

Project Report 3

GENDER DIFFERENTIALS IN THE SALT-AFFECTED AREAS OF ETHIOPIA



Dr. Rahel Jigi Kitessa
Dr. Asad Sarwar Qureshi
Dr. Tesfaye Ertebo Mohammed

**REHABILITATION AND MANAGEMENT OF SALT-AFFECTED
SOILS TO IMPROVE AGRICULTURAL PRODUCTIVITY
(RAMSAP) IN ETHIOPIA AND SOUTH SUDAN**



GENDER DIFFERENTIALS IN THE SALT-AFFECTED AREAS OF ETHIOPIA

Dr. Rahel Jigi Kitessa

Dr. Asad Sarwar Qureshi

Dr. Tesfaye Ertebo Mohammed

Rehabilitation and management of salt-affected soils to improve
agricultural productivity in Ethiopia and South Sudan (RAMSAP)

The authors: Dr. Rahel Jigi Kitessa is Professor of Economics at the University of Addis Ababa, Ethiopia; Dr. Asad Sarwar Qureshi is a Senior Scientist – Irrigation and Water Management and Project Leader for the RAMSAP project at the International Center for Biosaline Agriculture (ICBA), Dubai, UAE and Dr. Tesfaye Ertebo Mohammed is Project Officer of the RAMSAP project based in Addis Ababa, Ethiopia.

This survey has been possible with the generous financial support of International Fund for Agricultural Development (IFAD) within the ICBA-led project on “Rehabilitation and management of salt-affected soils to improve agricultural productivity (RAMSAP)” in Ethiopia and South Sudan (Grant No. 2000001100). This publication is the result of collected information on women understanding of the soil salinity issues and their impact on their socio-economic, health and environmental conditions. The report also discusses the challenges faced by women in expanding their involvement in agricultural activities in Ethiopia. The measures needed to empower women for improving agricultural productivity in salt-affected areas of Ethiopia are also discussed. This project report series document the on-going work of the RAMSAP project in Ethiopia and South Sudan.

This project is led by the International Center for Biosaline Agriculture (ICBA), Dubai, and is being implemented with the collaboration of the Ministry of Agriculture, Ethiopia; Ethiopian Agricultural Research Institute (EIAR) and Directorate of Research and Training (DRT), South Sudan. The authors are extremely grateful to Dr. Ismahane Elouafi, Director General-ICBA for her overall leadership and Ms. Seta Tutundjian, Director of Programs-ICBA for her guidance during the execution of this project. We are also thankful to H.E. Dr. Kaba Urgessa, State Minister of Agriculture, Ethiopia, Dr. Temesgen Desalegn, Director-EIAR, Mr. Tefera Solomon, Director of Soil Fertility, Ministry of Agriculture, Ethiopia, and Dr. Victor Bennet, Director General, DRT-South-Sudan for their continued support during the implementation of this project. The hard work and dedication of the research staff and field teams in Ethiopia and South Sudan is also highly appreciated.

The views expressed in this report are those of the authors and do not necessarily reflect the views or policies of ICBA.

© ICBA 2020

ICBA encourages the use, reproduction and dissemination of material in this report except where otherwise indicated. Material presented in this report may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of ICBA as the source and copyright holder is given and that ICBA's endorsement of users' views, products or services is not implied in any way.

Table Of Contents

1. ACRONYMS	03
LIST OF TABLES	04
LIST OF FIGURES	05
EXECUTIVE SUMMARY	07
1. INTRODUCTION	09
2. ROLE OF WOMEN IN AGRICULTURE IN ETHIOPIA	12
2.1 EXTENT OF WOMEN PARTICIPATION IN AGRICULTURE IN AFRICA	12
2.2. WOMEN PARTICIPATION IN AGRICULTURE IN ETHIOPIA	13
2.2.1 Women and crop production	13
2.2.2 Women and livestock	14
2.3 WOMEN PROBLEMS IN ETHIOPIAN AGRICULTURE	16
2.3.1 Gender, land and water	16
2.3.2 Access to agricultural inputs by women	18
3. DESCRIPTION OF STUDY AREAS	21
3.1 AMIBARA DISTRICT OF THE AFAR REGION	21
3.2 FANTALLE DISTRICT OF OROMIA REGION	19
3.3 RAYA ALAMATA DISTRICT OF TIGRAY REGION	19
3.4 SHOWA ROBIT DISTRICT OF AMHARA REGION	20
4. METHODOLOGY	21
4.1 CONCEPTUAL MODEL OF THE EVALUATION	21
4.2 THEORY OF CHANGE	21
4.3 METHODOLOGICAL APPROACH AND DESIGN	23
4.3.1 Sampling design	24
4.3.2 Data analysis, interpretation, and presentation	24
4.3.3 Considerations of ethics, gender and human rights	25

5. RELEVANCE OF RAMSAP PROJECT TO ETHIOPIA	26
5.1 ALIGNMENT OF RAMSAP WITH NATIONAL POLICIES AND SDGS	26
5.2 ALIGNMENT OF RAMSAP WITH THE LOCAL SALINITY PROBLEMS	28
5.3 WOMEN PERCEPTIONS ABOUT SALINITY AND ITS IMPACTS	30
5.3.1 Effects of salinity on natural environment	30
5.3.2 Effects of salinity on socio-economic conditions	34
5.3.3 Effect on food security and health	39
6. SALINITY MANAGEMENT in ETHIOPIA	40
6.1 TRADITIONAL MANAGEMENT OF SALT-AFFECTED SOILS	40
6.2 ICBA INTERVENTIONS FOR THE MANAGEMENT OF SALT-AFFECTED SOILS	41
7. WOMEN EMPOWERMENT IN ETHIOPIA	44
7.1 GENEALOGY OF GENDER IN AGRICULTURE AND ENVIRONMENT	44
7.2 GENDER GAPS IN AGRICULTURAL PRODUCTIVITY	45
7.3 WOMEN IN AGRICULTURE IN THE TARGET AREAS	46
7.4 ATTITUDINAL ANALYSIS OF RESPONDENTS ON WOMEN EMPOWERMENT	48
8. CONCLUSIONS AND RECOMMENDATIONS	50
9. REFERENCES	51
Brief about the RAMSAP Project	55

Acronyms

AIS	Amibara Irrigation Scheme
DAC	Development Assistance Committee
FTC	Farmers Training Center
FAO	Forest and Agricultural Organization
FIBID	Fantalle Irrigation Based Integrated Development
ICBA	International Center for Biosaline Agriculture
IAS	Irrigation associated salinity
GAS	Groundwater Associated Salinity
GTP	Growth and Transformation Plan
NAS	Non-groundwater associated salinity
OECD	Organisation for Economic Cooperation and Development
RAMSAP	Rehabilitation and management of salt-affected soils to improve agricultural productivity
UNDAF	United Nation Development Assistance Framework
WARC	Werer Agricultural Research center

List Of Tables

Table 1. Household consumption (regional median annual consumption per adult equivalent)	10
Table 2. Sample respondents for quantitative survey	24
Table 3. Relevance to national policy pillars and outcomes	26
Table 4. Relevance of RAMSAP project to selected international documents	27
Table 5. Descriptive statistics of the respondents.	28
Table 6. Socio-economic and health effect of salinity in target areas.	34
Table 7. Attitudinal analysis of women empowerment (n = 16)	49

List Of Figures

Figure 1. Map of the selected project sites	20
Figure 2: Major types of salinities based on salinization processes (Rengasamy, 2006)	30
Figure 3. Fantalle floods destroyed the first high school built in the area.	31
Figure 4: Salt accumulation in the upper soil layers in Werer Area	32
Figure 5. Shallow groundwater in Tumuga area of Raya Alamata	33
Figure 6. Cultivated lands near Showa Robit	33
Figure 7. Focus group discussions with farmers at Fantalle district	34
Figure 8. Focus group discussion with farmers at Werer site.	36
Figure 9. Individual interviews with women in Werer district	37
Figure 10. Individual interviews with women in Showa Robit area.	38
Figure 11. Farmer Field Days in different regions of Ethiopia.	41
Figure 12. A farmer is talking about seeds introduced by ICBA.	42
Figure 13. Path model of gender gaps in agricultural productivity	45
Figure 14. Gains from closing the gender gap in agricultural productivity.	46
Figure 15. Gender gaps in agricultural productivity in selected SSA countries.	47

EXECUTIVE SUMMARY

The soil salinity effects the natural environment in Ethiopia in two ways; (i) gradual change of upper fertile soil into saline soil; and (ii) waterlogging of farms due to rise in groundwater table depth as a result of excessive leaching from irrigation activities and other water bodies. In most of the target areas where irrigation is practiced, groundwater table has risen to 2-3 meters below ground surface. Consequently given the semi-arid climatic conditions of the area, flooding of farmlands has become a routine problem in many areas. The lands of these areas are constantly vulnerable to flooding because saline soils have limited capacity to absorb rainfall resulting in high runoff rates. This has caused significant amount of damages to roads, buildings, fences, dams, agricultural land and wetlands.

Soil salinity causes loss of land productivity which results in reduced farm incomes, food shortage and increased poverty. This situation has increased the rural unemployment and hardship of life. In order to win their daily bread many have opted to work as daily laborers rather than regular farmers. Hence, the short run effect of rural unemployment is migration of the family members to urban areas which has added to the prevalent problems of urban unemployment.

Most of the rural population do not have access to clean drinking water, which is causing huge health problems for communities particularly to women and children. The inhabitants reports that this water tastes like salt and people who drink this water gradually start to feel sick. Slowly this salty water affects their bones, especially back bones. Therefore when you walk around these areas, you will see many people have hunched backs and they literally cannot walk straight.

Despite difficulties, farmers in Ethiopia are continuing their efforts to reclaim their saline soils to improve their agricultural productivity. Traditional salinity management in the target areas includes application of natural fertilizer such as animal compost to the soil and draining irrigation water from the fields at appropriate times. Application of natural fertilizer is reported to have multiple purposes. The animal compost is used to dry the excessive water present on the surface of the soil either by flooding or from excessive rise of groundwater table. However, applying natural fertilizer to minimize the negative effect of salinity has not yielded significant results because of two reasons: the labor force required and shortage of compost. Furthermore, although application of animal compost helps in minimizing salinity problem, it is not the ultimate solution of complex salinity problems. Therefore it is largely regarded as a supporting mechanism for the rehabilitation of saline soil.

ICBA together with Ministry of Agriculture have introduced more than 20 food and forage crops that have capacity to grow successfully in salt-affected areas of Ethiopia. These include Quinoa, Cowpea, Sorghum, Barley, Lablab, and forages such as Panicum, Sesbania and Rhodes grass. These crops have the tendency to tolerate salinity, heat and uses much less water compared to local traditional varieties. ICBA scientists have also given training to farmers on how to prepare natural fertilizer (compost) and can be more productive in farming. The grain crops introduced by ICBA gave good harvest and can be used food for both humans and livestock. Farmers are also trying to grow Quinoa on their fields due to its high yields, salt-tolerance and nutritional superiority over traditional crops.

In line with other respondents, women in the target areas also stressed the effect of salinity in relation to reduced crop yields, increased production cost which is often not affordable for poor farmers resulting in poor crop yields. As a result, poor farmers are abandoning their lands to rich farmers who can afford the increased production costs. Most of the women respondents reported that only a small portion of their land is being cultivated whereas the rest has become abandoned due to salinity problems. The production cost has increased because they need to employ more labor and utilize additional fertilizers to get reasonable yields from these degraded lands. This has caused additional financial burden to poor farmers. The overall impact of this situation is increased food insecurity and household poverty. The Fantalle district was most hard hit by salinity resulting in food insecurity and health problems on women and children.

Women empowerment was also another cross cutting issue considered by ICBA in this study. Data from participants of the target areas including women shows that; (i) soil salinity has impact on productivity, health and food security of the farmers especially women and children; and (ii) overall attitude of the community on women empowerment is not hostile as they scored above average in likert scale attitudinal measure of women empowerment indicators. However, it was interesting to note that two of the four target areas (Raya Alamata and Showa Robit) have low performance in women involvement in agricultural activities. This is because women in these areas are expected to do unpaid domestic work. The prospects of women empowerment were found to be more promising in the Fantalle and Werer districts.

The results of focus group discussions reveals that in Fantalle and Werer districts women take part in farming while in Showa Robit and Raya Alamata women do not engage in farming even if they are household heads. This is more related to socio-cultural norms of these areas rather than any economic considerations. In the rural areas especially where the livelihood of the population includes pastoralism, most of the household work falls on the shoulders of the women. This makes them more vulnerable to salinity-induced health problems as they are subjected to more work pressure than men. This reduces their capacity to contribute in agriculture, although engaging women in farming can help in decreasing production costs, increasing farm income and reducing poverty. However, this requires motivation and incentives for women within their social norms.

Women involvement in agriculture largely depends on the societies' attitude towards women empowerment, which is not always as favorable as it should be. To examine this issue, we have made general attitudinal analysis of all respondents. The aggregate attitudinal analysis of all the respondents in all regions is above average (4.10; SD = 0.79) as the likert scale was coded from 1 to 5. The results of these attitudinal analysis indicate that in all areas, respondents have positive attitude in engaging women in farming and empowering them financially, socially and politically. However, still gender gaps in agricultural productivity in Ethiopia is 11%, which is lower than many neighboring countries. It is estimated that, in Ethiopia, closing the gender gap can increase crop production by 1.4% that can add US\$ 221 million in agricultural GDP. This shows that there is a great potential to improve agricultural productivity in Ethiopia by increasing the contribution of women in agriculture. This should include better access to agricultural land and credit facilities to buy agricultural inputs, assistance in reclaiming their salt-affected lands and better access to local and regional markets to sell their produce on competitive prices.



INTRODUCTION

In Ethiopia, 80% of the population lives in rural areas, out of which 98% is directly or indirectly depend on agriculture for food and livelihood security (CSA, 2016). Crop production and livestock are the most dominant sub-sectors, accounting for more than 60% and 20% of the agricultural GDP, respectively (Bekabil, 2014). Ethiopian agriculture is characterized by subsistence farming that is highly dependent on rainfall and extremely vulnerable to climatic shocks. As a result, vast majority of the population is in extreme poverty and faces persistent food shortages (Admassie and Abebaw, 2014). Therefore, increasing agricultural productivity is vital for the fast development of agricultural sector, which is challenged by many constraints including soil salinization.

The productivity of the agricultural production systems in the country is highly constrained by degraded soils and increasing incidences of drought due to climate change (Menale et al., 2010). Ethiopia ranks 7th in the world and stands first in Africa in terms of percentage of total land area affected with salinity. Out of the total area of 1.1 million km², 16 million ha (Mha) is cultivated and 20 Mha is permanent pastures (EPA & UNEP, 2008). Currently, about 11 Mha land is affected by salinity (8 Mha salinity and 3 Mha sodicity) (Qureshi et al., 2018). The increasing problems of land degradation and droughts are resulting in lower crop yields, reduced farm incomes and increasing food insecurity. For instance, it is reported that up to 15% of the Ethiopian population is chronically food insecure in different times of the year (Bekele et al., 2019). This requires designating more resources to minimize negative effects of soil salinity in the affected areas to boost crop productivity, ensure food security and improve rural livelihood.

Despite relentless efforts over the last two decades, Ethiopia is still one of the poorest countries in the world. In 2018, the Global Food Security Index (GFSI) ranked Ethiopia as 100th among 113 countries with food affordability, availability, quality, and safety. In this report, Ethiopia has been declared a state with 28.8% prevalence of undernourishment, 201 kcal/person/day of intensity of food deprivation, very low performance in diet diversification, food consumption as a share of total household expenditures and proportion of population under the global poverty line.

Poverty is still predominant, particularly in rural areas of Ethiopia (ERSS, 2013). The ERSS report states that a third of rural household face food shortage at least one month in a year. This figure drops to 21% for small town. Food insecurity get severe in the months of June to September and this seasonality is more prominent in rural than urban areas. The rural areas with more than 95% of the population depending on farming, are more vulnerable to poverty due to unfavorable climate conditions and low soil fertility. The welfare of household is often measured by the consumption or spending they make. The median consumption in the rural areas of Ethiopia increased by 7% during 2011-16 compared to 32% in the urban areas (World Bank, 2018). Similarly, the real consumption levels in 2015/16 were 43% higher in urban than in rural areas. The overall consumption increased in urban areas except for Afar and Amhara regions (Table 1).

The National Planning Commission's poverty report, also shows that urban poverty decreased by 11 percentage points between 2011-16 compared to only 5 percentage points in rural areas (FDRE, 2017)

Table 1. Household consumption (regional median annual consumption per adult equivalent)

Region	Total			Urban			Rural		
	2011	2016	Change (%)	2011	2016	Change (%)	2011	2016	Change (%)
Tigray	9,308	10,749	15.5	13,786	15,665	13.6	8,604	9,705	12.8
Afar	9,031	8,503	-5.9	11,317	15,339	35.5	8,277	7,892	-4.7
Amhara	9,395	9,219	-1.9	10,289	16,095	56.4	9,301	8,758	-5.8
Oromia	9,748	10,993	12.8	10,758	14,090	31.0	9,615	10,894	13.3
Somali	9,197	10,195	10.9	11,052	12,143	9.9	8,868	10,128	14.2
Benishangul-Gumuz	9,671	10,641	10.0	11,640	14,659	25.9	9,506	9,971	4.9
SNNPR	9,278	9,972	7.5	10,308	14,089	36.7	9,169	9,692	5.7
Gambella	9,134	11,382	24.6	10,304	13,862	34.5	8,837	10,210	15.5
Harari	11,255	16,739	48.7	12,448	18,392	47.8	10,638	15,607	46.7
Addis Ababa	10,377	12,718	22.6	10,377	12,718	22.6	-	-	-
Dire Dawa	9,610	12,203	27.0	9,540	15,876	66.4	9,733	11,280	15.9

Sources: Household Consumption Expenditure Surveys 2011-16 (World Bank, 2018).

