WATER SECURITY SCAN OF ETHIOPIAN COTTON PRODUCTION

PUTTING WATER STEWARDSHIP TO WORK: TACKLING WATER POLLUTION IN THE TEXTILE AND APPAREL VALUE CHAIN

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Prepared by Solidaridad Ethiopia and Aid by Trade Foundation (AbTF)

Solidaridad

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COTTON MADE IN AFRICA

FOREWORD

Cotton is one of the most important commodities set to influence the development of Ethiopia's economy in the years to come. The commodity is outlined in Ethiopia's Growth and Transformation Plan II (GTP II), 2015-2020, as a key driver for economic growth. The Government of Ethiopia envisions making the country the textile and apparel manufacturing hub of Africa with annual exports of US$ 30 billion by 2025. To this end, the Government launched the National Cotton Development Strategy (NCDS), 2016-2030, which aims to increase cotton production to 1.1 million metric tons, on one million hectares of suitable land, for cotton production between 2017 and 2032.

This report is a review of cotton and water-related issues. It presents an analysis of the Ethiopian cotton production system, its main stakeholders and water-related topics. It attempts to provide a practical overview of the key water-related issues in the Ethiopian cotton production system as required by the Alliance for Water Stewardship (AWS) Standard – a universal framework for sustainable water use. The result of desk reviews and field research, this report aims to inform water stewardship in Ethiopian cotton production.

The report reviews information on the water security status of the Ethiopian cotton sector to understand priority water and climate risks and opportunities. The report also outlines the existing partnerships, stakeholders, beneficiaries, and networks of initiatives contributing to improved water stewardship in cotton production. The field research was conducted in the Awash River Basin area, where cotton production is under irrigation. This report combines knowledge from literature sources including: peer reviewed books, articles, and journals, publications and reports, proclamations, laws and regulations, and policy documents prepared on cotton and water issues in Ethiopia.

The authors and contributors for this report support a sustainable, inclusive, and transparent cotton supply chain that generates business growth, improved natural resource management, environmental standards, and water stewardship. Based on inputs provided by Solidaridad East and Central Africa (Solidaridad), Aid by Trade Foundation (AbTF), Alliance for Water Stewardship (AWS), and Water Witness International (WWI), this publication is a collaborative effort of the consortium partners in the "Putting Water Stewardship to Work: Tackling Water Pollution in the Textile and Apparel Value Chain" project funded by the Swiss Agency for Development and Cooperation (SDC).

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EXECUTIVE SUMMARY

Cotton remains and will continue to be one of the most important commodities for the economy of Ethiopia. Currently, at least 600,000 people, including numerous smallholders, commercial farmers, seasonal cotton pickers, employees in the downstream handloom sector and the textile and garment value chain, depend on the crop for their income. The dominant type of cotton production in Ethiopia, practiced by small-scale farmers as well as commercial large farms, is rain-fed cotton production. In the coming years water usage in cotton production is expected to grow because irrigated farms are more productive than rain-fed farms.

In this context the Government of Ethiopia launched the National Cotton Development Strategy (NCDS), an ambitious 15 year plan (2017-32) that aims to increase cotton production to 1.1 million metric tons on one million hectares of land. This is complimented by Ethiopia's Growth and Transformation Plan II (GTP II), 2015-2020, and Cotton Production and Textile Industry Sector Ten Years Strategic Plan (2021 -2030) by the Ethiopian Textile Industry Development Institute (ETIDI), to ensure Ethiopia is able to achieve its potential. The Ethiopian Water Resources Management Policy outlines some fundamental principles regarding Water Management that are in line with the Organization for Economic Co-operation and Development (OECD). These policies are of core importance for the cotton sector.

As such, important consideration needs to adequately address existing and emerging water-related issues for both large and small-scale farms. This report suggests that the water-related issues should be addressed using a multi-pronged approach and through meaningful involvement of farmers/producers. Similarly, the report proposes addressing the broader off-farm issues such as regulatory policies and mechanisms, enforcement of such policies and water-saving and waste-water reduction practices, information gathering and sharing, and availability of financial inputs for implementation of the aforementioned policies.

Clear government goodwill to support sector growth on the one hand, and an increasing international demand for sustainable cotton and textile products from Ethiopia on the other, are essential advantages for a sustainable cotton production and for putting improved water stewardship into practice. At the same time, the existing and established sustainability cotton standards provide incentives to support water stewardship. These standards promote adaptation and promotion of conservation agricultural practices. The report underlines the need for relevant capacity building for farmers, stakeholder involvement and coordination as well as awareness creation.

This report also proposes the development of water-related training elements on water stewardship as one of the practical ways of boosting sustainable water management. The report further notes that integration of water-related components into established farmer training will contribute to the mitigation of associated risks and foster resilience in cotton production.

Finally, this report concludes that sustainable use of water and the reduction of negative impacts on water quality in cotton production will produce positive effects on water sources, soil productivity and, eventually, economic and social development, while still fostering cotton production.

Credit: AbTF/ CmiA

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ACRONYMS

AbTF	Aid by Trade Foundation
AWBA	Awash River Basin Authority, see also AwRBA
AwRBA	Awash River Basin Authority, see also AWBA
BCI	Better Cotton Initiative
CmiA	Cotton made in Africa
ECDA	Ethiopian Cotton Development Authority
ECPGEA	Ethiopian Cotton Producers Ginners and Exporters Association
EIA	Ethiopian Investment Agency
EIAR	Ethiopian Institute of Agricultural Research
EIIDE	Ethiopian Industrial Input Development Enterprise
ETIDI	Ethiopian Textile Industry Development Institute
FAO	Food and Agriculture Organization
GTP	Growth and Transformation Plan
ICAC	International Cotton Advisory Committee
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
MoA	Ministry of Agriculture
NCDS	National Cotton Development Strategy
NGO	Non-Governmental Organization
NRM	National Resource Management
OECD	Organization for Economic Co-operation and Development
RBA	River Basin Authority (National Level)
RBO	River Basin Office (Regional Level)
SNNPRS	Southern Nations Nationalities and Peoples Regional State
WASH	Water, Sanitation and Hygiene
WRG	Water Resource Group

Credit: Solidaridad

1 INTRODUCTION

1.1 Sector characterization, contexts, and trends

Ethiopia is fast emerging as one of the sourcing hubs for garments and textiles in Africa (GTP II, 2015-2020). Despite the potential, the country is yet to fully benefit from cotton production. As part of the efforts to promote sustainable cotton and lint production, the Government of Ethiopia launched the National Cotton Development Strategy (NCDS) 2017-2032, a 15-year strategy aimed at positioning the country as a major sustainable cotton producer in the continent, as well as to address the growing demand for cotton in the country and globally. The strategy was instrumental in the promotion of sustainable production practices, efficient use of inputs, integrated water resource management, integrated pest management (IPM), protection of forests and biodiversity, efficient waste management, and improved soil fertility management. The NCDS is also complimented by the Cotton Production and Textile Industry Sector Ten Years (2021 -2030) Strategic Plan developed by Ethiopian Textile Industry Development Institute (ETIDI).

