ADOPTION RATE AND TRENDS IN ADOPTION OF CONSERVATION AGRICULTURE IN ETHIOPIA

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ECON M. Consultants/Oxfam in Ethiopia

Since 2019 the Ethiopian Ministry of Agriculture has offered extension advice on conservation agriculture (CA). However, agricultural policy focuses mainly on intensive tillage whereas CA calls for zero or minimum tillage. Policy seems to favour productivity over sustainability, with CA adoption remaining low. Supply-side constraints include lack of access to high-quality inputs, credit, and machinery. Demand-side constraints include risk aversion and competition for crop residues needed for mulching from requirements for fuel and feed. Women farmers like CA because it does not require draft animals. However, some women in male-headed households report a shift of labour responsibilities to women.

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# ACRONYMS

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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ACT</td>
<td>African Conservation Tillage Network</td>
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<tr>
<td>AGRA</td>
<td>Alliance for a Green Revolution in Africa</td>
</tr>
<tr>
<td>ATA</td>
<td>Agricultural Transformation Agency</td>
</tr>
<tr>
<td>CA</td>
<td>conservation agriculture</td>
</tr>
<tr>
<td>CASI</td>
<td>conservation agriculture-based sustainable intensification</td>
</tr>
<tr>
<td>CF</td>
<td>conceptual framework</td>
</tr>
<tr>
<td>CFGB</td>
<td>Canadian Foodgrains Bank</td>
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<tr>
<td>CIMMYT</td>
<td>International Maize and Wheat Improvement Center</td>
</tr>
<tr>
<td>CRGE</td>
<td>climate-resilient green economy</td>
</tr>
<tr>
<td>CSO</td>
<td>civil society organization</td>
</tr>
<tr>
<td>EiAR</td>
<td>Ethiopian Institute of Agricultural Research</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>FHE</td>
<td>Food for the Hungry, Ethiopia</td>
</tr>
<tr>
<td>FFH</td>
<td>female food hero</td>
</tr>
<tr>
<td>FGD</td>
<td>focus group discussion</td>
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<tr>
<td>KII</td>
<td>key informant interview</td>
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<tr>
<td>MCC</td>
<td>Mennonite Central Committee</td>
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<tr>
<td>MoA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MSCFSO</td>
<td>Migbare Senay Children and Family Support Organization</td>
</tr>
<tr>
<td>SIMLESA</td>
<td>Sustainable Intensification of Maize Legume system for Food Security in Eastern and Southern Africa</td>
</tr>
<tr>
<td>SLLC</td>
<td>second-level land certification</td>
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<td>TDA</td>
<td>Terepeza Development Association</td>
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EXECUTIVE SUMMARY

This summary presents the findings of qualitative research commissioned by Oxfam in Ethiopia. The main objective of the research was to assess the content and depth of training given to female food heroes (FFHs). The specific objectives were to investigate the adoption of conservation agriculture (CA) in Ethiopia, and trends in adoption rates, by assessing opportunities and barriers to the promotion of this technology.

The assessment covered the perspectives of Oxfam’s Female Food Heroes Campaign Agenda Project beneficiaries and other stakeholders from government, research institutions, and civil society organizations. The FFHs participating in the study came from various regions, including Addis Ababa, Afar, Amhara, Benishangul-Gumuz, Dire Dawa, Gambela, Harari, Oromia, and SNNP. The study also used information from policy makers at the MoA, researchers, and CA-implementing civil society organizations (CSOs). In August 2021 the research team collected primary data by conducting in-depth interviews, focus group discussions (FGDs), and key informant interviews (KIs) and collected secondary data by conducting a literature review. The report identifies the following key findings:

Key finding 1: In 2019 the Ethiopian Ministry of Agriculture (MoA) adopted conservation agriculture-based sustainable intensification as part of its extension package and cascaded it to regional agricultural bureaus for implementation. It issued directives stating that CA should be included in the extension package and promote it where appropriate. The MoA has developed a manual that guides the implementation of CA-based sustainable intensification and a policy brief. Wider CA implementation remains limited.

Key finding 2: Institutionalization of CA appears to be limited by constraints at the level of both policy and vision at the MoA. The country’s existing extension policy focuses on intensive tillage whereas CA calls for zero or minimum tillage. Also, coordination on the CA agenda between the MoA’s different directorates is limited. Publication of the MoA’s technical manual should have been followed by an implementation strategy and full treatment of CA in agricultural extension packages, but these are missing.

Key finding 3: The government’s agricultural policy seems to focus on increasing productivity in the short term even at the expense of sustainability. CA technology is aimed at long-term environmental sustainability, and its effects are realized over time. Farmers may need to wait three to seven years to see yield increases. The government gives less priority to CA than to conventional farming approaches such as the cluster farming initiative. Unlike other farming technologies, CA is severely underfunded.

Key finding 4: Information from the MoA shows that in 2020/21 an estimated 8,000 hectares of land are under CA technology, mainly in Amhara, Benishangul Gumuz, Oromia, and SNNP. CSOs have also released project-based CA adoption information. However, accessing accurate information on adoption and its trends over the years is difficult as a result of limited central reporting and data collection initiatives. In addition, the scattered nature of the data means that it is not possible to ascertain which CA principles farmers practice or the gender of the adopters.

Key finding 5: Some Ethiopian researchers say one cannot make reliable claims about adoption at this stage of CA diffusion as most of the adoption initiatives are project-induced rather than practices freely implemented by farmers as routine farming habits. Overall, it is safe to claim that despite the introduction of CA in Ethiopia more than 20 years ago, adoption remains low and has not progressed as fast as hoped. CA intensification is still a function of the intensity of CA activities by civil society and projects operated by research organizations.
Key finding 6: The FFHs claim to have benefited from CA training and have exhibited good concept-level understanding. They describe CA as ‘cultivation without ploughing’ or ‘agriculture without oxen’. Even if some participants were not able to articulate each of the core principles, when asked how they implement CA, almost every discussant was able to explain the crucial underlying concepts. However, with few exceptions, FFHs seem to have an on-and-off relationship with CA technology. Continuous adoption of the technology matters if CA is to improve soil fertility and lead to future improved yields.

Key finding 7: The literature review and interviews with policy makers and implementers reveal that CA faces barriers on both the supply and demand sides. Supply-side constraints include lack of access to, or timely delivery of, improved or high-quality inputs, limited access to credit, and limited availability of affordable, appropriate machinery that is locally produced and maintained. CA adoption is also affected by demand-side (behavioural) constraints such as risk aversion by some farmers and competition for crop residues (needed for mulching in CA) from requirements for fuel and feed. In addition, farmers often lack experience with technology, have inadequate land endowment, and are located far from public extension officers. Likewise, limited stakeholder coordination and the problem of free grazing and the CA capacity of actors involved in the extension system remain challenges.

Key finding 8: CA adoption is not the same for men and women. Adoption of CA had both positive and negative impacts on men and women farmers’ labour demands. The most attractive feature of CA for women, particularly for female-headed household FFHs, was that CA makes draft power irrelevant. Further, the lack of a need to clear pre-tilled land tended to reduce the workload for women. However, some women in male-headed households report a shift of labour responsibilities from men to women.

In order to improve CA adoption and agricultural productivity, this report provides some broad and specific recommendations targeted at policy makers, development partners, researchers, and civil society organizations (including Oxfam). These recommendations are focused on (1) improving policy and institutional arrangements for CA, (2) improving CA awareness among smallholder farmers and experts, (3) improving mechanization and input supply, (4) promoting a gender agenda in CA interventions, and (5) improving research and reporting for CA.
1. INTRODUCTION

1.1 BACKGROUND

Africa is witnessing severe degradation to its farmlands that can be attributed to common farming practices – ploughing that destroys the soil structure and degrades organic matter, burning or removal of crop residues, monocropping, and so on (IIRR and ACT, 2005). Ethiopia is no exception. To sustain agricultural production and realize the country’s present and future economic development objectives, scholars advise that Ethiopia needs to shift from the current paradigm of agriculture focused mainly on productivity enhancement to an agricultural development trajectory that puts environmental sustainability at its core through the use of conservation agriculture (CA) practices, among others (Mengistu et al., 2019).

CA is a sustainable intensification practice that has been tried in Ethiopia for some time but thus far without much attention to scaling up. It refers to a set of practices aimed at reducing soil erosion, improving soil health and water management, and enhancing crop yields. CA is characterized by three crop management practices: (1) minimum mechanical soil disturbance (minimum or zero tillage), (2) permanent soil cover with crop residues or cover crops, and (3) diversification of crop species grown through crop rotation and/or intercropping (CIMMYT, 2019). Most evaluations of CA find that the approach increases productivity and improves soil health (e.g. Abera et al., 2020).

In 2012, Oxfam Ethiopia launched the GROW campaign – part of Oxfam’s global GROW campaign – under the theme a ‘Food-Secure Ethiopia’, which later became the Female Food Heroes campaign agenda. The project forms part of a broader agricultural programme designed to address hunger and poverty in Ethiopia by focusing on sustainable agricultural investments and the resilience of small-scale farmers (Oxfam in Ethiopia, 2019). The project identifies outstanding female farmers who have overcome challenges and made significant gains in their farming. The ultimate goal of the Female Food Heroes (FFH) initiative is to contribute to wider recognition of small-scale women food producers through awarding, acknowledging, and celebrating their efforts and contributions to agriculture and food security and to thereby build demand for an enabling environment for women producers, who will be at the centre of future debates and solutions (Oxfam, 2021). Through this program Oxfam Ethiopia is promoting CA in several regions and providing trainings to FFHs.

As of April 2019, 111 women farmers had been recognized as FFHs (Oxfam in Ethiopia, 2019). Besides recognition and cash prizes, the FFH awardees receive training on basic business skills, entrepreneurship, agricultural marketing, saving and credit, recordkeeping, public advocacy, family planning, climate change adaptation, and conservation agriculture techniques.

In general, adequate data on CA adoption in Ethiopia are lacking and unavailable at all levels, though adoption rates appear to be low (Jirata et al., 2016). Furthermore, little is known about the challenges of CA and its adoption from the perspective of female smallholder food producers. To fill this knowledge gap and provide evidence of what works, Oxfam Ethiopia commissioned the current study on the status of and trends in adoption of CA with the hope of unpacking factors affecting CA adoption, including for the FFHs.