The low welfare index in smallholder farmers is attributed to the fact that agricultural production is mainly used to secure food for home consumption and to generate cash to meet other needs such as clothing, farm inputs, and other expenditures (Bekabil, 2014). The average landholding in rural areas of Ethiopia is 1.38 ha per household, which shows small and fragmented nature of farm land ownership (CSA, 2017). Though this figure varies across regions and gender, the small land size per household shows that in areas with low soil fertility either because of salinity or acidity, special attention must be given for increasing agricultural productivity (Bekabil, 2014). This emphasis is desirable because: (i) smallholder agriculture is the most important sub-sector of Ethiopia's economy; (ii) there remains a high prevalence of poverty among smallholder farming communities; and (iii) there is a large potential to improve crop and livestock productivity using proven, affordable and sustainable technologies (Chipeta et al., 2015).

With the financial assistance of International Fund for Agricultural Development (IFAD), ICBA is implementing a project on "Rehabilitation and management of salt-affected soils to improve agricultural productivity (RAMSAP)" in the arid and semi-arid regions of Ethiopia. In addition to others, RAMSAP project is aimed at increasing crop productivities of the targeted areas by introducing alternative soil tolerant crops and fodders. Different food and forage crop genotypes are being evaluated for their suitability in salt-affected areas of different regions of Ethiopia. The ultimate impact of the project would be the improved livelihood of poor rural communities and pastoralists in salt-affected areas.

Through this project, ICBA is also attempting to address issues of rural women empowerment who make essential contributions to agriculture and rural economy of the country. Rural women often manage complex household tasks and pursue multiple livelihood strategies particularly when they are threatened by adverse environmental factors such as soil salinity and droughts.

Thus understanding practical undertakings as well as attitudes of both men and women regarding women engagement in agricultural labor, accessing and controlling the finance of the household, engaging in important social, economic and leadership roles are key inputs for policy decisions regarding women empowerment. The aim of this study is to understand women perceptions about soil degradation and to document their response about the impact of RAMSAP project in solving soil salinity problems in the target areas. Challenges of empowering women in the rural areas of Ethiopia are also foci of this study.

The specific objectives of this study were to:

- Record the multi-dimensional effects of soil salinity in project sites;
- Identify and document the way forward to overcoming soil salinity;
- Identify and document the prospects and challenges of making women beneficiaries in the project; and
- Identify and document substantive lessons learned and good practices with the aim of supporting the sustainability of the RAMSAP project.



ROLE OF WOMEN IN AGRICULTURE IN ETHIOPIA

2.1 Extent of women participation in agriculture in Africa

Women contribute significantly to agricultural and rural economies of all regions of the world. In the EU, agriculture is the 7th largest employer of women. In Greece, 38% women (of all family workers in agriculture) are employed in agriculture whereas in Portugal, 50% of the agricultural workforce is female (FAO, 2014).

Throughout the South Asian region, women account for 39% of the agricultural workforce (from managers of land to agricultural laborers). In India, average contribution of women is estimated at 55% to 66% compared to 70% in China (Chayal et al., 2013). Women in Latin America also contribute significantly to food production.

In Africa, 80% of the agricultural production comes from smallholder farmers, who are mostly rural women. According to FAO (2014), women contribution to agriculture is 60- 80% in Benin, 48% in Burkina Faso, 80% in Congo, 30% in Sudan and 50% in sub-Saharan Africa (40% in Southern Africa to 50% in Eastern Africa). Currently, 80% of food stuff in developing countries of Asia and Africa and more than 50% in the world is produced by smallholder women farmers (Devender and Krishna, 2011; Shafiwu et al., 2013). Despite their large contribution, they do not have access and control over land and productive resources. Therefore, the magnitude and exact nature of their contributions is difficult to assess and demonstrates a high degree of variation across countries.

Women participate in activities related to crop production, livestock ranching, food processing and preparation, fetching water and collecting fuel-wood, off-farm work for wages, caring for family members and maintaining their homes. In sub-Saharan Africa, 70-80% of the work related to food production, harvesting and marketing of farm produce is performed by women. However, their contributions are often invisible and underestimated. The contributions of women are often faced by gender-specific challenges to full participation in the labor forces, which may require policy interventions beyond those aimed at promoting economic growth and the efficiency of rural labor markets. Women wages are low due to the perception that the efficiency of women's labor is low compared to that of men. Therefore, women have to work longer than men to achieve the same level of living (IFAD, 2011).

The agriculture sector in Ethiopia is central both for overall economic performance and poverty alleviation of the country. There are about 12 million smallholder households, which accounts for 95% of the agricultural GDP and 85% of employment. In Ethiopia, share of women in agricultural labor force is about 48% and account for 70% of the household food production (Shafiwu et al., 2013). The role of women is critical within the household and outside of the household and in the development context. It is also estimated that about 79% of rural women in Ethiopia work 13-17 hours per day almost two fold of men (Nahusenay and Tesfaye, 2015). However, women suffer from socio-cultural discrimination and have fewer opportunities compared to men for personal growth, education, employment etc. There is no equity in the distribution of power and decision-making between men and women at all levels of the government structure and local institutions. At the household level, most of the decision making regarding selection of crops to be grown, marketing of produce and field expenses on equipment etc. are also done by men.

2.2. Women participation in agriculture in Ethiopia

Rural women in Ethiopia represent an enormous productive resource in the agricultural sector. They are major contributors to the agricultural workforce, either as family members or in their own right as women heading households. About 88% of the women live in rural areas; nearly 85% of their labor is spent on agricultural activities such as food processing, storage, weeding, harvesting, marketing produces, preparing threshing fields and animal husbandry (Woudnesh, 2000; Gashaw, 2016). Gender studies on division of labor reveals that women contribution in agriculture in most of the sub-Saharan African countries has increased to 50% in 2016 from 45% in 1980 (Zewdu et al., 2016).

2.2.1 Women and crop production

In Ethiopia, about 12 million smallholder farmers produce around 95% of agriculture production, with more than half of them holding one ha or less of land. The main crops include coffee, cereals, maize, sorghum, wheat, barley and millet. Cereals accounted for 71 % of the total cultivated area, produced 66% of the total crop production during 2013 (CSA, 2013) and contributed 70% of the agricultural GDP (FAO, 2014).

Both male and female landholders take part in cereals production. However, the percentage share of female holders in cereal production is, on average, lower than the percentage of male holders. Since cereals are considered as field crops unlike other crops grown on homesteads, their cultivation by female holders may not be convenient vis-à-vis their busy domestic work (Kasa et al., 2015). For example, the fraction of female holders who take part in teff production is 27% compared to 41% by male holders. This may be attributed to higher labor requirements for teff cultivation including land preparation, harvesting and other agronomic practices. The proportion of female holders involved in wheat and barley production is also lower than their male counterparts because a large proportion of these crops is sold in the market to earn money to meet other household needs.

Pulses are the second most widely cultivated crops in terms of area coverage and output. Oil crops are produced for domestic market as well as for export. Accordingly, the share of pulses in foreign exchange earnings is the second highest after coffee, accounting for approximately 16% of total export earnings (EEA, 2012). However, like other crops, the proportion of female holders involved in pulses and oil crops production is much lower than their male counterparts. Even the gender gap is wider for pulse and oil crops production with an average value of 0.66 for female to male ratio, as compared to the average 0.80 female to male ratio for cereal crops. This is consistent with the findings of Aregue et al. (2010) who argue that women's preferences for crop varieties differ from that of men in Ethiopia, and that women tend to produce types or varieties that are mainly used for domestic consumption.

Vegetable production is not much common among most of the rural farm households. Most of the vegetables are produced in peri-urban areas. Green and red peppers, cabbage, and tomatoes are the dominant vegetables grown in the country. Like in the case of other crops, the percentage

share of male holders involved in the production of vegetables is also higher than the share of female holders. However, the gender gap in this case is much narrower than in other crops, with an average female to male ratio of 0.77. This is mainly due to the fact that most vegetables produced by the smallholders are cultivated at the homesteads.

Fruit cultivation covers 0.5% of the total farmland and produce only 1.6% the total crop production. The proportion of female holders who produce fruit is lower, on average, than the share of male holders. But the gender gap in this case is even narrower than in the case of vegetables, with a female to male average ratio of 0.91. There has been a larger gender gap in banana and orange production compared to other fruit crops, which may be related to their volume of production and level of commercialization as they entail male domination.

2.2.2 Women and livestock

Ethiopia is believed to have the largest livestock population in Africa. The estimated cattle heads in Ethiopia are about 53.4 million, including 10.7 million dairy cows, 25.5 million sheep, 22.9 million goats, 6.2 million donkeys, 2 million horses, 1.1 million camels, 49.3 million poultry, and 5.1 million beehives. Almost all cattle, sheep and goats are indigenous breeds with low productivity (CSA, 2010/11). Aregue et al. (2010) found that both men and women in Ethiopia prefer local dairy cattle and small ruminants for fattening because of their low feed requirements and high adaptability.

The proportion of female holders participating in some form of livestock production is about 5% lower than the share of male holders. There is a clear gender disparity in cattle ownership, with a female to male ratio of 0.73 in the average size of livestock holding. The number of total livestock (measured in Tropical Livestock Units (TLU)), owned by female holders was found to be 25% less than the number owned by male holders.

Goats and sheep are the main source of cash earnings or income for a considerable number of rural households, particularly during crop failure and off harvest seasons. Traditionally it was believed that small ruminants were considered the female domain. However, on average, the proportion of female holders who owned sheep was less than that of male holders with a female to male ratio of 0.85. Similarly the proportion of female goat holders is less than that of male holders with a female to male ratio of 0.77. The gender gap in the case of goats' ownership was greater than the gender gap in the case of cattle (Kasa et al, 2015). As it is generally believed that poultry production is in the female domain, 58% male and 51% female holders are involved in poultry production. The gender gap in the number of poultry owned by both females and males was significantly lower when compared with cattle and small ruminants.

Njuki and Sanginga (2013) found that women are more likely to be considered the owners of small livestock compared to larger livestock, and to have a say in the disposal and sale of their livestock and its by-products, and in the use of income accrued from the sales. Despite their significant roles in livestock production, women's control over produce has gradually declined. Productivity has increased and more and more products (including dairy) have been marketed through organized groups such as cooperatives, whose membership is predominantly male. This situation is especially prominent in the areas of the country where livestock production is commercialized.

Hence, women in all circumstances of class and marital status single, married, divorced and widowed-participate in different agricultural activities. In the rural areas of Ethiopia, women are engaged in variety of activities including the construction of houses, land cultivating and harvesting, food storage and marketing (Regassa, 2009). However, their contributions in the agricultural sector has often been erroneously documented as marginal and they have been considered more as consumer than producers.

Women are generally given secondary status within the family and in the society and regarded as an appendage to the family. The female role in agricultural production is dominant because the country is sparsely populated and agricultural mechanization is almost non-existing. Therefore, more human labor is needed to accomplish the field tasks. This forces farmers to involve women and children in agricultural activities. This reduces their expenses on labor and increase their on-farm income. However, the important roles they play have not always been recognized.

Without, equal opportunities, they have lagged behind men in all fields of self-advancement. Economic development is unthinkable without women participation; however, because their participation in the economy has not been valued Ethiopian women have not received even their share of the nation wealth (Melese, 2011). The farm income is used to cover household expenses of the family. However, the decision regarding the use of this money lies with men and women are usually consulted. In this way, women remain cash starved and dependent on men to meet their financial needs.

Moreover, the role and the contribution of both male and female, in the agricultural activities, is not necessarily the same in all parts of the country. Since Ethiopia is the country of multi-ethnic and multicultural groups, all ethnic and cultural groups have different gender roles in agriculture. In Amhara region, for example, women do not plough land but assist their husbands in supportive tasks except harvesting. They feed their husbands, fetch water to men and livestock during agricultural field work, help men during threshing and make grain seeds ready for sowing. Land preparation, weeding, harvesting, threshing and storing have been some of women's primary responsibilities. In most cases, women are also in-charge of herding, tending sick animals, watering, barn cleaning, milking and milk processing.

On the other hand, the women of Awra Amba, Southern Gonder of the Amhara region, have no specific role in agriculture. They equally participate with men in all agricultural activities. They plough the land with oxen while men perform domestic activities at home. The division of labor, in this area, is based on age rather than sex. Hence, both women and men are equally considered as producers and have equal position in agricultural production and decision making. In Southern Nations, Nationalities and Peoples' Region, the participation of women in agricultural activities is common. According to Sintayehu (2011), manuring, harvesting, storing are exclusively the tasks of women. However, women are culturally prohibited from activities such as ploughing, hoeing, sowing and weeding. They are not also allowed to use farm instruments like plows, hoes and sickles. In this area men are engaged in production of both food and cash crops.

In the South-East Shoa administrative zone of Oromia region, women's involvement in agricultural production is not much different than the Amhara region (Regassa, 2009). Ploughing is entirely men's activity because there is a belief that 'if women cultivate, there will be no rainfall'. Therefore, clearing the farming land, tilling, sowing, preparing the threshing floor and farm implements are all carried out by men. Other activities like weeding, digging and storing are shared with women. Women participation in the field does not seem a common norm in the area though not strictly forbidden. In all these activities, women receive no remuneration for their labor, no monetary or material gains and no benefit in luxury time and improving their living condition. There should be some remuneration to recognize their productive services and involvement in decision making to motivate them to produce efficiently and use their energies more meaningfully (Yigremew, 2011).

2.3 Women problems in Ethiopian agriculture

2.3.1 Gender, land and water

Gender gap in decision making leads to inequality in access to resources and differential treatment given to women and girls as compared to men and boys (Bogalech et al., 2000). Land is one of the essential productive resources for agricultural production. The productivity and efficiency of the rural labor force is based on the degree of access and control over the natural resources. In Ethiopia, land and natural resources ownership is vested in the State according to Article 40 of the 1995 Federal Constitution. Citizens, both men and women have use rights and inheritance of use rights, and this include a short term lease. The Federal Constitution, as well as all regional land proclamations, stipulates that the existing land rights are to be granted equally to men and women. Land-use rights do not include mortgage, collateral, change or exchange.

FAO (2014) shows that only 19.2% female agricultural landholders has access to agricultural resources compared to 80.8% of male agricultural holders. This pattern of agricultural holding demonstrates a gender gap in the management of agricultural holdings, identifying the extent to which women and men have the management responsibility of agricultural production resources. This incidence of landowners adds further nuance to the sex disaggregated statistics on land by showing the share of women (12%) out of all women and the share of men (28%) out of all men in the country who own agricultural land.

According to the FAO (2014), women's rights to land were sidelined despite the legal provisions that envisage joint ownership of husbands and wives. Moreover, widows, divorced women and polygamous wives are not taken into consideration. Despite constitution guarantees women's rights upon dissolution of marriage, in reality the only way for widows or divorced women to secure their rights to land is to enter into marriage with one of their brothers-in-law. Indeed, if women return to their natal homes, they will not be provided for lands because traditional inheritance and marriage practices envisage that a woman's right to land resides with her husband in the eastern, southern and south-western parts of the country. Land reforms in the form of registration and certification which aims to improve tenure security for women are not yet fully enforced in practice. The traditional gender bias against women cultivating their own land leads single women to depend on male assistance or on renting and sharecropping their land.

Mogues et al. (2009) found that important gender asymmetries in de facto access to and control over land still exists. Upon forming a new household through marriage, women bring only a negligible amount of land into the household, and nearly all land is brought in by the male spouse, suggesting high intra household land inequality at the initial stage of a household. Traditionally, this inequality in land has been perpetuated later in the household's life cycle, upon the death of the spouses' parents. Husbands nearly always inherited land when their parents died, whereas wives very rarely inherited their parents' land. However, more recently women have started inherited lands from their parents in the Tigray and Amhara regions (Mogues et al, 2009). On the other hand, women in Oromia, Gambella, Afar and the Southern Nation, Nationality and People (SNNP) regions have no right to own land (FAO, 2019). This is because a household was considered as a unit for land distribution in these regions and only heads of households were registered as members of the peasant association (Gebrehiwot, 2007).

In Ethiopia land rights have been and continue to be one of the most contentious political issue. Prior to the agrarian reform of 1975, farmers gained access to land through inheritance or through corporate groups and have the right of inheritance and the ruling class women received land as gifts and or were able to purchase land. However, the land reforms introduced in 1975, land distribution was done by family size and registered under the name of male family head. As a result, most women failed to obtain rights to possess land. The situation was more complicated for women in polygamous unions, divorced and for those who came of age after the initial land apportionment. After the transitional period (1991-1994), there was a lack of clear legal and policy directives on land ownership, which was addressed in the Constitution of 1994. This states that women have equal rights with men with respect to access, use, administration and transfer of land. They shall also enjoy equal treatment in the inheritance of property.

There are three mechanisms, for both women and men, for obtaining rights to land: (i) through social and kinship relations at the local level; (ii) on the land market, or (iii) from the state. There are four categories of legal rights to land that affect women. These are (1) the rights women hold in marriage (shared tenure); (2) the right to land when the marital household changes through polygamy, divorce, or abandonment; (3) the right to receive land through inheritance; and (4) the right to purchase land. In the absence of land ownership, women cannot get agriculture credit because banks require some form of guarantee of repayment and since women do not own either the land, equipment, or the produce it is more difficult for them to qualify for a loan.

