includes several case study analyses of farm households participating in small-scale schemes or using small-scale irrigation technologies. This research shows that households using small-scale irrigation are more likely than non-irrigating households to produce vegetables, fruits and other cash crops, resulting in reduced poverty among irrigating households (Gebregziabher et al. 2009; Hagos et al. 2012), greater food security (Namara et al. 2010), increased income and dietary diversity (Baye et al. 2019, Passarelli et al. 2018, Mengistie and Kidane 2016; Getacher et al. 2013) and higher technical efficiency of production (Makombe et al. 2017). Despite these demonstrated benefits, research also suggests there remain serious barriers to adoption of small-scale irrigation technologies, such as cost of the technology and biophysical constraints (Haile et al. unpublished, Gebregziabher et al. 2014).

This research was carried out as part of the Innovation Lab for Small-Scale Irrigation (ILSSI) and was implemented by the International Food Policy Research Institute (IFPRI) and the International Water Management Institute (IWMI). The ILSSI project investigates how to expand small-scale irrigation in ways that are inclusive, financially viable, socially acceptable, and environmentally sustainable. Between 2013 to 2018, the ILSSI project field tested and evaluated small-scale irrigation (SSI) interventions, and implemented household surveys to assess the impact of SSI on nutrition, economic status and women's empowerment and utilized a suite of integrated analytical models, the Integrated Decision Support System (IDSS), to evaluate and interpret results from field studies. Through 2023, the ILSSI project aims to support

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<sup>1</sup> There is evidence that current irrigated area is lower than government estimates (Chandrasekharan et al. 2018).

greater use of mechanized irrigation technologies through partnerships with the private sector and other actors and to develop business models for scaling promising technologies.

To support the scaling of small-scale irrigation technologies, stakeholder mapping workshops were carried out in Addis Ababa, Ethiopia, on October 8-9, 2019 with representatives of government agencies, NGOs and the private sector, operating at the national and Oromia regional levels.

### **Net-Map Method**

Net-Map is a facilitation or interview technique that helps people understand, visualize, discuss, and improve situations in which many different actors influence outcomes. By creating Influence Network Maps, individuals and groups can clarify their own view of a situation, foster discussion, and develop a strategic approach to their networking activities. More specifically, Net-Map helps participants to determine what actors are involved in a given network, how they are linked, and their level of influence.

Net-Map is a tool to explore how things are actually done, not how things ‘should be’ or how they are ‘officially’ or in formal documents. The overall guiding questions that framed the participatory activity were:

- National level (Addis Ababa): Who influences the diffusion of improved small-scale irrigation technologies at the national level?
- Regional level (Oromia): Who influences the diffusion of improved small-scale irrigation technologies at the regional level?

Participants in each workshop identified the actors that influence the diffusion of small-scale irrigation (SSI) technologies in Ethiopia and how these stakeholders interact with each other. Participants listed all the actors involved in the diffusion of small-scale irrigation (SSI) technologies and discussed their role in the diffusion of SSI. They then discussed how these actors were linked, the level of influence of each actor, and ways to accelerate the diffusion of SSI technologies in the country/region.

Nine participants attended the national level workshop on October 8, 2019 and seven participants attended the Oromia regional workshop on October 9, 2019. Both workshops were held at the ILRI Campus in Addis Ababa and were led by representatives of IFPRI, IWMI and a consultant who provided facilitation. Organizations represented at the workshops are shown in the Tables 1 and 2 below.



Table 1: National Workshop, October 8, 2019

| <b>Organization</b>   | <b>Type</b>                |
|---|----------------------------|
| Agricultural Transformation Agency                                  | Government                 |
| Ethiopian Horticultural Producers and Exporters Association (EHPEA) | Civil society organization |
| Hagbes  | Private                    |
| iDE   | NGO                        |
| Small Scale and Micro Irrigation Support Project (SMIS)             | NGO                        |
| BISELEX Ethiopia  | Private                    |
| Solar Development PLC   | Private                    |
| IRC WASH  | NGO                        |
| Association of microfinances in Ethiopia                            | NGO                        |

Table 2: Regional Workshop, October 9, 2019

| <b>Organization</b>  | <b>Type</b> |
|--|-------------|
| Dugda Woreda Irrigation Authority Office                                     | Government  |
| Small Scale & Micro Irrigation Support Project (SMIS) Oromia Regional Office | NGO         |
| Meki Batu Fruits and Vegetable Union   | Cooperative |
| RENSYS ENGINEERING AND TRADING PLC   | Private     |
| Green Scene Energy PLC   | Private     |
| iDE  | NGO         |
| Biselex Ethiopia PLC   | Private     |

## **Analysis and Discussion of Results**

### ***National-level Stakeholder Network***

Figure 1 shows the complete national network as described by participants at the national level stakeholder workshop. Participants identified 90 actors at the national level as having an influence on the diffusion of SSI. Because of the large number of actors, some actors were grouped with similar organizations and influence levels were assigned and links were drawn for the group rather than the individual actors. The network shown in Figure 1 illustrates the shorter list of actors including the groupings as defined by the participants. This condensed stakeholder network contains 48 nodes and 117 links. It is a highly centralized network (degree centralization: 93 percent). Government actors comprise 60 percent of the nodes, followed by private sector actors (21 percent), international actors (15 percent) and national NGOs (4 percent). The full list of actors identified is shown in Table 3 along with the full organization name, grouping to which they were assigned (if any), and the organization category (government, private sector, international, and local NGO).

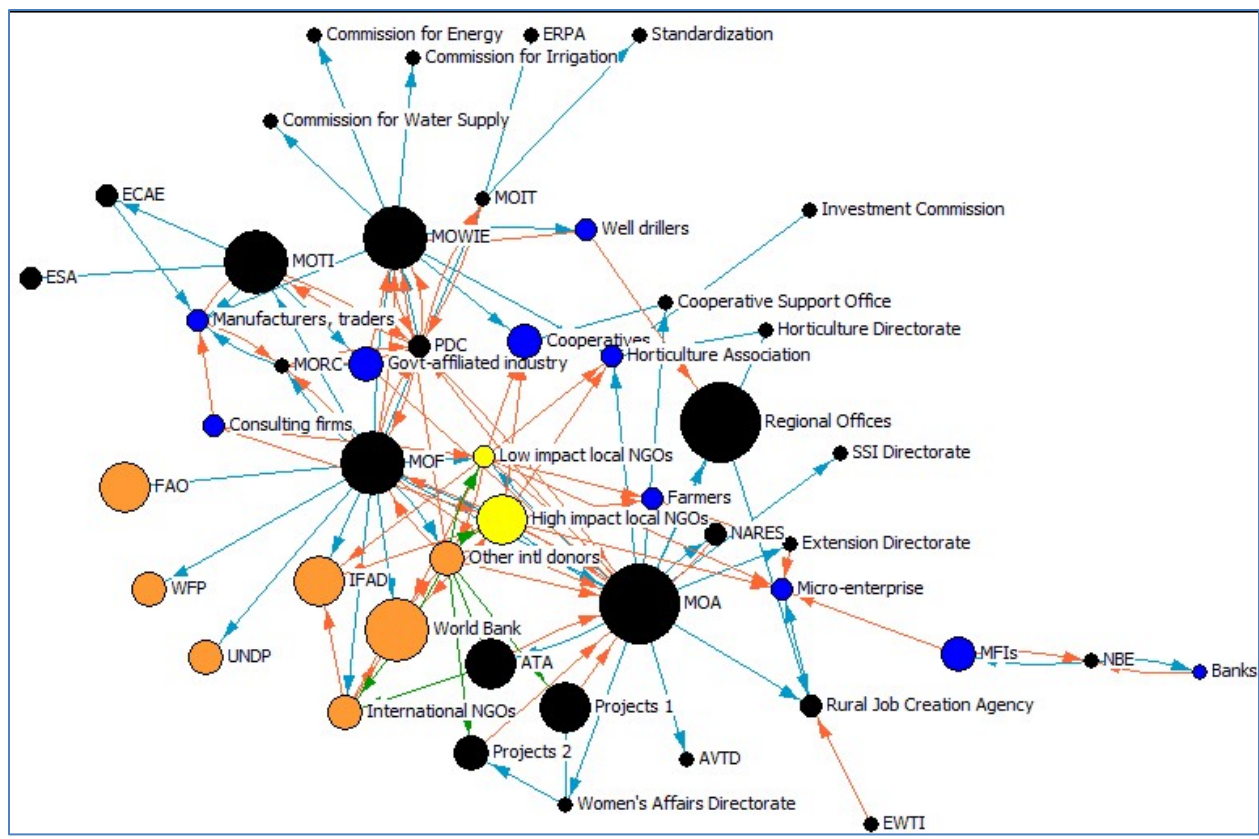


Figure 1: Complete National Network, Actors Sized by Relative Influence

Table 3: National Actor List, Full Names, Category, and Influence

| Actors           | Actors-Full Name  | Condensed to group       | Category      | Influence |
|------------------|---|--------------------------|---------------|-----------|
| MOA              | Ministry of Agriculture                                   | MOA                      | Government    | 5         |
| Regional Offices | Regional Offices of Federal Ministries                    | Regional Offices         | Government    | 5         |
| MOTI             | Ministry of Trade and Industry                            | MOTI                     | Government    | 4         |
| MOWIE            | Ministry of Water, Irrigation, and Energy                 | MOWIE                    | Government    | 4         |
| MOF              | Ministry of Finance                                       | MOF                      | Government    | 4         |
| World Bank       | World Bank  | World Bank               | International | 4         |
| Projects 1       | Projects (AGP, PASDEEP)                                   | Projects 1               | Government    | 3         |
| ATA              | Agricultural Transformation Agency                        | ATA                      | Government    | 3         |
| REST             | Relief Society of Tigray                                  | High impact local NGOs   | Local NGOs    | 3         |
| ORDA             | Organization for Rehabilitation and Development of Amhara | High impact local NGOs   | Local NGOs    | 3         |
| IFAD             | IFAD  | IFAD                     | International | 3         |
| FAO              | Food and Agriculture Organization                         | FAO                      | International | 3         |
| Projects 2       | Projects (PSNP, DRDP, RLRDP, SMIS)                        | Projects 2               | Government    | 2         |
| Ambasel          | Ambasel   | Govt-affiliated industry | Private       | 2         |
| Bruh Tesfa       | Bruh Tesfa  | Govt-affiliated industry | Private       | 2         |
| Dinsho           | Dinsho  | Govt-affiliated industry | Private       | 2         |
| Govt consultants | Construction and design agencies                          | Govt-affiliated industry | Private       | 2         |
| Wondo            | Wondo   | Govt-affiliated industry | Private       | 2         |
| Guna             | Guna  | Govt-affiliated industry | Private       | 2         |
| AAEI             | Adama Agricultuere Equipment Industry                     | Govt-affiliated industry | Private       | 2         |
| Cooperatives     | Cooperatives  | Cooperatives             | Private       | 2         |