Figure 1: Potential cotton growing areas in Ethiopia (Source: Solidaridad, 2016)

The Ethiopian cotton sector is diverse, combining irrigation and rain-fed cultivation, large commercial operations and smallholder farmers, saw and roller ginning, traditional handloom weaving and a modern textile industry, as well as domestic and international cotton markets (SOFRECO, 2017). Currently, more than 600,000 people in the textile and garment value chain – smallholders, commercial farmers, seasonal cotton pickers, and employees in the downstream handloom sector – depend on cotton production for their income. The dominant type of cotton production in Ethiopia, practiced by small-scale farmers as well as commercial large farms, is rain-fed cotton cultivation.

In the years 2012-2019, an average of about 77.117 hectares (ha) was used for rain-fed cotton production. About 71% of all land used for cotton production (54,469 ha) is located in predominantly rain-fed regions of Amahara, Tigray, Benishangul and Gambela – while 29% of all land used for irrigation cotton production is located in Afar, Southern Nations, Nationalities, and People's Regional State (SNNPRs), and Oromia (22,648 ha) (Table 1).

		SMALL SCALE FARMERS		COMMERCIAL FARMS			
WATER SOURCE	REGION	AREA	%	AREA	%	TOTAL AREA	PRODUCTIVITY (T/HA)
RAIN FED	Amhara	17,693	76%	11,187	21%	28,880	1.64
	Tigray	716	3%	9,934	18%	10,650	1.58
	Benishangul	-	0%	8,065	15%	8,065	1.58
	Gambela	-	0%	6,874	13%	6,874	1.58
	Sub Total	18,409	79%	36,060	67%	54,469	
IRRIGATION	Afar	2,194	9%	11,103	21%	13,297	2.17
	SNNPRs	2,753	12%	6,154	11%	8,907	1.97
	Oromia			444	1%	444	2.78
	Sub Total	4,947	21%	17,702	33%	22,648	
	Total	23,355	100%	53,762	100%	77,117	1.78

Table 1: Production by farming type, region and water source (average cotton 2012-2019) (Source: ETIDI 2020)

1.1.1 Trends and actual cotton production in Ethiopia

Ethiopia's Growth and Transformation Plan II (GTP II), 2015-2020, and NCDS aim to stimulate sector growth and increase cotton lint production (SOFRECO, 2017). The ambitious development plans incorporate global sustainability standards, such as Better Cotton Initiative (BCI) and Cotton made in Africa (CmiA), which are becoming mainstream production systems. The plans underline Ethiopia's ambitions to "be the world's top cotton producers with annual lint production of 1.1. Million metric tons (mt)" (USDA Foreign Agricultural Service, 2019). Large and medium-scale commercial cotton farms contribute on average more than 70% to the nation's lint production. Small-scale cotton farmers contribute the remaining 30% (see Table 2).

#	TYPES	FARM SIZE (HA)	FARM MACHINERY		FARM BUILDINGS		INTERNAL ORGANIZA-TION	SERVICES SUPPLED TO OTHER FARMERS		SERVICES RECEIVED FROM OTHER FARMERS		ACCESS TO FINANCE AND CREDIT	COTTON BUSINESS MODEL
A	Small	<30	-	None	-	None	100% family	-	None	++	Tractor services/ contract farming	Inputs through cooperatives/ Microfinance institutions/ No collateral	Sale of seed-cotton (to coops or traders)
B	Medium	30-200	+	1 tractor/ plough/ disc harrow	+	Storage facilities/ shed	Family business – owner (manager) & 2 max full-time employees	+	Tractor services (ploughing)	-	None	Inputs through cooperatives/ loans from commercial banks/ collateral	Sale of seed-cotton or sale of lint
C	Large	>200	+++	Several tractor & various types of machinery	+++	Several types of buildings (storage, workshop, administrative buildings)	Owner is different from the manager. Several departments (technical, machinery, accounting, etc.) More than 5 full-time employees	++	Contract farming with neighboring smallholders	-	None	Inputs through cooperatives/ loans from commercial banks / Development Bank of Ethiopia/ collateral	Sale of lint after commission ginning

Table 2: Typology of cotton farmers in Ethiopia (Source: SOFRECO, 2016)

According to SOFRECO (2016), Ethiopia has more than three million hectare (ha) of land suitable for cotton cultivation. The land identified is also suitable for production of various cash crops and locally consumed agricultural products, including sugarcane, sesame, sorghum, fruits, and other local vegetables.

This area is spread over eight out of the ten regions of the country (see Table 3). Out of the total area suitable for cotton cultivation, 66% of the potential land is suitable for cotton production under full irrigation, while 34% of the land is suitable for rain-fed cotton production and small-scale supplementary irrigation (SOFRECO, 2016).

For the past eight years, the areas cultivated with cotton has varied between 50,000 ha and 100,000 ha, depending on rainfall patterns and market fluctuations (Figure 2) distributed over the seven regional states: Afar, Tigray; Amhara, Benishangul, Gambela, Oromia, and SNNPRs. Cotton production in the Somali region is so far negligible. Regarding the production scale, 79% of small-scale cotton producers in Ethiopia are mainly located in Amhara (76% of all small scale farmers) and Tigray (3% of all small-scale farmers); the predominantly rain-fed cotton producing regions. This also applies to most of the commercial large farms. About 21% of all commercial farms are located in Amhara, Tigray (18%), Benishangul (15%) and Gambela (13%) which represent 67% of all commercial farms producing cotton in Ethiopia, located in the predominantly rain-fed cotton producing regions.

The average production in the cotton growing areas is 1.7 tons and 2.5 tons per hectare seed cotton in rain-fed and irrigated areas respectively (ETIDI, 2019). Production in the past three years has been disrupted by late rain on-sets, flooding (for example, in Afar in 2020), frost, and pests, among other issues. In the coming years, water usage in cotton production is expected to increase in some of the existing rain-fed farms, as well as new farms considering irrigation in order to increase yields and fibre quality.