Women are usually not involved in heavy tasks during the construction of irrigation facilities. They are not represented in Water User Associations and are not considered to be part of the training in operations and maintenance of irrigation systems. Although due to less mobility compared to men, women are better suited to maintain and manage such facilities. Women in rural households are involved in some form of processing of farm produce but mainly for home consumption. However, their major constraint is accessibility in terms of roads and transport, equipment for processing of foods, lack of knowledge about preservation and storage techniques, and diversifying the types of foods processed. If they are provided with these facilities, their work efficiency and incomes can be increased significantly.

2.3.2 Access to agricultural inputs by women

In Ethiopian smallholder agriculture, draught animals, especially oxen, are the principal source of power for pulling ploughing tools during land preparation, threshing and transporting crops during harvest. Traditionally a pair of oxen is used for pulling ploughing tools and carts for transporting. There is a large gender gap in owning this decisive asset: For instance in a recent national survey, it was found that only 42% female owned one or more oxen compared to 74% for their male counterparts (CSA, 2013;Kasa et al, 2015).

Although the use of improved seeds has been promoted for the last couple of decades in the country, the rate of application for improved seed, in general, remains low. Study have shown that the proportion of female holders who applied chemical fertilizers is about 50% compared to 58% male holders. There is also a high need to irrigate crops for increased production because agriculture in Ethiopia is mostly characterized as rainfed agriculture. Despite this need the use of irrigation by smallholder farmers in crop production season is less than10%. The proportion of female holders who use irrigation is 5% compared to 8% for male holders (Kasa et al 2015).

Studies have also been conducted to assess the existing gender disparities in applying agronomic practices (CSA, 2013; Kasa et al, 2015; FAO, 2019). These practices include access to crop production advisory services, use of crop extension packages, and application of good practices such as row planting and crop rotation. FAO (2019) reports that 41% of female holders and 46% of male holders use row planting. The low adoption of row planting by female holders can be attributed to higher labor demand (Vandercasteelen et al., 2014). Furthermore, women do not plough the land due to customary gender roles although they have access to land and draught power in terms of ownership. A study by FAO argues that if women were to have access to the same level of resources as men, agricultural productivity would go up by 30% and the agricultural output would increase by up to 4% (FAO, 2011).

In Ethiopia, women has dual responsibility of farm and household tasks. Women on average spent 26 hours per week on agricultural production in addition to their other household duties which include food preparation for family consumption, grain grinding, fetching water and fuel, washing clothes and house cleaning (Harun, 2014). Women of all age groups participate in these activities. However, level of engagement changes with the age.

Rural development in Africa cannot be imagined without the active participation of women. Women are poor because they have fewer economic opportunities and less autonomy than men. Their access to economic resources, education and training and support services are limited. They also have very little participation in decision making. The rigidity of socially prescribed roles for women and tendency to scale back social services have increased the burden of poverty on women (Shafiwu et al., 2013).



DESCRIPTION OF STUDY AREAS

RAMSAP project targeted selected communities of the arid and semi-arid areas in Ethiopia. Four sites (Amibara District of Afar Region, Fantalle District of Oromia Region, Raya Alamata District of Tigray Region and Showa Robit District of Amhara Region) were selected for this study. The RAMSAP project was used as a unit of analysis for this study. Farmers living in these areas were taken as sample clusters and were sampled as units of data collection. A brief description of study areas is given below.

3.1 Amibara District of the Afar region

Amibara District of the Afar Region is located 280 km to the northern east of Addis Ababa at an average altitude of 740 masl and 9°20'31" N latitude and 40°10'11" E longitude. The climate of Amibara area exhibits typical characteristics of semi-arid environment. The mean minimum temperature is 15.2°C in December and 23°C in June, while the mean maximum temperature is 32.5°C in December and 38°C in June for cool and main season, respectively. The mean annual rainfall is about 533 mm. Rainfall of the area is very erratic and scarce occurring two or three times yearly and hence not dependable for crop production. Amibara Irrigation Scheme (AIS) project, which is the result of the plan of the countries water sector policy, was established in 1964 to irrigate 16,000 hectares of land for states farm and also smaller holder farmers. The major crops grown is cotton and sugar cane with minor crops including maize, sesame, rice, wheat, date palm, banana and vegetables in some areas of Werer Agricultural Research center (WARC).

3.2 Fantalle District of Oromia Region

Fantalle District of Oromia Region is the second site for the project. It is located 200 km to the east of Addis Ababa at an average altitude of 1089 masl and latitude of 8°48' N and 39°4' E longitude. The climate of Fantalle area exhibits typical characteristics of semi-arid environment. The yearly maximum temperature ranges from 30 to 39°C while the minimum temperature ranges from 10 to 22°C. The mean annual rainfall is about 553 mm. Rainfall of the area is also very erratic and scarce occurring two or three times yearly and hence not dependable for crop production. Fantalle Irrigation Based Integrated Development (FIBID) project was established in 2010 to irrigate 18,000 ha of land for smallholder farmers & more than 5,000 ha of land has been irrigated so far. In this area, improper irrigation mechanisms and excessive irrigation on the agricultural lands has contributed to soil salinity.

3.3 Raya Alamata district of Tigray Region

Raya Alamata district of Tigray Region is located 600 km to the east of Addis Ababa at an average altitude of 1520 masl and 12°56'54" N latitudes and 39°14'35" E longitudes. The climate of Raya-Alamata area is arid to semi-arid. The annual rainfall, minimum and maximum temperatures collected from NMSA (1997-2019) show that, it is 663.12 mm, 14.70°C and 28.17°C, respectively. Raya valley is one of the most agriculturally productive areas in the Tigray region. The major crops grown are Teff and sorghum which covers 75% of the cultivated crop.

3.4 Showa Robit district of Amhara Region

Showa Robit district is found in the North Shoa zone of the Amhara region within the Awash River basin in the Rift valley system, 235 km northeast of Addis Ababa. The district is classified as hot to warm moist agro-ecological zone with a mean annual rainfall of 1000 mm and temperatures ranges from 17°C to 32°C. The soil of this area is typically dark gray when dry and very dark gray brown when moist with a clay texture. The clay is montmorillonite type, which has high shrinkage capacity when dry and high swelling when wet. The district is widely irrigated through springs, the river Jeweha and its tributaries. The area is mainly cropped with teff, sorghum, onion, maize and tobacco. With increased irrigation activity in the area after the establishment of the tobacco industry, signs of soil salinization are becoming prevalent in many areas. Figure 1 shows the map of ICBA project target areas. But in this study Fantalle District was included in th sample for assessment as this sit e was later included in the project as the main affected areas by salinity.

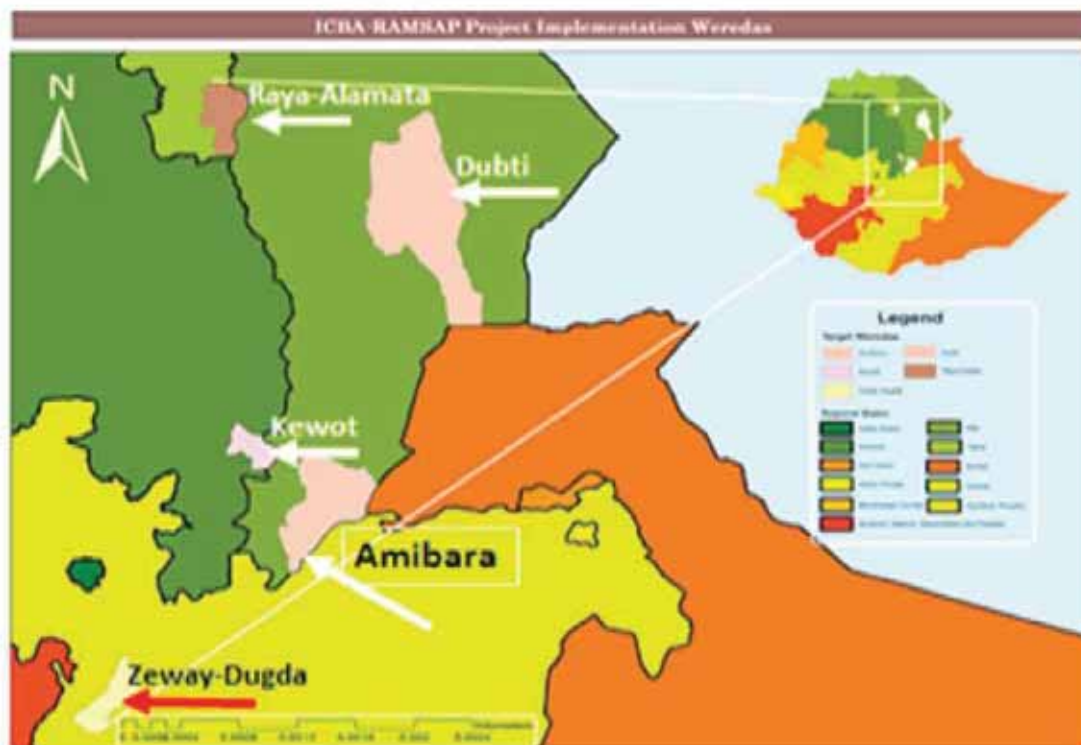


Figure 1. Map of the selected project sites



METHODOLOGY

4.1 Conceptual model of the evaluation

As all interventions have different effects on women and men, this study integrates a gender perspective in the whole cycle of study – from the evaluation criteria to the definition of the key questions of the evaluation. This study considered different dimensions underlined in the gender analysis. This assessment focused on the inclusion of needs, labor division, women's and men's roles in decision making and leadership, time-use, different access to and control over resources, benefits, and services by women and men. The conceptual model of reference that informed this evaluation was, therefore, the women empowerment continuum model, which is participatory, ensures ownership of stakeholders and beneficiaries as well as includes the theory of change in the context of results and operationalizes women empowerment as a process of change in relations at institutional and individual levels.

The study applied criteria and key evaluative questions in two result areas. First, broader development results (enabling environment, livelihood outcomes and changes in mediating institutions) were assessed; and second, project specific results. Both processes and result-level outputs are evaluated. The criteria for the impact study includes design (relevance), processes (efficiency of time, resource and management arrangement, ownership, and coordination) and results (effectiveness, sustainability and the impacts) of the project on rural women's empowerment.

4.2 Theory of change

The theory of change assumed in this project is that rural farmers with salt-affected areas including women increase farm productivities. In the context of this, the theory of change is that by strengthening rural women's access to resources for agricultural activities, entrepreneurial inputs, and coping mechanisms at the household levels, interventions can achieve inclusive growth by also harnessing women's contribution to, and benefit from the economic growth anticipated in line with national, regional and local level policies and plans. The theory of change for the project identifies three areas where change needs to happen for progress to be made on gender equality and the empowerment of women. For gender equality to happen: (1) changes need to take place at the individual level, where individual capabilities have to change; (2) changes must happen within institutions (changes in standards, norms, and practices) so that they promote gender equality and ensure equitable service provision; and (3) changes are required at the community level, where norms, attitudes and practices that often undermine gender equality must be challenged.

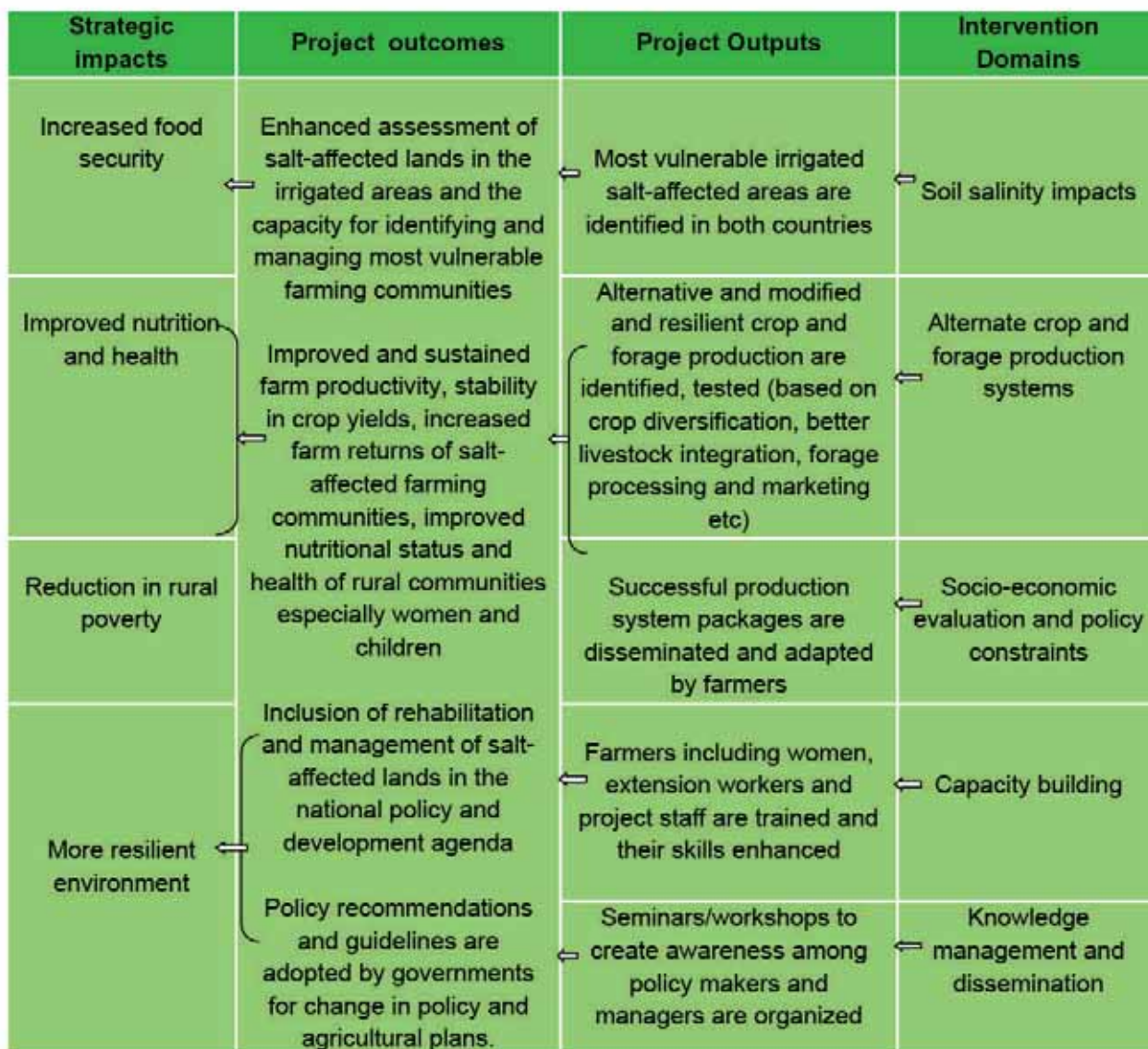
In order to achieve the change, the project needs to adopt a multi-sectoral and comprehensive approach taking place at three levels which reinforce and support each other by maintaining horizontal linkages using various entry points at the implementation level. The project interventions should build individual skills and provide inputs for rural women to manage and expand their smallholding farms and by doing so, the farm productivity will be increased. The

development of such skills/capacities and support is assumed to effect in changes at the individual level such as individual women improve livelihoods, food security, nutrition, and capacity to engage with formal institutions to access more benefits as well as influence decision-making processes at household and broader levels.

The project in this respect implemented community awareness, increased the capacities of rural institutions and research institutions, by delivering financial and non-financial services in associations with local government bodies. These supports are assumed to result in sustainable livelihoods and ultimately contribute to women’s empowerment.

In a nutshell the project contribution is assessed with the fraermwork as shown in the diagram 1.

Diagram 1: A schematic illustration of impact way for RAMSAP project



4.3 Methodological approach and design

To produce the deliverables, following methodological assumptions were considered: (1) uniform data collection tools were designed considering the qualitative and quantitative data required for substantiation of projects results; (2) farmers in selected areas of the project were used as sample respondents of the survey questionnaire; (3) project documents including reports from ICBA and participating organizations were reviewed; (4) the baseline survey and feasibility study reports were compared with the results of the current cross-sectional survey.

This study process employed:

- A mixed methods approach with qualitative-quantitative concurrent design was used to collect validated information during the data collection process. The concurrent design considers the collection of primary and secondary data in a parallel arrangement and develops associations of variation in data to generate and validate evidence in the process. Such validation of data and establishing associations in a step-by-step manner is important in gender research.
- A phased approach was employed to consistently generate substantive evidence and to organize data and conduct phase-by-phase data analysis. These include preparation phase which is related to the completion of desk review, the design of data instruments and validation. This phase also included the extensive review and finalization of the study design. The second phase is the fieldwork that includes the collection of primary and secondary data from interviews, survey, focus group discussions, case story note-taking and observation. This phase includes conducting preliminary data analysis, discerning key initial findings for further qualitative study for depth and developing recommendation points. The third and final phase was related to report writing, which includes a draft report, validation, and final report submission.
- The study used both desk review and direct evaluation techniques. Desk review entails the use of secondary evaluative information contained in the past reports of the project to the extent that the data are still relevant and valid. Meta-data evaluation includes a review of the project documentation including progress reports, regular monitoring data, a review of the outputs of the project itself and a review of reports, plans and legislation of relevance.
- The direct evaluation technique entails the use of individual and group interviews, farmer survey, case study, direct observations, focus group discussions as well as consultations from “user-side” and “supply-side” stakeholders.

The methodological and technical approaches above provided evidence-based knowledge on what works, why and in what context as well as when to collect and analyze data, substantiate evidence and report. The approaches chosen offers the opportunity to conduct a step-by-step assessment of outcomes, substantiate evidence on a broader level. The approaches also enabled one to write the study reports – evidence generated from criteria based, appropriate measurement and observation in the field.