| <b>Actors</b>             | <b>Actors-Full Name</b>  | <b>Condensed to group</b> | <b>Category</b> | <b>Influence</b> |
|---------------------------|--|---------------------------|-----------------|------------------|
| MFIs                      | Micro-Finance Institutes   | MFIs                      | Private         | 2                |
| iDE                       | iDE  | International NGOs        | International   | 2                |
| EU/EC                     | European Union/European Commission   | Other intl donors         | International   | 2                |
| DfID                      | DfID   | Other intl donors         | International   | 2                |
| FINIDA                    | FINIDA   | Other intl donors         | International   | 2                |
| KOICA                     | KOICA  | Other intl donors         | International   | 2                |
| China                     | China Foundation for Poverty Alleviation   | Other intl donors         | International   | 2                |
| Norway                    | Norway   | Other intl donors         | International   | 2                |
| DANIDA                    | DANIDA   | Other intl donors         | International   | 2                |
| Sweden SIDA               | Sweden SIDA  | Other intl donors         | International   | 2                |
| Gates                     | Gates Foundation   | Other intl donors         | International   | 2                |
| SAID                      | Spanish Agency for International Development   | Other intl donors         | International   | 2                |
| IDC                       | Italian Development Cooperation  | Other intl donors         | International   | 2                |
| Global Affairs Canada     | Global Affairs Canada  | Other intl donors         | International   | 2                |
| GIZ                       | GIZ  | Other intl donors         | International   | 2                |
| KRC                       | KRC  | Other intl donors         | International   | 2                |
| ADB                       | African Development Bank   | Other intl donors         | International   | 2                |
| USAID                     | USAID  | Other intl donors         | International   | 2                |
| JICA                      | JICA   | Other intl donors         | International   | 2                |
| SNV                       | SNV  | Other intl donors         | International   | 2                |
| Netherlands               | Kingdom of the Netherlands   | Other intl donors         | International   | 2                |
| World Vision              | World Vision   | International NGOs        | International   | 2                |
| Red Cross                 | Red Cross  | International NGOs        | International   | 2                |
| Save the Children         | Save the Children  | International NGOs        | International   | 2                |
| CRS                       | Catholic Relief Services   | International NGOs        | International   | 2                |
| WFP                       | World Food Programme   | WFP                       | International   | 2                |
| UNDP                      | United Nations Development Programme   | UNDP                      | International   | 2                |
| PDC                       | Planning and Development Commission  | PDC                       | Government      | 1                |
| ESA                       | Ethiopian Standardization Agency   | ESA                       | Government      | 1                |
| ECAE                      | Ethiopian Conformity Assessment Enterprise at the Ministry of Science and Technology | ECAE                      | Government      | 1                |
| Rural Job Creation Agency | Rural Job Creation Agency  | Rural Job Creation Agency | Government      | 1                |
| NARES                     | Agriculture Research Institutes  | NARES                     | Government      | 1                |
| Davis & Shirtliff         | Davis and Shirtliff Ethiopia   | Manufacturers, traders    | Private         | 1                |
| Hagbes                    | Hagbes PLC   | Manufacturers, traders    | Private         | 1                |
| Biselex                   | Biselex Ethiopian PLC  | Manufacturers, traders    | Private         | 1                |
| Traders                   | Small traders  | Manufacturers, traders    | Private         | 1                |
| Solar Development         | Solar Development  | Manufacturers, traders    | Private         | 1                |
| ACME Engineering          | ACME Engineering   | Manufacturers, traders    | Private         | 1                |
| Access Dev                | Access Development PLC   | Manufacturers, traders    | Private         | 1                |
| AMIO Engineering          | AMIO Engineering   | Manufacturers, traders    | Private         | 1                |
| Plastic factories         | Plastic factories (e.g. PVC pipes)   | Manufacturers, traders    | Private         | 1                |
| Netafim                   | Netafim  | Manufacturers, traders    | Private         | 1                |
| Excel                     | Excel  | Manufacturers, traders    | Private         | 1                |
| Farmers                   | Private farmers  | Farmers                   | Private         | 1                |
| Horticulture Association  | Ethiopia Horticulture Producers and Exporters Association                            | Horticulture Association  | Private         | 1                |
| Micro-enterprise          | Micro-Enterprise (employment creation)   | Micro-enterprise          | Private         | 1                |
| Well drillers             | Well drilling companies and enterprises  | Well drillers             | Private         | 1                |
| Soil & water labs         | Soil and water laboratories  | Soil & water labs         | Private         | 1                |
| Consulting firms          | Consulting firms   | Consulting firms          | Private         | 1                |
| Agri-service              | Agri-service   | Low impact local NGOs     | Local NGOs      | 1                |
| Action for Development    | Action for Development   | Low impact local NGOs     | Local NGOs      | 1                |

| Actors                      | Actors-Full Name                          | Condensed to group          | Category   | Influence |
|-----------------------------|---|-----------------------------|------------|-----------|
| Ethiopian Red Cross         | Ethiopian Red Cross                       | Low impact local NGOs       | Local NGOs | 1         |
| MORC                        | Ministry of Revenue and Customs           | MORC                        | Government | 0.5       |
| NBE                         | National Bank of Ethiopia                 | NBE                         | Government | 0.5       |
| AVTD                        | Agriculture Vocation Training Department  | AVTD                        | Government | 0.5       |
| Horticulture Directorate    | Horticulture Directorate                  | Horticulture Directorate    | Government | 0.5       |
| Investment Commission       | Investment Commission                     | Investment Commission       | Government | 0.5       |
| SSI Directorate             | Small-Scale Irrigation Directorate at MOA | SSI Directorate             | Government | 0.5       |
| Women's Affairs Directorate | Women's Affairs Directorate               | Women's Affairs Directorate | Government | 0.5       |
| Cooperative Support Office  | Cooperative Support Office                | Cooperative Support Office  | Government | 0.5       |
| Extension Directorate       | Extension Directorate at MOA              | Extension Directorate       | Government | 0.5       |
| Commission for Energy       | Commission for Energy at MOWIE            | Commission for Energy       | Government | 0.5       |
| Commission for Irrigation   | Commission for Irrigation at MOWIE        | Commission for Irrigation   | Government | 0.5       |
| Commission for Water Supply | Commission for Water Supply               | Commission for Water Supply | Government | 0.5       |
| EWTI                        | Ethiopia Water Technology Institute       | EWTI                        | Government | 0.5       |
| MOIT                        | Ministry of Innovation and Technology     | MOIT                        | Government | 0.5       |
| Standardization             | Ethiopian Standards Agency                | Standardization             | Government | 0.5       |
| ERPA                        | Ethiopian Radiation Protection Authority  | ERPA                        | Government | 0.5       |
| Banks                       | Private Banks                             | Banks                       | Private    | 0.5       |

### ***Actor Influence and Role***

Actors in Figure 1 are sized by their influence over the diffusion of SSI, based on the perceptions of the participants in the mapping workshop. Colors are assigned to each category of organization—government (black), private sector (blue), international organizations (orange) and local NGO (yellow). The influence scores assigned to each actor are listed in Table 3. Government actors are considered the most influential actors in the network. Ethiopia has a federal government structure with four tiers—federal, regional, woreda (or city/municipal) and kebele (village). At the federal level, ministries are responsible for developing the overall development strategies and policies for the country, with input from the regions and other stakeholders. Similarly, the ministries are mandated to develop the national strategy (e.g. the Ministry of Water, Irrigation, and Energy develops the National Water Policy and Strategy), and provide policy direction, financial support (e.g. the development of medium- and large-scale irrigation schemes and infrastructure across the whole country), and technical backstopping, and monitoring and evaluation. The nine regional states have their own constitutions and this legal framework enables greater participation of the regional states in matters that concern them. The Regional Offices of Federal Ministries are mandated to develop regional legal and policy frameworks in line with the federal laws and policies and carry out small scale and the operational activities of their respective offices, and report to the regional executive organ (Hailelassie et al. 2008; ATA & MOA. 2014). Thus, the regional offices have fully authorized to carry out all small-scale irrigation development situated in their region.

Not surprisingly, the Ministry of Agriculture (MOA) at the National Level and the Regional Offices of the Ministry of Agriculture are the only organizations assigned a score of 5—the highest score assigned by the workshop participants. The MOA was considered the most influential actor because of its important roles

in issuing policies, regulations and directives for stakeholder engagement; disseminating agricultural technologies and inputs, such as fertilizer, seed and water-lifting technologies; providing agricultural extension services; and facilitating farmers' access to markets. Given the large role of the Regional Offices in setting policy and implementing programs in their regional state, the Regional Offices of the Ministry of Agriculture were considered as influential as the Federal MOA.

While the Ministry of Water, Irrigation, and Energy (MOWIE) is responsible for development and maintenance of large and medium scale irrigation infrastructure, responsibility for micro-level irrigation falls under MOA, which operates largely through regional offices that have a stronger mandate and scope in this area. Still, given its responsibility for development and planning of water and energy infrastructure MOWIE was assigned an influence score of 4. Similarly, the Ministry of Trade and Industry (MOTI) was assigned a score of 4 given its responsibility for overseeing industry, manufacturing, trading, standardization and quality control, which includes overseeing development of irrigation equipment and standards.

The Ministry of Finance (MOF) is also assigned an influence score of 4 because it oversees the activities of all other ministries, by approval and granting of annual government budget and monitoring its implementation, even though it is less directly involved in the diffusion of SSI technologies. International donors, international NGOs, and local NGOs have memorandums of understanding (MoUs) with the MOF to operate and ensure alignment with government priorities. Other government organizations are considered to be moderately influential in promoting the diffusion of SSI technologies (assigned scores of 3). These include the Agricultural Transformation Agency (ATA), which is created to help accelerate the growth and transformation of Ethiopia's agriculture sector and projects that are implemented and funded by the government and donors including the Agricultural Growth Program (AGP) and the Plan for Accelerated and Sustained Development to End Poverty (PASDEP), both of which focus on promotion of small-scale irrigation across large parts of the country. Other government-led projects including the Productive Safety Net Program (PSNP), the Disaster Rehabilitation and Development Project (DRDP), the Rural Livelihood Reconstruction and Development Program (RLRDP), and the Small Scale and Micro Irrigation Support Project (SMIS) are considered less influential (assigned an influence score of 2) given less direct focus on irrigation as a key objective. The low score on the seemingly important SMIS project may suggest ineffectiveness of the project to deliver on its core objectives—to provide support for government organizations, private institutions, water user groups and smallholder farmers to develop participatory and sustainable small-scale irrigation schemes, to provide capacity building trainings and irrigation technologies for efficient water use, and to improve the input and product market chains of farmers—given that these remain key challenges to the expansion of SSI.

Other government organizations involved, but even less influential in the diffusion of SSI technologies include the Planning and Development Commission (PDC), the Ethiopian Standardization Agency (ESA) and the Ethiopian Conformity Assessment Enterprise (ECAE) which contribute to the development of guidelines and standards for the irrigation equipment. The ESA recently replaced the former Quality and Standard Authority of Ethiopia (QSAE) to develop and implement a national standardization strategy and to enable Ethiopian industries to benefit from technology transfer by providing standards, technical support and training on implementation of national standards. ECAE's mandate is to establish and operate a national conformity assessment system and also to provide management system certification for quality management, environmental management and food system management systems. These organizations were all assigned a score of 1, perhaps due to weak enforcement of these guidelines and standards.

While private sector organizations comprised the second largest group of organizations mentioned by workshop participants, they were assigned relatively low influence scores (of 1 and 2). Organizations assigned an influence score of 2 include government-affiliated industries, such as Ambasel, Bruh Tesfa, Dinsho, Wondo, Guna, and the Adama Agriculture Equipment Industry, cooperatives, and micro-finance institutes. Other private sector actors assigned influence scores of 1 included manufacturers, suppliers and traders, such as Davis and Shirtliff, Hagbes, Biselex, and Solar Development that distribute irrigation equipment as well as other manufacturers such as the plastic factories that make PVC pipes. The private sector gets a low score partly because they are primarily supplying governmental and non-governmental organizations implementing irrigation projects, rather than targeting farmers directly. It appears that the private sector does not have a robust supply chain to market irrigation products to farmers directly. Other private actors assigned a score of 1 included small farmers and farmer groups, such as the Horticulture Association and micro-enterprises, and private services, such as well drillers, soil and water labs, and consulting firms. The fact that farmers and farmer groups were assigned such low influence scores, likely reflects the top down orientation of the national level actors and implementation approaches of the agriculture sector that lack participatory planning. Cooperatives, rather than individual farmers, were seen as being the target of private sector manufacturers, suppliers and traders because they were more likely to buy irrigation equipment.

Private banks were assigned a score of 0.5, the lowest influence score of all private sector actors because private banks currently have no loan packages or facilities available for smallholder farmers to use to purchase irrigation equipment. Currently only MFIs support adoption of SSI, while private banks, not having credit products targeting smallholder farmers, are not involved at this level. Moreover, many major microfinance institutions do not provide microloans for irrigation technologies (Wiedmaier-Pfister 2008). The participants emphasized that the low scores for private sector actors was not as it should be (meaning

that private sector actors should be more influential in the diffusion of small-scale irrigation technologies) but rather the low scores reflect the current level of influence of these actors.

Some international actors are considered to be particularly influential in the diffusion of small-scale irrigation especially donors such as the World Bank (with a score of 4), IFAD (with a score of 3) and the UN Agency, FAO (with a score of 3). These donors provide much of the financing for the expansion of small-scale irrigation in the country through irrigation schemes that target smallholder producers. Other international donors, including the European Union/European Commission, DfID, KICA, Gates Foundation, GIZ, ADB, and USAID among several others, are all assigned scores of 2. Similarly, other UN Agencies including WFP and UNDP, are assigned a score of 2. Few international and national NGOs were listed during the workshop which suggests little involvement of these organizations in the diffusion of small-scale irrigation.

As mentioned above, local NGOs comprised only 4 percent of actors in the Net-Map. Two local NGOs stood out as being relatively more influential (with scores of 3) and these were the Relief Society of Tigray (REST) and the Organization for Rehabilitation and Development of Amhara (ORDA). REST and ORDA have higher influence scores because they are major implementing partners of international agencies. Other local NGOs, such as Agri-service, Action for Development, and the Ethiopian Red Cross received a lower score of 1. International NGOs were seen as less influential than the most influential local NGOs but more influential than lower impact local NGOs. International NGOs, including iDE, World Vision, the Red Cross, Save the Children, and Catholic Relief Services were assigned scores of 2.