REGION	HECTARE (HA)
Tigray	269,130 ha
Amhara	678,710 ha
SNNPRs	600,900 ha
Oromia	407,420 ha
Gambella	316,450 ha
Benishangul Gumuz (Benishangul)	303,170 ha
Afar	200,000 ha
Somali	225,000 ha
TOTAL	3,000,771 ha

Table 3: Land suitable for cotton production by region (Source: SOFRECO, 2016)

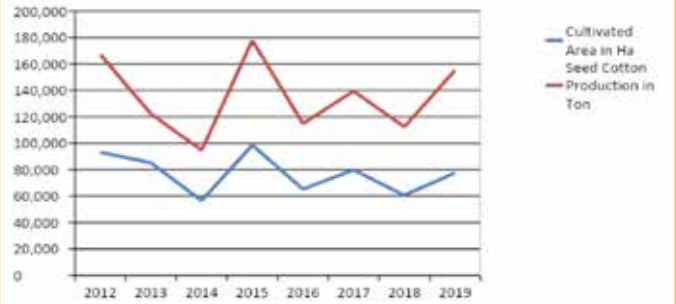


Figure 2: Area and seed cotton production between 2011 and 2018 (Source: ETIDI, 2019)

1.1.2 Cotton production and water sources used

Cotton production in Amhara (Metema and Quara), Tigray (Humera), Benishangul, and Gambella – all located in the Westand North-West of Ethiopia – predominantly depend on rainfall has been significantly affected by the impacts and climate change and climate variability (Table 4).

REGION	COTTON PRODUCTION AREA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Tigray	Humera	0.2	0.0	1.3	12.8	24.1	112.8	183.1	235.0	116.8	20.1	1.2	0.0	707.42
Amhara	Sanja	0.0	1.5	4.0	17.5	75.5	145.1	289.5	272.2	117.1	42.0	9.1	2.5	976.06
	Metema	0.0	0.0	5.2	12.9	76.4	186.9	219.3	248.2	193.4	52.7	2.7	0.6	998.31
	Quara	0.0	0.6	3.4	10.0	109.6	136.0	214.6	271.9	187.3	71.1	0.6	0.0	1,005.04
	Mambuk	4.2	0.6	3.8	5.5	132.6	188.9	275.1	239.9	184.2	84.6	23.9	1.4	1,144.78
Gambela	Gambela	2.4	3.5	27.2	63.3	160..1	137.0	196.0	196.1	168.5	123.9	50.1	12.6	1,140.74
	Abobo	3.8	1.8	18.4	73.2	170.9	136.5	173.4	149.9	166.7	114.5	76.5	8.5	1,094.08
Afar	Assaita	8.3	10.2	16.7	23.5	13.0	11.6	31.0	44.1	19.2	10.8	12.2	12.5	213.17
	Gewane	11.3	29.7	59.4	46.4	24.9	9.5	109.0	129.1	37.0	26.3	15.0	11.7	509.07
	Melka Sedi	22.6	21.7	51.5	59.7	25.9	24.9	74.9	94.3	30.4	18.5	19.1	20.7	464.13
SNNPRs	Arba Minch	27.7	35.7	53.7	167.1	144.7	66.5	39.1	49.6	87.0	124.1	74.2	40.1	909.40

Table 4: Historical rainfall data of cotton production areas in 2019 (Source: Author computation, 2020)

In Afar, SNNPR, and Oromia small-holders cultivate 21% of all land used for cotton production and 34% of all commercial farms cultivating cotton in Ethiopia rely on furrow irrigation. This is seen especially in the Awash Valley and the Omo where Valley large farms produce cotton using irrigation.

Data shows that there has been an increase in water usage in cotton cultivation. Specifically in cotton, supplementary irrigation water is a critical input to increase productivity – this entails the provision of water for the plant with the use of irrigation water as primary source and/or supplementary irrigation. At the same time, extracting water from catchment areas used by others also leads to water conflicts over water usage patterns. Several factors can be cited as driving forces for the increase in water usage, including: i) a sizable growth in the number, variety, and capacity of irrigation systems. This comprises of farmer-constructed traditional schemes, modern diversion schemes, pumping schemes, micro-irrigation, and rainwater harvesting schemes; ii) an increase of government interventions over several years to raise awareness among farmers and investors on the use of supplementary irrigation as a means to increase productivity and circumvent effects of rain shortages in most crop cultivation; and iii) an expansion of cotton cultivation into arid regions of the country. In these areas cultivation is only possible with irrigation from rivers (for example, the Somali). Although the current production covers less than 1,000 ha, the Somali region has a potential of up to a quarter of a million hectares suitable for cotton cultivation. In the Somali region there are also a number of micro- and medium-scale dams. Large-scale cultivation of other crops such as lowland wheat has also started.

According to reports from Ethiopia's Ministry of Agriculture, in the 2019/2020 crop year, irrigated cultivation had reached more than 2.500 ha (in lowland wheat, at least for now) and is set to expand to cotton production with promising productivity of up to 3.0 tons per ha. The intensification of agricultural production under irrigation is contributing to shifting patterns and quantities of accessible water for the diverse stakeholders within the various rivers' catchment areas.

Credit: Solidaridad

1.1.3 Ginning and further value addition

It takes about six months to plant and harvest cotton. After the harvest, the seed and fibre are separated in ginneries, and the thin coating of wax that surrounds the fibres and protects them from moisture is removed. Eventually, the raw cotton is pressed into large bales and sold to spinning mills for yarn manufacture. There it starts its trip along the textile chain – from the spinning mill to the finished garment (AbTF, 2020).

Currently, there are 20 ginneries operating in Ethiopia and four new ones at the establishment stage. Six of the ginneries use roller technology, while the other 14 use saw gin techniques. In terms of capacity, the total daily installed gin capacity is estimated to be 1,113 tons, equivalent to 5,000 bales. In terms of geographic distribution, eight ginneries (42%) are strategically installed around cotton farming's areas and 12 (58%) are located away from farms (Table 5).

In Ethiopia there are more than 20 textile mills with 125,000 spindles, more than 150 garment factories and over 1,000 handlooms settings add value to cotton. A large percentage of Ethiopia's textile mills have the capacity to add further value. The textile mills range from stand-alone spinning to vertically integrated mills, and garment producers use either local fabrics or imported ones.