4.3.1 Sampling design

In order to select the sample respondents (for the farmers survey and qualitative interviews), both probability and non-probability sampling techniques were employed. The first considerations for the sampling procedure are that the RAMSAP project targeted rural farmers/pastoralists from the four regions: Oromia, Afar, Tigray and Amhara regions. The second consideration was that the RAMSAP project delivered same products in all target locations. Therefore, a simple random sampling procedure was employed. The participants in the focus group discussions, key informant interviews, and case studies were purposively selected. The sample size is determined based on the reliability of estimates, the experience of similar surveys, cost and time constraint for the collection, management, and analysis of data as well as the objectives of the assessment. Sample size for quantitative and qualitative data is presented in Table 2.

Table 2. Sample respondents for quantitative survey

Districts	No.	Percent of total
Fantalle	20	25
Werer	20	25
Showa Robit	20	25
Raya Alamata	20	25
Total	80	100

The sample size for the qualitative data collection was decided on the basis of non-probability sampling techniques. From the non-probability techniques, availability and convenient sampling for beneficiary rural farmers including women were used. The convenient sampling was used to target rural farmers including women for case stories, focus group discussions and key informant interviews. This gives the chance to select men and women with special information and cases to respond to the checklist questions.

4.3.2 Data analysis, interpretation, and presentation

The data results from the fieldwork, document research, and meta-data content were analyzed using the models, the assessment and matrix and the corresponding questions. The qualitative data was analyzed using thematic narrations and establishing patterns along the categories. The meta-data was analyzed using thematic contents. Both data sets were summarized by checklists to ensure availability and authenticity. The quantitative data was analyzed using statistical tables, graphs, and charts of outcomes and outputs. In order to ensure data quality and evidence, data was cleaned before entering software (STATA 21).

Data collected from different methods and sources were used to cross-check the validity of evidence to the themes and response sets. The use of diverse approaches and frameworks would ensure the quality of evidence and practical recommendations. The data quality control and verification of evidence considered triangulation, stakeholder participation and on-field (comparative evidence from districts and participating partners) validation. The critical document

review, principled field observation and measurement and participation of stakeholders during data collection ensured the quality of data and ownership in the process. A systematic presentation of results along with the outcomes and evaluation matrix ensured the dependability of data, conclusions, and recommendations.

4.3.3 Considerations of ethics, gender and human rights

This assessment applied ICBA standards on ethics, compliance with human rights and gender issues. In the assessment process, due care was taken for ensuring the confidentiality of the responses of the participants and the protection of privacy of the participants. A field work protocol was prepared, and each interview and discussion sessions were undertaken by building rapport and the purpose of the collection of the information. In order to maintain power balance between individuals and ensure flow of information, without symbolic power pressure, ICBA stakeholders and farmers were separately interviewed.

The information from documents, interviews, discussions and survey results were systematically recorded and categories of narrative points were identified to systematically triangulate the data. In this respect, the similar questions were asked on the activities, outputs and limitations, as well as comparative information and perspectives, enhanced triangulation, cross-checking, and substantiation of evidence across the evaluation criteria. The participation of key stakeholders and project staff such as the coordinators and focal persons from the implementing and participating actors enhanced the credibility and the dependability of the evidence generated from the evaluation process.

Specifically, the participation of RAMSAP project coordinators, focal persons, and the farmers were essential in our ethical compliance to the issues of gender and human rights and leading us to technically and methodologically to reliable and "trust-worthy" data that were used in the assessment of RAMSAP project (in the framework of gender responsiveness and gender-related human rights in subsistence societies like in the research districts). The active engagement of the stakeholders in the assessment process enabled the stakeholders to reflect, analyze issues, identify what works and does not work, and to take responsibility for needed changes now in the assessment process and beyond. Therefore, participatory approach was implemented for this assessment process.



RELEVANCE OF RAMSAP PROJECT TO ETHIOPIA

5.1 Alignment of RAMSAP with national policies and SDGs

The relevance of the project to the national and international development goals can be assessed on two grounds. The first is on the analysis of the project alignment with national policy pillars and outcomes as well as international policies. The second is based on its relevance in addressing ground problem in the target areas. Accordingly, this section examines the project's relevance in relation to its alignment with national and international policy priorities, outcomes and standards. In terms of alignment to national policy pillars and outcomes, a summary is presented in Table 3.

Table 3. Relevance to national policy pillars and outcomes

Key national policies	Alignment and contribution to national policy pillars and outcomes
RAMSAP is aligned to national policy priority outcomes	The GTP-II program priorities emanate from the national policy priorities set out in the GTP-II (2016-20). The project contributes to increased agricultural production, sustainable conservation and utilization of natural resources (food availability), increased smallholder farmer income, and participation of women in all development processes and benefit from them.
RAMSAP is aligned to GTP-II pillars	The project contribute to the 5-year development plan of the government (GTP). Pillar-1: "Sustainable economic growth and risk reduction", Pillar-4: "Maintaining agriculture as major source of economic growth", and Pillar-7: "Promote gender and youth empowerment and equity".
RAMSAP is aligned to social protection policy outcomes of livelihood, addressing inequalities in getting basic services.	The project also contribute to the national social protection program (under implementation starting 2012), which focuses on access to social safety nets, support over livelihood and employment schemes and address inequalities of access to basic services by women and youth in Ethiopia. The loan and agricultural input support also contributes to the productive social safety net outcomes of this key national program.
RAMSAP is aligned to women's policy priorities such as changing the working conditions and institutional barriers of Ethiopian women (focusing on rural women).	The RAMSAP project outcomes contribute to National Women's Policy (under implementation starting 1993) – whose priority is improving the working and institutional conditions of rural women. The priorities of this policy are on facilitating equality between men and women, facilitating rural women's access to basic social services and to ways and means of reducing workload and eliminating step-by-step, prejudices, customs and other practices that limit women participation in decision-making process at all levels. RAMSAP outcomes related to decision-making power, participation in local institutions, access to services, gender sensitization etc. will contribute to this policy.
RAMSAP is aligned to gender Equality action Plan Priorities of women's economic empowerment, improving decision-making power & women's participation in institutions.	The RAMSAP outcomes contribute to the National Action Plan on gender equality (under implementation starting 2010) priorities. Its priorities include poverty reduction and economic empowerment of women & girls, education and training of women and girls, empowering women in a decision-making position and enhancing their participation in institutional mechanisms for the advancement of women. In this respect, the project outcomes contribute to increase in income (poverty reduction and economic empowerment), improvement in literacy and skills, improved rural women's participation in local committees, etc. are aligned to the action plan's priorities.

RAMSAP project is aligned to agricultural transformation agenda priorities & outcomes related to food security, agricultural productivity, demand-driven knowledge, and inclusive growth	The RAMSAP outcomes are aligned and contribute to priority outcomes of the Agricultural Transformation Agenda of Ethiopia. This includes provision of improved seeds, seedlings & livestock breeds for crop and livestock production and productivity, increased income and enhanced food security. The project also contribute to improving productivity (by supplying improved seeds, livestock breeds & inputs), demand-driven research & financing, market linkage, land management, and food security. RAMSAP project also contribute to the improvement of inclusive growth (gender equality and targeted livelihood support for selected population groups), and agrobusiness and market development (cooperative development, agro-processing and value addition).
--	--

(Source: National policy documents of Ethiopia)

The analysis made above shows that the RAMSAP project contributes to the broader policy outcomes and is aligned to the priorities of the government policies and plans. As Ethiopia is heavily dependent on agriculture for its economic growth, improvements in soil salinity and provision of seeds for alternate crops for salt-affected lands will contribute positively in achieving selected international development goals set for Ethiopia under SDGs and other documents such as OECD and UNDAF. The project is designed and being implemented keeping in mind these objectives. A brief summary of these alignments is given in Table 4.

Table 4. Relevance of RAMSAP project to selected international documents

Alignment to International Document	Alignment to selected International documents
Alignment to OECD/DAC Principles	RAMSAP project works according to OECD/DAC principles, which states that "where governments demonstrate political will, international actors and donors should align behind government policies."
RAMSAP project is aligned with the Ethiopia UNDAF 2012-2016	The RAMSAP project is fully aligned with the Ethiopia UNDAF 2012-2016 pillars on sustainable economic growth and risk reduction, with a strong focus on strengthening agricultural development, financial inclusion, and supporting vulnerable communities; on governance and capacity development; and also on women, youth, and children. Cutting across all UNDAF pillars are issues such as gender equality, the environment, and human rights, all of which are addressed through this project with its focus on promoting greater equity and supporting the inclusion the poor who are striving to change.
RAMSAP project is in alignment with SDGs	The RAMSAP project contributes to different SDG goals. These include Goal 1. End poverty in all its forms everywhere; Goal 2. End hunger to achieve food security and improved nutrition and promote sustainable agriculture; Goal 5. Achieve gender equality and empower all women and girls; Goal 8. Promote sustained and inclusive economic growth, full and productive employment and decent work for all.

(Source: Selected International Documents)

5.2 Alignment of RAMSAP with the local salinity problems

The relevance of the project can also be assessed from the fact that the identified problem exists in the targeted areas. For this study, data collected from farmer respondents in the form of survey, focus group discussion and observation was analyzed separately for each region. The descriptive statistics of the respondents is presented in Table 5.

Table 5. Descriptive statistics of the respondents.

	Fantalle	Werer	Showa Robit	Raya Alamata
Gender (men)	0.200 (0.414)	0.667 (0.488)	1 (0)	0.750 (0.447)
Age	30.07 (8.362)	36 (11.05)	39.50 (9.813)	44.87 (11.99)
Marital status				
<i>Single</i>	0.267 (0.458)	0.200 (0.414)	0 (0)	0 (0)
<i>Married</i>	0.667 (0.488)	0.533 (0.516)	1 (0)	0.750 (0.447)
<i>Widow</i>	0.0667 (0.258)	0.267 (0.458)	0 (0)	0.250 (0.447)
Educational status				
<i>Illiterate</i>	0.867 (0.352)	0.533 (0.516)	0.833 (0.408)	0.750 (0.447)
<i>Read and Write Informal</i>	0 (0)	0.0667 (0.258)	0 (0)	0 (0)
<i>Read and Write Formal</i>	0 (0)	0.133 (0.352)	0 (0)	0.250 (0.447)
<i>Secondary Education</i>	0.133 (0.352)	0.267 (0.458)	0.167 (0.408)	0 (0)
Family size	5.133 (1.642)	6.867 (2.774)	5.500 (1.643)	5.625 (1.408)
Total No. of livestock	7.857 (8.448)	28.60 (18.70)	7.500 (4.183)	7.438 (7.248)
Cows	2.714 (3.292)	4.733 (5.750)	3.667 (2.733)	3.750 (3.804)
Got and sheep	3.929 (5.903)	22.53 (16.76)	2.500 (3.332)	2.500 (3.899)
Land size	0.464 (0.489)	1.600 (0.930)	0.875 (0.754)	0.813 (0.574)
Land types				
Land type (poor)	0.750 (0.452)	0.400 (0.507)	0.167 (0.408)	0.625 (0.500)
Land type (Average)	0.167 (0.389)	0.267 (0.458)	0 (0)	0.250 (0.447)
Land type (Good & above)	0.0833 (0.289)	0.333 (0.488)	0.833 (0.408)	0.125 (0.342)
Observations	20	20	20	20

(Mean coefficients; SD in parentheses)

Table 5 shows that except for Fantalle district, majority of the sample respondents are male farmers. In Fantalle district, however 80% of the respondents are female farmers, which stand in sharp contrast with Showa Robit and Raya Alamata district in which the female participants were none and about 25% respectively. In Werer district as well women participation in the survey was only about 34%. In terms of age, respondents are within the productive age varying from 30 years of age in Fantalle to 43 years in Raya Alamata. In terms of household composition, Werer and Raya Alamata districts have the highest percentage of widows i.e. 27% and 25% of widows, respectively. However, for Showa Robit and Fantalle area, widow respondents were very low (0 to 7%). This shows that the hardship of life in salt-affected areas of Werer and Raya Alamata districts is higher due to the with existence of many single parents. Illiteracy is above 70% in all regions except for Werer district. This might be as result of existence of many migrants from other place that settled in this particular Afar region.

Werer district of Afar region has the largest family size with average of 6.87, while other three regions have family size of 5 to 5.50. Thus, as in other fertile soil rural areas of Ethiopia, salt- affected soil areas have smaller family size, probably because of the hostile environment and low life expectancy with widespread health problem induced by hostile environment.

In terms of livestock ownership, Werer district of Afar scores the highest number followed by Fantalle district. This is probably because of existence of widespread pastoralists who depend on animal rearing as means of livelihood in these two areas. Cows, goats and sheep are common animals. These animals are used to fulfill household demand of milk and other dairy products. They also serve as a last resort in the extreme circumstances such as drought. Many farmers sell these animals to earn necessary cash to meet their demands.

With regard to the quality of the land, the 75% respondents in Fantalle consider it very poor while majority of respondents in Showa Robit (83%) rated their land to be good and very good. In Raya Alamata, irrigated land is considered poor by majority of the respondent due to high groundwater table problems. These demographic characteristics of the respondents give an initial overview of the study areas and the relevance of the project to these selected areas.

Lack of effective drainage systems and poor on-farm irrigation practices are considered as the major causes of salinity problems. With the increasing interest in irrigated agriculture to boost agricultural production, problems of waterlogging and soil salinity are increasing in many areas. Farmers usually do not have sufficient knowledge and resources to address these issues. As a consequence, these problems are expected to increase in near future. The mismanagement of irrigation water which exacerbates the salinity of the soil has multidimensional effect on these areas. In this assessment, we breakdown the reported effects into two stages; effect on natural environment and socio-economic related effect on the inhabitants. The second stage can further be understood by decomposing the effects first from the point of view of farmers, and then on the rest of the inhabitants who are not directly dependent on farming.

5.3 Women perceptions about salinity and its impacts

5.3.1 Effects of salinity on natural environment

Fantalle District

According to data collected via observation and focus group discussion, the natural environment of the Fantalle area has been affected by salinity problems in two ways; (i) gradual change of the previous fertile soil into saline soil; and (ii) unpredicted flooding of the farm land due to rise in groundwater table depth as a result of excessive leaching from irrigation activities. According to data from the focus group discussion, the ground water table has risen to 2-3 meters below ground surface. Consequently given the semi-arid whether of the area, flooding of farmlands has become a frequent problem in the Fantalle district. This might be caused by excessive amounts of water applied by irrigation which move past the root zone and contribute to rising water tables.

In this district, the flooded groundwater usually takes the form of a lake that it is commonly called by the name Basaka Lake in that area. Hence, this area is affected at least with two types of salinity; that is salinity associated with groundwater and salinity that is associated with irrigation. According to Adler et al. (2016) there are three types of salinity. The first one is, groundwater associated salinity where fluctuations in shallow groundwater levels lead to salt discharge into root zone layers. The second type is non-groundwater associated salinity which is caused by poor leaching due to restricting hydraulic properties of some soil layers (also referred to as transient salinity). The third is Irrigation associated salinity (IAS) which is due to the input of salts in the irrigation water and their accumulation in the root zone due to inadequate drainage (also see figure 4 as explained by (Rengasamy, 2006).

Salt accumulation occurs when the groundwater tables are shallow (< 4m) and the salinity of groundwater becomes progressively higher due to evapotranspiration. Usually this situation occurs in foot slopes and valley floors of the landscape (Adler et al., 2016). This is a typical characteristic of the Fantalle District.

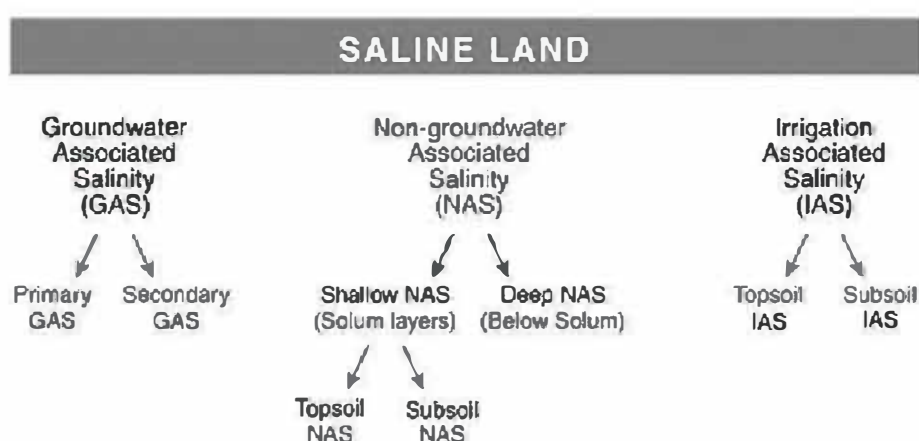


Figure 2: Major types of salinity types based on salinization processes (Rengasamy, 2006).

The inhabitants in this area are vulnerable to flooding. Saline soils has limited capacity to absorb rainfall, resulting in high rates of runoff. This has caused significant amount of damages to roads, buildings (examples are residential and school buildings destroyed by flood in the past in this same district), fences, dams, agricultural land and wetlands.

Hence, the inhabitants have lost many physical capitals as a community because of salinity in this area. In arid and semi-arid lowlands of Ethiopia, the land that farmers and pastoralists depend on, often faces multi-dimensional problems. Salinity and groundwater disturbances are the major ones. As these issues are interlinked, solving salinity problems should address groundwater table control at environmentally safe levels to avoid flooding and secondary soil salinization.



Figure 3. Fantalle floods destroyed the first high school built in the area.