#### 4.1.2 Actor Centrality

Degree centrality is an important network measure that represents the sum of actors one actor is connected to. Degree centrality can be further broken down by the number of in-coming connections—a measure suggesting prestige as many others try to influence them—and out-going connections—an indication of being an influencer. Degree centrality scores for national actors are shown in Table 4.

Table 4: Degree Centrality Scores, National Level

| <b>Actor</b>           | <b>Degree</b> | <b>InDegree</b> | <b>OutDegree</b> |
|------------------------|---------------|-----------------|------------------|
| MOA                    | 25            | 10              | 15               |
| MOF                    | 18            | 3               | 15               |
| MOWIE                  | 13            | 5               | 8                |
| Other intl donors      | 13            | 4               | 9                |
| PDC                    | 12            | 6               | 6                |
| High impact local NGOs | 12            | 4               | 8                |
| Low impact local NGOs  | 12            | 4               | 8                |

| <b>Actor</b>                     | <b>Degree</b> | <b>InDegree</b> | <b>OutDegree</b> |
|----------------------------------|---------------|-----------------|------------------|
| MOTI                             | 8             | 3               | 5                |
| Manufacturers, traders           | 7             | 5               | 2                |
| MORC                             | 6             | 3               | 3                |
| Horticulture Association         | 6             | 6               | 0                |
| International NGOs               | 6             | 3               | 3                |
| Micro-enterprise                 | 5             | 5               | 0                |
| MOIT                             | 5             | 2               | 3                |
| Govt-affiliated industry         | 4             | 2               | 2                |
| Cooperatives                     | 4             | 4               | 0                |
| NBE                              | 4             | 2               | 2                |
| Rural Job Creation Agency        | 4             | 3               | 1                |
| ATA                              | 4             | 2               | 2                |
| IFAD                             | 4             | 4               | 0                |
| World Bank                       | 4             | 4               | 0                |
| Well drillers                    | 3             | 1               | 2                |
| MFIs                             | 3             | 1               | 2                |
| Women's Affairs Directorate      | 3             | 1               | 2                |
| Irrigation Extension Directorate | 3             | 1               | 2                |
| Regional Offices                 | 3             | 2               | 1                |
| Projects 1                       | 3             | 2               | 1                |
| Projects 2                       | 3             | 2               | 1                |
| Farmers                          | 3             | 3               | 0                |
| Consulting firms                 | 3             | 0               | 3                |
| ECAE                             | 2             | 1               | 1                |
| Banks                            | 2             | 1               | 1                |
| Horticulture Directorate         | 2             | 1               | 1                |
| Cooperative Support Office       | 2             | 1               | 1                |
| NARES                            | 2             | 1               | 1                |
| ESA                              | 1             | 1               | 0                |
| Commission for Energy            | 1             | 1               | 0                |
| Commission for Irrigation        | 1             | 1               | 0                |
| Commission for Water Supply      | 1             | 1               | 0                |
| AVTD                             | 1             | 1               | 0                |
| SSI Directorate                  | 1             | 1               | 0                |
| Investment Commission            | 1             | 0               | 1                |
| WFP                              | 1             | 1               | 0                |
| UNDP                             | 1             | 1               | 0                |
| FAO                              | 1             | 1               | 0                |
| Standardization                  | 1             | 1               | 0                |
| ERPA                             | 1             | 1               | 0                |
| EWTI                             | 1             | 0               | 1                |



Given that the MOA is considered by the participants to be the most influential actor in the network, it is no surprise that it also appears as the actor with this highest level of degree centrality with 25 connections—10 incoming and 15 outgoing. Other government actors with high degree centrality include MOWIE and MOF. MOWIE has a degree centrality score of 13 with 5 incoming and 8 outgoing connections. MOF is also highly connected to other actors in the network, although most of these links are outgoing (15 out of 18 connections) given that it has authority over many of the other actors in the network. The PDC also has a high degree of centrality (score of 12, 6 incoming and 6 outgoing connections) given its coordinating role among many other actors in the system.

International donors also have high degree centrality scores (13 connections with 9 outgoing) given their funding ties to many organizations in the network. Both high and low impact NGOs have higher degree centrality scores than international NGOs (scores of 12 compared to 6) with more outgoing connections, suggesting that learnings from projects carried out by local NGOs filter through the network more easily.

Among private sector actors, manufacturers, traders, and middlemen have the highest degree centrality score (score of 7) with most connections incoming, suggesting that other organizations in the network have more influence over these actors. Similarly, the Horticulture Association has the next highest score of 6, all of which are incoming connections.

### ***Types of Linkages***

Isolating the types of links between actors—authority, information, and funding—provides further information about the roles of actors in the network. Figure 2 isolates the authority linkages, Figure 3 shows the information linkages, and Figure 4 shows the funding linkages. Authority and information linkages account for most of the linkages in the network—53 and 57 linkages, respectively, with funding linkages only accounting for 7 links. This may be because participants mainly focused on external funding flowing from international donors rather than funding flows between government ministries and from the national to the local levels.

The authority links in Figure 2 illustrate the vertical linkages among government ministries and sub-agencies, as well as government authority over local NGOs and international actors within the network. Almost all actors in the network are shown to be linked based on authority relationships. Participants mostly noted formal authority relationships but sometimes would specify that the link was one of informal authority. Most links flow from the national ministries, namely the MOF, which as previously mentioned, is responsible for allocation of funding to and monitoring of all other ministries, the MOA, the MOWIE, and the MOTI.

Many of the information flows in Figure 3 are two way, between NGOs, both local and international, donors and government ministries. While not assigned a high level of influence, the Planning and Development Commission (PDC) plays an important coordinating role between government ministries, with information flowing in and out of the PDC.