The rest of this research report is organized as follows: Section 1.2 presents the study’s objectives, followed by the literature review (1.3), conceptual framework (1.4), and methodology (1.5). Section 2 presents results and discusses CA adoption and trends. This section explores the existing CA policy framework and institutional arrangements (2.1), activities being implemented by civil society organizations (CSOs) (2.2), the level of and trends in CA adoption (2.3), the CA experience of FFHs (2.3), and constraints and barriers to CA adoption (2.4). Section 3 summarizes key findings and
provides recommendations on how to promote CA for greater environmental sustainability and improved yields.

1.2 OBJECTIVES OF THE RESEARCH

The general objectives of this research are to assess and understand the content and depth of training given to FFHs on CA and to compile data on the level of understanding among small-scale female food producers and their applications of the key principles.

The specific objectives of the assignment are as follows:
• show the state of knowledge and practice of CA and trends in CA adoption over several years;
• understand efforts made by different practitioners to take action on CA;
• understand the adoption rate of key CA principles and its trend over several years;
• present evidence that CA is an approach capable of building sustainability into an agricultural production system;
• discuss CA’s major achievable benefits and present an overview of the uptake of CA;
• elaborate the conditions necessary for the spread of CA;
• describe the policies, interventions, and institutional arrangements that empower female food producers and have been implemented by different development practitioners;
• consider the impact of practicing CA and identify the constraints faced by female food producers in the adoption process;
• describe the lessons learned through the adoption process and determine how to improve the adoption of CA;
• assess the socioeconomic situation of local communities, including women and young people, in selected woredas (including educational attainment, income, wealth, deprivation and inequalities in access to land and other resources, power relations, and control);
• assess the status and availability of women’s and youth organizations in the study areas, and examine the roles they play in agricultural transformation, forest conservation, livelihood improvement, and so on. In particular, assess the degree to which women and youth are involved in integrated local development initiatives, and identify barriers, opportunities, and incentives affecting their participation; and
• identify key challenges in the CA adoption rate and untapped opportunities, and provide recommendations that emerge from the analysis to chalk out a future action research agenda that is relevant to small-scale female food producers.

1.3 LITERATURE REVIEW

Ethiopia’s current crop production system involves intensive tillage; farmers till four to seven times annually to prepare the land and remove crop residues from agricultural fields for feed, fuel, and free grazing. Research shows that this system contributes to a high level of soil erosion on agricultural fields, depletion of soil fertility, and deterioration of soil health. Although this intensive tillage system favours short-term productivity gains, it has long-term negative consequences for soil fertility, soil health, productivity, and ecosystem services (CGIAR, 2020).

In response to the environmental costs of conventional repeated tillage agriculture, decision-makers are considering CA as a possible sustainable agriculture trajectory. It is founded on three pillars: maintaining permanent soil covers with crop residues or live mulches, no or minimum mechanical soil disturbance, and crop diversification through intercropping and crop rotation (Abera et al., 2020). FAO (2012) considers that CA, in conjunction with other complementary good agricultural practices, is a major entry point for sustainable agriculture that both protects and
enhances the environment. The reviewed literature provides evidence about the positive impacts of CA adoption on several dimensions, and some issues are presented here.

**Agronomic benefits that improve soil productivity:** CA improves soil productivity by increasing organic matter, conserving in-soil water, and improving soil structure in the rooting zone. The constant addition of crop residues leads to an increase in the organic matter content of the soil that is limited to the top layer of soil at first but that extends to deeper soil layers over time. Organic matter plays an important role in the soil: fertilizer use efficiency, water-holding capacity, soil aggregation, the rooting environment, and nutrient retention all depend on organic matter (Abera et al., 2020).

**Economic benefits that improve production efficiency:** CA adoption can produce three major economic benefits: (1) time savings and consequent reductions in labour requirements; (2) reduced costs for, for example, fuel and the operation and maintenance of machinery; and (3) more efficient labour (more output for a lower input) and consequent reductions in labour costs. A policy brief using evidence from Ethiopian studies reported that because CA involves minimum and/or zero tillage, it significantly reduces the labour and draft power required for tillage. In maize production, average male and female labour use under CA fell by 14.4 and 8.2 person-days per hectare (ha), respectively, compared with conventional practice. The same study reported that CA adoption decreased the use of draft power for land preparation in maize production by 13.2 pairs of oxen-days per ha (CGIAR, 2020).

**Environmental benefits and food security:** Evidence indicates that CA protects the soil and makes agriculture more sustainable. Maintaining cover on the soil protects it from heavy rain and conserves moisture during dry spells. It reduces the soil temperature under intense sunshine. Combining CA with measures to prevent erosion and harvest water can raise yields significantly. In addition, CA helps increase crop diversity. The crop rotations and intercropping in conservation agriculture enable farmers to broaden their own diets and sell a greater variety of produce (FAO, 2012).

**CA increases both farmers’ income and their investments in inputs:** Although CA reduces the labour and draft power required for tillage, it increases farmers’ investments in herbicides for weed control and management. Thus, compared with conventional farming, CA requires a higher financial investment but gives a higher economic return. On the other hand, intercropping under CA brings additional food, nutrition, and income to farmers from the same farm plots (CIMMYT, 2019).

**Critiques of CA in Sub-Saharan Africa:** Despite several favourable reviews, some scholars cast doubt on the effectiveness of CA, particularly as applied in Sub-Saharan Africa (Giller et al., 2009; Andersson and Giller, 2012; Rademaker and Jochemsen, 2019). These scholars position CA alongside other agronomic practices that have become part of a trend toward ‘political agronomy’ (Sumberg et al. 2013), in which research agronomists compete dogmatically to promote their preferred technologies or practices to the point of excluding all other ideas.

For instance, Giller et al. (2009) argue that although some cases offer evidence to support CA benefits, some equally convincing scientific reports contradict these claims. They raise concerns about, for example, decreased yields often observed with CA and increased labour requirements when herbicides are not used. The authors also report that despite publicity claiming widespread adoption of CA, the available evidence suggests virtually no uptake of CA in most Sub-Saharan African countries, with only small groups of adopters in Gambia, South Africa, and Zambia. The authors conclude that there is an urgent need for a critical assessment of the ecological and socioeconomic conditions under which CA is best suited for smallholder farming in Sub-Saharan Africa. In general, however, most critics of CA appear to focus on what is missing to make CA a success rather than on the soundness of the favourable evidence.

**Gender and CA:** Given the current study’s focus on FFHs, it is necessary to review literature to identify gender aspects of CA. Several studies suggest that CA reduces the overall time required for farming because farmers using CA technology spent less time on land preparation and weeding. CA
reduces labour requirements bringing significant advantages for women who are both farmers and caretakers. It may help spread women’s workload over time and make them less dependent on oxen or mechanical tillage equipment.

Yet Tsige et al. (2020) identify several gender-related barriers that limit women’s benefits from CA technology in Ethiopia. They argue that although modern laws allow female smallholders to enjoy use rights to agricultural land, customary laws accept men as the primary ‘owners’, and in most parts of Ethiopia, land inheritance is guided by patriarchal principles. Furthermore, male household heads normally own livestock in rural Ethiopian households, and this adversely affects women’s ability to make decisions about using oxen for irrigated agriculture. Similarly, inequality between men’s and women’s access to credit, water, fertilizer, and market linkages have also been identified in other parts of Sub-Saharan Africa affecting women’s adoption of CA.

CA is assumed to be a labour-saving approach, and the authors concur that this aspect of CA can appear attractive to Ethiopian women smallholders, who are responsible for multiple productive, reproductive, and community roles. However, actual impacts on labour depend on how inputs are used. For example, savings are less likely to occur if farmers do not use adequate herbicides and if they do manual weeding. Weed infestation in CA tends to increase as a result of lack of herbicide use, and women are responsible for weeding [Tsige et al., 2020]. The literature on CA encourages the use of herbicides, arguing that herbicide application at planting time makes weeding easier in CA systems. By using non-selective herbicides, farmers can remove all weeds in a single operation. Research in Zimbabwe, for example, shows that it is economical to use herbicides under CA because farmers save at least US$388/ha worth of time to be used on other off- or on-farm activities [Muoni et al., 2013]. In recent years, however, there have been growing concerns about the potential wide-ranging direct and indirect environmental and human health effects of large-scale use of the commonly used herbicide glyphosate [Van Bruggen et al., 2018]. In addition, most smallholder farmers cannot afford a wide spectrum of herbicides [Khan and Damalas, 2015], and availability in the market also remains a challenge.

Furthermore, women users and non-users in male-headed households rarely travel for skills training sessions. Women in male-headed households, in particular, have restricted mobility, which inhibits their access to information. Men have better mobility and greater knowledge of CA compared with women. In addition, the authors reveal that most women users and non-users do not have direct contact with input suppliers from woredas (districts) and kebeles (multi-village clusters) because husbands are considered to be the appropriate input collectors. This constrains women users’ ability to identify their input needs.

Similarly, compared with households headed by men, women-headed households faced more challenges in protecting their crop residues, particularly in unfenced plots and in areas where communal livestock grazing was practiced. Also, women farmers had more difficulties defending their mulch against theft and use by men or individuals from more powerful households [Hove and Gweme, 2018]. They had limited contact with extension services as well. Research showed that men were more likely than women to be reached by CA extension services providers [Kalinda et al., 2017]. In a broader discussion of service provision in Ethiopia’s decentralized rural governance system, Cohen and Lemma (2010) have shown the gender gap in service provision. They argue that extension services in Ethiopia have long focused on male farmers, in keeping with the cultural perception that women do not farm. Further, they report that the extension packages tailored to women tend to be biased towards women in male-headed households rather than those in female-headed households.

The literature review points to both general constraints and particular gender-related constraints to the adoption of CA. Major constraints identified in one study include the intense competition for crop residue for use as livestock feed or soil mulch, heavy soil texture that may result in waterlogging, and institutional factors such as lack of market availability [Tesfaye et al., 2015]. Gender related effects of CA implementation include a potential shift of labour demand from male to female family members [Teklewold et al., 2013] and limited access to inputs necessary for CA, such as herbicides and sprayers.
The literature review also shows that for development interventions and institutions working to promote CA or other technologies for improved food security and livelihoods in low- and middle-income countries, success depends not only on agronomic performance but also on eliminating the gendered constraints on use of the agricultural technologies (Tesfaye et al., 2015).

1.4 CONCEPTUAL FRAMEWORK

In order to understand the levels and trends in rates of CA adoption in Ethiopia, this study was guided by three theoretical perspectives on technology adoption used in past studies (Ntshangase et al., 2018): innovation diffusion theory, economic constraints, and adopter perceptions (Adesina and Zinnah, 1993). Information dissemination is at the centre of the innovation diffusion theory, in which adoption is viewed as a linear series of stages from knowledge acquisition to persuasion, decision, implementation, and finally confirmation (Rogers, 2003). The economic constraints perspective, as explained by Ntshangase et al. (2018), states that adoption is influenced by access, or lack of access, to economic resources. The theory identifies the complex differences in small-scale farmers’ access to these resources and postulates that asymmetric distribution of these resources could lead to heterogeneity in adoption. The adopter perceptions perspective identifies farmers’ perceptions as key to the adoption of farming technology (Adesina and Zinnah, 1993). This study integrates the three theories to develop a conceptual understanding of the research problem.