Werer district

The effect of soil salinity in Werer area on natural environment is largely related to the changing of upper fertile soil to saline soil in recent years. The infiltration capacity of these soils has reduced and flooding of soils after rain has become a routine practice. After the evaporation of this water, upper soil is covered by salts as can be seen in Figure 4. During the rainy season, salts are transported from one place to another due to surface runoff affecting the entire district's upper soil. In this salinization process, the accumulation of salt on upper soil has direct relationship with shallow depth of the groundwater.

In similar fashion with Fantalle District of Oromia, the focus group discussion reveals that the Werer area is also characterized by shallow groundwater. The shallow groundwater is caused by the biotic effect of irrigation water mismanagement in terms of applying excessive irrigation water for farming. Excess irrigation water that passes the root zone usually contributes to shallowness of the ground water. In Werer area farmers utilize irrigation that is channeled from the nearest river. With irregular rain in the rainy season and no rain during dry seasons, the farmers in this

area do not depend on rainfall agriculture. The majority of the population is dependent on irrigation water that is diverted from the river. According to the inhabitants, application of excess water to farmland coupled with improper drainage management and the leakage from irrigation channels have contributed to rising groundwater tables in the area. This has significantly contributed to the pace salinity development in the area.



Figure 4: Salt accumulation in the upper soil layers in Werer Area

The surface soils of the area are covered with salt as a result of shallow groundwater. Furthermore, the respondents have confirmed that the inhabitants find it very hard even to bury their dead relatives by digging the ground due to shallow groundwater table conditions prevailing in the area.

Amina, a female aged 38, reports

"In Werer area, we find it increasingly difficult to farm and even dig the ground deeper than 2 meters. For instance, when we dig to bury our dead the water emerges and we cannot dig deeper. Hence, the shallow depth of groundwater has become a serious problem for us.. On top of that the upper soil is often covered by salt that damages

This shows that although shallow depth of groundwater in the area provided easy access to water for farmers and inhabitants, its increasing salinity has made it difficult for them to use it for domestic and agricultural purposes. The use of this water for irrigation is replete with serious consequences as it can increase the salinity of their lands on permanent basis. This restricts the pumping of groundwater causing rising groundwater depths and soil salinization. Thus poor environmental management in the area has resulted in degraded environment that has less carrying capacity and calls for an urgent intervention. The interventions should include improved on-farm water management practices to control groundwater table rise and management and rehabilitation of salt-affected lands to increase crop yields. The introduction of salt-tolerant food and feed crops can be a big step forward in reducing poverty in the salt-affected areas.

Raya Alamata District

In Raya Alamata area farmers have opportunity to use irrigation water for farming. According to focus group discussions, farmers in this area own two types of land; land with access to irrigation water and land that has no access to irrigation water. Irrigation practices in the area were started a decade and a half ago. As per key informant interviews, there are three types of effect of salinity on the natural environment: (i) secondary salinization due to use of poor quality water for irrigation; (ii) rising groundwater tables and consequent soil salinization; (iii) Frequent flooding of land due to high groundwater table and rainfall exacerbating upper soil salinity.

The excessive percolation of irrigation water due to poor on-farm irrigation management practices results in the rise of groundwater. Due to high surface temperatures, water from the soil surface is evaporated leaving the salts behind. In the absence of effective drainage systems, accumulation of salts makes the soils unsuitable for cultivation resulting in poor crop growth.



Figure 5. Shallow groundwater in Tumuga area of Raya Alamata

Showa Robit district

Data collected through observation and focus group discussions indicate that Showa Robit district seems to be in better position in terms of salt accumulation on upper soil. However, it is common to observe salt is transported in drainage systems made for storm water.



Figure 6. Cultivated lands near Showa Robit area

5.3.2 Effects of salinity on socio-economic conditions

IFantalle district

Above and beyond the negative effects of soil salinity on the natural environment, data collected from the sample respondents show that salinity also effects socio-economic and health conditions of the inhabitants of the target areas. The primary effects come through loss in crop productivity, food insecurity, and ultimately the health of the inhabitants. Among others, since the available water for everyday consumption for the people has high level of sodium and other chemicals, the inhabitants are subjected to water-borne diseases. Higher salt contents affect the taste of drinking water, especially chloride which has a low taste threshold. Sodium and magnesium sulfate levels in drinking water may produce a laxative effect.



Figure 7. Focus group discussions with farmers at Fantalle district

The international organizations and numerous civil societies are working to ensure that extreme poverty is eradicated and food security is ensured for the poorest parts of the world. Hence, identifying root causes of extreme poverty and food insecurity is one of the effective ways of solving the problem. Soil salinity causes loss of land productivity which in turn results in reduced farm incomes, food shortage and increased poverty. The study results indicate that the salinity has affected the life of farmers in Ethiopia in many ways as detailed in Table 6. The Fantalle and Werer areas are most hard hit followed by Raya Alamata. Shows Robit area is relatively less affected by salinity.

Table 6. Socio-economic and health effect of salinity in target areas.

No.	Abandonment of the farmland (%)	Rural unemployment (%)	Decrease in crop yield (%)	Increase in production cost (%)
Fantalle	85.6	79.0	99.2	90.3
Werer	23.5	38.7	93.0	96.7
Showa Robit	3.0	5.0	50.0	62.0
Raya Alamata	75.0	77.0	88.4	94.2

This situation has increased the rural unemployment and hardship of life. In order to win their daily bread many have opted to work as daily laborers rather than regular farmers. Hence, the short run effect of rural unemployment is migration of the family members to urban areas which has added to the prevalent problems of urban unemployment.

The majority of respondents (85.6%) in Fantalle district have shown that their previous arable lands are now being abandoned and only a portion of their land is being cultivated. Consequently, compared to the previous situation only part of their land is utilized for farming with implication of low productivity (assuming the technology of farming has not changed much which is confirmed in the baseline survey and the current survey). Due to salinity development, the crop yields from their land are extremely low which is not enough to cover all the needs of their family resulting in more poverty and malnutrition.

Poverty in the Fantalle area is further exacerbated by increase in production cost for farmers. The majority of target farmers in Fantalle area (90.3%) have reported that the production cost of farming has increased at an astronomical level due to salinity enhancement. Hence to get equal amount of production as previous years from the same land, the household must hire additional working force and utilize more inputs such as seed and fertilizers.

Werer district

The inhabitants of the Werer district depend on diversified livelihood means to support themselves and their families. However, like many districts in Afar region, majority of the population are mainly pastoralists with limited engagement in farming. The results of focus group discussions and individual survey suggest that the salinity has affected the inhabitants of the area economically in various ways including decreased yields and farm incomes.

Amina, a female aged 38, reports

"Salinity is affecting our land mainly in two ways. First by changing the previous fertile soil into salt-affected soil which is a big problem for us because the crops planted get burned by the salt before the harvest time. Secondly, the land we used to utilize for grazing is being affected by the salt. This has decreased the availability of fodder for our livestock. Probably this is the most important issue for inhabitants of this area as pastoralists. Livestock owners cannot find enough fodder for their animals".

Table 6 shows that in the Werer district, about 93% of respondents reported decline in crop and livestock productivity because of salinity, while 97% of the respondents indicated that the cost of production (both in farming and animal rearing) has significantly increased. Because of these factors, farmers are abandoning their land (23.5% respondents) resulting in increased rural poverty and unemployment (38.8% respondents).

Momina Musa, a female farmer (from Fantalle) reported that;

"Few years back, we were getting good yields from our land in this area. Now-a-days we have to hire daily laborers in addition to the household human power and the additional fertilizers to get something out of our land. This has increased production cost and does not give us the harvest we intent to get. People are now getting tired from trying and abandoning their lands".

Mohammed (from Werer), also reported that:

"In this area we farm mainly onion, cotton and tomatoes. But our main production is onion. Because of the soil salinity, our productivity has significantly decreased even though we utilize different management mechanisms to minimize the negative effect of salts in the soil. As management mechanism we used to create drainage to prepare an outlet for the salt. But this year the mechanism failed as the rain brought salt on our crop and the outlet for salt was not very useful. This stopped the growth of the crop. What is worrying to this community is that such uncontrollable effect of salinity is increasing at an alarming rate from year to year. Our area is severely affected by soil salinity which is a great threat to crop productivity".



Figure 8. Focus group discussion with farmers at Werer site.

In the Werer district, decrease in farm yield and livestock feed because of salinity directly affect the livelihood of the inhabitants. Because of the meager return from farming and livestock rearing, farmers are now engaging themselves in off-farm jobs. Thus, fragmented land ownership coupled with its poor quality has resulted in rural and semi-urban unemployment. The consistent reduction in crop production from the farmland is increasing the incidences of poverty. Many farmers remain without food at least 2-3 months of the year causing malnutrition and other related health issues.

The women in the study areas also stressed the effect of salinity in relation to reduced crop yields, increased production cost which is often not affordable for poor farmers resulting in poor crop yields or abandoning their lands to relatively rich farmers who can afford the increased production costs. It was also shown by women respondents that only a small portion of their land is being used intensifying the increased poverty in their communities. This is because to get production from the same land, the household must hire more labor and use more fertilizer which are often not affordable for women poor farmers. Women farmers reported that most of their land has been rendered useless either due to salinity or flooding.



Figure 9. Individual interviews with women in were district.

Momina Musa, a female farmer of aged 30, reports that:

"Soil salinity affected both our crop yield and our families' health, especially that of women and children. Women are suffering from various health problems mainly due to poor quality of the drinking water, which makes them feel excessive tiredness and dizziness. In the morning we find it very hard to get energy to rise up for work. This is because of the heat in this area which is intensified by salinity. We go to health stations frequently but all the medicine they give us seems to be not working. Amazingly it seems all the women have the same health problem. So, we are less productive as human beings although our work requires more energy. Even our children find it very hard to find strength to rise up and play like happy children. Hence, the issue of salinity is decreasing our productivity and destroying our grains, damaging our health as well as the health of our children. Dizziness and joint pain has become a challenge for us. Physically we are weak and our bones are affected. Even our children do not look healthy. They remain sick and tired all the time. Therefore we are facing enormous problems as family and community because of the soil salinity".

Fatuma Ali (Werer Area), age 27, also reported that:

"The soil salinity has significantly decreased productivity in this area. Most of the soils in the area are covered with salt. The appearance of white salts on the soil surface becomes more prominent after rainfall events. Hence, after the rainfall, our whole village is covered with salt and we avoid going out to work on the farmland. Due to this situation, we do not always have sufficient food to feed our family and animals. This causes weakness in our bodies and we become more vulnerable to diseases. Children are more affected with this situation. As a result, our work efficiency is compromised and farm production suffers. Children are reluctant to go to schools because they do not feel active and energetic to take bear long school hours. Due to poor feeding, our animals are also under-weight. Therefore, we want that government and/or other international organizations should do the needful to solve the problems of soil salinity in our areas before it is too late.

Raya Alamata district

In Raya Alamata district, participants have indicated that their land has shown decreasing trends in crop yields due to increasing soil salinity. Table 6 shows that 88.4% of respondents agree that yield has decreased, while 94.2% have indicated that the cost of farming has increased. Because of this, rural unemployment has increased (77%). The practice of abandoning lands is becoming common (75% respondents). This means that salinity induced socio-economic problems in Raya Alamata district remain a challenge to the livelihood of farmers.

A male farmer from Raya Alamata district reported that:

"I have an irrigated farmland, which used to give 1.5 to 2.0 tons/ha of sorghum. But currently because of the salinity I am not getting anything from the land. When I plant seeds, the crops seem to be growing well until they reach a certain level and then it dies. Hence, because of decrease in the yield and productivity from this land, my income has declined".

Another male farmer Raya Alamata district reports that

"The soil salinity in this area is increasing with an incredible speed. Because of this we have started abandoning our lands. Now our fear is not only that crop yields are decreasing but that we might abandon our all land and home because of expansion of soil salinity and emergence of groundwater on the land. Every time the groundwater rises, it destroys our crops. This phenomenon is dangerous not only for farmland but also for the district and its inhabitants".

Showa Robit district

In Showa Robit district, soils are moderately affected by salinity. Even then, decrease in crop yield from farmland is reported by 60% of the farmers. Rural-urban migration due to soil salinity is not reported in this region. Respondents from this district also did not report any negative effects on their health due to soil salinity. Furthermore, traditional way of salinity management such as preparing outlets for the salt seems to be working.



Figure 10. Individual interviews with women in Showa Robit district.

5.3.3 Effect on food security and health

According to focus group discussions, low crop yields and increasing cost of production due are the major causes of food insecurity for the households. Due to increased cost of production, poor farmers cannot hire additional labor for their farmland, while decreased production implies that the amount of food available for household consumption decreases. This causes food insecurity for the households. Non-availability of adequate nutritious food and lack of access to safe drinking water is creating health issues for the rural communities. The survey results indicate that there are many types of inter-related health issues observed in the population because of salinity.

A male farmer from Raya Alamata district reported that:

"I have an irrigated farmland, which used to give 1.5 to 2.0 tons/ha of sorghum. But currently because of the salinity I am not getting anything from the land. When I plant seeds, the crops seem to be growing well until they reach a certain level and then it dies. Hence, because of decrease in the yield and productivity from this land, my income has declined".

Farmers in Werer and Showa Robit districts showed similar concerns about health issues. The participants believe that health problems due to soil salinity are inevitable and will keep on growing if no action is taken to address this issue. Other than that, no specific health issue were reported by the respondents in these two districts. Contrary to Werer and Showa Robit, respondents of Raya Alamata district reported clear evidences of salinity induced health issues. More precisely, in Raya Alamata district, the effect of soil salinity in relation to food insecurity is reported because of continuous decrease in productivity from year to year.

The respondents believe that the farmland that utilize irrigation water has experienced significant reduction in production resulting in decreased food availability and loss of household income. This has led to migration of young generation out of the area. Furthermore, poor quality of groundwater has affected the health of people who are farming on field by giving them skin disease and other related dermatological issues.

A male farmer from Raya Alamata district reported that:

"Previously we used to work standing in the irrigation water the whole day without any problem. But now if we stand in the water for an hour our skin become itchy; so it seems the water is not good for our skins. Thus this irrigation water has become a threat not only to the crop but also for our human health".

Farmers in this district have also reported that unknown worms were found in their bodies even though they make sure that they do not use the irrigation water for drinking purposes. There are also farmers who reported that the irrigation water is not only salty but contain some other elements which are harmful for the inhabitants' health. Hence, in Raya Alamata there is visible effect of irrigation water on health as reported by the community.



SALINITY MANAGEMENT IN ETHIOPIA

6.1 Traditional management of salt-affected soils

Fantalle district

Traditional saline soil management in this area includes application of natural fertilizer such as animal compost to the soil and draining irrigation water from the fields at appropriate times. In Fantalle area, natural fertilizer is reported to have multiple purposes. The natural fertilizer is used to dry the excessive water present on the upper soil surface either from flooding or from the rise of groundwater table. Local inhabitants sometimes also explained it as expansion of the Lake Basaka*. Expansion of Lake Basaka considered as the main reason for groundwater rise and deterioration of its quality in this area, which is causing impediment of farm productivity and increase in poverty. The traditional way of applying natural fertilizer to minimize the negative effect of salinity has not brought significant results because of two reasons: the labor force required and shortage of compost. Furthermore, even though the application of animal compost minimizes the salinity problem, it cannot solve salinity problem completely and increase agricultural productivity. Therefore it is considered as a supporting mechanism for the rehabilitation of saline soil.

Werer district

Data from respondents in this area shows that the traditional method that has been utilized by the community for saline soil management is utilizing different drainage designs for irrigation water. This practice is used to allow the salts in irrigation water to settle in the outlets rather than entering into the farmlands. Respondents have indicated that this mechanism has helped in mitigating the problem of soil salinity to some extent by reducing the amount of salt accumulation in the topsoil. However, it is not considered as the strong mechanism in overcoming the overall salinity problem as the crop yields continue to decrease. Therefore, more advanced water and salt management strategies need to be introduced in this area for complete rehabilitation of saline soils and improve agricultural productivity of these lands.

Raya Alamata district

In Raya Alamata, traditional salt affected soil management includes usage of natural fertilizers (animal and farmyard manure) and utilization of different drainage strategies to evacuate salts from the farmland. Due to high groundwater table in most of the areas, soils remain wet for longer time making it difficult to plant crops on time. Therefore in this district, salinity development is very much linked to drainage issues. The application of natural fertilizer is useful to dry the excessive water from the topsoil, but drainage of salts remain a challenge. Therefore, this area also needs a good irrigation and drainage management plan to support rehabilitation of salt-affected soils.

Often resulted from salinity of soil and groundwater in addition to semi-arid conditions of the area.

Expansion of Lake Basaka is damaging infrastructure in semi-urban areas and farmlands in rural areas.

A male farmer reported that:

"Traditionally we used to apply animal manure to minimize the effect of salinity in the soil. However this mechanism did not give us good results as salinity continue to increase. We have also applied fertilizers to the land. But the salinity increased from year to year. Normal fertilizers given by the government are not useful for overcoming the salinity problem".

Another male farmer reported that:

"I have applied compost and animal manure to minimize the negative effects of soil salinity. But I have not seen any change. On the recommendation of extension workers, I have also added fertilizer to the land however, it was also not useful in increasing the yield. Conversely it seems that the problem keep on growing".

Showa Robit district

In Showa Robit district, traditional way of salinity management include preparing outlets and drainage system for the evacuation of salts carried by the irrigation water. According to focus group discussion and individual interviews, with this method farmers are trying to manage salinity induced by the irrigation water. The respondents further indicated that this traditional way is helpful in managing the negative effects of salinity on low to moderate saline soils.