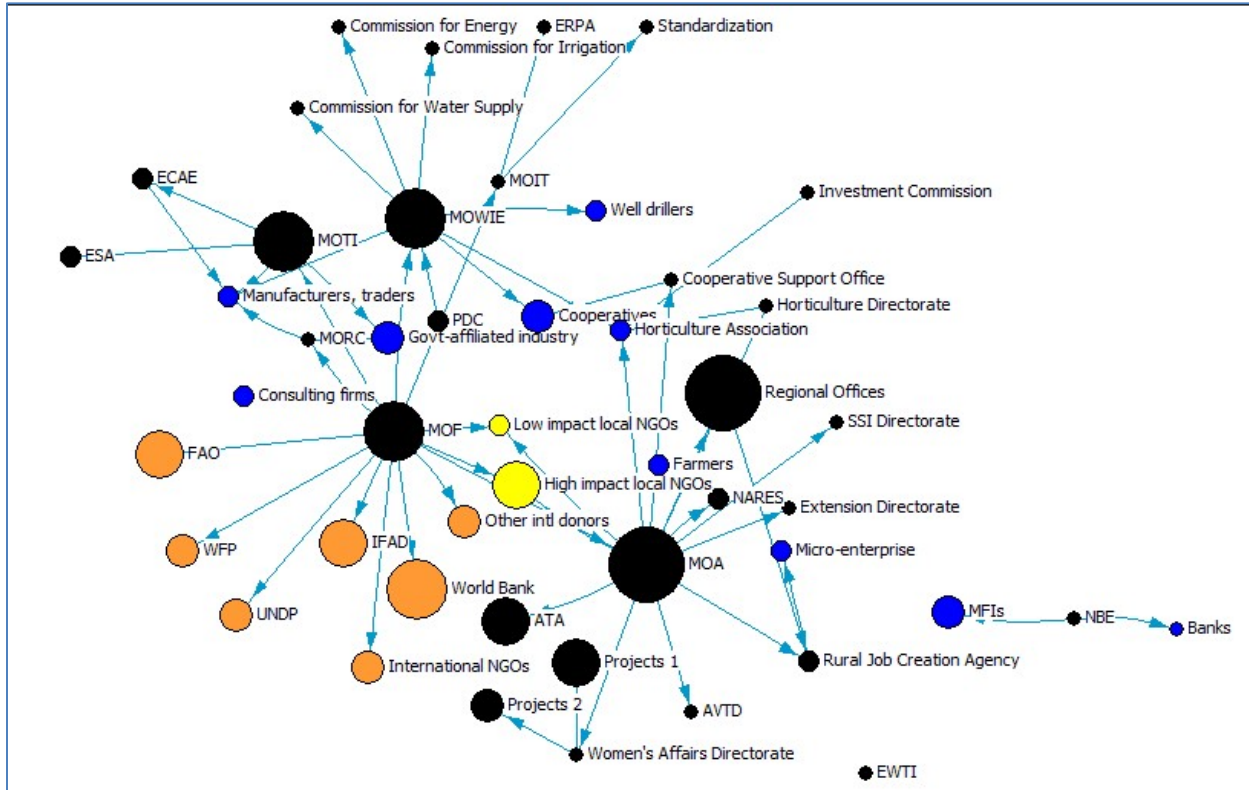


Figure 2: National Level Authority Linkages

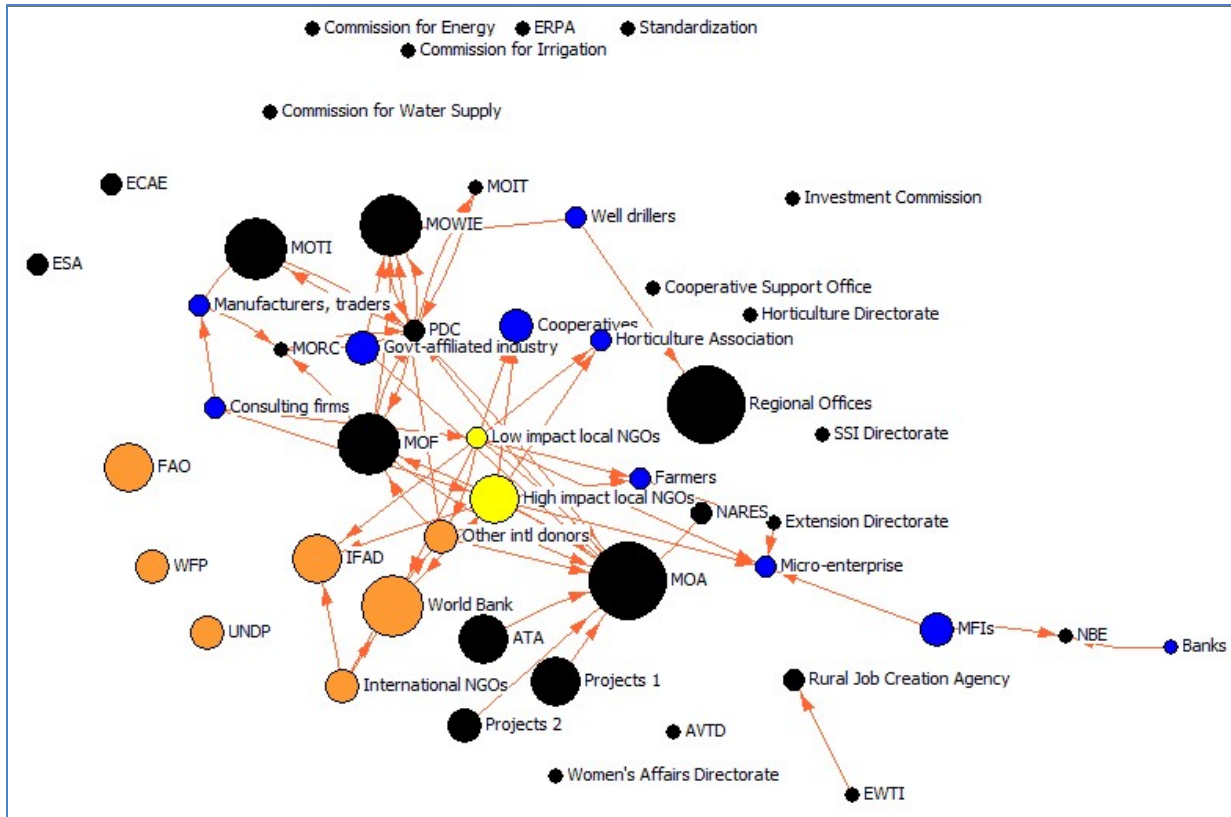


Figure 3: National Level Information Linkages

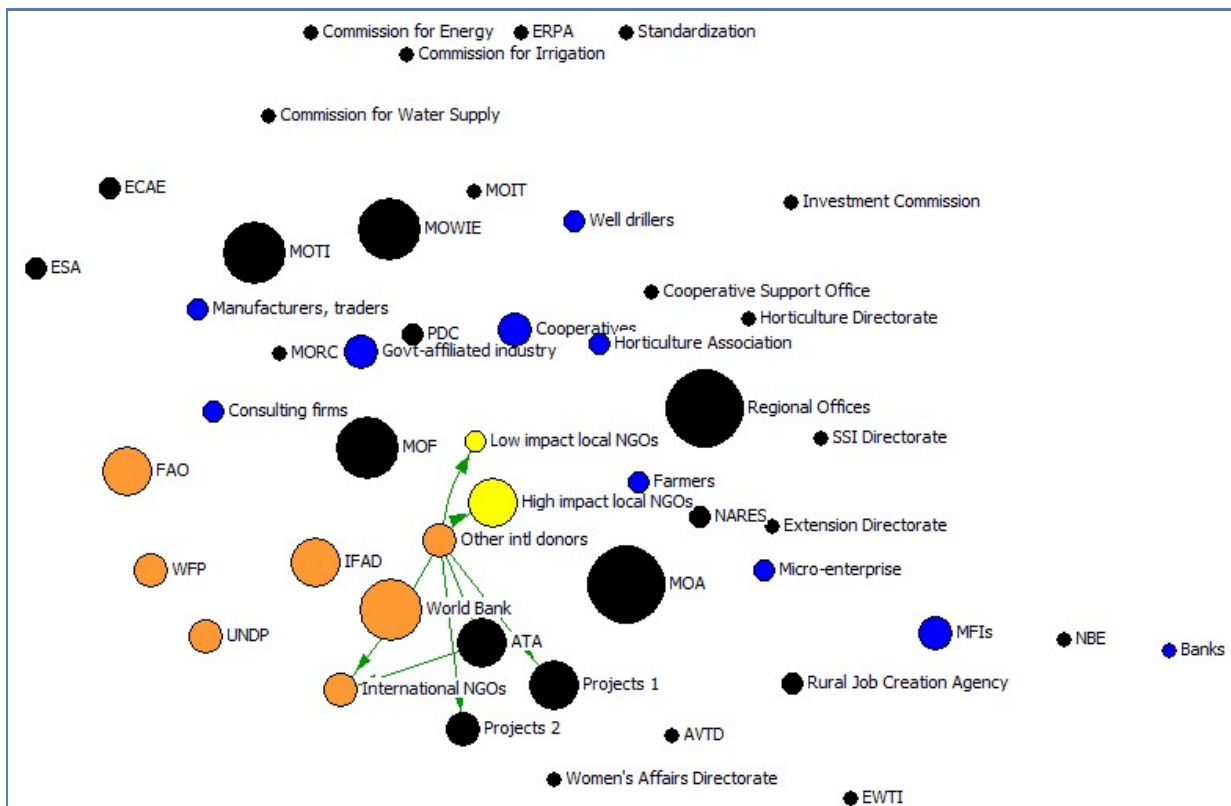


Figure 4: National Level Funding Linkages

Very few funding links were highlighted by the participants in the workshop. Participants mainly considered external funding sources and highlighted funding flows from the World Bank and other international donors to local and international NGOs and irrigation projects. This may also result from the fact that, the funding flows from the MOF to other national ministries were already implicit in the assigned authority links earlier during the workshop.

### ***Discussion***

Following the Net-Map exercise the discussion among participants focused mostly on the constraints to greater diffusion of technologies for SSI and the changes that are needed to scale SSI. One of the main constraints highlighted is the lack of finance to support smallholder adoption of SSI technologies. As mentioned above, only MFIs currently provide funding to farmers to support adoption of irrigation, while government-owned and private banks are not involved in any major way. Access to finance from MFIs is not enough to promote the spread of SSI technology to the required level. MFIs provide only small loans with high interest rates<sup>2</sup>, while private banks could provide bigger more attractive loans, but then providing adequate collateral becomes a challenge for small farmers. The question is whether MFIs can address smallholder needs through an expansion of loans products with appropriate collateral requirements. Private banks can support private suppliers through innovative financing schemes like public-private sector collaboration (involving the Development Bank) and partial risk guarantees.

This lack of access to finance is also one of the main challenges for private sectors actors to diffuse small-scale irrigation technologies to farmers. Participants suggested that the private sector should be supported by the MOA and the extension agency through investments aimed at creating awareness and demand for technologies among smallholder farmers. Moreover, lack of foreign currency, taxation on imported technology, and lack of liquidity of the banking sector also pose bottlenecks to the private sector to import irrigation equipment. Therefore, the need to improve the enabling environment for businesses to have access to finance is crucial, and this includes providing importers with greater access to foreign currency. The private sector also needs incentives to supply irrigation technologies and this would be facilitated by more duty-free import of agricultural technologies. The current Council of Ministers' decision to introduce import tax breaks on irrigation technologies is a move in the right direction, although implementation of this policy change is still lagging behind. Solar energy equipment was duty free previously. However, under the current system, such equipment is subject to tax and that critically limits the potential for expansion of solar pumps. Adding SSI technologies to the National bank list of priority import goods that receive tax exemption during import and custom clearance would make these products

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<sup>2</sup> Interest rates were considered high even though the government caps the interest rate on loans from MFI, making these much lower than in other countries in Africa.

more affordable for importers and smallholders. Better standardization and enforcement of the standards would also contribute to sustainability of SSI by making it easier to import spare parts, for example.

Participants also highlighted that banks only fund projects that have the highest returns, and it has not yet been demonstrated that SSI can bring higher returns. Large banks may also be more reluctant to accept the high transaction costs of providing small loans to farmers, while favoring bigger loans for borrowers that bring in foreign exchange. Thus, the problem is not only related to farmers' lack of collateral or low repayment rates. Cooperatives are legal entities with bank accounts, and they have better access to finance than individual farmers. Therefore, participants suggested that more farmers should organize themselves into groups, like cooperatives, to access finance. The government would then provide a guarantee for the banks to lend to groups to reduce risk.

Better organization of farmers into enterprises/cooperatives would also help them move towards more capitalized, profit-oriented farming. This would also increase their ability to access finance from banks. Furthermore, the private sector focuses more on cooperatives because they have greater power to buy irrigation equipment compared to individual farmers at the moment. A sustainable private sector business model should also target farmers instead of tenders by NGOs and government entities.

Moreover, smallholders often lack market linkages. Therefore, farmers need to identify crops that have greater market potential and link with the markets for those crops. Lack of market linkages and storage facilities limit irrigated crop choices and crop diversity, leading to monocropping, with negative implications for the price that farmers receive for their irrigated produce. Farmers would not be able to easily cultivate more profitable crops with limited market linkages. Thus, there is a need for more market research and information on what crops to produce and how farmers can easily access market for their products.

Another challenge is related to farmers' lack of access to agricultural inputs and input service providers. Farmers also lack awareness of SSI, as well as the knowledge and skills to engage in irrigated production. Farmers lack technical capacity and knowledge on how to apply irrigation technologies to particular crops and the extension system has to be adapted to meet this capacity limitation. Participants also pointed out that farmers tend to be risk averse and may avoid testing new technologies like irrigation. Linking smallholders with commercial farms (through out-grower schemes) was suggested as one way to support farmers adoption of SSI.

Participants also highlighted the fact that water management issues are generally not adequately addressed in the agriculture sector, and that ensuring efficient and sustainable water resources use should

get greater emphasis by the concerned authorities, by establishing and facilitating community-based organization, such as irrigation water user associations (IWUAs) or enterprises. Currently, there is also not a well-organized database on inputs, water availability, and technology options, although there are attempts to establish online data infrastructure on water availability and use by the Ethiopian Agricultural Water Management Platform (EAWMP), chaired by the Director of SSI at MOA. Furthermore, there is a need to invest more in developing appropriate, affordable technologies including technology options to access groundwater at deeper depths. In this regard, the Ethiopia Water Technology Institute could play a larger role, under MOWIE, or this role could be performed by regional agencies or universities/research institutes.

Another challenge relates to the absence of an irrigation water tariff or cost recovery system, which raises questions about who should pay for investments (e.g. digging wells, maintenance etc.). Participants suggested that water users should pay for maintenance and some sort of cost recovery system for investments in irrigation schemes in which smallholder farmers participate. Failing to have a strong property right policy and proper enforcement negatively influences water development and management in the country. For example, there is currently no groundwater monitoring unit in the country to monitor groundwater use (and charging accordingly) in order to minimize water depletion.

Water resources monitoring and management was stressed as an urgent issue by participants. They emphasized that there is a need for more information on water availability and depletion (e.g. through groundwater monitoring) given that sustainability is becoming a growing problem, as the country is already losing lakes and problems of siltation are growing. For example, there is a huge water abstraction from Lake Ziway and large horticulture farms are blamed. However, there are also thousands of smallholder farmers growing vegetables and using pesticides, that need to be monitored. Both MOWIE and the MOA should play a stronger role in monitoring and regulating water supply and use to avoid increasing environmental and sustainability challenges. This will require better monitoring of water abstraction, tracking of pesticide use, nutrient loading, and ecosystem management, including payment for ecosystem services, at the regional level.

### ***Oromia Regional-level Stakeholder Network***

Expansion of small-scale irrigation in Oromia Region would increase agricultural production outcomes to meet growing food demand in the region and support household food security given the importance of the agriculture sector to the regional economy. Some areas of the region, including Dugda and Harmony districts, already have significant irrigation activities ongoing on small, medium, and large-scale farms using both surface and groundwater resources and different water-lifting technologies.

Figure 5 shows the complete Oromia Regional network as described by participants in the regional level stakeholder workshop. Participants identified 101 actors at the Oromia regional level as having an influence on the diffusion of SSI. Because of the large number of actors, some were grouped together with similar organizations and influence levels were assigned and links were drawn for the grouping rather than the individual actors. The network shown in Figure 5 illustrates the condensed list of actors with the groupings defined by the participants. This condensed stakeholder network contains 34 nodes and 148 links. While less centralized than the National network, the regional network still has a high degree of centralization (78 percent). Government actors comprise 56 percent of the nodes, followed by private sector actors (24 percent), international actors (18 percent) and national NGOs (3 percent). The full list of actors identified is shown in Table 5 along with the full organization name, group to which they were assigned (if any), and the organization category (government, private sector, international, and local NGO).