REGION	NUMBER OF GINNERIES	DISTRIBUTION (%)
Amhara	6	30%
Tigray	1	5%
Benishangul	1	5%
Gambela	1	5%
Rain-fed Areas	9	45%
Afar	3	15%
South NNPRS	1	5%
Ormiya	6	30%
Addis Ababa	1	5%
Irrigation and Addis	11	55%
GRAND TOTAL	**20**	**100%**

Table 5: Number and distribution of ginneries in the regions (Source: ETIDI 2019)

1.1.4 Demand and supply dynamics

According to USAID (2019), there is a demand and supply gap, as the investment in the textile and garment industry has increased significantly, consuming 64,000 mt of lint, while supply met only 57,000 mt, filling the gap 8,000 mt of lint through importation. The Ethiopian Industrial Input Development Enterprise (EIIDE) is a state-owned organization established in 2014 to play a market stabilisation role. EIIDE is responsible for bridging the supply and demand gaps of industrial raw materials, including cotton, by managing buffer stock and credit financing mechanisms. This is done by buying from producers when there is excess and supplying to textile mills when there is a shortage of cotton in the market. Nevertheless, cotton producers prefer to sell to textile factories directly where the price is set through price negotiations, instead of going through the EIIDE. Furthermore, the majority of large-scale cotton producers prefer to deal directly with the textile factories and sell their cotton at better-negotiated prices.

1.2 Contribution to job creation and national growth

The cotton sector is a source of employment and livelihoods for farmers, traditional weavers, and handloom operators. According to the Ethiopian Institute of Agricultural Research (EIAR, 2017), the cotton sector employs about 57,000 small-scale cotton farmers, and 1,020 commercial cotton growing private investors/farms create jobs for over 150,000 workers. There are an estimated 2,000 workers working in the 16 functional ginneries. Traditional cotton growing culture and the practice of spinning and weaving are also major traditional non-farm activities practiced by the rural household farming community and urban weaving (ITAB, 2015).

There are about 297,989 cottage industries - 60% of which are operating in the rural areas and the remaining 40% in the urban areas – producing hand-woven colorful fabrics, light clothing, and thick blankets. This type of enterprise involves more than 483,903 weavers (39% females and 61% males) (EIAR, 2017). According to the Oeko-Tex Institute report (2018), the cotton sector provided a livelihood for almost 500,000 households in Ethiopia in 2018.

TYPE OF ENGAGEMENT IN COTTON PRODUCTION AND TRADITIONAL TEXTILES SECTOR	TOTAL (#)
Small-scale cotton farmers	57,000
Workers on 1,020 commercial cotton growing private farms	150,000
Workers in the 16 functional Ginneries	2,000
Weavers in urban and rural 297,989 cottage industries	483,903
TOTAL (PEOPLE)	**692,903**

Table 6: Livelihood provision through cotton production and traditional textile sector (Source: EIAR 2017; ITAB 2015)

1.3 Policy setting – Sector policy frameworks, investments and recent trends

The cornerstone of the National Cotton Development Strategy (NCDS) is to: i) improve the policy and institutional environment to raise the efficiency and the competitiveness of the cotton value chain; ii) increase transparency along the cotton value chain; iii) promote and manage environmentally and socially sustainable cotton supply chains; iv) raise the competitiveness and the profitability of cotton production; and v) strengthen Ethiopia's focus on investment as a vector for growth and integration in the cotton value chain.

The GTP II (2015-2020) targets to create 140,000 new jobs in this sector, with export revenues targeted to reach US$1 billion by the end of 2020. Beyond the GTP II, the Government also envisions making Ethiopia the textile and apparel manufacturing hub of Africa with annual exports of US$30 billion by 2025. In addition, the NCDS lays out short-term five year development plans for the cotton sector. The government has, through its plans projected that 250,000ha will be used for cotton production with an annual lint production of 195,780 mt. Furthermore, the strategy includes an ambitious 15-year plan to increase cotton production to 1.1 million mt from one million hectares. For this purpose, the Government has launched several industrial parks to increase production and provide employment for millions of people. The NCDS also proposes the establishment of the Ethiopian Cotton Development Authority (ECDA) to oversee and promote a more competitive cotton sector. The ECDA is yet to be established.

The Government has also invested substantial resources (including, in textile and industrial parks) to attract potential international investors. Foreign investors from the United States, China, Korea, India, Sri Lanka, Bangladesh, and others are setting up operations in these parks (USAID, 2019). According to the NCDS 2017-2032, the comparative advantages for such investments are largely owing to availability of areas suitable for cotton production, abundance of water for irrigation, labour availability, competitive power rates, increasing local demand for quality lint, growing number of textile mills and integrated industrial parks, complete value chain combining cotton production, processing and consumption, proximity to major markets, and attractive government incentives.

GROWTH AND TRANSFORMATION PLAN II (GTP II) 2015-2020	
New jobs	140,000
Export revenues targeted by the end of 2020	US$1 billion
Billion by 2025	US$ 30 billion
NATIONAL COTTON DEVELOPMENT STRATEGY (NCDS) 2017-2032	
Land use for cotton production by 2022	250,000ha
Annual lint production of by 2022	195,780 mt
Land use for cotton production by 2032	1 million ha
Annual lint production of by 2032	1.1 million mt

Table 7: Ambitions of the GTP II and the NCDS for cotton production and the garment industry (Source: Author, 2020)

1.4 Anticipated trends and challenges that affect the sector

According to the NCDS, 2017-2032, Ethiopia plays a marginal role in global textile value chains as the textile industry is highly fragmented and its products are yet to meet the consistent competitive scale required by the international markets. Despite the efforts made by the Government in the last several years, the competitiveness of Ethiopia's lint cotton and ready-made garments in a global market remains suboptimal.

For more sustainable and competitive cotton production, reduction of contamination is essential. Contaminated cotton causes disruptions in the spinning process and is normally sold at a considerably lower price to compensate the spinner's additional costs. Reduced contamination depends on improved harvesting methods, handling, storage, transport, and ginning practices. Contamination of lint by non-vegetable substances is one of the major problems, especially in hand-picked seed cotton. While Ethiopian cotton is handpicked, a number of factors affect the lint quality and there is growing consensus that a lot needs to be done in order to avoid the mixing of mature and immature seed-cotton and reduce contamination (specifically, foreign material being introduced during harvesting, bagging and transportation). Ginneries need to pre-clean the seed-cotton and lint after ginning to further reduce the trash content in the lint. A decentralized quality control process has to be developed from the field to the gins and the industry. This ensures a better textile and fibre quality due to less breakage and more uninterrupted thread.