Adoption is defined as the extent to which farmers put into practice a new innovation in the future, given adequate information about the technology and its potential benefits. Several variables have been identified in the literature as determining the level of adoption. These include human capital, credit constraints, risk, farm size, labour availability, land tenure, livestock assets, agricultural training, interactions with extension, and input supply (Feder et al., 1985).

Figure 1 indicates that the decision to adopt or not adopt CA is an outcome of farmers’ perceptions of CA compared with other farming practices or technologies. FAO (2001) shows that there are several reasons why farmers may adopt a new farming technology. Some farmers may be rational in their outlook, and their perceptions may be influenced by the information available to them, their socioeconomic situation, and the characteristics of their farm enterprises (FAO, 2001). Getting information on rural financial opportunities and biophysical evidences showing where CA may be best suited has implications for adoption. Information could be received, among others, through membership in social networks. The current study assumes that with adequate information and support, an Ethiopian farmer will be convinced to adopt CA. This view is based on consistent empirical findings showing that CA raised crop yields, reduced production costs, improved soil fertility, and improved livelihoods for smallholder farmers. Understanding these variables and how they influence adoption is important in developing strategies for promoting CA in Ethiopia, and the current study considered CA dynamics from this conceptual perspective.
1.5 METHODOLOGY

1.5.1 RESEARCH DESIGN

The current study uses an exploratory case study research design involving a qualitative research approach. This approach is designed to better explain the experiences of FFHs in CA uptake and the state of CA in the country. In addition, the qualitative findings help integrate new ideas into the conclusions derived from the literature reviewed and help enrich the understanding of the topic.

1.5.2 SAMPLING STRATEGY

While the initial plan was to travel to selected regions to conduct interviews with FFHs, in August 2021 the research team learned that Oxfam, in collaboration with the MoA, was organizing a workshop for FFHs in Addis Ababa. The FFH project leaders at Oxfam were willing to link the FFHs with the research team. Taking advantage of the event, interviews and FGDs were conducted with all the participants from all regions except Tigray, who could not travel owing to the conflict. Thanks to this event, the research team had an opportunity to interact with FFHs from every region, which would not have been possible using the conventional sampling method. In addition, KIs were conducted purposively with selected CA researchers, implementing civil society leaders, and policy makers at MoA and its diverse directorates.

1.4.3 DATA COLLECTION METHODS

Primary data were collected using the following methods:

- **Focus group discussions (FGDs):** Focus group discussions were held with nine female food heroes from different regions (Table 1). Seven female household heads and two females in male-headed
households were part of the discussions, which covered issues related to CA training, understanding of CA, and behavioural changes as well as challenges and assistance they received during CA uptake.

**Table 1: FGD discussants from various regions**

<table>
<thead>
<tr>
<th>Region</th>
<th>Female household heads</th>
<th>Females in male-headed households</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Addis Ababa</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Dire Dawa</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Harar</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Benishangul-Gumuz</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Amhara</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Oromia</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SNNP</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Gambela</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Afar</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
<td><strong>2</strong></td>
<td><strong>9</strong></td>
</tr>
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</table>

**In-depth interviews:** To shed light on the individual experiences of female food heroes with CA adoption, and with the expectation that some women would be uncomfortable discussing personal issues during the FGDs, in-depth interviews were conducted with 11 selected women from all regions in Ethiopia. The purpose was to gain insights on the level of benefits they received from the CA training, the extent of their recall, and their adoption rate. We selected some women who claimed to be doing better in CA implementation and some who were facing challenges.

**Key informant interviews:** Key informant interviews were conducted using a semi-structured in-depth interview checklist based on the objectives of the assignment. The informants were from federal government agricultural offices, national and international NGOs working on the CA agenda, and research institutes. The KIIs were usually administered to groups of experts and officials at the same time. At the level of the MoA, the focus was on understanding the policy environment as well as on interdepartmental and partner collaboration on CA. All of the key informants were selected from institutions that have a significant role in strengthening CA adoption. Interviews were conducted with representatives of several directorates of the MoA (such as Soil Fertility, Crop, Gender, and Extension); research organizations such as the International Maize and Wheat Improvement Center (CIMMYT), the Agricultural Transformation Agency (ATA), and the Ethiopian Institute of Agricultural Research (EIAR); and civil society organizations, including Food for the Hungry Ethiopia (FHE) and the Canadian Foodgrains Bank (CFGB). More than 12 individuals took part in the KIIs.

**Literature review:** Secondary information was collected from literature. The literature review combined two tracks of literature searches. The first consisted of a search of bibliographic databases and academic journals. Using a set of inclusion criteria, forward and backward searches on key references were applied. Two main databases were used for the search: Google Scholar and Web of Science. Documents from the World Bank, the Food and Agriculture Organization of the United Nations (FAO), Oxfam, and other repositories that deal with the CA agenda, such as the African Conservation Tillage Network [http://act-africa.org], were also reviewed. The second track consisted of hand searching specific websites for relevant studies using similar search terms as for the bibliographic databases. The strategy focused on recent literature on Ethiopia published mainly in peer-reviewed journals, assessments made by organizations engaged in CA, and other reports from CSOs.
1.4.4 RESEARCH TEAM

The research team was composed of a development economist (Dr. Ziade Hailu), an agricultural economist (Alemeh Lewye), and a junior research assistant fluent in the Oromo language. The research team participated in the data collection process with FFHs, research institutes, implementing partners, and government offices, particularly the MoA. During the fieldwork, the members of the research team shared observations, discussed data collection successes and challenges, and charted mitigation measures on a daily basis.

1.4.5 DATA ANALYSIS AND REPORT WRITING

Following the fieldwork, members undertook a reflection session to discuss major findings and identify actions. The discussion helped to identify the draft research outline. The field data were thematically categorized, described, and interpreted. Conclusions and recommendations were drawn from the results and discussions.

1.5 LIMITATIONS

The research approach is chiefly qualitative, employing FGDs and KIs. Qualitative research was instrumental in helping understand the benefits of training received and the challenges that FFHs face in adopting CA as well as the state of CA’s institutional setup. However, the impacts of CA training would be better captured through mixed methods, particularly survey data that would enable one to make statistically valid generalizations using appropriate sampling techniques. The qualitative assessment used here should be considered formative research designed to grasp the state of CA technology in the country. The study mitigated this limitation through the literature review and KIs with scientists and CA practitioners in Ethiopia. This, together with the use of data from previous studies and literature, helped minimize the gap associated with the qualitative nature of the study, though this will not offset the need for surveys in the future. In addition, given the short period allocated for the research, it was difficult to conduct participatory action research. Nevertheless, the conventional qualitative research was able to capture whether FFHs are applying appropriate CA knowledge and skills, as well as the barriers they face in its implementation. The findings can help policy makers and implementers identify the action required to improve upon the existing CA environment.
2. ADOPTION OF CONSERVATION AGRICULTURE IN ETHIOPIA: RESULTS AND DISCUSSION

2.1 POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS

The policy brief on conservation agriculture identifies the Ethiopian government’s 2011 Climate-resilient Green Economy strategy (CRGE) and its Natural Resource Conservation Strategy (1994) as leading policy frameworks for CA implementation (CIMMYT, 2019). The CRGE lists conservation agriculture as one of the technologies identified for climate change adaptation, and the 1994 Natural Resource Conservation Strategy emphasized the need to focus on soil, water, and agricultural practices that ensure sustainable productivity gains while conserving the natural resource base. According to the policy brief, these two strategies show the availability of policy support for scaling up CA at a national level in areas where it brings sustainable productivity and conservation gains (CIMMYT, 2019).

After long years of research and advocacy, the MoA adopted conservation agriculture-based sustainable Intensification (CASI) as part of its extension package and cascaded it to regional agriculture bureaus for implementation in 2019. Along with other partners, the SIMLESA (Sustainable Intensification of Maize Legume system for Food Security in Eastern and Southern Africa project (2010–2019) was instrumental in promoting CA in the country. While CA was started in 1998 by Sasakawa Global (SG2000), knowledge of, investment in, and promotion of CASI were limited in Ethiopia. CIMMYT leaders reported that initially there was some resistance on the part of MoA leaders, who associated CA with sole and heavy use of herbicides, manual farming, and competition with livestock feed. As a result, CA received little attention from decision makers and influential actors.

The SIMLESA project report indicates several well-designed advocacy activities that were implemented to change mindsets and promote adoption of CA by the national extension system (CGIAR, 2020). The report identifies the following achievements:

- The MoA developed a national CA program and has issued directives to include CASI in the extension package and promote it where appropriate.
- A critical mass of CASI champions have been established at the federal level, where they promote CASI.
- Integration of programmes within MoA for CASI scaling has started.
- Several partners have increased their level of engagement with local governments.
- Strategic partnerships and collaboration with technical and political leaders were established.
- The capacity of partners and local community groups to form coalitions at national, regional, and local levels to advance CASI mainstreaming has been enhanced.

Discussions with MoA leaders, research institutions, and implementing partners indicate some of the institutional improvements that were made to promote CA in the country. Among these, the
workshop conducted in the presence of the state minister of MoA in 2018 was instrumental. The objective of the workshop was to incorporate CA as an alternative extension package in the identified high-adoption-potential areas of Ethiopia to ensure food security while conserving the environment. In the workshop, a representative from CIMMYT presented a policy synthesis on existing evidence around CA and potential recommendation domains for increased adoption of the technology in the country. According to the University of California, Davis (2012), "Recommendations domains are areas where a single recommendation has broad application due to similarities in both socio-economic and environmental conditions".

During the workshop, the extension service officially endorsed CA as one of the technology packages within the extension system, to be implemented in suitable areas of the country, and advised the regions to start implementation in the 2019 planning period. It was also agreed that the MoA would start collecting reports from CA implementing actors to track adoption coverage and would include CA indicators in its regular monitoring and reporting formats. The need to build the capacity of the extension system through customized hands-on trainings and demonstrations was highlighted, and the research and development institutions and other actors with experience in CA were requested to work together with the ministry to build capacity and scale up CA across the country (ACT, 2019).