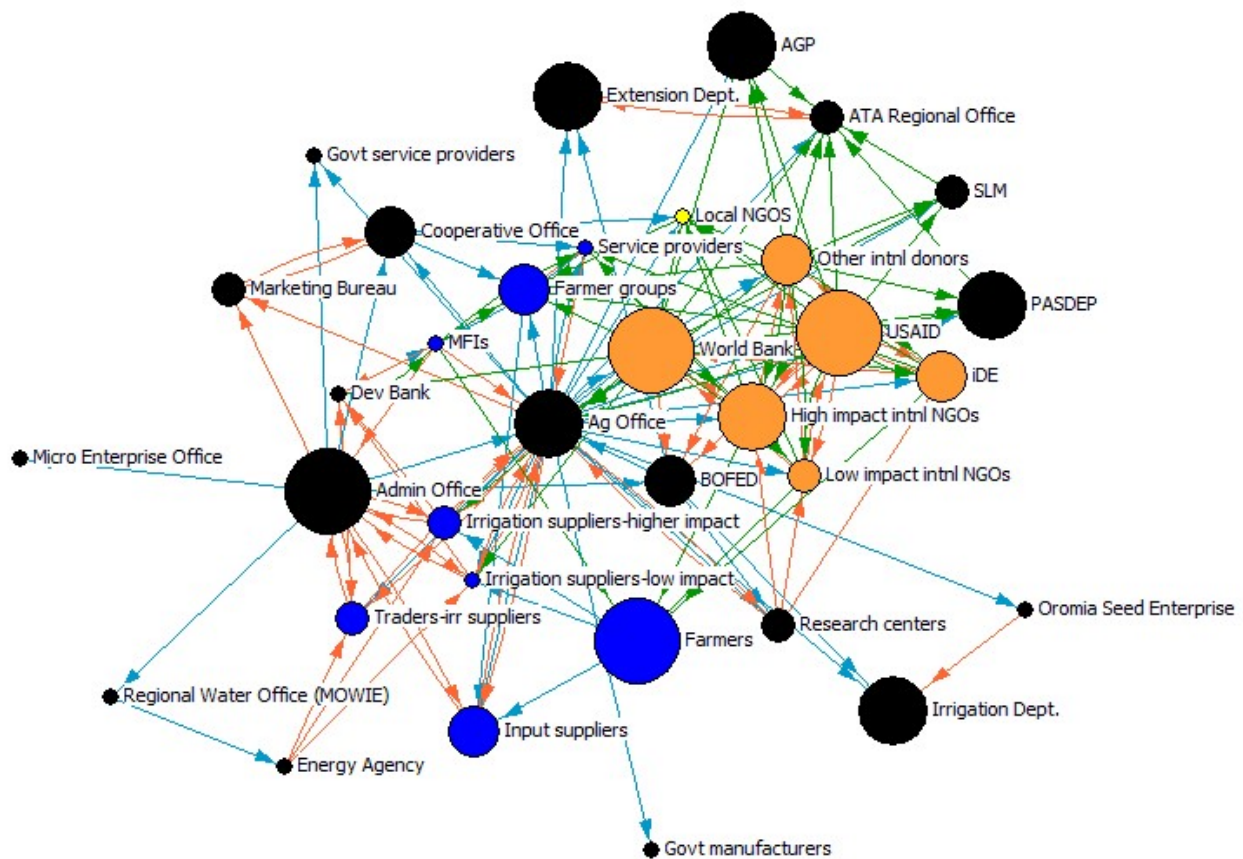


Figure 5: Complete Oromia Regional Network, Actors Sized by Relative Influence

Table 5: Oromia Regional Actor List, Full Names, Category, and Influence

| Actors               | Actors-Full Name  | Condensed to Group                 | Category      | Influence |
|----------------------|---|------------------------------------|---------------|-----------|
| Farmers              | Farmers   | Farmers                            | Private       | 5         |
| Admin Office         | Regional Administrative Office                                | Admin Office                       | Government    | 5         |
| USAID                | USAID   | USAID                              | International | 5         |
| World Bank           | World Bank  | World Bank                         | International | 5         |
| Ag Office            | Regional Agriculture Bureau                                   | Ag Office                          | Government    | 4         |
| Irrigation Dept.     | Irrigation Department   | Irrigation Dept.                   | Government    | 4         |
| Extension Dept.      | Extension Department  | Extension Dept.                    | Government    | 4         |
| PASDEP               | Plan for Accelerated and Sustained Development to End Poverty | PASDEP                             | Government    | 4         |
| AGP                  | Agricultural Growth Program                                   | AGP                                | Government    | 4         |
| Oxfam                | Oxfam   | High impact intl NGOs              | International | 4         |
| CARE                 | CARE  | High impact intl NGOs              | International | 4         |
| Catholic Relief      | Catholic Relief   | High impact intl NGOs              | International | 4         |
| World Vision         | World Vision  | High impact intl NGOs              | International | 4         |
| Traders 2            | Traders (marketing, wholesale etc)                            | Traders-service providers          | Private       | 3         |
| Seed suppliers       | Seed suppliers  | Input suppliers                    | Private       | 3         |
| Chemical suppliers   | Chemical suppliers  | Input suppliers                    | Private       | 3         |
| Fertilizer suppliers | Fertilizer suppliers  | Input suppliers                    | Private       | 3         |
| Oromia Ag Fed        | Oromia Agriculture Federation                                 | Farmer groups                      | Private       | 3         |
| Cooperative Union    | Cooperative Union   | Farmer groups                      | Private       | 3         |
| Bora Dembel          | Bora Dembel   | Farmer groups                      | Private       | 3         |
| Meki Batu            | Meki Batu   | Farmer groups                      | Private       | 3         |
| BOFED                | Oromiya Bureau of Finance and Economic Development            | BOFED                              | Government    | 3         |
| Cooperative Office   | Cooperative Promotion Agency                                  | Cooperative Office                 | Government    | 3         |
| DfID                 | DfID  | Other intl donors                  | International | 3         |
| EU/EC                | EU/EC   | Other intl donors                  | International | 3         |
| IFAD                 | IFAD  | Other intl donors                  | International | 3         |
| KOICA                | KOICA   | Other intl donors                  | International | 3         |
| JICA                 | JICA  | Other intl donors                  | International | 3         |
| GIZ                  | GIZ   | Other intl donors                  | International | 3         |
| KFW                  | KFW   | Other intl donors                  | International | 3         |
| SIDA                 | SIDA  | Other intl donors                  | International | 3         |
| SNV                  | SNV   | Other intl donors                  | International | 3         |
| Gates                | Gates Foundation  | Other intl donors                  | International | 3         |
| DFN                  | DFN   | Other intl donors                  | International | 3         |
| IDE                  | IDE   | IDE                                | International | 3         |
| Beta                 | Beta trading  | Irrigation suppliers-higher impact | Private       | 2         |
| Hagbes               | Hagbes Trading  | Irrigation suppliers-higher impact | Private       | 2         |
| Ambasel              | Ambasel Trading   | Irrigation suppliers-higher impact | Private       | 2         |
| Biselex              | Biselex   | Irrigation suppliers-higher impact | Private       | 2         |
| Emu                  | Emu   | Irrigation suppliers-higher impact | Private       | 2         |
| Traders 1            | Traders   | Traders-irrigation suppliers       | Private       | 2         |
| Marketing Bureau     | Marketing Bureau  | Marketing Bureau                   | Government    | 2         |
| ATA Regional Office  | ATA Regional Office   | ATA Regional Office                | Government    | 2         |
| SLM                  | Sustainable Land Management                                   | SLM                                | Government    | 2         |
| Fadis                | Fadis Research Center   | Research centers                   | Government    | 2         |
| Adami Tulu           | Adami Tulu  | Research centers                   | Government    | 2         |
| Werer                | Werer Research Center   | Research centers                   | Government    | 2         |
| Ag Research Inst     | Regional Agricultural Research Institute                      | Research centers                   | Government    | 2         |
| Ag Research Cent     | Melkassa Agricultural Research Center                         | Research centers                   | Government    | 2         |



| Actors                  | Actors-Full Name                                | Condensed to Group              | Category      | Influence |
|-------------------------|---|---------------------------------|---------------|-----------|
| MfM                     | Menschen fur Menschen                           | Low impact intl NGOs            | International | 2         |
| SMIS                    | SMIS  | Low impact intl NGOs            | International | 2         |
| Crop Life               | Crop Life                                       | Low impact intl NGOs            | International | 2         |
| COOPI (Italian)         | COOPI (Italian)                                 | Low impact intl NGOs            | International | 2         |
| CDSF                    | CDSF  | Low impact intl NGOs            | International | 2         |
| Horn of Africa          | Horn of Africa                                  | Low impact intl NGOs            | International | 2         |
| Farm Afric              | Farm Afric                                      | Low impact intl NGOs            | International | 2         |
| Islamic Relief          | Islamic Relief International                    | Low impact intl NGOs            | International | 2         |
| Action for Hunger       | Action for Hunger                               | Low impact intl NGOs            | International | 2         |
| Wetland International   | Wetland International                           | Low impact intl NGOs            | International | 2         |
| FHI                     | Food for Hunger                                 | Low impact intl NGOs            | International | 2         |
| IRC                     | International Rescue Committee                  | Low impact intl NGOs            | International | 2         |
| IDH                     | IDH (Sustainable Trade Initiative)              | Low impact intl NGOs            | International | 2         |
| Lutheran World Relief   | Lutheran World Relief                           | Low impact intl NGOs            | International | 2         |
| ACME                    | ACME Engineering                                | Irrigation suppliers-low impact | Private       | 1         |
| Greenscene              | Greenscene Energy                               | Irrigation suppliers-low impact | Private       | 1         |
| Davis & Shirtliff       | Davis & Shirtliff                               | Irrigation suppliers-low impact | Private       | 1         |
| Rensys                  | Rensys Engineering & Trading                    | Irrigation suppliers-low impact | Private       | 1         |
| Solar Dev               | Solar Development                               | Irrigation suppliers-low impact | Private       | 1         |
| Lydet Co.               | Lydet Co.                                       | impact                          | Private       | 1         |
| Vision Fund             | Vision Fund                                     | MFIs                            | Private       | 1         |
| Busa Gonofa             | Busa Gonofa                                     | MFIs                            | Private       | 1         |
| Savings & Credit        | Oromia Savings & Credit Association             | MFIs                            | Private       | 1         |
| Metemamen               | Metemamen                                       | MFIs                            | Private       | 1         |
| Wassa                   | Wassa   | MFIs                            | Private       | 1         |
| Peace MFI               | Peace Microfinance                              | MFIs                            | Private       | 1         |
| Bank Oromia             | Cooperative Bank of Oromia                      | MFIs                            | Private       | 1         |
| Service providers       | Local service providers (maintenance companies) | Service providers               | Private       | 1         |
| Farm services           | Private farm service (capacity building)        | Service providers               | Private       | 1         |
| Private consultants     | Private consultants (design)                    | Service providers               | Private       | 1         |
| Private contractors     | Private contractors (construction)              | Service providers               | Private       | 1         |
| Dev Bank                | Development Bank of Ethiopia                    | Dev Bank                        | Government    | 1         |
| Metech                  | Metech  | Govt manufacturers              | Government    | 1         |
| Adama Tractor           | Adama Tractor Assembly                          | Govt manufacturers              | Government    | 1         |
| Plant Clinic            | Government Plant Clinic                         | Govt service providers          | Government    | 1         |
| Construction Bureau     | Oromia Construction Bureau                      | Govt service providers          | Government    | 1         |
| WWCE                    | Waterworks Construction Enterprise              | Govt service providers          | Government    | 1         |
| Drilling Enterprise     | Oromia Drilling Enterprise                      | Govt service providers          | Government    | 1         |
| Waterworks Design       | Oromia Waterworks Design & Supervision          | Govt service providers          | Government    | 1         |
| Micro Enterprise Office | Enterprise                                      | Govt service providers          | Government    | 1         |
| Office                  | Micro Enterprise Office                         | Micro Enterprise Office         | Government    | 1         |
| Regional MOWIE          | Regional Water Bureau                           | Regional Water Office (MOWIE)   | Government    | 1         |
| Energy Agency           | Energy Agency                                   | Energy Agency                   | Government    | 1         |
| Seed Enterprise         | Oromia Seed Enterprise                          | Oromia Seed Enterprise          | Government    | 1         |
| Vision                  | Vision  | Local NGOS                      | Local NGO     | 1         |
| ERSHA                   | ERSHA   | Local NGOS                      | Local NGO     | 1         |
| CCF                     | CCF   | Local NGOS                      | Local NGO     | 1         |
| Oromia Self-Help        | Oromia Self-Help Organization                   | Local NGOS                      | Local NGO     | 1         |
| Self-Help               | Self-Help (CCF)                                 | Local NGOS                      | Local NGO     | 1         |
| Mekane Yesus            | Mekane Yesus                                    | Local NGOS                      | Local NGO     | 1         |

| Actors               | Actors-Full Name                                      | Condensed to Group | Category  | Influence |
|----------------------|---|--------------------|-----------|-----------|
| Meki Catholic Relief | Meki Catholic Relief                                  | Local NGOS         | Local NGO | 1         |
| SEDA                 | Sustainable Environmental and Development Association | Local NGOS         | Local NGO | 1         |
| RVCWA                | Rift Valley Children's and Women's Association        | Local NGOS         | Local NGO | 1         |

### ***Actor Influence and Role***

The actors in Figure 5 are sized by their influence over the diffusion of SSI, based on the perceptions of the participants in the mapping workshop. Colors are assigned to each category of organization—government (black), private sector (blue), international organizations (orange) and local NGO (yellow). The influence scores assigned to each actor are listed in Table 5.

Oromia Region is organized into 4 administrative layers: 20 zones, 265 districts, and 6,447 kebeles. All government bureaus at the regional level are accountable to the regional government while zone and district level offices are also accountable to their respective zone and district administration. Among government actors, the Regional Administrative Office received the highest influence score of 5. The Regional Administrative Office plays an important role in issuing regulations and directives. It is also involved in approving budgets for the supply of agricultural inputs, such as fertilizer, seed, pesticides and water-lifting technologies for SSI. Moreover, it is the sole government office responsible for providing extension services to familiarize small holders with new technologies. Several other government agencies were considered to have a very high level of influence on the diffusion of SSI technologies (with scores of 4) including the Regional Agriculture Bureau, and the Irrigation Department and Extension Department, both of which fall under the Regional Agriculture Bureau. Two large government-led projects that are operating in Oromia Region were also considered to be highly influential (scores of 4)—PASDEP and AGP. PASDEP is a large national government program that aims to define the nation’s overall strategy for development and set policies and programs in each major sector, with the ultimate objective of eradicating poverty. Similarly, AGP is a large national program operating in areas with high agricultural potential, the primary objective of which is to increase agricultural productivity and market access for key crop and livestock products through commercialization efforts and infrastructure development and management.