Limited access to resources (including, quality inputs and available patient investment) is also a major challenge for the sector. In addition, inferior technology and operational inefficiencies contribute to low productivity and low quality of cotton. Harvesting, bagging, and transportation methods, as well as the use of poly-propylene bags, compromise the quality of lint and pollute the environment. Limited financial investments (including, working capital and shortage of foreign currency), innovation, unfavorable input prices, and unsustainable agricultural practices further aggravate the situation. Many ginneries are old, with old machinery or are no longer in operation. They lack proper spare parts and, in some instances, require a complete overhaul. There are also ginneries that are no longer suitably located because cotton production areas have shifted, creating adverse implications for transportation of seed-cotton over long distances and risking contamination.

The NCDS, 2017-2032, also promotes increased production of local raw material for local value addition and export of finished products. Currently, a large portion of garment manufacturers, especially those in the newly constructed industrial parks, are using imported fabric. The main reason is the limited supply of locally produced lint that match the quality requirements and sustainable certification. As a result, a high percentage of textile (yarn and fabric) is imported from abroad to feed the ready-made garment industry. By using imported fabric, companies spend a sizable amount of hard currency on imports and, by doing so, reduce the range of value addition and employment generating opportunities. Even though most of the spinning mills operate outside the industrial parks, the traditional handlooms still use the locally produced cotton as primary input – some of the spinning and vertically integrated mills mention that lint from local sources is usually contaminated with high trash content. While others with ring frame spinning complain about difficulty in getting a consistent supply of cotton with longer staple length above 28mm, as production is limited to cotton cultivation in irrigated areas. The lack of the necessary sustainability certification is also an emerging issue.

A cotton sector scoping study by SOFRECO (2016) identified various other challenges including: i) policy and governance issues such as the lack of efficiency of the environmental and social prevention regulatory tools (that is, environmental impact assessments, code of conduct, corporate certification); ii) environmental issues such as water pollution and unsustainable utilisation of water resources, soil pollution, loss of soil fertility, loss of biodiversity, and the transformation or disappearance of ecosystems due to inappropriate land use; iii) social issues, including labour rights, inclusive participation processes, lack of land use management plans, minority rights (for example, the land policy in the Afar region is linked to tribes and hence land is not for lease to commercial farms), and limited adaptation to climate change; iv) civic space issues, including a lack of communication with local stakeholders resulting in dissatisfaction or the rejection of projects by local populations; v) finance issues, meaning small-scale farmers are unable to access finance or lines of credit; vi) ginning and grading limitations due to outdated equipment and the low quality of lint; and vii) low competitiveness and market access. Ethiopian cotton also faces stiff competition from Brazil and West Africa. Over 80% of garment exports go to Europe where production standards such as BCI, CmiA, or Organic Cotton are a requirement. Meanwhile, there is a growing (international) market for handloom textiles which demands raw cotton.

It has been noted that there are no incentives (including subsidies) for cotton producers in Ethiopia and therefore prices quoted by the international markets serve only as indicative and are not strict determinants of farm gate price. Farm gate prices and quality are often the causes of disputes between producers and spinners. Issues of contract management and respect of contract terms and conditions; and lack of arbitration and enforcement mechanisms remain a challenge in the sector. Other important factors affecting the sector as identified by Ethiopian Cotton Producers Ginners and Exporters Association's (ECPGEA) Annual Report (2017) are technology (improved seed quality, integrated pest management, including less hazardous pesticides), good agronomic practice, harvesters, irrigation technologies and farm machinery), insurance (to safeguard farmers and investors from risks of rainfall failure and other security problems), and infrastructure (improved irrigation schemes, access to roads, electricity that nevertheless have been addressed by the government in investment areas). Solidaridad's 2016 study recommended that all planning for cotton production investment takes into account the need to ensure climate mitigation and resilience (soil and water management, riparian boundaries, forested areas, etc.).

Addressing the above challenges will positively impact production, productivity, quality, market access, sustainability and reduce cost of cotton production. Furthermore, a commitment to regulatory enforcement by designated institutions (for example, agriculture, natural resource departments, etc) is needed.

Credit: Solidaridad

2 PRIORITY WATER AND CLIMATE ISSUES – RISKS AFFECTING THE SECTOR

To reduce the pressure of over-utilization of water resources in the cotton growing areas, it is necessary to develop practical and inclusive solutions for integrated water resource management (IWRM). The IWRM approach needs to emphasize the need for conservation and establishment of hydrologic boundaries and/or basins as the fundamental feature of water resources management. As part of our analysis, we looked at cotton production and water-related issues by region, as well as hydrologic boundary. This approach allowed us to appreciate the requirements for sustainable cotton production, the impact of climate change, as well as water-related challenges and potential opportunities. We focused on three case studies of three river basins, specifically: i) Awash-Basin; ii) Omo-Gibe Basin; and iii) North- and North-West Ethiopia.

2.1 Water and climate related issues

The potential of Ethiopia's hydrology has a causal link with climatic conditions, terrain, and other landscape characteristics. The country's high climate variability over time is the main reason behind the spatial and temporal variability for the availability of water (UNESCO, 2004). Rainfall in the past years has averaged below expected precipitation levels resulting in low levels of recharge of Ethiopia's water resources. Climate change has greatly influenced rainfall patterns and increasing the frequency of prolonged droughts. As a result, millions of Ethiopians are currently facing severe water shortage (Havekes et al., 2016).

In the dry years (that is, during the droughts), the surface water gaps have caused agricultural loss and the impact is projected to increase steeply by 2030. This puts agricultural production in Ethiopia (including, sustainable cotton production) at risk, as well as putting lowland pastoralists at risk. Under a business-as-usual, forecasts estimate agricultural losses from a one-in-ten-year drought to increase from US$ 3 Billion in 2016 to US$ 13 Billion in 2030. This would trigger a more than 20% loss of the sector's production by value (Figure 3).

More extreme forecasts predict a one-in-fifty-year drought which would affect agricultural production in several river basins, including Awash-Basin. The expected decline in production will be more than 80% – resulting in crop loss and livestock losses concentrated in the lowland regions. Droughts' on this scale would have devastating knock-on-impacts on the economies and societies of these regions (2030 WRG, 2016).