After the MoA’s adoption of the CASI extension package, a manual to guide implementation of CASI was developed and distributed in local languages. The CFGB helped develop and implement a master trainer programme in four regions of Ethiopia to equip government and NGO staff with technical knowledge and adult education facilitation skills to be effective CA trainers.

In addition, a technical CA steering committee was recently established within the MoA composed of representatives of the Crop, Extension, and Soil Fertility Directorates, with the aim of facilitating and promoting CA within extension services. In 2014 the government had established a national-level CA task force to coordinate different government and civil society initiatives promoting the application of both climate-smart and CA practices, but the performance of that task force is not very well known.

Furthermore, a report from SIMLESA reveals some institutional achievements in CA promotion from the regions (Beshir et al., 2017): the Amhara Regional State Bureau of Agriculture has scaled up maize-lupine intercropping in its extension program. Extension manuals to be used by extension agents and farmers were prepared in English and local languages. The Oromia Bureau of Agriculture and Natural Resources promotes reduced tillage as part of the Sustainable Land Management Programme in some districts. The MoA established a unit focusing on CASI technologies; it developed recommendations and manuals for implementing trial CASI practices in selected districts.

Efforts to institutionalize CA, however, appear to be affected both by constraints at the level of policy clarity and by slightly different departmental visions at the MoA. In terms of policy, Ethiopia’s existing extension policy focuses on intensive tillage while CA uses zero or minimum tillage. Also, coordination between the MoA’s different departments on the CA agenda is limited, and the publication of the technical manual should have been followed by development of an implementation strategy. Moreover, unlike other farming technologies, CA is severely underfunded.

Further, specific commodity-led biophysical and socioeconomically targeted extension packages are not available. For instance, in which ecological zones and socioeconomic settings is wheat appropriate for CA adoption? In addition, most of the commitments made in 2018 for better reporting and integration of monitoring and evaluation have yet to be implemented. Regular reporting from CA implementing actors has not yet started, and CA indicators have not been fully integrated into their regular monitoring and reporting formats.

Overall, while some directorates appear committed to implementing CA, the general government policy direction seems to focus on increasing short-term productivity through conventional farming practices such as cluster farming (እርሻ-ገጠም-ኩታ) initiatives. In comparison, the priority given to CA
Adoption refers to the uptake and practice of the three principles of CA: minimum tillage farming, retention of permanent crop residue cover on farmland, and crop rotation and/or rotational intercropping (Wekesah et al., 2019).

2.2.1 STATUS OF AND TRENDS IN ADOPTION OF CA

Discussions with MoA directorates and implementing partners and FGDs with FFHs shed light on the status of CA adoption in Ethiopia. The exact levels of and trends in CA adoption rates are hard to establish because of limited central reporting and data collection initiatives. However, information from the MoA Soil Fertility Directorate shows that as of 2020/21 more than 8,000 hectares of land were estimated to be under CA farming, particularly in Benishangul-Gumuz, Amhara, Oromia, and SNNP.

Other partners previously reported the number of farmers implementing CA. For instance, SIMLESA-Ethiopia reported reaching more than 210,289 smallholder farmers during 2010–2016. CFGB reported that as of 2020 about 35,000 farmers had implemented CA through the project and some farmers reported cultivating more than 1 hectare under CA. The CFGB project was phased out a year ago, but FHE leaders report that smallholder farmers have continued using CA even after the project phase-out, and the trend shows an increase in both the number of practitioners and the amount of land under CA. In our interview, FHE officials reported that more than 35% of project beneficiaries were female-headed households and that women in general have better uptake than men in CA farming. For more details on efforts to promote CA in Ethiopia, see Annex 1. Overall, it must be noted that currently CA covers very little of Ethiopia’s farmland and few of its farmers have taken up the practices.

Various sources indicate that in areas where conservation agriculture has been adequately demonstrated – for example, in some parts of Amhara, Oromia, and Tigray – adoption has been reported to be significant (Jirata et al., 2016). These areas include West Gojam Zone, East Gojam Zone, and South Gonder Zone of Amhara Regional State and West Wollega Zone, East Wollega Zone, South Shewa Zone, and West Shewa Zone of Oromia Regional State. These areas are known for teff and maize production.

However, these scattered data do not show which CA principles are being practiced or the gender of the adopters. Interviews with Oxfam FFHs suggest that zero tillage, compared with the other two principles, appears to be least preferred because it does not fit with the farming practice of land tillage; instead, minimum tillage is practiced. In addition, the interview with CIMMYT researchers revealed the impracticality of the idea of CA adoption at this stage as most of the adoption initiatives are project induced rather than practices freely implemented by farmers as routine farming habits. The interviewees insisted that one should discuss the barriers to adoption.

While there are several barriers to adoption, as shown in the next section, there are also favourable conditions for scaling up CA in Ethiopia. The CA policy brief recognizes the following (CIMMYT, 2019): the MoA and its development partners have recognized soil degradation in the highlands and moisture stress in the lowlands as national challenges, and CA has shown great potential to tackle these challenges. The MoA adopted CASI as part of its extension package, CRGE provides policy
support, and the 1994 Natural Resource Conservation Strategy emphasized achieving sustainable productivity gains while conserving the natural resource base.

In addition, Ethiopia has the largest extension system in Sub-Saharan Africa, and this may help expand the reach of technologies, practices, and services to millions of smallholder farmers. The extension system is well placed to scale out CA if appropriate CA guidelines are developed and required trainings are provided. The CA policy brief also considers that CA allows farmers to diversify their livelihoods. The current and future beef market presents an attractive opportunity for farmers to engage in fattening activities, and there is a room for smallholder farmers to fatten their oxen. Since CA significantly reduces draft power requirements and encourages a cut-and-carry feeding system, it opens an opportunity to farmers to increase their incomes from fattening activities. Likewise, CA has attracted the attention of development partners, which have provided assistance with both research and implementation.

### 2.2.2 Gender and Adoption of CA

CA adoption is not the same for men and women, so understanding the uptake of CA and its challenges and benefits requires gender analysis. One issue typically raised in the CA conversation concerns changes in gendered labour demands. Wekesah et al. (2019) review studies on adoption of CA, finding that it had both positive and negative impacts on the demands on men’s and women’s labour. The positive impacts result from the practice of crop residue retention, which eliminates the need to clear pre-tilled land and tends to reduce the workload for women and children.

Another advantage identified by the literature is that since planting basins were dug predominantly by women, and usually in the dry season, CA enabled women to spread the workload over a long period of time and still have their land ready in good time for early planting (Farnworth et al., 2016). Studies also show that herbicide use in CA farming reduced weeding requirements, freeing up women and children’s time to engage in other economic activities and go to school (Farnworth et al., 2016) and decreasing households’ need to hire labour. The perceived labour-saving aspect of CA is deemed attractive to Ethiopian women smallholders, who are responsible for multiple productive, reproductive, and community roles (Tsige et al., 2020), as shown in the literature section. However, discussion with FFHs did not reveal labour savings as a result of CA implementation, as most of the discussants said they do not use herbicides but employ manual weeding. The FGD discussants understood that weeds increase with CA but can be avoided with crop residue coverage of the surface. The discussants said mulching is the preferred method to control weeds on their farms but that their access to mulch is constrained.

The most attractive feature of CA for women, particularly for female-headed households, is that CA eliminates the need for draft power. Lack of oxen and male labour used to force the female household heads to engage in non-competitive sharecropping and rental markets for land. Sometimes farmers who have no oxen must pay up to half of their harvest to get their land ploughed. In some places (such as the Amhara region) women are culturally prohibited from ploughing. This aspect of CA was well articulated during an in-depth interview with a FFH, who said that with CA farming technology, not owning an ox is not the end of the world.

I am the female head of the household with three children. I have 2 hectares of land, and out of this, 0.25 hectare of land is under CA farming. In the past I used enter into sharecropping arrangement for the entire plot of my land, but now I have retained the plot under CA, and I have seen improvement in productivity and also was very happy that I didn’t need oxen to plough the land. I wish one day my entire land is under CA farming and the need for renting or sharecropping was terminated.

However, there is also a downside to CA and shifted labour responsibilities. During the FGDs, some women in male-headed households reported that some labour responsibilities had shifted from men to women. ‘Since we started CA, my husband has left most of the responsibility on me’, claimed...
one woman in a MHH. This finding is supported by research showing that CA shifts much of the responsibility for land preparation from men to women and children, increasing women’s and children’s workloads while decreasing the need for men’s labour (Nyanga et al., 2012). The evidence also shows that while CA helped women space out their workload, it increased women’s workloads over time, owing to the added complexity of the farm work, especially in the dry season, when the weather was hot and the soil hard.

KIs with MoA’s gender experts also revealed that women’s CA adoption is affected by limits on women’s decision-making power over agricultural production, control of land rights, and transfer powers. Although more research is required to understand whether the decision to adopt minimum tillage and cover cropping is made jointly or only by men, for most women jointly holding land certificates, major decisions affecting CA adoption and preferences are often made only by men.

Similarly, interviews with the female household heads support findings from a CA study from Ethiopia (Tsige et al. 2020) that shows that the use of crop residues as mulch increases the work burden on women, as they are responsible for collecting other sources of fuel, such as firewood. The study also shows that women in male-headed households usually have only limited access to extension services. Customary practices accept that men are the main ‘owners’ of land. This situation indirectly limits women’s access to extension services as development agents (DAs) anticipate providing extension services and information to the ‘owner’ of the land. The finding that DAs provide agricultural extension mostly to male household heads was also reflected during KIs with FFHs. Cultural factors also restrict men DAs from delivering extension services to women. Male household heads with better education status have more access to skills training on the use of technologies than women do.

Overall, discussions with FFHs and scientists working on CA indicate that women’s and men’s uptake of CA are a function of, among many other factors, access to credit, extension services, skills training, information on CA, membership in cooperatives and reduced gendered constraints. Over time, trends in adoption of CA are dependent on the intensity of activities undertaken by civil society and research organizations. When more CA activities take place, CA tends to increase. The fact that about 8,000 hectares of land are under CA farming technology indicates a rising trend in adoption, but since longitudinal data are hardly available, it is challenging to present accurate figures. It is safe to say, however, that even though it has been more than 20 years since conservation agriculture was introduced in Ethiopia, adoption of the practice remains low and has not progressed as fast might have been hoped (Adugna and Cherie, 2021).
2.3 OXFAM FFHS, CA KNOWLEDGE, AND ADOPTION

Oxfam Ethiopia’s Female Food Heroes (FFHs) project employs CA as one of the mechanisms to empower FFHs who live in areas suitable for CA. Project leaders believe, and the literature shows, that CA offers significant advantages for women by spreading women’s workload over time and making them less dependent on oxen. In addition, since most of the FFHs are role model farmers, their adoption of CA could lead to acceptance by other farmers. Accordingly, the current study was aimed at assessing and understanding the content and depth of training given to FFHs on CA and compiling data on the concept-level understanding and application of key CA principles among small-scale female food producers.