Among international organizations, two international donors were highlighted as having considerable influence in Oromia Region—the World Bank and USAID—with scores of 5. These donors channel significant resource to the agriculture sector in the region and are involved in sector policy formation, as well. Other international donors, such as EU/EC, DfID, GIZ, and Gates Foundation, were assigned influence scores of 3. Some international NGOs were also seen as being highly influential with influence scores of 4, including Oxfam, CARE, Catholic Relief Services, and World Vision. iDE was assigned an

influence score of 3 while all other NGOs, including Crop Life, SMIS, Islamic Relief International, and Lutheran World Relief, were given scores of 2. Contrary to international organizations, local NGOs were considered by the participants to have much lower influence scores. All local NGOs, including Vision, ERSHA, Oromia Self-Help, Meki Catholic Relief and Rift Valley Children's and Women's Association, were all grouped and given an influence score of 1. These organizations are only involved in a very limited way in the dissemination of SSI technologies.

Contrary to the National Net-Map, several private sector actors were considered to have much greater influence on the spread of SSI technologies in Oromia Region. Notably participants in the regional workshop considered farmers themselves to have the highest level of influence, score of 5, over the diffusion of SSI given their essential role in uptake of irrigation technologies at the farm level. Traders; input suppliers, such as seed, agricultural chemical and fertilizer suppliers; and farmer groups, including the Oromia Agriculture Federation, the Cooperative Unions, Bora Dembel and Meki Batu, were seen to be moderately influential with scores of 3. Some input suppliers that provide irrigation equipment, such as pumps, were given influence score of 2, including Beta Trading, Hagbes, Ambasel, Biselex and Emu. Other input suppliers, including ACME Engineering, Greenscene Energy, Davis & Shirtliff, Rensys Engineering & Trading, Solar Development, and Lydet Co, were ranked only 1. These input suppliers were grouped into these two groups due to differences in their scale of operations and based on their past performance in the diffusion of SSI technologies.

Other private sector actors with lower influence scores (of 1) include micro-finance institutes, like Vision Fund, Busa Gonofa, and the Oromia Savings and Credit Association. The Cooperative Bank of Oromia; the Development Bank of Ethiopia, local service providers (such as government and private irrigation maintenance companies), and private consultants and contractors for the design and construction of irrigation infrastructure also have lower influence scores (1).

### ***Actor Centrality***

Degree centrality scores for regional actors are shown in Table 6. The actor with the highest level of degree centrality at the Oromia Regional level is the Regional Agriculture Office with a score of 37 (12 incoming and 25 outgoing connections). While the Administrative Office was given a higher influence score, it had a lower degree centrality score with only 16 connections (5 incoming and 11 outgoing). These results suggest that, in fact, the Agriculture Office has more influence over the network at the regional level (with most connections outgoing) than the Administrative Office, despite the Administrative Office having higher authority at the regional level.

Other actors with high degree centrality include the two most influential international donors—the World Bank and USAID—with degree centrality scores of 18 and 15, respectively. Other international donors also have high degree centrality scores of 15. Most connections are outgoing, suggesting that these actors largely influence the network through funding flows.

International NGOs all have high degree centrality scores of 11, irrespective of their assigned influence scores, with relatively even numbers of ingoing and outgoing connections. Local NGOs have fewer linkages, score of 9, with most of these comprised of incoming connections.

Among private sector actors, farmer groups and service providers have the highest degree centrality scores of 9. Both high and low impact irrigation suppliers, and microfinance institutes have scores of 8, while individual farmers have 7 connections.

**Table 6: Degree Centrality Scores, Oromia Regional Level**

| <b>Actor</b>                       | <b>Degree</b> | <b>InDegree</b> | <b>OutDegree</b> |
|------------------------------------|---------------|-----------------|------------------|
| Ag Office                          | 37            | 12              | 25               |
| World Bank                         | 18            | 4               | 14               |
| Admin Office                       | 16            | 5               | 11               |
| USAID                              | 15            | 4               | 11               |
| Other intnl donors                 | 15            | 4               | 11               |
| Low impact intnl NGOs              | 11            | 5               | 6                |
| iDE                                | 11            | 5               | 6                |
| High impact intnl NGOs             | 11            | 5               | 6                |
| Farmer groups                      | 9             | 8               | 1                |
| Service providers                  | 9             | 6               | 3                |
| ATA Regional Office                | 9             | 8               | 1                |
| Local NGOS                         | 9             | 8               | 1                |
| Irrigation suppliers-low impact    | 8             | 5               | 3                |
| Irrigation suppliers-higher impact | 8             | 5               | 3                |
| MFIs                               | 8             | 2               | 6                |
| BOFED                              | 8             | 4               | 4                |
| Farmers                            | 7             | 4               | 3                |
| Cooperative Office                 | 7             | 3               | 4                |
| Input suppliers                    | 6             | 4               | 2                |
| Dev Bank                           | 6             | 5               | 1                |
| Research centers                   | 6             | 2               | 4                |
| Traders-irr suppliers              | 6             | 3               | 3                |
| PASDEP                             | 5             | 4               | 1                |
| AGP                                | 5             | 4               | 1                |
| SLM                                | 5             | 4               | 1                |
| Extension Dept.                    | 4             | 3               | 1                |

| <b>Actor</b>            | <b>Degree</b> | <b>InDegree</b> | <b>OutDegree</b> |
|-------------------------|---------------|-----------------|------------------|
| Energy Agency           | 4             | 1               | 3                |
| Marketing Bureau        | 4             | 3               | 1                |
| Irrigation Dept.        | 3             | 3               | 0                |
| Govt service providers  | 2             | 2               | 0                |
| Regional Water Bureau   | 2             | 1               | 1                |
| Oromia Seed Enterprise  | 2             | 1               | 1                |
| Micro Enterprise Office | 1             | 1               | 0                |
| Govt manufacturers      | 1             | 1               | 0                |

### ***Types of Linkages***

Figures 6, 7, and 8 isolate the authority, information, and funding links between regional actors, respectively. Information linkages account for most of the linkages in the network (54 linkages), followed by funding linkages (50) and authority linkages (44).

While the Administrative Office has authority over the Agricultural Office (and the Regional Water Bureau), most authority links shown in Figure 6 flow from the Agriculture Office to other departments under it, such as the extension department, the irrigation department and the ATA regional office, as well as important government-led programs, such as AGP, SLM, and PASDEP. The Agricultural Office also has authority over international actors, private sector actors, and local NGOs. Farmers were considered to have informal authority over irrigation and input suppliers, through their demand for irrigation equipment and agricultural inputs.

As with the National network, many of the information flows in Figure 7 move in both direction between actors. Information flows back and forth between the Administrative Office, the Agricultural Bureau and irrigation suppliers, input suppliers and traders. Information also flows in both directions between international donors and NGOs and these actors provide information to the Oromia Bureau of Finance and Economic Development (BOFED). Government research organizations are an important source of information for international organizations and these research centers link back to the Agricultural Bureau.

As shown in Figure 8, funding flows from international donors to international and local NGOs as well as government actors like the Regional Agricultural Bureau, the Regional ATA office, government-led projects. Funding also flows from international donors and NGOs to irrigation suppliers, farmer groups, and individual farmers. Funding also flows from the Development Bank to MFIs and then on to the individual farmers and farmer groups. As with the National network, participants in the regional workshop focused mostly on external funding flows coming from international donors and NGOs, rather

than funding flows between government entities, apart from the important funding flow from the Development Bank to the MFIs.