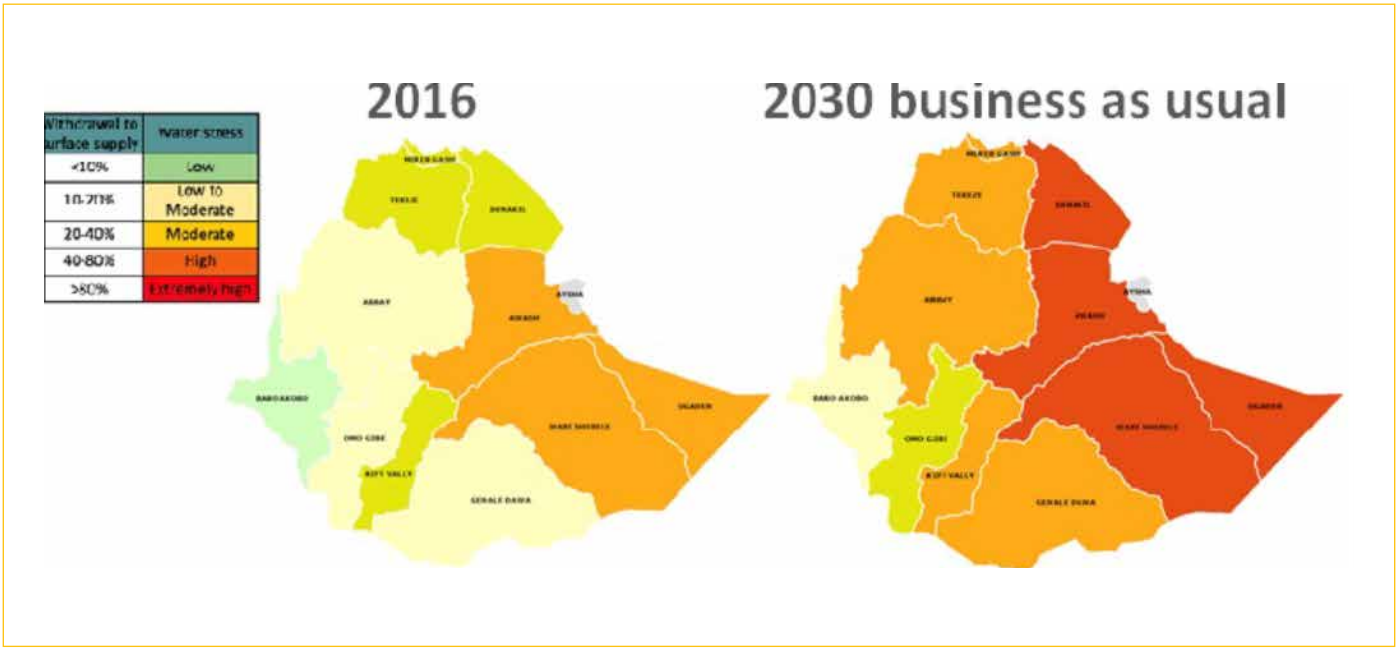


Figure 3: Water security forecast of Ethiopia (Source: WRG 2030, 2016)
Note: Figure 3 shows current conditions and projections of water stress in Ethiopia, where stress is measured as the ratio of water demand to availability in each basin.

2.1.1 Water governance and use

Sustainable development of water resources and effective governance are inseparable. Governance generally embraces the entire framework of decision-making. It stipulates who makes what kinds of decisions, when, and according to what criteria, norms and operational values. Such decisions range from those that are made at lower government institutions, which mainly deal with day-to-day operational and functional issues, to those that are made at higher levels (UNESCO, 2004). Effective water governance (including, social, economic, political, institutional, administrative systems and decision-making processes) is essential for sustainable cotton production as it promotes improved productivity (quantity and quality), as well protecting natural resources to enable long-term beneficial national economic and social development.

The successful implementation of water regulatory frameworks (for example, laws, policies, and strategies), as well as public and private sector programmes/projects is dependent on clear and coherent frameworks for stakeholders working at different levels to follow. These are stakeholders who share a common vision regarding sustainable development and management of water resources – whether to address climate conditions (for example, floods or droughts), water pollution, or the implementation of IWRM systems.

2.1.2 Legal frameworks of water resources and climate

Over the last decades, Ethiopia's water resource management has gone through various changes and restructuring of institutions. This was meant to address the gaps in efficiency, effectiveness, linkages, coordination, and collaboration within the water sector in Ethiopia (UNESCO, 2004). There are three key proclamations governing water management in Ethiopia are: i) Proclamation No. 197/2000: Water Resources Management; ii) Proclamation No. 300/2002: Pollution Control; and iii) Proclamation No. 534/2007: River Basin Councils and Authorities. The Ministry of Water, Irrigation, and Energy is the federal organization established to manage water resources, water supply and sanitation, large- and medium-scale irrigation, and electricity.

In addition, the Ethiopian Water Resources Management Policy (No. 197/2000) outlines fundamental principles to ensure the Ethiopian people have access to sufficient water of acceptable quality to satisfy basic human needs. The policy gives top priority to drinking water supply over other uses. It recognizes water as both an economic and social good. In terms of water resources development, it supports a rural-centered, decentralized, and inclusive management approach. This focuses on promoting decentralized management, fostering the participation of user communities and supporting community self-initiatives in water resources management. The management of water resources is aimed at ensuring social equity, system reliability, and sustainability. Integrated water resource management is also emphasized in the policy document. The Water Sector Development Program is an instrument for implementing the Water Resources Management Policy and advocating for the establishment of a river basin authority.

Credit: Solidaridad

2.2 Impacts and risks on the cotton production sector

The impacts and risks to sustainable cotton production are closely related to the over-reliance on rain-fed cultivation. Unpredictable rain patterns (including, large spatial and temporal variations in rainfall), unexpected appearance of heavy rains at the beginning of the season, as well as unexpected early-stop of favourable rainfall-conditions affect cultivation (Table 8). About 12 Ethiopian river basins total about 122 billion cubic meter annual flow (EIA, 2012). Generally, heavy clay soils due to rain reduce productivity and damage crops.

Most rivers in Ethiopia are seasonal and there are rarely perennial rivers below 1,500m altitude. All river basins except the Nile basin frequently face water shortages. About 70% of the total run-off takes place during the period June to September (Figure 4). Dry season flow originates from springs which provide base flows for small-scale irrigation (FAO, 2016). Irrigation is not widely practiced due to lack of water storage infrastructure and drainage systems.