The FFH project employs a multi-partnership approach, working with various arms of the government of Ethiopia, CSOs, and networks to secure visibility and promote enabling conditions for the rural women’s agenda and to change the terms of debate at various levels for women in agriculture (Oxfam in Ethiopia, 2019). The project was managed and implemented by Oxfam, and the FFH selection and nomination process was implemented through a partnership with Sustainable Environment and Development Action (SEDA). Activities included identification and award of FFH awardees; capacity building of FFH awardees (in areas such as record keeping, advocacy, family planning, and productivity); a media campaign (social media, television, and radio); and mobilization events. The project provides awardees with a platform to engage with the national government, including the Ethiopian minister of agriculture. They participate in meetings with parliamentarians to present a set of policy ‘asks’ derived from the challenges women face in their communities, and they take part in international advocacy events such as World Food Day, where they share their stories and demands with world leaders.
According to the project report [CGIAR, 2020], Oxfam provided training on conservation agriculture and climate change adaptation for the 2018 winners, who were drawn from Amhara, Oromia, Somali, Harari, SNNPR regional states, and Dire Dawa Administrative Council (training involved 18 winners, 6 regional coordinators, and 6 experts). The training was designed to enhance the FFHs’ knowledge and skills related to concepts, practices, and issues around CA and climate change adaptation by providing both theoretical and practical training. Conducted from August 5 to 18, 2019, the training took place at the Debre Zeit Management Institute, where the participants lodged. Participants were divided into three groups, with each group trained for about four days (conservation agriculture and sustainable land management training for two days and climate change adaptation training for another two days). Another training was organized in Addis Ababa at the Capital Hotel, and a similar training and experience-sharing session was organized in Addis Ababa and Debre Zeit in August 2021, where the current study benefited from face-to-face meetings with FFHs from several regions in Ethiopia.

The women who participated in the research were a mix of married, widowed, and divorced members of the community. Engaging women with different marital status helps shed light on the range of CA implementation challenges and benefits women may experience based on their marital status. Landholding sizes varied on average between 50 hectares in Benishangul-Gumuz and 1 hectare in Addis Ababa and Dire Dawa (Table 2).

### Table 2: FGD discussants from nine regions of Ethiopia

<table>
<thead>
<tr>
<th>Name</th>
<th>Household size</th>
<th>Headship status</th>
<th>Total land area (ha)</th>
<th>Total land area under CA (ha)</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woyeneshet Borga</td>
<td>5</td>
<td>Female-headed household</td>
<td>1</td>
<td>1</td>
<td>Addis Ababa</td>
</tr>
<tr>
<td>Hindia Adem</td>
<td>6</td>
<td>Female-headed household</td>
<td>1</td>
<td>1</td>
<td>Dire Dawa</td>
</tr>
<tr>
<td>Roda Siliman</td>
<td>11</td>
<td>Female-headed household</td>
<td>10</td>
<td>1</td>
<td>Harer</td>
</tr>
<tr>
<td>Betule Wosila</td>
<td>5</td>
<td>Female-headed household</td>
<td>50</td>
<td>1</td>
<td>Benishangul-Gumuz</td>
</tr>
<tr>
<td>Enate Ayehualem</td>
<td>8</td>
<td>Female-headed household</td>
<td>1</td>
<td>0</td>
<td>Amhara</td>
</tr>
<tr>
<td>Zeyena Bedana</td>
<td>8</td>
<td>Female-headed household</td>
<td>3</td>
<td>1</td>
<td>Oromia</td>
</tr>
<tr>
<td>Aberash Germa</td>
<td>7</td>
<td>Female-headed household</td>
<td>7</td>
<td>1</td>
<td>SNNP</td>
</tr>
<tr>
<td>Zara Feker</td>
<td>6</td>
<td>Female in male-headed household</td>
<td>2</td>
<td>0.25</td>
<td>Gambela</td>
</tr>
<tr>
<td>Arebaie Abahabe</td>
<td>6</td>
<td>Female in male-headed household</td>
<td>6</td>
<td>0</td>
<td>Afar</td>
</tr>
</tbody>
</table>

The FFHs were asked questions about learning and changes in behaviour resulting from the training. The reaction-level assessment had already been conducted at the end of training period; it measured whether FFHs found the training engaging and relevant. At this stage however, the focus was on the FFHs’ understanding of the benefits of CA and its core principles and how they were implementing the technology.
2.3.1 FFHs’ understanding of CA benefits

The literature section has shown several benefits that can be derived from CA implementation. In-depth interviewees and FGD participants were asked about perceived benefits and about their experiences with CA implementation. Almost all the FGD participants spoke in favour of CA and made strong cases on several grounds.

The first benefit of CA implementation, discussants said, is a lower demand for draft power, given that CA has the potential to eliminate dependence on oxen. Most of the discussants believe that the conventional agricultural system, which relies on draft power, marginalizes female-headed households, which as a result must engage in unfavourable rental and sharecropping markets for land.

Another CA advantage expressed by FGD discussants is reduced labour requirements. Most participants believed that women stand to benefit from CA because less labour is required to till the land. In addition, discussants agreed that if proper surface cover with crop residue is employed, CA reduces the need for weeding. One participant from Benishangul-Gumuz said CA had reduced her weeding time:

As in most parts of the country, weeding is perceived to be the responsibility of women. CA has the potential to reduce weeding on our farms if we listen to advice from CA experts either through using crop residue for covering land or using herbicides. In my case, a portion of the land was under CA, and I have seen not only an increase in yield, but also, I was able to get time for other important activities as a result of reduced weeding on my farm.

FFHs also cited improved soil quality and fertility. Not many described the soil science in terms of conservation of organic soil carbon or retained physical, chemical, and biological properties of soil; they simply described how crop residues left on the farm serve as compost, improve productivity, and maintain soil moisture. Furthermore, discussants agreed that with some farm input and training support, CA is a woman-friendly technology, particularly for female-headed households.

2.3.2 FFHs’ understanding of the three core principles of CA

To gauge the concept-level understanding of the FFHs, researchers asked discussants to describe the core principles of CA. Most participants could not recite the core principles, but when the question was reframed in terms of how they would implement CA, almost every discussant was able to describe CA, indicating that adult education is not about memorizing but about practice.

The FFHs explained that most of them practice CA by avoiding full conventional farming that encourages ploughing land three to four times a year. One in-depth interviewee defined CA as ‘farming method without oxen’. Another said CA is ‘cultivating without ploughing’. They also explained that CA encourages intercropping and crop rotation, and they understood the need for permanent soil cover. Further discussion on each concept is presented below.

Knowledge and practice of minimum tillage: One FGD discussant explained that FFHs had learned that ‘farming without oxen’ is good for the farm because minimum or no disturbance is good for the soil for the purposes of crop production. She added: ‘We practice this type of farming by making holes where seed is planted. The rest of the field remains undisturbed and crop residue is left on the surface’. Other members agreed with the definition and explained that not all farms are fit for this type of farming. One participant from the Amhara region, Awi zone, said that her land is made of hard soil, and despite her attempts to introduce minimum tillage, it has not worked.
Another participant from Benishangul-Gumuz said that in her region accessing draft animals is challenging, and farmers spend many hours preparing the land by hand. Animal diseases are rampant in the region, and CA is attractive to farmers there. Overall, both the FGD participants and in-depth interviewees understand and practice minimum tillage but claim that proper CA technology needs to be available as minimum tillage practices on larger plots of land are unlikely to succeed when conducted manually.

Knowledge and practice of soil cover with crop residues and live mulches: FFHs understand the need to use crops or residues of the previous year’s harvest to create a permanent soil cover. One FGD participant explained the need for soil cover in an analogy:

> We now understand that a farm without cover is like a person without clothes; as a result of the training, we make efforts to employ residue mulch or green crops. We are convinced about the benefits of covering soil. We have learned covering soil suppresses weed growth, reduces erosion, and maintains soil moisture.

Almost all interviewees and FGD participants agree on the need for permanent cover but disagree on its practicality. Some smallholder farmers maximize their profits by removing crop residues after harvest to sell or use as feed for livestock. One vocal member of the FGD complained,

> Knowledge alone is not enough. Unless we are supported with alternative feed for animals, demanding us to forgo the coveted crop residue for other purpose rather than feeding our cattle is too much to ask. Those who are promoting CA need to show us that alternative animal feed exists.

Knowledge and practice of crop rotations and intercropping: FFHs were also interviewed about the meaning, purpose, and practice of crop rotation and intercropping. Discussants explained that intercropping (የሰብልስብጥር) is a type of cropping in which two or more crops are cultivated on the same farm plot simultaneously. Most FFH discussants from Amhara, Oromia, and SNNP reported that both practices have become common in their respective regions. When asked what types of crops they mix, they gave examples of maize with potatoes, maize with pulses, coffee with enset (false banana), and sorghum with legumes.

Similarly, most FFHs discussants not only understand crop rotation (የሰብልፈረቃ), but practice it on their farms in the hope of managing soil fertility and increasing the nutrients available for crops. In terms of crop sequencing, they said that if one plants maize the first year, one should plant beans or other similar crops the next season. FGD participants were not able to identify the science behind the practice (the interplay between nitrogen–using plants and nitrogen–depositing plants), but they understand that engaging in this type of crop rotation gives better yields.

Overall, FFHs spoke favourably of CA and how it has helped them improve productivity and reduce labour time. Initially most of them claimed to have started using CA in a 10m-by-10m area in their backyard and reported witnessing a remarkable increase in yield. Increased productivity is also even more pronounced, they claim, on farms that have been under CA for two to three years. However, FFHs do not seem to practice CA continuously. They appear to have on-and-off relationships with CA technology, affecting the future productivity and sustainability of their farms.

In addition, most FFHs are serving as mentors for fellow local smallholders in their role as model farmers. For instance, FFHs from Afar, Gambela, and Amhara reported working with 56 farmers, 72 farmers, and 30 farmers, respectively. The women’s groups learn not only about CA or compost preparation but also other life skills and savings and credit issues. The success of these groups, the FFHs claim, is already attracting other farmers to emulate the farming technologies. ‘Initially the people in the village were making fun of us for trying to cultivate land without ploughing, but now they have seen CA works and have started inquiring how it works’, said one participant.
2.4 CONSTRAINTS AND BARRIERS IN CA ADOPTION AND SCALING

The literature review and the interviews with policy makers and implementers reveal that CA faces some daunting barriers to implementation from both the supply and the demand side. The lack of knowledge and inadequate information on agricultural technologies is a general constraint to technology adoption in Ethiopia. CA demands complex management skills and depends on farmers’ knowledge regarding the selection and proper use of herbicides and pesticides (Tsige et al., 2020).