6.2 ICBA interventions for the management of salt-affected soils

RAMSAP project has worked with agricultural department and extension workers to introduce best soil and water management practices for the salt-affected lands of the target areas. This include introduction of salt-tolerant crops that has the capacity to withstand salt stress up to a reasonable level. These crops were tested in the research stations of EIAR and demonstrated to farming communities in different regions through the organization of Farmer Field Days (FFDs). These demonstrations were made on farmer fields and on the premises of agricultural research centers within the study area. During these demonstrations, large number of farmers participated and they were briefed about different aspects of these crops.



Figure 11. Farmer Field Days in different regions of Ethiopia.

Fantalle district

Data collected from individual farmers show that majority of the communities (95%) are more interested in getting access to cowpea and sorghum varieties as they give promising yield that serves many purposes. The harvested cowpea seed will serve as main food for the community while the stem part can serve as fodder for livestock. Sorghum also seems tolerate to salinity and give good yield. However, the crop damage by birds is a big problem in case of Sorghum, which needs to be controlled. .

Fatuma Ahmed, a female owner of the demonstration field reported that:

"People from ICBA together with Ministry of Agriculture have shown us many seed varieties that are salt tolerant. These include quinoa, cowpea, sorghum and different fodder varieties. We also saw they apply fertilizers and medicine that kills dangerous worms. We saw most of these seeds growing beautifully and also giving good harvest. In the same way they showed us how to prepare natural fertilizer (compost) and can be more productive in farming. Most seeds introduced by ICBA gave good harvest and made us very hopeful in changing our lives. The cowpea seems to give a very good yield and can be food for both humans and livestock. I preferred cowpea but we are trying to grow quinoa as it is a new crop in this area".

In Fantalle area, ICBA has started working towards rehabilitating the salt-affected soils. To-date, the first phase of work which includes introduction of salt tolerant food and fodder crops to the community via demonstration on selected sites has been done. Thus, farmers had a chance to observe and learn about the growth and productivity of newly introduced salt-tolerant crop varieties. In addition, training and information exchange to create awareness on how to manage soil salinity issue was given. Based on these interventions, the respondents in the area have reported their needs and ideas on which varieties they want to access to minimize multifaceted effects of soil salinity. Farmers have shown interest in cowpea and sorghum crops because they gave very good yield and can be used both as a food and fodder. They have also shown interest to try other crops such as quinoa due to their high nutritional value and resistance to salinity.



Figure 12. A farmer is talking about seeds introduced by ICBA.

Werer district

Similar to Fantalle area, ICBA also introduced salt-tolerant crops and forages in the Werer area. Thus awareness creation in the community, specifically in Amibara Area of Werer District about these crops and fodders with practical demonstration was done. Based on these interventions, the respondents in the area showed great interest in Sesbania, cowpea and fodder crops such as Panicum and Rhodes grass. They have also shown interest in Labab and quinoa crops due to their salt-tolerance and high yields compared to local cultivars.

Abdu Ibrahim, a 32 year old farmer from Werer reported that:

"Last year people from ICBA planted salt tolerant fodder on farmers' land. This year when the land was utilized for other purposes, that is, for cotton, the land gave better yield than last year. This shows that fodder crops have helped in reclamation of soil to some extent. We have also seen good yields of other crops. Farmers showed keen interest in getting seeds of these crops through this project and NARS. Farmers of this area were particularly interested in fodder crops due to large population of livestock in this region".

Raya Alamata and Showa Robit districts

Like Fantalle and Werer districts, salt-tolerant crop and fodder varieties were also introduced in these two districts through demonstration on selected farmlands. Farmers in Raya Alamata area showed interest in cowpea and quinoa varieties because these two crops showed good tolerance to salinity on their soils. Cowpea showed better performance than quinoa in terms of yield and salt-tolerance. Therefore farmers of this area are very interested to have more seed of the ICBA cowpea varieties.

Farmers in Showa Robit area were more interested in fodder crops due to their large livestock population. Therefore, they made special request to make the process of accessing food and fodder crops seeds easy. They also showed eagerness to adopt other salt-tolerant crops such as cowpea, sorghum and quinoa. ICBA has promised to provide seeds of these crops to farmers after the seed multiplication process is finished.

A male farmer from Showa Robit reported that:

"As part of help from ICBA, we have taken trainings and had a chance to see the site demonstration of salt tolerant plants. We have seen many seeds that can tolerate the soil salinity. The project people for the purpose of demonstration selected a site that was rendered useless by the salinity. They ploughed and planted seeds. The seeds gave good yield. From what we saw quinoa was able to tolerate the salinity and produce good yield. Cowpea is even better than quinoa in tolerating the soil salinity and gave good yield. They have also introduced and demonstrated sorghum varieties that are resistant to soil salinity".



WOMEN EMPOWERMENT IN ETHIOPIA

7.1 Genealogy of gender in agriculture and environment

The literature has classified the genealogy of gender in agriculture and environment into two categories; liberal correctives and relational perspectives (Resurreccion and Elmhirst, 2012). Both approaches use different methods to understand and address the differences between men and women by the roles and rights assigned to them. The liberal perspective addresses gender-blind policy and practices, while relational perspectives seeks to address the power dynamics including differences in resource access and control between men and women.

Traditionally in developing countries, the most popular theory that explained and address the importance of recognizing role of women in agriculture and environment is WED (or 'women, environment and development'). WED theorized the existence of natural connections between women and environmental resources that rural women of the South were the unrecognized caretakers of the environment, and in whose care, it had better chances of surviving for future generations (Dankelman and Davidson, 1988; Shiva, 1989; Rodda, 1991; Sontheimer, 1991).

Though WED was the pioneering approach in systematically addressing lack of recognition given to women in their significant contribution in agriculture and natural resource management, this approaches was criticized on different grounds (Resurreccion and Elmhirst, 2012). The concept that women have fixed caretaker roles and thus have to be targeted to take care of environment was challenged (Rocheleau, 1991; Leach, 1992,1994). Rao (1991) stressed the need to know how women respond dynamically to complex agricultural and environmental situations. Following this, different researches have subsequently been conducted to address the dynamic contextual analysis of gender issues (Brunt, 1992; Agarwal, 1994; Meinzen-Dick et al., 1997; von Benda et al., 1997; Meinzen-Dick and Zwartveen 1998; Villareal, 1992; Mosse, 1994; Agarwal, 1997; Guijt and Shah, 1998; Cleaver, 2003; Colfer, 2005; Rocheleau et al., 1996; Elmhirst, 2001, 2002; Fortmann, 1996; Jewitt, 2002; Howard, 2003; Momsen, 2007; Resurreccion, 2012).

These studies challenged the position that gender is primarily relevant only within households and instead placed gender as salient within policy and practice across a variety of scales, and within institutions central to agriculture and natural resource governance. The new position was strengthened through the United Nations' World Commission on Environment and Development (Brundtland report in 1987), the United Nations Conference on Environment and Development (UNCED) in Brazil in 1992, the Women's Action Agenda 21 (Leach, 2007) and other UN agendas including SDGs. This effectively linked concerns with women and gender with environmentally sustainable development, both having been traditionally marginal issues. Today, gender issues and women empowerment remained a cross cutting issue on most of the development programs.

In light of this, in this section, women's perspective on the soil salinity and closely related issues as well as overall respondents' attitude concerning women empowerment is examined. This has significance in the process of understanding the prospects and challenges of empowering women in the implementation of the project.

7.2 Gender gaps in agricultural productivity

Women perspectives on environmental and agricultural issues is of significant value due to two reasons: (1) despite the gender gap in agricultural productivity women in the developing countries are considered as the good custodians of the environment (Resurreccion and Elmhirst, 2012); (2) the existence of gender gap in agriculture is identified, among other causes, a major reason for overall low agricultural productivity in sub-Saharan African (SSA) countries. For instance, studies have been conducted to examine and quantify the gender based differences in agricultural productivity in Africa (Quisumbing, 1995; Agarwal, 2012; World Bank and the ONE Campaign 2014; UN Women and UNDP-UNEP-PEI, 2018). The UNDP-UNEP-PEI (2018) report has shown that that there is a significant gender gap in agricultural productivity across SSA countries with estimated 11% in Ethiopia. Other studies using comparable methods have found similar results for other countries with gender gaps in agricultural productivity, ranges from 8% in Kenya to more than 30% in Nigeria (Backiny-Yetna and McGee 2105; Oseni et al., 2015; World Bank, 2012).

The determinants of gender gaps in agricultural productivity are identified as women's low access to agricultural land, lack of cash income, women tendency to plant food that serve immediate family need than to plant high-value crops (UN-Women and UNDP-UNEP-PEI, 2018; Agarwal, 2012). In Ethiopia, unequal access to male family labor accounts for about 45% of the agricultural productivity gap (UNDP-UNEP-PEI, 2018). Figure 13 shows the path model of gender gaps in agricultural productivity that affect economy and the environment of the country.

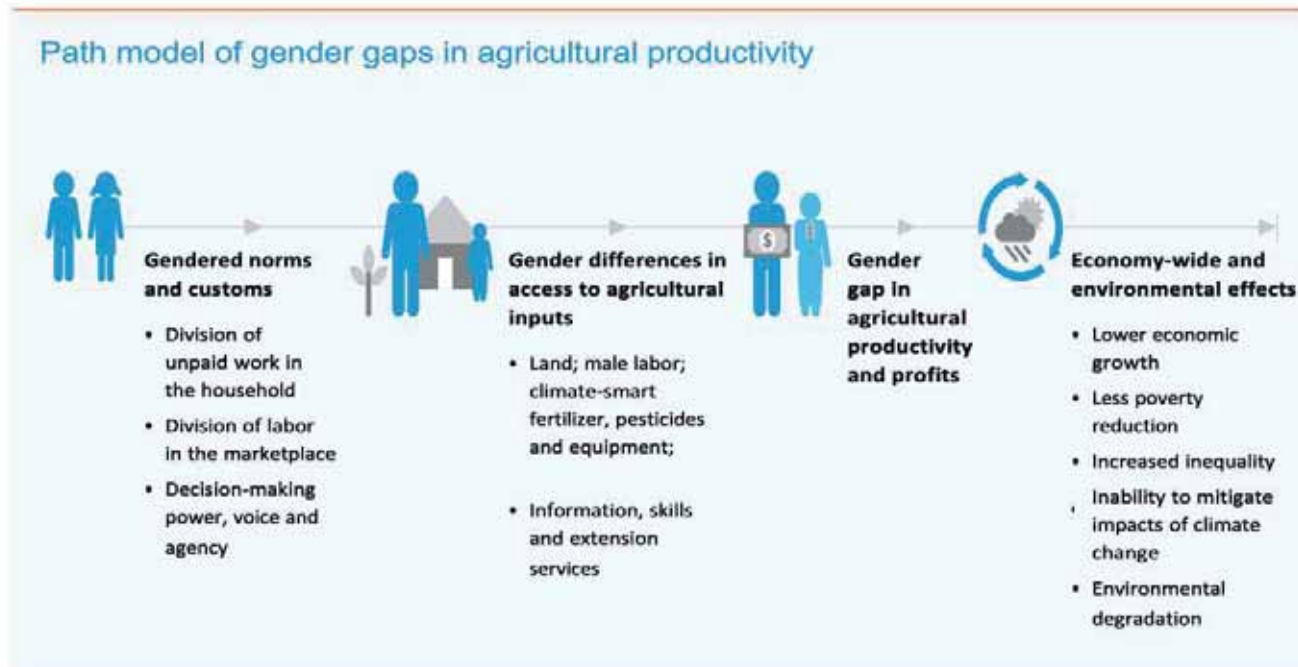


Figure 13. Path model of gender gaps in agricultural productivity.

Ministry of Agriculture and Natural Resources, UN-Women, UNDP-UNEP-PEI (United Nations Development Program-United Nations Environment Program Poverty- Environment Initiative), 2018. *The Cost of the Gender Gap in Agricultural Productivity in Ethiopia*. Ministry of Agriculture and Natural Resources, UN-Women, UNDP and UNEP.

Removing the gender gap in agriculture via increasing women’s access to agricultural inputs and improving returns can have significant economic benefits as well as reduction in poverty. It is estimated that, in Ethiopia, closing the gender gap can increase crop production by 1.4% that can add US\$ 221 million in agricultural GDP (Figure 14). This further strengthens the notion that women can play a central role to manage land sustainably, build resilience, ensure food security, and improve agricultural value chain including access to food (UNCCD, 2018).

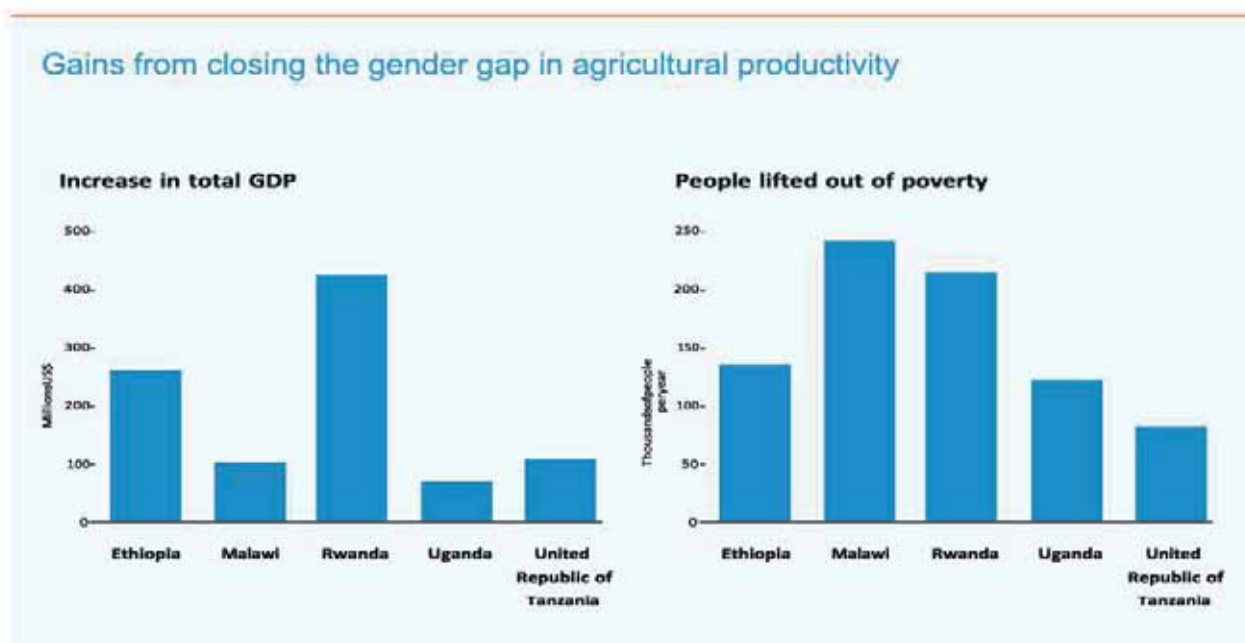


Figure 14. Gains from closing the gender gap in agricultural productivity.

The above discussion shows that including women perspective will enable in-depth understanding of the problem. Involving women in solving low productivity of soil via removing gender gap in agricultural productivity will increase agricultural productivity and contribute in decreasing rural poverty. During this study, special interviews and focus group discussion were organized with the women of the target areas to get their perspective on salinity and other related agricultural issues and get their feedback on possible solutions to overcome these challenges.

7.3 Women in agriculture in the target areas

In rural areas of Ethiopia especially where the livelihood of the population includes pastoralism, most of the household work including putting food on the table for the family falls on the shoulders of the women. Under these circumstances, women are more vulnerable to salinity induced health problems because they are subjected to more work pressure than men. The women have also reported the prevalence of such pressure on them although they are committed to be part of farm activities to improve productivity of their degraded lands.

Rukiha Adam (Fantalle Area), age 38, reported that:

"If I get my land free of salinity, I will spend more time in farming to change my life as well as the life of my children. Currently both plots of my land are located at different sites and they are badly salinized due to flooding from the Lake Basaka. We know how to do farming but we cannot work because our land is now useless due to increasing salinity levels."

It is not always the case that women are considered as contributors in improving agricultural productivity in Ethiopia. For instance, gender gaps in agricultural productivity in Ethiopia is about 11%, which is lower than many neighboring countries. Figure 15 shows that there is still a great potential to improve agricultural productivity in Ethiopia by increasing the contribution of women in agriculture. This should include better access to agricultural land and credit facilities to buy agricultural inputs, assistance in reclaiming their salt-affected lands and better access to local and regional markets to sell their produce on competitive prices.

(Sources: UN-Women, 2015; UN-Women and UNDP-UNEP-PEI, 2016; Ministry of Agriculture, 2018).