Figure 4: Rainfall pattern in cotton production regions and districts in 2019 (Source: National Meteorological Service Agency, 2019)

NO	BASIN NAME	LOCATION	TEMP (OC)		AVERAGE RAINFALL (MM)	AVERAGE EVAPORATION (MM)	SURFACE RUN-OFF (BM3)
			MIN	MAX			
1	**WABESHEBELE**	4045'N-9045'N 38045'E-45045'E	6	27	425	1,500	3.4
2	**ABAY (BLUE NILE)**	7045'N-12045'N 34005'E-39005'E	11.4	25.5	1,420	1,300	54.4
3	**GENALE DAWA**	3030'N-7020'N 37005'E-43020'E	<15	>25	528	1,450	6
4	**AWASH**	8030'N-12000'N 38005'E-43025'E	20.8	29	557	1,800	4.9
5	**TEKEZE**	11040'N-15012'N 36030'E-39050'E	<10	>22	1,300	1,400	8.2
6	**DANKIL**	1200'N-1500'N 3900'E-4200'E	5.7	>57.3	N/A	N/A	0.86
7	**OGADEN**	5030'N-9044'N 42041'E-45000'E	25	39	400	N/A	0
8	**OMO-GHIBE**	4030'N-9030'N 35041'E-3800'E	17	29	1,140	1,600	16.6
9	**BARO-AKOBO**	5031'N-10054'N 3300'E-36017'E	<17	>28	1,419	1,800	23.23
10	**RIFT VALLEY LAKES**	4020'N-8030'N 36030'E-39030'E	<10	>27	N/A	1,607	5.64
11	**MEREB**	14003'N-14052'N 37051'E-39027'E	18	27	N/A	1,500	0.72
12	**AYSHA**	10000'N-11000'N 42000'E-43000'E	26	40	N/A	N/A	0

Table 8: Ethiopian river basins overview (Source: Authors, 2020)

Credit: Solidaridad

2.2.1 Water challenges in Ethiopian cotton cultivation

Rain-fed (as practiced in Amhara, Tigray, Benishangul, and Gambela) and furrow irrigation cotton cultivation (dominant in Afar, SNNPRs, and Oromia) face several challenges. These challenges differ depending on the type of cotton production (rain-fed vs. irrigated), and cotton actor (small holders vs. commercial farms).

RAIN-FED COTTON CULTIVATION	FURROW IRRIGATED COTTON CULTIVATION
Key informants on local cotton producers practicing rain-fed cotton cultivation pointed out that major water-related challenges for respective farmers are: i) lack of data and climate information (that is, the onset of rain and its intensity) for planning purposes - the onset of rain and intensity is important for the determination of crop mix for the season; and ii) lack of climate prediction technologies - while inexpensive technologies to predict of rainfall patterns are readily available elsewhere in Africa, farmers in Ethiopia have not yet benefited from such advances. Data on challenges and opportunities of rain-fed agriculture are scarce. Meanwhile river basins are the emerging unit of land-water and other natural resources management. The presented case studies of the Awash-Basin and the Omo-Gibe Basin are reflecting this approach. Using a regional approach furthermore Humera, Metema Quara, Benishangul, and Gambela will be assessed to highlight specific water-related challenges and opportunities in cotton production and for the improvement in water stewardship.	Based on key informant interviews with local cotton producers practicing furrow irrigation, the water-related challenges are: i) lack of planning and construction of water conveyance systems into the field and drainage systems for excess out of the field; ii) use of old, costly, and inefficient motors/pumps to pump water; iii) impedance of proper water flow in the field due to lack of slope levels in the field; iv) limited use of newer technologies, such as sprinkler and drip irrigation systems. The challenges cause excess water usage often in excess of what is needed by the crops. In other instances, excessive water causes large patches of scorched plants resulting in losses in production. It is suggested by cotton producers that in the short- to medium-term, the investment and use of modern technological development (such as satellite imagery and drones) be employed to assess the field situation, including irrigation options.

Table 9: Challenges of rain-fed vs. furrow irrigated cotton cultivation (Source: Author, 2020)

2.2.2 Water issues in the Awash Basin and cotton production

Cotton production in the Awash-Basin rose in 1928 when international investors (for example, Italian producers) set up farms in the Upper Awash Valley. In the 1950's more private companies set up a cotton farm in the lower Awash Valley and State farms were established in the middle Awash in the 1980s (Girma and Awulachew, 2007). Currently, most private irrigated cotton farms are operating in the upper Awash, Middle Awash and Lower Awash valley along with a small number of farmers. In 2019, cotton in the Awash Valley (Afar and Oromia) was produced on nearly 9,000 ha. Out of these 1,087 ha were cultivated by 548 small scale farmers. In the Afar regions part of the Awash River Valley, the communities have been mostly pastoralists. Traditionally land has been owned by communities and not individuals. Recently, local officials gave land to individual households for permanent settlement and food crop production (ETIDI, 2019). According to Solidaridad (2016), 1ha of irrigable land is allocated per household (including, women-headed households) in the Afar region. The Afar community in Amibara Wereda are becoming vegetable producers – supplying to nearby cities and towns. New cooperatives are emerging in the Woreda, where communities are enjoying the public sector constructed irrigation infrastructure. Additional land has been also allocated for Afar investors from 5 to 50ha and produce cotton as their major crop.

Cotton production in the Awash Valley has historically been achieved by water extraction from the Awash River Basin (that is, the Upper Awash Valley, Middle Awash Valley and Lower Awash Valley). The Awash River flows from a highland 3,000 meter above sea level in Dendi District near Ginchi town in the Oromia region – passing close to Addis Ababa to Lake Abbay, 250m above sea level, to the lowland near the Djibouti border. It covers 1,250 km and includes various tributaries on the way to the 113,700 km^2 river basin catchment area. The Awash Valley has a semi-arid climate with a bimodal rainfall of 533 millimeters (mm) annually. The long rainy season occurring from July to September accounts for 49% of this rainfall (264mm) and the short rainy season from February to April (156mm) accounts for 29%. The rainfall pattern is characterised by inter-seasonal and inter-annual variations. The mean minimum temperature is 15.2ºC in December and 23ºC in June, while the mean maximum temperature is 32.5ºC in December and 38ºC in June. Mean relative humidity is lowest in June at 36% and highest in August at 58% (Girma and Awulachew, 2007).

Most inflow to the main river occurs through the western tributaries during the rainy season. The river twists downstream filling a number of artificial reservoirs such as Koka and Tendaho. Most of the basin areas are in the low land with annual temperature 25 to 40ºC and annual rainfall of less than 200mm. The river catchment has 406,000 ha land suitable for irrigation. However, considering the surface flow of the water (4.9 billion cubic meters annually) and with available technology it is estimated to irrigate 206,000 ha. Currently, there are close to 188,000 ha of irrigated area under the river basin (AWBA, undated).