2.4.1 SUPPLY-SIDE CONSTRAINTS

The CIMMYT report (2017) from the SIMLESA project identified a number of factors limiting CA adoption in Ethiopia, and FGD and KII responses supported these findings.

One constraint is the lack of access to, or timely delivery of, improved or high-quality inputs. The literature shows that credit opportunities and availability of farm inputs promote the adoption of CA in Ethiopia. Among smallholder farmers, finances and agricultural inputs are found to affect the likelihood of CA adoption. In an in-depth interview, a FFH respondent from Oromia said,

\[ \text{I am single mother of three children. I have about 2.5 hectares of land, and our livelihood is based on farming. With the support and training from SEDA and Oxfam, I am implementing CA on a limited plot of land, but I have problems to access fertilizers and high-quality seeds. Every time I visit the centres to access agricultural inputs, they are not available. This discourages me to employ CA. Also, I suspect being a woman is a disadvantage.} \]

Moreover, smallholder farmers are most likely to receive information about improved seeds when they belong to farmer cooperatives, but because not all farmers are cooperative members, they do not get timely access to information that would allow them to benefit from existing opportunities.

Access to rural credit is challenging, but some recent initiatives provide second-level land certification (SLLC)–linked loans to farmers in collaboration with microfinance institutions in most regions. Farmers use credit mainly to buy farm inputs. Though none of the FFHs claimed to have received SLLC-linked loans, access to loans would promote women smallholders’ opportunities to be involved in off-farm activities and employment opportunities that are vital to buying agricultural inputs for the proper use of CA technologies. Also, the limited availability of affordable, appropriate seeding machinery that is locally produced and maintained is a challenge for most farmers.

2.4.2 DEMAND-SIDE (BEHAVIOURAL) CONSTRAINTS

Risk aversion on the part of some farmers impedes adoption of CA. In some areas it takes a few years to realize the benefits of CA (particularly productivity gains). Some risk-averse smallholders may not wait and may be motivated to shift to conventional farming in the first one or two years. The need to convince adopters to wait to reap the full benefits of CA implementation remains a constraint. In addition, lack of experience with technology, limited land endowment, and difficulties in accessing extension services all inhibit adoption (Adugna and Cherie, 2021).

Another major constraint is the severe competition for crop residues for livestock feed and soil mulching (Tesfaye et al., 2015). The CA policy brief states that in Ethiopia’s highly complex farming system, crop residues are removed after harvest for fuel, construction, feed, sales, and other purposes. Agronomists say that removing residues has starved the soil for years and resulted in depleted and degraded soils. Studies conducted so far in Ethiopia show high trade-offs between uses of crop residue for animal feed and mulch. As a result CA adopters complain about the lack of mulch (CIMMYT, 2019).
Changes in extension approaches have also led to confusion about CA. There is a mistaken perception that soil cultivation (ploughing) is essential for high crop production. For several years agricultural extension workers have promoted repeated tillage, and smallholders have been implementing it. In contrast, CA calls for zero or minimum tillage. KIs with extension agents revealed the typical reaction of smallholder farmers during the initial CA training: ‘In the past, you used to teach us to till our land 3–4 times a year, and now you are teaching us never to plough? What happened to the previous instructions? Not only is changing the mindsets of farmers and experts on frequent tillage a challenge, but also Ethiopia has not revised its existing extension policy.

Women face particular constraints. Labour demand may shift from male to female family members (Teklewold et al., 2013). Adequate and timely supply of appropriate and affordable inputs (such as herbicides, fertilizers, and equipment) is also a challenge. FFHs claim that they receive only limited assistance from extension workers and agricultural offices. FGDs revealed that most DAs are men and tend to discriminate in service provision. A FFH discussant from the Oromia region said, *In our woreda most DAs are male and socialize with other men in meetings and local bars. When opportunity for agricultural extension awareness trainings emerge, it is mostly men who are summoned to meetings rather than women. More often, fertilizers and improved variety seeds are allocated for their friends, and we are told to wait. Some years back we had a female DA, and she was so supportive to us. After she left access to agricultural inputs has become next to impossible and is affecting our efforts to uptake CA.*

This observation by the FFH is in line with studies conducted in Ethiopia, such as Tsige et al. (2020). However, this may vary by region, according to local culture. For example, in Benishangul-Gumuz, women may go out to bars by themselves, whereas this would be rare in other regions (Cohen and Lemma 2011).

Smallholder farmers are also affected by the lack of access to CA mechanization. The literature asserts that mechanization (especially power units, seeders, rippers, and sprayers) is a key input for CA, but smallholder farmers often have difficulty making the necessary investments (Sims and Kienzle, 2015). As a result, small-scale cultivators are discouraged from implementing CA on a wider scale. In addition, lack of green cover and mulching is believed to lead to weeds, which should be controlled through the use of herbicides or manual weeding. Poor availability, accessibility, and affordability of herbicides is considered a hindering factor for CA adoption under smallholder farmers’ conditions (CIMMYT, 2019).

Likewise, limited stakeholder coordination and limited financial investment in CA affects successful adoption. As shown in the previous section, coordination between the MoA and stakeholders, and even among MoA directorates, such as coordination between the soil fertility directorate and the agricultural extension directorate, is limited. Also, Ethiopia has issued CA guidelines to promote uptake, but the guidelines lack an implementation strategy, clear ownership, and commitment, and they are not adequately reaching smallholder users and local leaders. Relatedly, in 2018, the MoA made efforts to include CA in crop development packages, but these lacked detailed descriptions of CA.

There is some mismatch between what the CA science says and what is practiced. The CA policy brief emphasizes that recommendations on CA practices are influenced by the biophysical and socioeconomic conditions in a given area (CIMMYT, 2019). Hence, CA cannot be recommended for everyone and everywhere in the same way. Scaling up CA requires targeting the technology so that it is implemented where it works best and offers the most benefits. However, implementing partners have limitations in considering and recognizing the recommendation domains proposed by the scientists.

Free grazing of livestock also poses a constraint. Free grazing occurs when livestock of neighbouring farmers roam across farms and consume crop residue; this happens mostly when access to alternative grazing land is limited. Some CA-implementing FFHs leave crop residues on their fields to control weeds and improve soil fertility, but postharvest free grazing of livestock...
threatens crop residues. There is no national or regional policy on free grazing; in some regions (such as Benishangul-Gumuz) community by-laws are being introduced until regional laws are announced.

Lastly, some experts at the MoA admit that the CA capacity of actors involved in the extension system is inadequate. CA cannot be applied everywhere without considering local conditions and needs, making it relatively knowledge-intensive compared with conventional practice. Wider adoption of CA demands strong technical know-how on the part of farmers, development agents, and experts involved in CA implementation, and this know-how is currently not in place.

Overall, the CA adoption process involves both opportunities and challenges, and the conceptual framework used for this study correctly predicts most aspects of CA adoption in Ethiopia. As postulated by the conceptual framework, qualitative responses from the current study reveal that CA adoption is a function of, among other things, farmer attributes, financial factors, biophysical factors, and farm inputs. While the conceptual framework employed is a highly valuable tool to explain adoption by FFHs, it does not explicitly consider gender-related factors in adoption.
3. KEY FINDINGS AND PROPOSED INTERVENTIONS

3.1 KEY FINDINGS

The main objectives of this research were to assess the content and depth of training given to FFHs and to investigate trends in the adoption of CA in Ethiopia. From the results and discussions presented in the preceding sections, the key findings can be summed up as follows.

Key finding 1: In 2019 the Ethiopian Ministry of Agriculture adopted CASI as part of its extension package and cascaded it to regional agricultural bureaus for implementation. It has issued directives stating that CA should be included in the extension package and promote it where appropriate. The MoA has developed a manual that guides the implementation of CASI and a policy brief. Wider CA implementation remains limited.

Key finding 2: Institutionalization of CA appears to be limited by constraints at the level of both policy and vision at the MoA. The country’s existing extension policy focuses on intensive tillage whereas CA calls for zero or minimum tillage. Also, coordination on the CA agenda between the MoA’s different directorates is limited. Publication of the MoA’s technical manual should have been followed by an implementation strategy and full treatment of CA in agricultural extension packages, but these are missing.

Key finding 3: The government’s agricultural policy seems to focus on increasing productivity in the short term even at the expense of sustainability. CA technology is aimed at long-term environmental sustainability, and its effects are realized over time. Farmers may need to wait three to seven years to see yield increases. The government gives less priority to CA than to conventional farming practices such as cluster farming (æå ýď ʃ M). Unlike other farming technologies, CA is severely underfunded.

Key finding 4: Information from MoA shows that in 2020/21 about 8,000 hectares of land were under CA technology, mainly in Amhara, Benishangul-Gumuz, Oromia, and SNNP. CSOs have also released project-based CA adoption information. However, accessing accurate and comprehensive information on adoption and its trends over time is difficult as a result of limited central reporting and data collection initiatives. In addition, these scattered data do not show which CA principles are being practiced or the gender of the adopters.

Key finding 5: Some Ethiopian researchers say one cannot make reliable claims about adoption at this stage of CA diffusion, as most of the adoption initiatives are project-induced rather than practices freely implemented by farmers as routine farming habits. Overall, it is safe to claim that despite the introduction of CA in Ethiopia more than 20 years ago, adoption remains low and has not progressed as fast as hoped. CA intensification is still a function of the intensity of CA activities by civil society and projects operated by research organizations.

Key finding 6: The FFHs claim to have benefited from CA training and have exhibited good concept-level understanding. They describe CA as ‘cultivation without ploughing’ or ‘agriculture without oxen’. Even if some participants were not able to articulate each of the core principles, when asked how they implement CA, almost every discussant was able to explain the underlining principles. However, with few exceptions, most FFHs seem to have an on-and-off relationship with CA technology. Continuous adoption of the technology matters if CA is to improve soil fertility and lead to future improved yields.
Key finding 7: The literature review and interviews with policy makers and implementers reveal that CA faces barriers on both the supply and demand sides. Supply-side constraints include lack of access to, or timely delivery of, improved or high-quality inputs, limited access to credit, and the limited availability of affordable, appropriate machinery that is locally produced and maintained. CA adoption is also affected by demand-side (behavioural) constraints such as risk aversion by some farmers and competition for crop residues (needed for mulching in CA) from requirements for fuel and feed. In addition, farmers often lack experience with technology, have inadequate land endowment, and are located far from public extension officers. Other challenges include limited stakeholder coordination, free grazing of livestock that impedes the use of crop residue as demanded by CA, and the lack of CA capacity on the part of actors involved in the extension system.