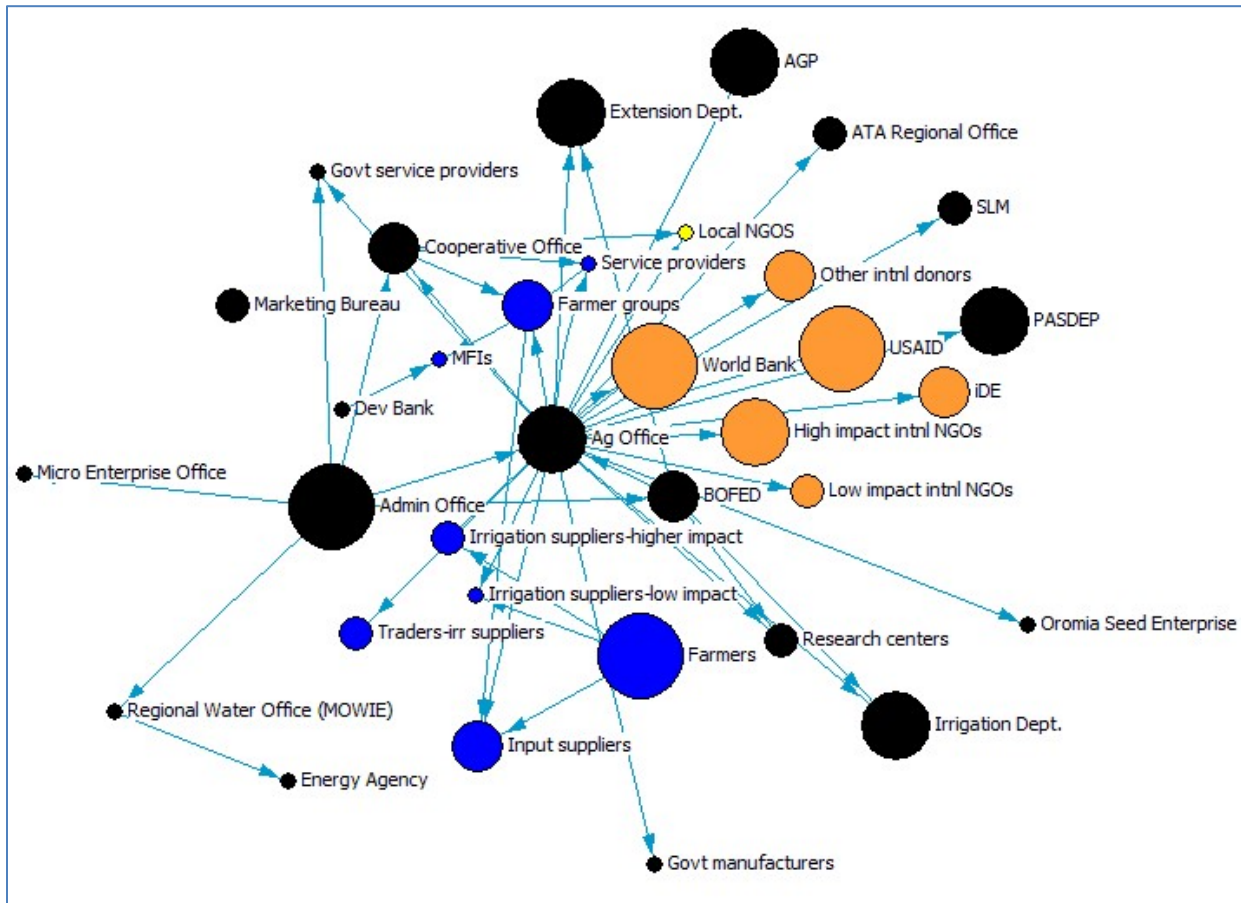


Figure 6: Regional Level Authority Linkages

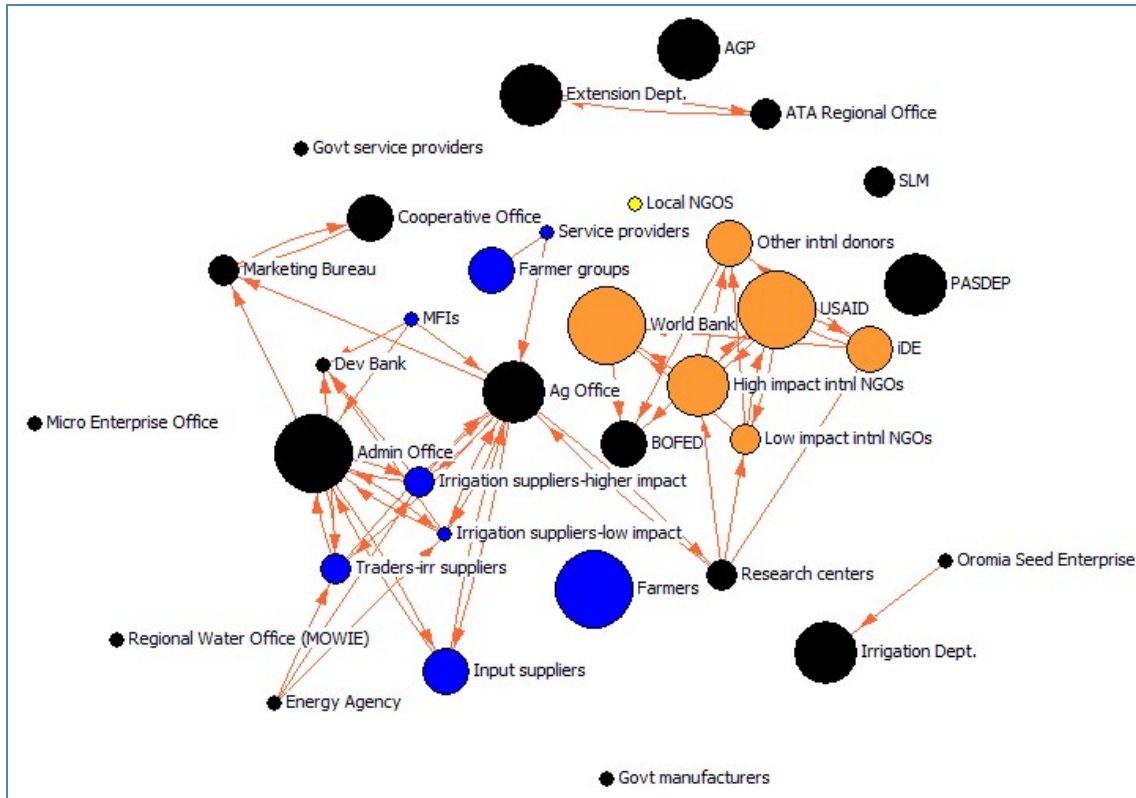


Figure 7: Regional Level Information Linkages

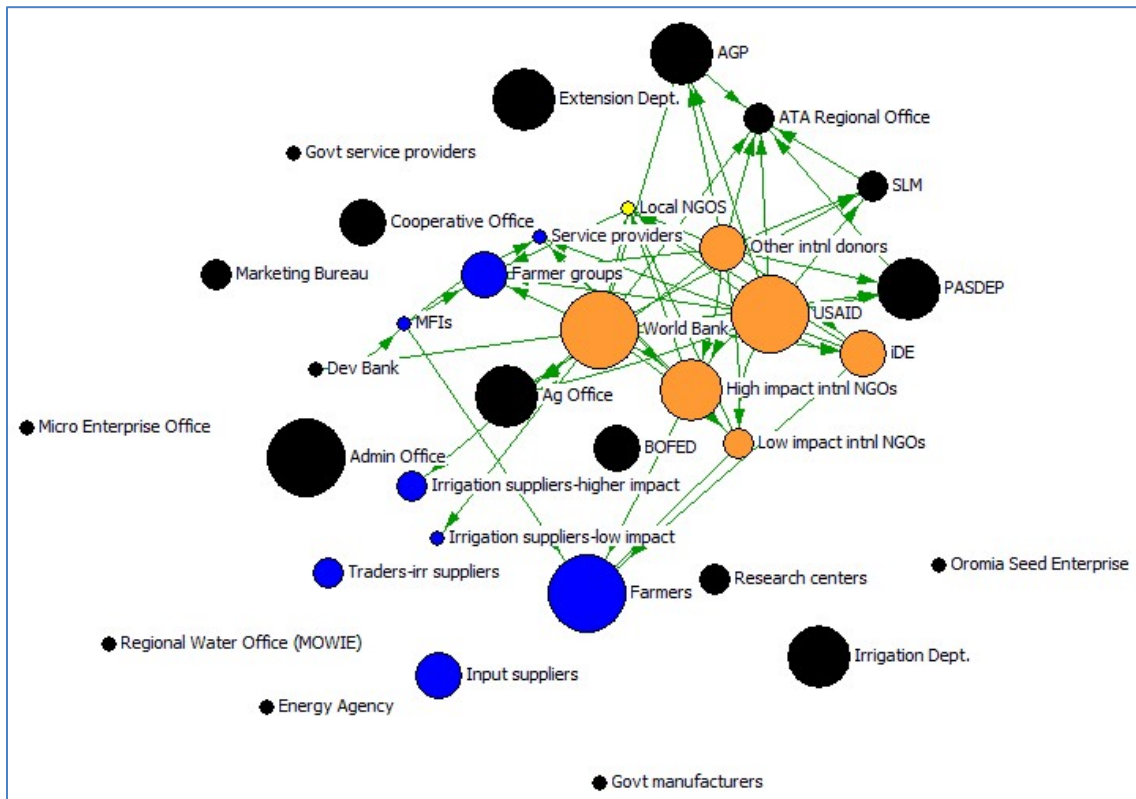


Figure 8: Regional Level Funding Linkages

It should be noted that while the Net-Map process shows the linkages between different actors in the network it does not indicate the strength of these linkages. A previous institutional mapping exercise looking at the strength of the linkages between the Oromia Irrigation Development Authority and other institutions directly or indirectly working on irrigation development within the region found limited sharing of information, financial resources, physical resources, and technical support (OSMIS 2016).

### ***Discussion***

Many of the same challenges that were discussed at the National level were again raised during the regional workshop. Lack of access to finance and the absence of vibrant institutions were identified as the main challenges for the dissemination of small-scale irrigation technologies in Oromia Region. In order to promote greater diffusion of irrigation in Oromia Region, participants stressed that there is a need to expand access to finance for farmers and make foreign currency available for irrigation technology importers.

Participants also highlighted the lack of access to irrigation technologies. Many farmers at the woreda level do not have access to some irrigation technologies, such as solar pumps, because the supply chain does not reach the woreda level. Moreover, most farmers are not able to afford the high cost of irrigation technologies from formal traders and instead opt for cheaper irrigation materials from parallel markets (a participant mentioned that 75% of irrigation technology equipment in Harar was contraband). In addition, after sale services, such as maintenance and repair, almost do not exist. Another challenge in SSI technology diffusion is lack of awareness of farmers on how to use the available irrigation technologies.

One participant noted that the Irrigation Authority of Oromia Region does not disseminate small-scale irrigation technologies that are appropriate for and preferred by small farmers in terms of their specifications, types and quality. Moreover, complementary post-harvest and planting technologies needed to increase farm productivity are almost totally overlooked by irrigation authorities.

Another impediment is that there is no clear and sustainable water source identification process. Data are not available on where and how much potential water is available throughout the country. There is an ongoing effort by ATA to organize a groundwater map, but that is not enough. Participants emphasized that a water data platform need to be developed and made accessible to water users and other stockholders investing in the sector.

There is also a need to provide training and develop proper extension services for irrigated farming. This would include providing farmers with knowledge about crop water requirements, when to use irrigation, how to plant, and what other complementary inputs should be used. Improving irrigation extension



services (especially the agronomic aspects) would enable farmers to achieve expected outcomes of increased agricultural productivity and increase income from irrigated farming.

Furthermore, revising standardization and regulations of irrigation equipment is needed as there is still a lengthy process to get a pass via custom authorities, as this equipment is used for non-irrigation purposes that are subject to domestic taxation. Clear institutional structures should be in place to facilitate irrigation technology imports. This includes establishing a better communication platform to share information between government institutions and other stakeholders. Participants suggested that a website that provides such information for stakeholders could also help. More could also be done to encourage research on irrigated production so that practical advice given to farmers on the ground is based on scientific findings.

## **Conclusions**

The National and Regional Net-Map workshops shed light on key organizations involved in the diffusion of small-scale irrigation technologies in Ethiopia and Oromia Region, respectively. They also highlighted areas where institutional strengthening may lead to increased spread of irrigation.

Several notable similarities and differences emerged between the National and Regional level workshops. Both workshops highlighted the essential role played by government ministries, agencies and bureaus at National and Regional levels in the diffusion of small-scale irrigation. The participants were able to define a clear chain of authority from the ministries to the agencies that operate below them as well as the linkages with private sector, international and NGO partners. The high level of degree centralization of the networks (93 percent at the national level and 78 percent at the regional level) reflects this hierarchy. Key government agencies were designated as the most influential actors in both the national and regional Net-Maps as evidenced by their high influence and degree centrality scores—notably the Ministry of Agriculture at the National level and the Regional Administrative Office at the Oromia Regional level. In essence, the government provides a number of key functions necessary to promote small-scale irrigation from setting policies and standards for the development and dissemination of irrigation equipment, developing and implementing key agricultural and rural development programs, investments in infrastructure and providing information and inputs to farmers. Some of these roles, such as providing information and inputs to farmers and implementing agricultural and rural development programs, are often played by private sector and NGO actors in other contexts.

Local and international NGOs did not appear to play a pivotal role in the diffusion of small-scale irrigation technologies, particularly at the national level. Few of these organizations focus specifically on irrigation development and diffusion although some local NGOs more heavily involved in implementing

key agricultural and rural development programs, namely REST and ORDA, were viewed as relatively more influential at the national level. International NGOs were not viewed as essential players at the national level. At the Oromia Regional level, international NGOs figured somewhat more prominently with some organizations assigned higher influence scores, namely Oxfam, CARE, Catholic Relief Services, and World Vision, while local NGOs were not seen as highly influential. Similarly, international donors that were considered highly influential in the national Net-Map, featured less prominently in the regional Net-Map and vice versa. The World Bank stood out as the most influential international player at the national and regional level given its role in influencing policies related to small scale irrigation and investments in this area. At the national level, IFAD and FAO were also considered key international actors, while at the Oromia regional level participants highlighted USAID as playing a key role in the diffusion of small-scale irrigation.

Participants also pointed to the weakness of private sector actors, especially finance institutions (MFIs and banks), manufacturers, suppliers and traders, that are essential for accelerating the diffusions of small-scale irrigation technologies. Suggested recommendations from participants for increasing the role of the private sector focused on government actions needed to improve the enabling environment for businesses, rather than actions that need to be taken by the companies themselves. They emphasized changes that are needed to strengthen the flow of financing and technologies for irrigation, such as organizing farmers into cooperatives to enable them to access loans, improving the enabling environment for businesses to have access to finance, providing importers with greater access to foreign currency, and continuing to provide import tax breaks on irrigation technologies.

One notable difference was in the way participants at the national level and regional level workshops viewed the farmers themselves. Participants in the national workshop did not consider farmers to have an influential role in the diffusion of SSI, while participants in the Oromia regional workshop considered that farmers play an essential role in the uptake of irrigation technologies at the farm level. Traders, input suppliers, such as seed, agricultural chemical and fertilizer suppliers, and farmer groups were also assigned somewhat higher influence scores at the regional level than they were at the national level.

## APPENDIX 1: INTERVIEW GUIDE

### ILSSI Net-Map Workshop Guide - Ethiopia

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#### Overview of the Workshop:

Net-Map is a facilitation or interview technique that helps people understand, visualize, discuss, and improve situations in which many different actors influence outcomes. By creating Influence Network Maps, individuals and groups can clarify their own view of a situation, foster discussion, and develop a strategic approach to their networking activities. More specifically, Net-Map helps players to determine what actors are involved in a given network, how they are linked, and their level of influence.

In this workshop we will focus on identifying the actors that influence the diffusion of small-scale irrigation (SSI) technologies in Ethiopia (at the national/regional level) and how these stakeholders interact with each other. We will start by listing all the actors involved in the diffusion of small-scale irrigation (SSI) technologies at the national level and regional level for Oromia and discuss their role in the diffusion of SSI. We will then determine how these actors are linked, examine how influential each actor is, and then discuss ways to accelerate the diffusion of SSI technologies in the country/region.

Net-Map is a tool to explore how things are actually done, not how things ‘should be’ or how they are ‘officially’ or in formal documents. This is why we need the personal knowledge and insight of people like you, who have knowledge of the stakeholders involved in SSI and how they interact.

#### The overall guiding question that frames the session (but will not be directly asked) is:

National level (Addis Ababa): Who influences the diffusion of improved small-scale irrigation technologies at the national level?  
Regional level (Oromia): Who influences the diffusion of improved small-scale irrigation technologies at the regional level?

#### Planning: Pre-Workshop Preparation

- Determine date for the workshop (week of October 7)
- Identify organization types to categorize actors (e.g. government, NGO, private sector, Research, donors)
- Invite participants from organizations representing the range of organization types
- Aim for 10-15 participants for each workshop (national and regional)
- Identify 3-4 types of links between different stakeholder to explore during the workshop and assign colors to these
- Prepare how to frame SSI technologies (e.g. are we focusing on particular technology types (e.g. motor pumps, solar?) We are talking about “improved” small-scale irrigation technology
- Gather supplies:
  - Sticky notes
  - Flip chart paper
  - Markers
  - Chips/tokens (for stacking influence towers)

## Step 1: Determine Actors

Addis Ababa: Which actors play a role in the diffusion of small-scale irrigation technologies at the national level?

Oromia: Which actors play a role in the diffusion of small-scale irrigation technologies at the regional level?