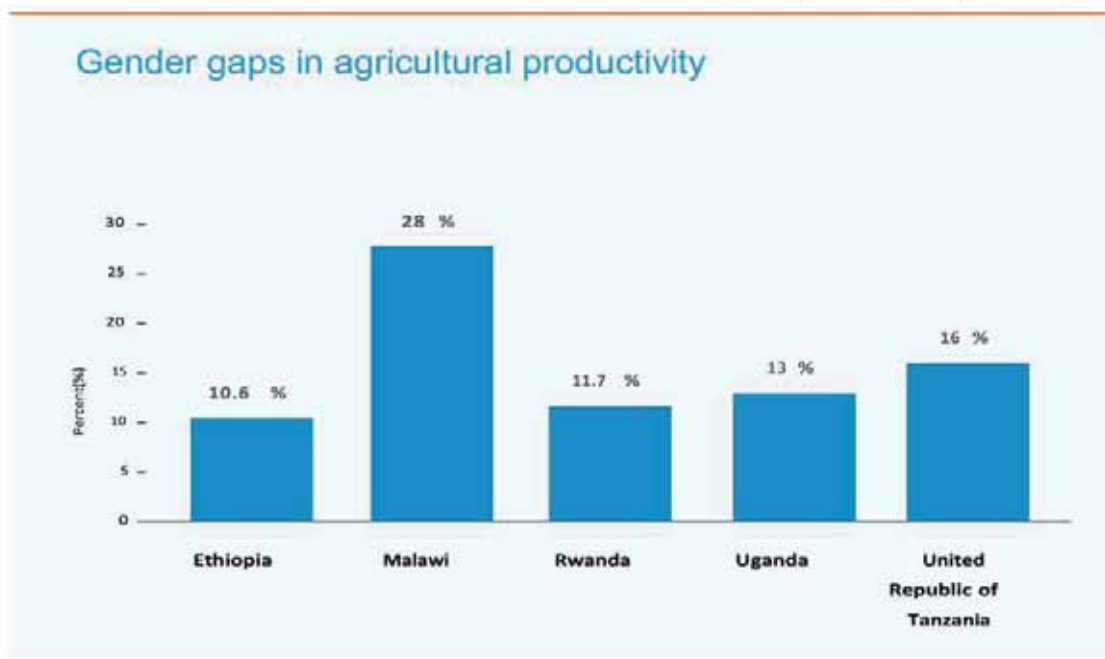


Figure 15. Gender gaps in agricultural productivity in selected SSA countries.

In order to understand the problems and challenges faced by women, a practical assessment was done in areas where women are allowed to engage in agriculture and counted as contributors. This enable us to directly assess the prospects of women empowerment in agriculture in the target areas of the project. The focus group discussions with women farmers at all sites show that in Fantalle and Werer area women do participate in farming while in Showa Robit and Raya Alamata women participation in agriculture is very limited even if they are household heads. Hence findings from these data indicate that the areas with good prospects of women empowerment are Fantalle and Werer. In Fantalle it was found that women participate in farming in a similar fashion as men.

Fatuma Ahmed (Fantalle area), a woman farmer aged 40 reported that:

"Women are active participants in farming in this area. Most of the time they will be on the field helping as well as making sure that food is prepared for the family at home. In the meantime women are engaged in many household activities. Thus providing access to salt-tolerant seeds to the household can positively affect the lives of the women."

In the Werer area, women are also actively involved in farming. Therefore, interventions by the RAMSAP project are of a great value for women farmers.

Fatuma Ali (Werer Area), aged 27 reported:

"As a woman, we are interested in getting access to salt-tolerant seeds, especially the ones we can use for fodder because this will help us in increasing the farm productivity. Thus we are hopeful that the project will help us in fighting soil salinity and low productivity."

Another female farmer reports that:

"At the demonstration site we have seen many tolerant crops and fodder varieties. We have even seen the wheat varieties. We are interested in fodder varieties that we saw at the demonstration site because it will be a great help for our livestock."

Since in Showa Robit and Raya Alamata districts, women are not involved in farming, these areas can be considered as areas with possible challenges in women empowerment. It would be interested to study in detail why women are interested in farming and what can make them interested in farming. For instance in Raya Alamata district it was found that women do not engage in farming even though they own farmlands. In cases where there is no husband to do the farming, women prefer to hire male helpers to do the farm work for them. In the same way in Showa Robit district it was reported that women do not engage in farming but spend most of their time in taking care of the household chores. Engaging women in farming can help in decreasing production cost and increasing on-farm incomes to reduce poverty. However, this requires good motivation and incentives for women keeping view their social norms.

7.4 Attitudinal analysis of respondents on women empowerment

One of the factors that contribute to high gender gap in agricultural productivity between men and women is the existing social norms in the communities (UNDP-UNEP-PEI, 2018). It is often the case in rural areas of Ethiopia women are expected to spend most of their time on domestic work. These norms reduce the amount of available time that women can spend to work on their farm. Moreover, these social norms also restrict women to take part in socio-economic political matters that concerns them. In this section, these social norms are measured using standard attitudinal questions concerning women empowerment.

The results of focus group discussions reveals that in Fantalle and Werer districts women take part in farming while in Showa Robit and Raya Alamata women do not engage in farming even if they are household heads. However, it is also often the case that the societies' attitude towards women empowerment is not as favorable as it should be. To examine this issue, we have made general attitudinal analysis of all respondents on the basis of four different women empowerment related variables. The mean scores of all respondents on each variable are shown in Table 7.

Table 7 show that even though Fantalle and Werer areas seem to perform better in engaging women in agriculture, the attitudinal score of whether women's role should be mainly household activities than outdoor work is lower than Showa Robit and Raya Alamata districts. Therefore, to ensure that women are directly benefited from the project, the systematic discrimination against them should be considered than mere attitudinal analysis. This will help in designing the means and policies to engage women in the scaling up processes for direct benefit and the economic empowerment in the target areas. The aggregate attitudinal analysis of all the respondents in all regions is above average (4.10; SD = 0.79) as the likert scale was coded from 1 to 5. The results of these attitudinal analysis indicate that in all areas, respondents have positive attitude in engaging women in farming and empowering them financially, socially and politically. Hence, the project can have high impact by directly involving women directly in project activities.

Table 7. Attitudinal analysis of women empowerment

	Fantalle	Werer	Showa Robit	Raya Alamata
I believe women role should be mainly household activities than outdoor work	2.267 (1.486)	2.867 (1.846)	4.333 (0.816)	4.063 (1.692)
I believe women should be empowered in financial terms equal with men	4.600 (0.632)	4.267 (1.438)	3.333 (1.862)	4.938 (0.250)
I believe women should be empowered in social participation on equal basis with men	4.533 (0.915)	4.400 (1.121)	3.500 (1.643)	4.563 (1.209)
I believe women should be empowered in political participation on equal basis with men	4.600 (0.507)	4.143 (1.292)	3.167 (1.722)	4.750 (0.775)
Overall attitudinal analysis at district level	4 (0.55)	3.9 (0.85)	4.6 (0.99)	4.9 (0.60)

(Mean coefficients; SD in parentheses)



CONCLUSIONS AND RECOMMENDATIONS

The soil salinity in Ethiopia causes loss of land productivity which results in reduced farm incomes, food shortage and increased poverty. Consequently, rural unemployment has increased adding miseries to the life of people of salt-affected areas. In order to win their daily bread, many have opted to work as daily laborers rather than regular farmers. This has resulted in unprecedented migration of the family members to nearby urban areas exacerbating prevalent problems of urban unemployment. Most of the rural population do not have access to clean drinking water, which is causing huge health problems for communities particularly to women and children. The inhabitants are gradually start feeling sick. Back bone problems are most common. Therefore many people have hunched backs and they literally cannot walk straight.

Farmers in Ethiopia are continuing their efforts to reclaim their saline soils using traditional salinity management methods, which involves application of natural fertilizer such as animal compost to the soil and draining irrigation water from the fields at appropriate times. However, these methods have not yielded promising results because problems of salinity are much more complex. ICBA together with Ministry of Agriculture have introduced more than 20 food and forage crops that have capacity to grow successfully in salt-affected areas of Ethiopia. These include Quinoa, Cowpea, Sorghum, Barley, Lablab, and forages such as Panicum, Sesbania and Rhodes grass. These crops have the tendency to tolerate salinity, heat and uses much less water compared to local traditional varieties. Farmers are also trying to grow Quinoa on their fields due to its high yields, salt-tolerance and nutritional superiority over traditional crops.

Women are well aware of salinity problems and their impacts on their lives. They are particularly concerned with the increasing production costs, reduced yields and farm incomes and health problems. The overall impact of this situation is increased food insecurity and household poverty. Women in Fantalle and Werer areas take part in farming while in Showa Robit and Raya Alamata districts, they prefer to focus on household chores due to socio-cultural norms. In the rural areas especially where the livelihood of the population includes pastoralism, most of the household work falls on the shoulders of the women. This makes them more vulnerable to salinity-induced health problems as they took more work pressure than men. This reduces their capacity to contribute in agriculture, although engaging women in farming can help in decreasing production costs.

Women involvement in agriculture largely depends on the societies' attitude towards women empowerment, which is not always as favorable as it should be. The attitudinal analysis done under this study reveals that in all regions, respondents have positive attitude towards engaging women in farming and empowering them financially, socially and politically. However, still gender gaps in agricultural productivity in Ethiopia is 11%, which is much lower than many neighboring countries. It is estimated that, in Ethiopia, closing the gender gap can increase crop production by 1.4% that can add US\$ 221 million in agricultural GDP. This shows that there is a great potential to improve agricultural productivity in Ethiopia by increasing the contribution of women in agriculture. However, this should include better access to agricultural land and credit facilities to buy agricultural inputs, assistance in reclaiming their salt-affected lands and better access to local and regional markets to sell their produce on competitive prices.

REFERENCES

- Adler, M. D., Posner, E. A., Greene R., Timms W., Rengasamy P., Arshad M., & R., C. 2016. *Soil and Aquifer Salinization: Toward an Integrated Approach for Salinity Management of Groundwater*: Jakeman A.J., Barreteau O., Hunt R.J., Rinaudo J.D., Ross A. (eds) I. Cham: Integrated Groundwater Management Springer,.
- Admassie, A., & Abebaw, D. 2014. Rural Poverty and Marginalization in Ethiopia: A Review of Development Interventions. In J. von Braun & F. W. Gatzweiler (Eds.), *Marginality: Addressing the Nexus of Poverty, Exclusion and Ecology* (pp. 269-300). Dordrecht: Springer Netherlands.
- Agarwal, B. 1994. *A Field of One's Own: Gender and Land Rights in South Asia*, Cambridge: Cambridge University Press.
- Agarwal, B. 1997. 'Gender, environment and poverty interlinks: Regional variations and temporal shifts in rural India, 1971–1991', *World Development* 25 (1): 23–52
- Agarwal, B. 2012. "Food Security, Productivity and Gender Inequality." Working Paper no. 320, Institute of Economic Growth, Delhi.
- Ali, D., K. Deininger and M. Goldstein. 2014. "Environmental and Gender Impacts of Land Tenure Regularization in Africa: Pilot Evidence from Rwanda." *Journal of Development Economics* 110: 262-275.
- Almaz Eshete, 1991. Perspectives on Gender and Development. In: Tsehai Berhane Selassie (Ed.) *Gender Issues in Ethiopia*. Institute of Ethiopian Studies. Addis Ababa University, Ethiopia. Almaz Eshete, 2000. Why is Gender a Development Issue? In the Proceedings of National Workshop Institutionalizing Gender Planning in Agricultural Technology Generation and Transfer Process EARO. PP. 37-45 Addis Ababa
- ALEMU, G.T. and GEBREYOHANNES, T.K., 2016. Addressing gender in agriculture and rural development in Ethiopia. *A Journal of Radix International Educational and Research Consortium*, 5(1).
- Aregu, L., Bishop-Sambrook C., Puskur R. & Tesema, E. 2010. Opportunities for promoting gender equality in rural Ethiopia through the commercialization of agriculture. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 18. Nairobi, ILRI (International Livestock Research Institute).
- Aregu, L. and Puskur, R. 2011. Strategies in increasing women's participation in commodity value chain development: Experiences from IPMS. Paper presented at the Gender and Market Oriented Agriculture (AgriGender 2011) Workshop, Addis Ababa, Ethiopia
- Aregu, L., Puskur, R. and Bishop-Sambrook, C. 2011. The role of gender in crop value chain in Ethiopia. Paper presented at the Gender and Market Oriented Agriculture (AgriGender 2011) Workshop, Addis Ababa, Ethiopia.
- Backiny-Yetna, P. and K. McGee. 2015. "Gender Differentials in Agricultural Productivity in Niger." Policy Research Working Paper 7199, World Bank, Washington, DC.
- Bekabil, U. T. 2014. Review of Challenges and Prospects of Agricultural Production and Productivity in Ethiopia. *Journal of Natural Sciences Research*, 4(18), 70-77.
- Bekele, E., Zhou, D., Kidane, A., & Dessalegn, S. 2019. Household Income Diversification and Food Security: Evidence from Rural and Semi-Urban Areas in Ethiopia *Sustainability*, 11(3232). doi: 10.3390/su11123232

- Bogalech Alemu, Teklu Tesfaye and Addis Tiruneh, 2000. Gender and Natural Resource Management in Ethiopia. Paper Presented at the International Symposium on Vertisoll Management. Nov. 28-31/ 2000. Addis Ababa , Ethiopia.
- Brunt, D. 1992. *Mastering the Struggle: Gender, Actors and Agrarian Change in a Mexican Ejido*, Amsterdam: CEDLA Publications.
- Chayal, K. 2013. "Involvement of farm women in decision- making in agriculture". *Studies on Home and Community Science* 7.1: 35-37.
- Chipeta, M., Emanu, B., and Chanyalew, D. 2015. *Ethiopia's Agriculture Sector Policy and Investment Framework (2010–2020) External Mid-term Review: October*. Secretariat of the Government of Ethiopia/Development Partners.
- Cleaver, F. 2003. 'Reinventing institutions: Bricolage and the social embeddedness of natural resource management'. In T.A. Benjaminsen and C. Lund (eds) *Securing Land Rights in Africa*, London: Frank Cass, pp11–30.
- Colfer, C. J. P. (ed.) 2005. *The Equitable Forest: Diversity, Community and Resource Management*, Washington DC: Resources for the Future
- CSA (Central Statistical Agency) 2010/11. *Report on Livestock and Livestock Characteristics. Agricultural Sample Survey Volume II*. Addis Ababa, Ethiopia.
- CSA. 2013. *National Labour Force Survey*. Addis Ababa, Ethiopia.
- CSA. 2014. *Ethiopian Mini Health and Demography Survey*, Addis Ababa, Ethiopia.
- CSA. 2016. *Ethiopian Central Statistical Authority. Ethiopia Demographic and Health Survey 2016.*: CSA and World Bank.
- CSA. 2017. *Ethiopian Central Statistical Authority . Living Standards Measurement Study (LSMS)*. Addis Ababa: CSA and World Bank.
- Dankelman, I. and J. Davidson (eds) 1988. *Women and Environment in the Third World: Alliance for the Future*, London: Earthscan de Bruijn, M., I. van Halsema and H. van den.
- Devender, D. and Krishna, R.C. 2011. "Socio-economic conditions of agricultural labor in Andhra Pradesh: A case study in Karimnagar District". *International Journal of Business Economics and Management Research* 2.3:115-134.
- Doss, C. 2018. "Women and Agricultural Productivity: Reframing the Issues." *Development Policy Review* 36 (1): 35-50.
- EEA (Ethiopian Economic Association). 2012. *Report on the Ethiopian economy: Transport sector development in Ethiopia: Performance, policy and its role in the economy*. Ethiopia.
- Elmhirst, R. 2001. 'Resource struggles and the politics of place in North Lampung, Indonesia', *Singapore Journal of Tropical Geography* 22 (3): 284–306
- Elmhirst, R. 2002. 'Daughters and displacement: Migration dynamics in an Indonesian transmigration area', *Journal of Development Studies* 38 (5):138–166
- EPA, & UNEP. 2008. *Ethiopia environment outlook. Environment for development*. Environmental Protection Authority. United Nations Environment Programme. Addis Ababa.
- ERSS. 2013. *Ethiopia Rural Socioeconomic Survey*. In C. S. A. t. W. Bank (Ed.). Addis Ababa: CSA and World Bank.
- FAO (Food and Agriculture Organization), 2011. *The state of food and agriculture 2010-11. Women in agriculture: Closing the gender gap for development*. Rome, Italy.
- FAOSTAT. 2014. *Ethiopia. Economic Indicators*.
- FDRE. 2017. *Ethiopia's Progress Towards Eradicating Poverty: An Interim Report on 2015/16 Poverty Analysis Study*. Addis Ababa, Ethiopia: National Planning Commission.