Key finding 8: CA adoption is not the same for men and women. Adoption of CA had both positive and negative impacts on men and women farmers’ labour demands. The most attractive feature of CA for women, particularly for female-headed households, was that CA makes draft power irrelevant. Further, the lack of a need to clear pre-tilled land tended to reduce the workload for women. However, some women in male-headed households report a shift of labour responsibilities from men to women.

3.2 RECOMMENDATIONS

This section offers some broad and specific recommendations targeted at policy makers, development partners, researchers, and civil society organizations (including Oxfam) for better CA adoption.

3.2.1 RECOMMENDATIONS FOR POLICY MAKERS (MOA)

- Promote appropriate mechanization to encourage minimal till. Policy makers at the ministry level should design ways of locally producing labour-saving machinery (such as rippers and jab planters) and making it available to smallholder farmers for better and faster adoption of reduced-tillage practices.
- Produce CA training manuals for extension services. Governments at all levels and extension service providers should prepare concise user guides for how to implement reduced-tillage practices using labour-saving machinery. They should also train more farmers on the practices, use, and advantages of reduced tillage for a better environment, greater food production, and more effective adaptation to climate variability and change (CIMMYT et al., n.d.).
- To scale up CA, design policies and practices that support and encourage farmers to retain minimum crop residues on fields while growing forage crops alongside main crops in and/or around farm plots. Also, link soil fertility interventions with CA for better adoption.
- Design new arrangements for free grazing or incentives for minimum herd size to enable farmers to retain residue in fields.
- Revisit or amend Ethiopia’s existing extension policy, which focuses on intensive tillage and clearing of fields before planting in all agroecologies. In addition, develop a CA implementation strategy.
- Include CA in the agricultural education curriculum, extension systems, and agricultural policy and strategy. Reduce gender biases in extension service design and implementation.
- Link CA-appropriate commodities with recommendation domains. Also, identify CA adoption indicators, and put in place a reporting system similar to the reporting practice for greenhouse gas emissions as practiced by the MoA.
- Make stronger efforts to implement policies on the ground. Overall, an enabling policy environment that promotes rural development and women’s empowerment is in place, but there is a gap between policymaking and policy practice.
3.2.2 RECOMMENDATIONS FOR PROJECT IMPLEMENTERS AND RESEARCHERS

• The experiences of FFHs have demonstrated that while training was useful, CA technology is not being employed continuously. Oxfam needs to not only facilitate periodic trainings but also assist FFHs with farm inputs and access to mechanization so that the FFHs scale up CA in a sustainable way. To enhance women’s participation in CA, future projects need to deliberately enlist women as CA beneficiaries and offer agricultural inputs directly to women (Wekesah et al., 2019).

• Most CA research in Ethiopia appears to be gender neutral. A number of issues need to be investigated, such as whether CA shifts labour responsibilities to women, the long-term impacts of CA on gender relations, and the dynamics of gendered access to local farmland inputs.

• There is a need to engage in continuous CA-related research focusing not only on soil and productivity but also on mechanization.

• Projects should facilitate rural credit opportunities for women linking with second-level land certification (SLLC) in collaboration with microfinance and other financial institutions and ensure that the funds received are used on agricultural technologies. Rural cooperatives should not consider women to be ‘represented’ by their husbands. Financial institutions should directly involve women in male-headed households as input buyers so that they can identify the women’s input needs.

• CA projects should promote women’s decision making about farm management, production, and control. Legally, women may access or use agricultural land, but they do not enjoy these rights in practice. Landholding (ownership) rights are not equal to control and transfer rights.

• To promote women’s adoption and practice of CA, development partners must target farm input support for women and training for men (CIMMYT et al., n.d.).

• Alternative livestock feed supply and feeding arrangements need to be established and supported through research and funding.

• Projects should facilitate continuous CA trainings for policy makers, regional and local agricultural experts, and smallholder farmers. They should conduct training for model farmers and facilitate experience-sharing events among agricultural experts and farmers, with field days conducted on demonstration plots for practical learning of CA principles.

• Civil society organizations and other implementers must give attention to the recommendation domains for CA implementation as CA cannot be practiced everywhere equally. The CA-recommended sites and information need to be easily accessible to users.
BIBLIOGRAPHY

List any key websites, journals, books etc. used during the production of this report, to enable researchers to easily locate them. Use a standard referencing format. Please see the Oxfam Style Guide (available from Policy Practice Communications Team).


ANNEX 1: CURRENT AND RECENT CONSERVATION AGRICULTURE INITIATIVES

The conservation agriculture (CA) ecosystem is made up of researchers, policy makers, implementing partners, input suppliers, and male and female smallholder farmers. The research institutions working on CA include the Ethiopian Institute of Agricultural Research (Melkassa and Bako Research Centres), the International Maize and Wheat Improvement Center (CIMMYT), the Agricultural Transformation Agency (ATA), the agricultural departments of universities, and other partners that conduct both research and implementation. The policy-making entity is chiefly the Ministry of Agriculture (MoA), regional Bureaus of Agriculture, and the many directorates within the ministry, including Extension, Crop Development, Food Security, Soil Fertility improvement, Mechanization, and Gender. International and national civil society organizations working on CA technology in Ethiopia include Sasakawa Global 2000 (SG2000), the Mennonite Central Committee (MCC) Canada, the Canadian Foodgrains Bank (CFGB), Self Help Africa, the Alliance for a Green Revolution in Africa (AGRA), Food for the Hungry Ethiopia (FHE), and the Terepeza Development Association.

Source: Authors.

This annex presents a non-exhaustive list of organizations and their activities in CA implementation for experience sharing and best practice learning purposes. Data are based on interviews with most of the organizations and CA reports and promotional materials from the respective organizations.

The Ethiopian climate-smart agricultural scoping study provides a brief history of CA in the country, the actors that are promoting CA, and the available CA outcome evidence (Jirata et al., 2016). The study reveals that Ethiopian farmers have long undertaken soil conservation practices such as reduced tillage; however, the promotion of CA technology began in earnest in 1998, when Sasakawa Global (SG2000) joined with regional agricultural development bureaus to promote and demonstrate the technology.

Food for the Hungry Ethiopia (FHE): FHE implemented the Scaling Up Conservation Agriculture in East Africa (CA) project in Assosa and Bambasi woredas in the Benishangul-Gumuz Region. The project was part of a program funded by Global Affairs Canada through the Canadian Foodgrains Bank (CFGB) and the Mennonite Central Committee (MCC) from December 2015 to March 2020. FHE (the local office of an international NGO) is one of three Ethiopian partners in this program. The FHE project covered 39 kebeles in the two woredas. The project targeted farmers in 10,700 households (with 83,500 family members) over the five-year period. According to project documents, FHE strategies included conducting a familiarization workshop with stakeholders; training kebele leaders, development agents, agricultural experts at the woreda level, and community workers on CA principles; preparing demonstration plots within farmer training centre (FTC) compounds to offer farmers practical training on CA principles; conducting training for model farmers and follower
farmers; and organizing experience sharing among farmers through field days conducted on demonstration plots (CFGB et al., n.d.).

The project was phased out in 2020, and an interview with FHE project leaders confirmed the success of the project; currently more than 35,000 farmers are implementing CA. According to the interview, FHE helped translate CA extension manuals into the Amharic language, established and strengthened CA demonstration plot committees that mobilize farmers to learn about CA at the farmer training centres, organized and strengthened self-help groups, facilitated links between self-help groups and microfinance institutions, established seed-multiplying groups for navy beans, soya, and lablab, and facilitated market linkages for smallholder farmers.

**Terepeza Development Association (TDA):** TDA has been promoting CA adoption in Wolaita Zone, SNNPR, since 2012. It claims that CA is highly relevant given the Wolaita area’s high population density, low soil fertility (repeated tillage, soil erosion), and recurrent drought and moisture stress. With support from CFGB, TDA implemented a project targeting 300 farmers in four districts. The project uses farmer training centres (FTCs), community-based organizations (CBOs), and animators (farmers training farmers). During a June 2017 experience-sharing and networking workshop, project leaders claimed that the project has demonstrated farmers’ increasing interest in CA as well as strong local support and cooperation.

**Migbare Senay Children and Family Support Organization (MSCFSO):** Also with support from CFGB, MSCFSO operated a four-year project in East Gojam, Amhara region. The project promoted a set of core principles – minimum soil disturbance, permanent soil cover, crop rotation, and/or association – for an estimated 5,620 beneficiary households (CFGB, 2017). It used a farmer-to-farmer extension approach as well as a training-and-visit approach through government extension advisers.

**Sustainable Intensification of Maize Legume System for Food Security in Eastern and Southern Ethiopia (SIMLESA):** Since 2010, CIMMYT – in collaboration with national and regional research organizations such as the Ethiopian Institute of Agricultural Research (EIAR) – has been conducting trials and demonstrations across the country to promote CA-based cropping systems through the SIMLESA programme. During 2010–2016, SIMLESA-Ethiopia reported reaching more than 210,289 smallholder farmers and supporting institutional bases of CA technology in Ethiopia. For instance, CIMMYT and GIZ, the German aid agency, supported the Oromia region’s initiatives to translate the CA manual into the Affan Oromo language and created a CA specialist structure from the region to district level. The project also prepared a documentary on CA and shared it with several natural resource management experts representing Arsi and west and east Wollega. A project-supported TV broadcast on the soil health problem in west Oromia aimed to create awareness among farmers.

**Food and Agriculture Organization of the United Nations (FAO):** FAO introduced a range of CA equipment, including jab planters1 and oxen-drawn seed and fertilizer planters, and supported the training of extension agents to conduct CA farmer field schools. Some agents were also trained in the assembly and operation of CA equipment.

**Agricultural Transformation Agency (ATA):** In 2013, the federal government’s ATA supported 6,000 farmers in seven woredas to practise CA. It also trained 327 experts and 750 development agents (extension advisors) in CA in selected woredas. ATA’s target for 2014 was to have 50,000 farmers practicing CA in 57 woredas across the country (Jirata et al., 2016).