- Prompt the workshop participants by asking for actors within various categories (government, NGO, private, donor, etc.).  
*Note: Be sure to include the organizations the participants represent.*
  
- Each category of actors gets a different color sticky note. Sticky notes will be spread out on the large sheet (or sheets) of flip chart paper.  
*Note: Decide what the actor categories are before the workshop. Let the workshop participants add any categories that are missing*
  - o Government (regional and national)
  - o International Organizations (donor or NGO)
  - o Local NGOs / Civil Society
  - o Private Sector
  
- Ask participants to describe why the actor they identify is important for the diffusion of SSI and what is their role
- Actors do not have to be highly influential, but they do have to be “involved” or influence the diffusion of SSI. We want to know who is not-influential as well as who is as long as they are involved.
- Use sticky notes to write the names of the actors, spread these on a large flip chart sheet, in no particular order: Spread them out sensibly so that there is room to make connections among them.

## Step 2: Drawing links between actors

For each actor on the sheet, who is connected to whom by the following types of relationships? Pre-identify 3-4 links of interest (no more than 5). Options include:

- Formal authority
- Money/financial flows
- Communication of information or technical/policy advice (should be specific about what type of information)

- One link at a time, explain the definition of the link, and go through all the actors on the board asking if a link exists.  
*Note: Links should be very specific to avoid linking all actors to every other actor. Links should be done in different colors.*

## Link definitions:

- **Formal Authority/informal pressure:** Formal authority is any official relationship that links people based on a formal chain of command / organizational hierarchy. Informal Pressure is the ability to influence or obstruct the other actor's decisions outside official means such as political or social power
- **Money/financial flows:** exchanges of money including funding/lending (such as loans or grants from a donor to a NGO or government) or as a commercial purchase or payment (as in a water user to a water provider)
- **Communication of information or technical/policy advice:** professional information or advice provided from one actor to another on agricultural water related issues (governance or policy).

## Step 3: Attribute Influence Levels

Addis Ababa: How strongly can actors influence the diffusion of small-scale irrigation technologies at the national level?

Oromia: How strongly can actors influence the diffusion of small-scale irrigation technologies at the regional level?

- **Define influence:**
  - We define influence as the ability to increase or reduce (or maintain the status quo) the level of small-scale irrigation in the country/region using SSI technologies. We are interested in the current and actual state of influence, not a possible future level of influence over the issue. Focus on the ability to influence the diffusion of SSI, not the actor's overall level of influence.
  - If you want to clarify further: Ask the interview partner "*what are different ways someone could influence the diffusion of SSI?*" After they give some input, add any additional possible way of influencing that you see.
    - Ways of influencing include, but are not limited to: changing formal rules and policies, providing respected information on an issue, funding or withdrawing funds to support SSI diffusion, bending or breaking the rules, etc.
- **Attribute influence:**
  - First, ask the influence level of each actor and place an influence tower.
    - The more influence an actor has the higher the tower.
    - The towers can be as high as the interviewee wants.
    - Two actors can have towers of the same size.
    - If an actor has no influence at all, the figure is put on the ground level without any influence tower.
  - Second, after setting up the influence towers, verbalize what you see, starting with the highest tower. E.g. "Actor X has the highest tower with a height of five tower pieces, followed by the actors Y and Z, both on towers of four." Encourage the interviewee to adjust anything if he or she has second thoughts. Then adjust the heights of the other towers accordingly.
  - Third, review the entire board, starting with the most influential actor all the way down to the lowest, ask the participants about the sources and effects of influence. Prompt

explanations about all actors that are very high, very low, or seem a bit inconsistent or unclear where their influence comes from. Examples include:

- I see you have put this actor on the highest tower. Why? Where does his/her influence come from?
- You have linked this actor to so many others, but you say he doesn't have much influence, why is that so?
- The purpose of doing this in three stages is to allow the interview partner to reflect on his/her answers and possibly make changes upon noticing inconsistencies.

#### **Step 4: Discussion**

After the Net-Map is completed, lead participants in a discussion around the following questions:

- What are major constraints to diffusion of SSI technologies?
- Looking back at the map, how can we accelerate diffusion? (e.g. who needs to talk to who?)

## APPENDIX 2: WORKSHOP AGENDA

*Tuesday, October 8: National Level*

*Wednesday, October 9: Regional Level*

- 9:30am-9:45am: Welcome and Introduction – Dawit Mekonnen, Research Fellow, IFPRI and Elizabeth Bryan, Senior Scientist, IFPRI
- 9:45am-11:00am: Identifying Actors Involved in the Diffusion of Small-Scale Irrigation (facilitated by Demie Abera Gemedo)
- 11:00am-11:15am: Coffee Break
- 11:15am-12:30pm: Linking Actors (facilitated by Demie Abera Gemedo)
- 12:30pm-1:30pm: Lunch
- 1:30pm-2:30pm: Building Influence Towers (facilitated by Demie Abera Gemedo)
- 2:30pm-3:00pm: Discussion on Ways to Scale the Diffusion of SSI technologies (facilitated by Demie Abera Gemedo)
- 3:00pm-3:15pm: Reflections and Closing – Fitsum Hagos, Economist, IWMI
- 3:15pm-3:30pm: Refreshments

## REFERENCES

- Aseyehgn, K., C. Yirga, and S. Rajan. 2012. Effect of Small-Scale Irrigation on the Income of Rural Farm Households: The Case of Laelay Maichew District, Central Tigray, Ethiopia. *Journal of Agricultural Sciences*, 7 (1): 43–57.
- ATA and MOA. 2014. National Strategy for Ethiopia’s Agricultural Extension System: Vision, Systemic Bottlenecks and Priority Interventions, policy document, Addis Ababa, Ethiopia.
- Baye, K., J. Choufani, D. K. Mekonnen, E. Bryan, C. Ringler, J. K. Griffiths, and E. Davies. 2019. Irrigation and women’s diet in Ethiopia: A longitudinal study. IFPRI Discussion Paper, 1864. Washington, DC: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.133399>
- Bryan, E. and E. Garner. 2020. What does Empowerment Mean to Women in Northern Ghana? Insights from Research Around a Small-Scale Irrigation Intervention. IFPRI Discussion Paper, 1909. Washington, DC: International Food Policy Research Institute.
- Burney, J. A., R. L. Naylor, and S. L. Postel. 2013. The Case for Distributed Irrigation as a Development Priority in Sub-Saharan Africa. *Proceedings of the National Academy of Sciences*, 110 (31): 12513–17. doi:10.1073/pnas.1203597110.
- Chandrasekharan, K. Siddiqui, S. Barron, J. Subasinghe, C. Hailelassie, A. 2018. Ecological footprint of food security: mapping irrigated area in Ethiopia, draft report, International Water Management Institute.
- The Federal Democratic Republic of Ethiopia. (2016). Growth and Transformation Plan II (GTP II) (2015/16–2019/20) (Vol. I). Addis Ababa, Ethiopia.
- Gebregziabher, G. Namara, R.E. Holden, S. 2009. Poverty reduction with irrigation investment: An empirical case study from Tigray, Ethiopia, *Agricultural Water Management* 96: 1837–1843.
- Gebregziabher, G., M. Giordano, S. Langan, and R. Namara. 2014. Economic analysis of factors influencing adoption of motor pumps in Ethiopia, *Journal of Development and Agricultural Economics*, 6(12): 490-500. doi: <http://dx.doi.org/10.5897/JDAE2014.0576>
- Getacher, T., A. Mesfin and G. Gebre-Egziabher. 2013. Adoption and impacts of an irrigation technology: Evidence from household level data in Tigray, Northern Ethiopia, *African Journal of Agricultural Research*, 8(38): 4766-4772. DOI:10.5897/AJAR2013.7014
- Giordano, M., and C. de Fraiture. 2014. Small Private Irrigation: Enhancing Benefits and Managing Trade-Offs. *Agricultural Water Management*, 131: 175–82. doi:10.1016/j.agwat.2013.07.003.
- Hagos, F., Jayasinghe, G., Awulachew, S. B., Loulseged, M., Yilma, A.D. 2012. Agricultural water management and poverty in Ethiopia. *Agricultural Economics*, 43: 1-13.
- Haile, B., D. K. Mekonnen, J. Choufani, C. Ringler, E. Bryan. Unpublished. Determinants and constraints of small-scale irrigation in Sub-Saharan Africa: An econometric analysis.
- Hailelassie, A.; Hagos, F.; Mapedza, E.; Sadoff, C.; Awulachew, S. B.; Gebreselassie, S.; Peden, D. 2008. Institutional settings and livelihood strategies in the Blue Nile Basin: Implications for upstream/downstream linkages. Colombo, Sri Lanka: International Water Management Institute. 81p. (IWMI Working Paper 132)
- Lefore, N., M. Giordano, C. Ringler, and J. Barron. 2019. Sustainable and equitable growth in farmer-led irrigation in sub-Saharan Africa: What will it take? *Water Alternatives* 12(1): 156-168.



- Makombe, G. Namara, R. E. Awulachew, S. B. Hagos, F. Ayana, M. and Kanjere, M. 2017. An analysis of the productivity and technical efficiency of smallholder irrigation in Ethiopia, *Water SA* 43 (1): 551-560.
- Mekonnen, D., J. Choufani, E. Bryan, C. Ringler, and B. Haile. Unpublished. Irrigation improves WHZ-scores of children under five, WDDS, and HDDS in Ethiopia and Tanzania, with stronger effects in households who reported drought shocks.
- Mengistie, D. and D. Kidane. 2016. Assessment of the Impact of Small-Scale Irrigation on Household Livelihood Improvement at Gubalafto District, North Wollo, Ethiopia, *Agriculture* 6(27): 1-22 doi:10.3390/agriculture6030027
- MoANR (Ministry of Agriculture and Natural Resources), MOWIE (Ministry of Water, Irrigation and Electricity) and ATA (Agricultural Transformation Agency). 2016. National smallholder irrigation and drainage strategy, Final September 2016, Addis Ababa.
- Namara, R. E. Godswill, M. Hagos, H. Awulachew. S. B. 2010. Rural poverty and inequality in Ethiopia: Does access to small-scale irrigation make a difference? *Ethiopian Journal of Development Research*, 32(2): 1-31.
- NPC (National Planning Commission). 2016. Growth and Transformation Plan II (GTP II) (2015/16-2019/20), Volume I: Main Text, Federal Democratic Republic of Ethiopia, Addis Ababa.
- OSMIS (Small Scale and Micro Irrigation Support Project, Oromia Regional Office). 2016. Institutional Mapping and Linkage Assessment Draft Report.
- Passarelli, S., D. Mekonnen, E. Bryan, and C. Ringler. 2018. Evaluating the Pathways from Small-Scale Irrigation to Dietary Diversity: Evidence from Ethiopia and Tanzania. *Food Security*, 10 (4): 981–97. doi:10.1007/s12571-018-0812-5.
- Schmitter, P. K. S. Kibret, N. Lefore, and J. Barron. 2018. Suitability mapping framework for solar photovoltaic pumps for smallholder farmers in sub-Saharan Africa. *Applied Geography*, 94: 41-57.
- Theis, S., N. Lefore, R. Meinzen-Dick, and E. Bryan. 2018. What Happens after Technology Adoption? Gendered Aspects of Small-Scale Irrigation in Ethiopia, Ghana, and Tanzania. *Agriculture and Human Values* 35, 3: 671–684.
- Wiedmaier-Pfister, M. Gesesse, D. Amha, W. Mommartz, R. Duflos, E. Steel, W. 2008. Access to finance in Ethiopia Sector assessment study, Volume 2, German Technical Cooperation, Eschborn, Frankfurt am Main, Germany.
- Worqlul et al. 2017. Assessing potential land suitable for surface irrigation using groundwater in Ethiopia
- Xie, H., N. Perez, W. Anderson, C. Ringler and L. You. 2018. Can Sub-Saharan Africa feed itself? The role of irrigation development in the region's drylands for food security, *Water International*, 43(6): 796-814, DOI:10.1080/02508060.2018.1516080
- Xie, H., L. You, B. Wielgosz, and C. Ringler. 2014. Estimating the Potential for Expanding Smallholder Irrigation in Sub-Saharan Africa. *Agricultural Water Management*, 131: 183–93. doi:10.1016/j.agwat.2013.08.011.
- You, L., C. Ringler, U. Wood-Sichra, R. Robertson, S. Wood, T. Zhu, G. Nelson, Z. Guo, and Y. Sun. 2011. What Is the Irrigation Potential for Africa? A Combined Biophysical and Socioeconomic Approach. *Food Policy*, 36 (6): 770–8. doi:10.1016/j.foodpol.2011.09.001.

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