- Fisher, M. and V. Kandiwa. 2014. "Can Agricultural Input Subsidies Reduce the Gender Gap in Modern Maize Adoption? Evidence from Malawi." *Food Policy* 45:356-362.101-111.
- Fortmann, L. 1996 'Gendered knowledge: Rights and space in two Zimbabwe villages: Reflections on methods and findings'. In D. Rocheleau, B.Thomas-Slayter and E. Wangari (eds) *Feminist Political Ecology: Global Lives and Local Experiences*, London: Routledge, pp211–223
- Gebrehiwot. M. 2007. *Gender mainstreaming in forestry in Ethiopia, Africa*. FAO, Rome.
- Guijt, I. and Shah, M.K. 1998. *The Myth of Community: Gender Issues in Participatory Development*, London: Intermediate Technology Publications.
- Harun, M.E. 2014. Women's workload and their role in agricultural production in the Ambo district, Ethiopia. *Journal of Development and Agricultural Economics*. Vol. 6(8):356-362.
- Howard, P. (ed.) 2003. *Women & Plants: Gender Relations in Biodiversity Management and Conservation*, London: Zed Books.
- IFAD (International Fund for Agricultural Development), 2011. *Women and rural development: Enabling poor rural people to overcome poverty*. Rome, Italy.
- Jewitt, S. 2002. *Environment, Knowledge and Gender: Local Development in India's Jharkhand*, Aldershot: Ashgate
- Kasa L., Abate G.T., Warner. J. & Kieran.C. 2015. *Patterns of agricultural production among male and female holders: Evidence from agricultural sample surveys in Ethiopia*. IFPRI.
- Leach, M. 1994. *Rainforest Relations: Gender and Resource Use Among the Mende of Gola, Sierra Leone*, Edinburgh: Edinburgh University Press
- Leach, M. 2007. 'Earth mother myths and other ecofeminist fables: How a strategic notion rose and fell', *Development and Change* 38 (1): 67–85
- Meinzen-Dick, R. S., Brown, L.R., Feldstein, H.S., and Quisumbing, A.R. 1997. 'Gender and property rights: An overview', *World Development* 25 (8): 1299–1302
- Meinzen-Dick, R. and M. Z. Zwarteveen 1998. 'Gender participation in water management: Issues and illustrations from water users' associations in South Asia', *Agriculture and Human Values* 15: 337– 345
- Mogues.T., Cohen .M. J., Bimer.R., Lemma.M., Randriamamonjy.J., Tadesse. F., and Paulos.Z. 2009. *Agricultural Extension in Ethiopia through a Gender and Governance Lens; Ethiopia Strategy Support Program 2 (ESSP2)*. Discussion Paper No. ESSP 007.
- Momsen, J. 2007. 'Gender and agrobiodiversity: Introduction to the special issue', *Singapore Journal of Tropical Geography* 28: 1–6
- Mosse, D. 1994. 'Authority, gender and knowledge: Theoretical reflections on the practice of participatory rural appraisal', *Development and Change* 25 (3): 497–526.
- Nahusenay, A. and Tesfaye, T. 2015. "Roles of rural women in livelihood and sustainable food security in Ethiopia: A case study from Delanta Dawunt District, North Wello Zone". *International Journal of Nutrition and Food Sciences* 4.3: 343-355.
- Njuki.J and Pascal C. Sanginga (ed). 2013. *Women, livestock ownership, and markets: bridging the gender gap in Eastern and Southern Africa*. International Livestock Research Institute and the International Development Research Centre Routledge. New York, NY.
- Oseni, G., P. Corral, M. Goldstein and P. Winters. 2015. "Explaining Gender Differentials in Agricultural Production in Nigeria." *Agricultural Economics* 46 (3): 285-310.

- Qureshi, A. S., Ertebo, T., & Mehansiwala, M. 2018. Prospects of alternative coping systems for salt affected soils in Ethiopia. *J. Soil Sci Environ. Manage.*, 9 (7), 98-107.
- Rengasamy, P. 2006. World salinization with emphasis on Australia. *Journal of experimental botany*, 57(5), 1017-1023.
- Resurreccion, B. P., & Elmhirst, R. 2012. *Gender and natural resource management: Livelihoods, mobility and interventions*: Routledge.
- Rocheleau, D. 1991. 'Gender, ecology and the science of survival', *Agriculture and Human Values* 8 (1):156–165
- Rocheleau, D., B. Thomas-Slayter and E. Wangari (eds) 1996. *Feminist Political Ecology: Global Issues and Local Experiences*, London: Routledge.
- Rodda, A. 1991. *Women and the Environment*, London: Zed Books.
- Shafiwu, A.B. 2013. "The role of Agricultural Development Bank in the development of rural women in agriculture: A case study of Wa-West District". *Research Journal of Finance and Accounting* 4.12: 168-180.
- Sintayehu, D. 2011. *Gender Roles in Agricultural Production Among the Sidama of South Western Ethiopia*. CER-TWID. Addis Ababa University press: Addis Ababa.
- Shiva, V. 1989. *Staying Alive: Women, Ecology and Survival in India*, London: Zed Books.
- Sofa Team and Doss C. "The role of women in agriculture. Agricultural Development Economics (ESA) Working Paper No. 11-02 (2011).
- Sontheimer, S. (ed.) 1991. *Women and the Environment: A Reader*, London: Earthscan Publications.
- UNCCD. 2018. *Towards Gender Responsive Gender Responsive Implementation United Nation Convention towards Desertification*. UN Women. New York.
- UN-Women and UNDP-UNEP-PEI (United Nations Development Program-United Nations Environment Program Poverty-Environment Initiative). 2018. *The Cost of the Gender Gap in Agricultural Productivity in Ethiopia*. Addis Ababa: Ministry of Agriculture and Natural Resources, UN-Women, UNDP and UNEP.
- Vandercasteelen, J., M. Dereje, B. Minten, and A. S. Taffesse. 2014. *Perceptions, Impacts and Rewards of Row Planting of Teff*. ESSP Working Paper 65. Washington, DC: International Food Policy Research Institute
- M.M. 1992. 'The poverty of practice: Power, gender and intervention from an actor-oriented perspective. In N. Long and A. Long (eds) *Battlefields of Knowledge: The Interlocking of Theory and Practice in Social Research and Development*, London: Routledge, pp247–267 von Benda-Beckmann, K., M. de Bruijn, H. van Dijk, G. Hesselning,
- Villareal, M.M. 1992. 'The poverty of practice: Power, gender and intervention from an actor-oriented perspective. In N. Long and A. Long (eds) *Battlefields of Knowledge: The Interlocking of Theory and Practice in Social Research and Development*, London: Routledge, pp247–267 von Benda-Beckmann, K., M. de Bruijn, H. van Dijk, G. Hesselning,
- Yigremew, A. 2011. *Land Distribution and Female Headed Households: A Study in Two Rural Communities in North West Ethiopia*. FSS Discussion Paper. No 5. Forum for Social Studies, Addis Ababa.
- World bank. 2018. *Ethiopia Economic Update 7. Apecial Topic: Poverty & Household Welfare in Ethiopia, 2011-16*: World Bank.
- Zewdu, A., Zenebe, G., Abraha, B., Abadi, T. and Gidey, N., 2016. *Assessment of the Gender Role in Agricultural Activities at Damota Kebele of Haramaya District, Eastern Hararghe Zone, Ethiopia*. Assessment, 26.

BRIEF ABOUT THE RAMSAP PROJECT

Background

Increasing salinity remains a challenge to sustainability of irrigated agriculture in Ethiopia and South Sudan as it reduces natural biodiversity as well as farm and livestock productivity. Agriculture sector in Ethiopia supports 85 percent of the work force. About 85 percent of the population living in rural areas is directly dependent on agriculture for their livelihood. There are 7 million smallholder farmers, which produces more than 95 percent of the total agricultural outputs including food crops, cereals, oil seed and pulses. Cotton and sugar are produced on state-owned large-scale enterprises. Ethiopia also has large livestock resources including cattle, sheep, goats and camels. Despite this high biodiversity and distinctive ecosystems, Ethiopia is known as a country of famine. Food shortages are widespread and since 1970s there have been severe famines almost once per decade.

Land degradation is one of the major causes of low and declining agricultural productivity, food insecurity and rural poverty in Ethiopia. Ethiopia stands first in Africa in the extent of salt-affected soils. Current estimates suggest that about 11 million ha land is exposed to salinity and sodicity, out of which 8 Mha have combined salinity and alkalinity problems whereas the rest 3 Mha have alkalinity problems. About 9 percent of the population lives in the salt-affected areas. The saline areas in Ethiopia are in the Tigray region, and Awash River basin and the situation is expected to exacerbate in future due to climate change induced factors.

In South Sudan, agriculture accounts for 36 percent of the non-oil GDP with 80 percent of the population living in rural areas largely dependent on subsistence farming, and 75 percent of the households consuming cereals as a main part of their daily diet. Despite abundant water supplies, only 5 percent of total 30 million ha arable land is cultivated. Crop yields are low, which negatively affect incomes and livelihood of poor farmers. Lack of agricultural inputs such as seed and fertilizer, poor advisory services and inefficient irrigation management are considered as the major barriers. Although South Sudan has highest livestock per capita in the world, with 23 million head of cattle, sheep, and goats, there is little use of improved varieties of seed or breeds of livestock. For increasing livestock productivity, there is a need to introduce improved forage varieties that are resistant to common diseases. The salt-affected lands in South Sudan are in the White Nile irrigation schemes. These areas have hardly been utilized for agricultural production despite having great potential due to freshwater availability from Nile. Therefore, bringing back degraded lands into acceptable production levels is essential to ensure food security and social stability.

With a 3 percent average population growth in these countries, future food security as well as the livelihood source for a considerable portion of the population remains a challenge to the governments. Increasing the productivity of existing salt-affected lands and protecting newly developed areas from the spread of salinity is therefore of paramount importance. The smallholder farmers in both countries have the potential to increase their agricultural productivity and farm incomes if their technical and financial capacity is enhanced. They need guidance on the improved irrigation and salinity management strategies and access to modified salt-tolerant seeds for crops and forages.

The areas of low to moderate salinity levels can be restored by improving irrigation and crop management practices. However, in areas where increased salinity levels have restricted the growth of normal field crops, use of Biosaline Approach could be a potential solution. This approach is based on adaptable technology packages composed of salt-tolerant fodders and halophytes integrated with livestock and appropriate management systems. These integrated crop and forage-livestock feeding systems have the capacity to increase resilience of crop-livestock farms, particularly in Ethiopia and South Sudan where livelihood of smallholder farmers is largely dependent on the development of livestock sector.

This project will devise a strategy to improve productivity of saline soils to an economically feasible level and to minimize future salinity development in these areas. The project will draw on the successful experiences of past work to identify most productive alternative crop and forage production systems, test them for local conditions and devise a strategy for scaling up these production packages to rural communities especially women in the target areas of both countries. Through improved crop yields and reduced loss of land to degradation, the project will improve the resilience of farmers thereby reducing both migration to cities and health problems of the local communities suffering from the impact of salinity on their livelihoods.

Project goals and objectives

The major goal of the project is to attain higher agricultural productivity, food security and income for smallholder farmers, agropastoral/pastoral communities through rehabilitation and management of salt-affected farming areas of Ethiopia and South Sudan. The main objective of this project is to introduce, test and promote suitable technologies and practices for sustainable rehabilitation and management of salt-affected lands in Ethiopia and South Sudan and draw scaling up.

The Target Group

The project will directly target 5,000 smallholder farmers in Ethiopia and South Sudan who are facing high food insecurity due to their high dependency on marginal land and water resources. The indirect beneficiaries will be about 50,000 farmers that are dependent on forage production in both countries with an estimated total area of 200,000 ha. These targets will be achieved through the production and distribution of tested crop and forage seeds, dissemination of improved soil and water management practices, and training of farmers and extension workers in the target areas.

The rehabilitation of degraded lands will improve the livelihood of 9% the population which lives in salt-affected areas. In South Sudan where only 7% of the 30 million ha of land is being cultivated, rehabilitation and management strategies developed under this project will open a window of opportunity for thousands of rural farmers to improve productivity of their saline lands and increase farm incomes. The project will especially benefit women, as they will have better access to food and health facilities. Transformation of degraded lands into productive lands will also create direct and indirect job opportunities for the young population. This will help in reducing the migration trends of unemployed youth from rural areas to urban areas.

The project will target Ethiopian highlands (Tigray, Amhara and Afar) and lowlands (Oromia) which produce 87% of Ethiopia's cattle and 5% of its sheep and goats. However, soil salinity has reduced farm and livestock productivity of these areas resulting in increased poverty. The crop-livestock value chain system will benefit Ethiopia because this is the largest livestock producer in Africa. In addition, it will provide easy access to dairy products to the local rural communities resulting in improved health of household especially women and children.

The project will target the White Nile irrigation schemes in the South Sudan. These soils have a large potential due to availability of fresh water from White Nile River and its tributaries, which runs through 7 out of 10 states, providing ready access to an abundant water supply for agriculture producers. However, these soils are not being cultivated for decades due to low soil fertility and non-availability of good quality seeds for crops and forages. It is estimated that about 18 percent of the land is not cultivated due to shortage of seed and another 9 percent due to low soil fertility. Increasing productivity of these lands will be crucial to ensure food security for the smallholder farmers of the area.

Strategy, approach and methodology

This project will adopt an integrated soil and water management approach to tackle the salinity problems in irrigated areas of both countries. The project strategy would be to first diagnose the issues and then to develop long term mitigation, management and rehabilitation strategies at farm and regional level relevant to the problem using proven and high level international interventions. Since the rehabilitation of saline soils through drainage systems or chemical amendments is an expensive and time-consuming process, this project will work on adaptive and mitigation approaches for the rehabilitation of salt-affected soils.

This project will adopt a participatory approach to conduct field trials in different parts of both countries to test the suitability of local and imported crop and forage species for the rehabilitation of salt-affected soils. Adaptation trials will be conducted at the Farmers Training Centers (FTCs) and volunteer farmers' plots in collaboration with the national partners. These trials will also be used for demonstration purposes before scaling up. The project team will jointly implement the best management practices for salinity control at farm level. Smallholder farmers (especially women and young farmers) will be trained to establish seed/gene banks at the community level. ICBA has successfully applied this approach in SSA.

The project will generate and disseminate sustainable integrated crop-livestock technology packages to diversify incomes of farmers through the sale of animal products and forages to local markets, thus making the production systems economically sustainable. However, salt-tolerant forages are variable in biomass production and nutritive value. The available salt-tolerant forages have not been selected or managed for improved livestock production. For this reason, they need to be tested locally for their (a) edible biomass production (kg/ha/year); (b) nutritive value of edible biomass (i.e. the response in animal production per unit of voluntary feeding intake), and (c) the use of micronutrients and nutraceutical properties.

The project will address gender equality and social issues as crosscutting themes in each area. The project will include most vulnerable groups of the society, to ensure that the interventions benefit very poor men and women farmers and households. Since rural women play key role in undertaking agricultural and livestock activities, enhancing their knowledge and capacity will be one of the main targets of this project.

Project outcomes and impacts

The immediate outcome will be full implementation of new salt-affected management strategies within the pilot sites with related benefits to farming communities and land management organizations. The longer-term outcome will be new thinking and awareness of the gains possible from new salinity management approaches and both support and implementation of overall system reform. This, in turn, will lead to out-scaling of alternative production packages beyond the project area through project partners including key government organizations. The successful implementation of above activities will increase the productivity of salt-affected lands, which will contribute positively to country's economy and reducing rural poverty. The overall impact of the project will be a revitalized agriculture in Ethiopia and South Sudan.

Scaling up pathways

The key element of this project is to pilot test innovative strategies and approaches for the rehabilitation and management of salt-affected soils and then "scale up" recommended technologies to reach up to a greater number of rural poor. As discussed before, all activities of this project will be carried out with the involvement of local rural communities. Once convinced, these communities will act as the champions of change and critical drivers in the process of scaling up. For successful scaling up, policy support and institutional infrastructure is very crucial. During the pilot stage, opportunities and constraints that may affect the scaling up process will be critically evaluated. For long-term sustainability, the overall impact of the alternate production systems on the lives of the rural poor, natural resources and environment will also be reviewed.

Socio-economic and environmental impacts

Adoption of alternative crop and forage production systems will reduce the area lost to salinity degradation, bring income to farmers and improve livelihood of poor rural communities especially women. Transformation of salt-affected lands into productive lands will also contribute directly to poverty reduction by increasing the availability of fuel wood, construction materials, wild foods, and medicinal plants.

About the International Center for Biosaline Agriculture (ICBA)

ICBA is a not-for-profit, international center of excellence for research and development in marginal environments. It was established in 1999 through the visionary leadership of the Islamic Development Bank (IDB), the Organization of Petroleum Exporting Countries (OPEC) Fund, the Arab Fund for Economic and Social Development (AFESD) and the Government of United Arab Emirates. The host country, through the Ministry of Climate Change and Environment and the Environment Agency – Abu Dhabi extended the agreement with IDB in 2010 and increased their financial support to the Center.

ICBA originally focused on the problems of salinity and using saline water for irrigated agriculture. Over the last 15 years, ICBA has evolved into a world-class modern research facility with a team of international scientists conducting applied research to improve the well-being of poor farmers in marginal environments. In 2013, the Center developed a new strategic direction addressing the closely linked challenges of income, water, nutrition, and food security. The new Strategy takes innovation as a core principle and identifies five innovations that form the core research agenda: assessment of natural resources; climate change adaptation; crop productivity and diversification; aquaculture and bioenergy, and policy analysis. ICBA is working on a number of technology developments including the use of conventional and non-conventional water (such as saline, treated wastewater, industrial water and seawater); water and land management technologies; remote sensing and modeling for climate change adaptation.

ICBA is a unique institute with a clear mandate and capacity to work on the rehabilitation of salt-affected lands. ICBA is custodian of the world's largest collections of genetic resources of crops and forages suitable for salt-affected lands with a proven capacity of seed development and seed multiplication for variety of environments. In addition, ICBA's long history of working in Africa with local partners makes it fully qualified and eligible to lead this project.



The International Center for Biosaline Agriculture (ICBA) is implementing a 4-year project on the "Rehabilitation and management of salt-affected soils to improve agricultural productivity (RAMSAP)" in Ethiopia and South Sudan. The project is funded by the International Fund for Agricultural Development (IFAD) and is being implemented with the technical support of the Ministry of Agriculture (MoA), Ethiopia and the Directorate of Research and Training (DRT), South Sudan. The project is of great importance for both countries as it directly targets resource-poor smallholder farmers, especially women and children, who face high food insecurity due to their dependence on marginal soils. The project is introducing innovative soil and water management practices and salt-tolerant genotypes of food and forage crops that have the potential to grow in marginal areas. In addition, scientists, extension workers and farmers are being trained to improve their capacity for the management of marginal resources. Through improved crop yields and reduction of loss of land to degradation, the project empowers farmers by increasing their resilience against the impact of salinity on their livelihoods.

**Academic City, Al Ain Road
Al Ruwayyah 2, Near Zayed University
Dubai, United Arab Emirates
P.O. Box 14660**

**icba@biosaline.org.ae
www.biosaline.org
+971 4 304 63 00
+971 4 304 63 55**

Partners