**CA and research:** Several organizations have been at the forefront of building evidence and manufacturing mechanization equipment. Sasakawa Global 2000/Sasakawa Africa Association (SAA), one of the pioneers of CA in Ethiopia, set up demonstration sites in the country. CIMMYT has conducted several studies and produced potential recommendation domains for CA in Ethiopia. CIMMYT scientists consider CA a potential remedy to the problems of conventional farming, and they conducted several experimental studies on-station and on-farm between 2010 and 2016. In the

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1 A jab planter is a manual tool used to sow large seeds (such as beans, peas, and corn) in rows or bunches on plastic mulch films or in the soil.
interview for the current study, CIMMYT researchers stated that the challenge of promoting adoption of CA in Ethiopia is not the lack of evidence on whether CA works but rather the difficulty of changing farmers’ mindsets and making mechanization accessible.

The Department of Dryland Crop and Horticultural Science, Mekelle University, and Tigray Agricultural Research Institute (TARI) were also active research partners in CA before the war. The Ethiopian Institute of Agricultural Research was involved in manufacturing and demonstrating two-wheel tractor (2WT)-based technologies to support CA systems, using expertise and implements from Africa, Australia, and South Asia for improved farm mechanization. In 2016, the berken maresha – a locally produced plough designed for use with CA – was marketed for the first time (CFGB, 2017). Aybar Engineering and Haramaya University were also engaged in CA research.

Another popular entity that promotes CA is the African Conservation Tillage Network (ACT). One of the purposes of the ACT is to share and serve Africa’s conservation agriculture knowledge and information needs. It does this by, amongst other things, producing materials and sponsoring conferences and symposiums that appear on its online platform. Its online products include a CA manual, CA case studies, a CA toolbox, documentaries, and scientific publications.

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2 Both researchers and CA equipment manufacturers were invited to the experience-sharing workshop.
ANNEX 2: QUALITATIVE DATA COLLECTION TOOLS

A2.1 INSTITUTIONAL KEY INFORMANT INTERVIEWS (KIIS)

- MoA (extension directorate) and regional agricultural offices
- Agricultural Transformation Agency (ATA)
- Ethiopian Institute of Agricultural Research
- Self Help Africa
- Alliance for a Green Revolution in Africa (AGRA)
- Canadian Foodgrains Bank (CFGB)
- Mennonite Central Committee (MCC)
- International Maize and Wheat Improvement Center (CIMMYT) [Kindie Tesfaye]
- Food and Agriculture Organization of the United Nations (FAO)
- Oxfam Ethiopia

<table>
<thead>
<tr>
<th>Region/woreda</th>
<th>Name of the institution</th>
<th>Name of the key informant</th>
<th>Gender of informant</th>
<th>Position in the organization</th>
<th>Date of the interview</th>
<th>Name of the interviewer</th>
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Adoption rate and trends in adoption of CA in Ethiopia

[Now I am going to ask you about the state of CA adoption, trends, opportunities, and challenges.]

1. What are the most common farming systems and climate-smart agriculture technologies and practices promoted in the country?
2. Can you give us a little background about CA and its history in Ethiopia?
3. What are the activities conducted by the Ministry of Agriculture (MoA) to diffuse CA in its agricultural package? Do you think adequate demonstration efforts are being conducted?
4. What are the achievements of the National Conservation Agriculture Taskforce established in 2014?
5. What existing donor-supported projects are working on CA currently? [Ask this to MoA only]
6. What are the roles of extension agents in promoting CA? How often do they go to the field? Are there resources available?

7. What does uptake look like among smallholder farmers?

8. Is there data available on the number of smallholder farmers practicing conservation agriculture and an estimate of land area under CA? Any data on female farmers and their uptake?

9. How is the work coordinated at kebele, woreda level?

10. Who are the most popular actors in CA in the country?

11. How is CA applicable across different agroecologies?

12. What is the extent of input availability for CA in the country?

13. What are the benefits of practicing CA at farm level and at community level?

14. What are the best practices and success stories of CA in the country?

15. How do you evaluate CA technology adoption trends over the years in the country?

16. Do farmers using CA do any better than those using conventional agricultural techniques?

17. Why do some farmers start to use CA? Why do some not take it up?

18. What are the unique CA challenges female farmers face and also their adoption rate?

19. Do farmers adopt all the three conservation agriculture principles? Which principle do they find harder to put into practice?

20. [Probe: minimum tillage, intercropping, cover cropping and crop rotation]

21. What are the strategies put in place so that innovation and adoption of conservation agriculture principles fit local contexts?

22. [Probe: experimentation, seed varieties, challenges to address mulch access]

23. How is CA able to contribute to addressing challenges with drought, flooding, and other threats to agriculture such as fall armyworm?

24. How is information on CA being disseminated in woredas and kebeles?

25. How are gender inequalities addressed in CA programming?

26. Is there a gender strategy in relation to CA by the ministry? [Ask this to MOA only]

27. From your experience, in general, who are the early adopters of CA? Male-headed families versus female-headed families? If so, why?

28. [Probe: the labour required for weeding, increasing yields and farm income, reducing expenditure…]

29. What are the roles of local organizations [women’s groups, self-help groups, youth league…] in CA participation, and what should be done to promote their uptake?

30. What efforts are being conducted to provide access to capital and market linkages to those engaged in CA?

31. Most research confirms the benefits of CA. If so, why is adoption a challenge? What argument can be made beyond productivity and land sustainability?

32. In your view, what are the key challenges in increasing the CA adoption rate?

33. [Probe: weak integration into existing extension planning, prevalence of open grazing, shortage of livestock feed, removal of crop residue for animal feed and firewood, and lack of knowledge on appropriate cropping systems, crop rotations, and intercropping combinations]

34. What should be done and by whom to promote CA in the country?

35. Are there any other CA issues you would like to discuss?
Laws and policy barriers

[Now I am going to ask you about the policies, directives, and guidelines related to CA.]

36. What is the level of integration of conservation agriculture into the existing agricultural extension delivery system?

37. Are CA curriculum materials and other resources for extension workers in place?

38. What are the gaps in those materials (local language, issues not covered...)?

39. Are the CA policy and extension works gender sensitive?

40. The prevalence of open grazing is known to affect CA, and there is no policy for it. Is there any plan to come up with a national and local policy that discourages free grazing?

41. Is there a system of collecting reports from CA-implementing actors to track CA adoption and coverage?

42. Are there known CA indicators for regular monitoring and reporting purposes?

43. Is there any policy support particularly geared toward female small-scale food producers in Ethiopia? If not why?

A2.2 IN-DEPTH INTERVIEWS OF OXFAM’S FEMALE FOOD HEROES (FFHS)

Woreda: ________ Kebele:__________ Village:_________

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<th>Name of the key informant</th>
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<tr>
<th>Interview method</th>
<th>Name of the interviewer</th>
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<td>[in person, remote by phone]</td>
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[Now I am going to ask you about your a) reaction, b) learning, and c) behavioural change as a result of the training you received, and d) successes and challenges you faced in CA adoption.]

Reaction to the training

- When did you first hear about CA and from where? Did you participate in any CA activities before this project?
- Did you receive CA and other training from Oxfam? Who provided it and where?
- Did the course meet your expectations? What did you like about the course?
- In addition to the training, how did you benefit from the project?

Learning due to the training

- What were the topics of the training you were provided, if you remember?
- Probe [basic business skills, entrepreneurship, agricultural marketing, saving and credit, record-keeping, family planning, climate change adaptation, conservation agriculture techniques]
- What is CA?
- What are the three principles of CA?
• What are the benefits of CA?
• What is the use of rotating the crops?
• Why do we need to keep some of the crop residues on the soil?
• How do we keep soil healthy?
• How can we conserve soil and water?
• What do you know about basic business skills and saving and credit issues?

**Behavioural changes due to the training**
• How did you benefit from the project, and what types of services were provided?
• Are you adopting CA? If so, are you adopting in all parcels or in only few parcels?
• As someone using CA, do you have any greater success than those using conventional agricultural techniques?
• What effects are you observing by using CA?
• What success stories can you tell us as a result of adopting CA?

**Challenges and assistance received**
• What challenges are you facing in implementing CA (labour, inputs,...)?
• What do you think are the major constraints in adoption of CA?
• What has been the impact of bad weather?
• Why do some farmers start to use CA? Why do some not take it up?
• How is the extension service involved?
• From whom do you receive close support? Are they able to answer your questions about CA?
• How often did you meet with the extension agents, and what support or training was given? Where did you meet and at what time? Are you still meeting?
• Are there any difficulties for women in particular in participating?
  o What do your families think of you using CA?
  o Do you have enough time to participate in trainings, etc.?
  o Is there any complaint from your family/husband about participating in training and working together with other men?
  o Does CA mean more agricultural work or less for you?
• Have you heard radio or TV broadcasts on CA? Have they been useful? Led to changes in practice?
• Will you continue to apply CA in the future, even if Oxfam is not there giving support?
• Do you have any hungry months now (i.e., does the food you grow cover your needs all year)?
• What was the situation before you adopted CA?
• Can you estimate by what % your household income has increased since using CA?
• Is there any future support that you would like to ask for to promote your CA activities?

**A2.3 FOCUS GROUP DISCUSSIONS (FGDS) WITH OXFAM’S FEMALE FOOD HEROES**

Region: ________ Woreda: ________ Kebele: ________

List of participants
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<tr>
<th>No.</th>
<th>Name</th>
<th>Age</th>
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* Household headship status may be male headed, female headed, or child headed.

**Instructions: Conduct FGD with FFHs**
- How did you benefit from the project, and what types of services were provided?
- What are the three principles of CA?
- Can you tell us how you practice CA?
- What is the use of rotating the crops?
- Why do we need to keep some of the crop residues on the soil?
- How do we keep soil healthy?
- How can we conserve soil and water?
- What success stories can you tell us as a result of adopting CA?
- What challenges are you facing in implementing CA (labour, input, weed control...)?
- Why do some farmers start to use CA? Why do some not take it up?
- Will you continue to apply CA in the future, even if Oxfam is not there giving support?
- What support do you get to link your products with markets and loan opportunities?
- Is there any future support that you would like to ask for to promote your CA activities?

**CASE STORIES**

Document some cases that show the success and challenges that FFHs are dealing with to adopt CA.
PICTURES

Figure 1. Focus group discussion (Oxfam in Ethiopia).

Figure 2. FFH from Oromia (Oxfam in Ethiopia).
Figure 3. FFH from Benishangul Gumuz (Oxfam in Ethiopia).

Figure 4. FFH from Harari (Oxfam in Ethiopia).
Figure 5: Conservation Agriculture poster in English (CIMMYT).

Figure 6: Conservation Agriculture Guideline in Amharic (Ministry of Agriculture, Federal Democratic Republic of Ethiopia).
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