Large state-owned sugarcane irrigation schemes, cotton farms, foreign investment in horticulture, textile, leather and steel and manufacturing industries are found upstream. A few industries are found downstream. The river system is shared by five regional states (Oromiya, Afar, Amhara, Somali, and SNNPR) and two administrative towns (Addis Ababa and Dire Dawa) (Figure 5). There are three artificial reservoirs (Koka, Kesem-Kebena and Tendaho) in the basin which support water flow stabilization and reduce the risk of flooding. Moreover, Koka high dam generates electricity. There are two additional reservoirs, Awash Park and Logia river dam, which are under study (AwBA, undated). Both the upper, middle and downstream developments of Awash valley were affected by scarcity of water at planting, flood damage at harvest, and an increase in saline soils (Solidaridad, 2016).

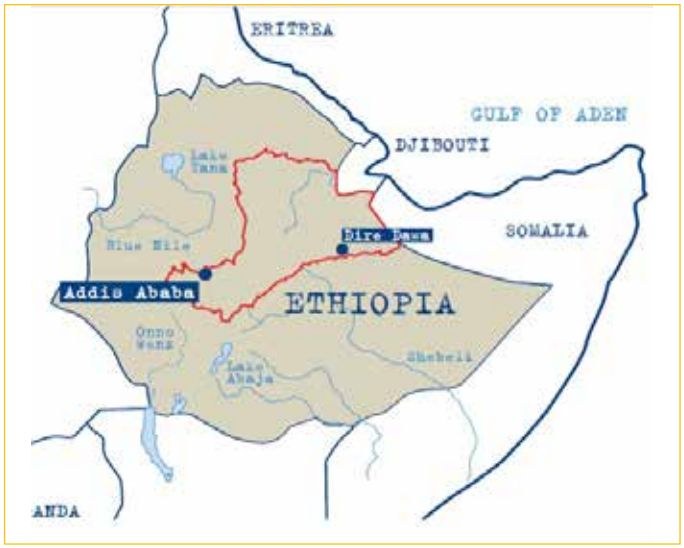


Figure 5: Map of the Awash River Basin (Source: Havekes et al., 2016)

Credit: Solidaridad

Priority issues, challenges and risks, and root causes in the Awash Valley

#	ISSUES	DESCRIPTION
1	**FLOODING**	River flooding, flash floods, lake flooding and urban floods are the major flood types in the river valley. The floods affect communities and several investments. The causes of flooding are river embankment/ dyke over topping, erosion of river embankment and dykes sediment load in river channel bed, and change in river morphology (AwBA, undated). Most irrigated farms have been protected from flooding, both from the Awash River and from the adjacent hillside catchments, by a series of earth dykes (Girma and Awulachew, 2007). In August and September 2020, during our field survey the area was affected by unprecedented flooding. According to a Afar Regional State report, the flood affected about 240,000 citizens and displaced about 144,000 citizens due to the overflow of the Awash River. The flooding damaged about 41,000 ha of crops ready for harvest and caused the loss of about 21,000 animals. The loss in monetary terms was estimated at Ethiopian Birr (ETB) 5 billion (approximately EUR 98.5 million). Pastoralist communities, women and children, investments and small business, and infrastructures were significantly affected. The rehabilitation efforts will demand an estimated ETB 350 million (approximately EUR 6.8 Billion). Unlike previous incidents, the flooding was aggravated by heavy rains causing the Awash River Basin to change its course in multiple pathways and tributaries. The release of excess water from the Koka and Kesem-Kebena dams contributed to the flooding in August 2020. The Koka dam generates 350MW electric power. The water management practices were against global best practices which complicated the flooding situation of the already overflowing river basin. With less than two weeks pre-warning, water was released from the two dams which enhanced the flooding. The water release from the damn was necessitated to maintain appropriate water levels. The lack of coordination on water governance contributed to the flooding. Previously, Awash River Basin Authority managed the river, including water distribution for irrigation and flood control however since 2019, flood management of the Awash River Basin has outsourced to regional water works construction companies.
2	**WATER SCARCITY**	The current irrigation water pricing system in the Awash River basin does not limit the maximum extraction rate of irrigation water for upstream users. Therefore, there is no way to restrict the amount of water used during peak irrigation demand. As a result, downstream irrigation users suffer from water shortage during low flow and high irrigation water demands, complaining about increasing instances of water shortage particularly in the dry season and water users will have to expect more and more situations of water scarcity in the future (Mosello et al., 2015). Huge portions of the river flow are also redirected to irrigate 10,000ha of sugarcane by inundation – an old system established in the 1950s. At least two irrigation schemes of similar size are found in the Upper and Middle Awash. Such out-of-proportion water use certainly adds to the water shortage problem. Efficient and innovative irrigation techniques such as drip irrigation could provide a solution, but the incentives to invest are missing. The lack of incentives to invest in this area comes in two common forms and are not unique to Ethiopia (Havekes et al., 2016): i) insecure property rights; ii) low water prices (for example, currently the service charge is set at ETB 3 per 1,000 m^3 of water (about EUR 0.12). This amount set should be more than a factor 10 less than the costs of operating and maintaining the diversions, primary canals and drains and access roads by AwRBA); and iii) dam filling and unplanned water releases. Our field survey for this publication found that in areas that depend on dams, the timing of dam filling and water release from the dam has been problematic. Water use and regulation of the Koka reservoir does not coincide with lower stream needs (such as, water release at night). In addition, the dam restrictions for water users in the middle Awash and unsanctioned expansion of sugarcane farms in Wonji and Metehara upset lower stream users and exacerbate water shortages (Mosello et al., 2015).
3	**WATER QUALITY AND POLLUTION**	Metal and leather manufacturing industries, as well as pesticides from farms are threats in the river basin (FAO, 2016). One of the consequences of industrial activity is more uncertainty about what substances entering the water system and biosphere. Nearby farmers use this stream to water their crops and hydrate their cattle. Cases of cattle dying after drinking from the stream have been reported – but due to broken lab equipment testing on heavy metals is either not happening or happening with not enough samples to understand the water quality. Generally, testing for pesticides and insecticides is not being done in Ethiopia (Havekes et al., 2016).

4	**SALINITY AND IRRIGATION PRACTICES**	Salinity and sodicity/alkalinity are also major problems that emanate from improper use of irrigation water and inadequate drainage facilities (FAO, 2016). Thousands of irrigated hectares of land have been abandoned in the 1990s and 2000s due to salinity (EIAR, 2017; FAO, 2016; Havekes et al., 2016; Girma and Awulachew, 2007). The unregulated outflow from Lake Beseka is threatening downstream water users as it could lead to major salinization of the Awash River, thereby damaging the ambitious irrigation projects downstream and threatening water supply for urban settlements (Mosello et al., 2015). Surface furrow irrigation methods are dominantly used for cotton (FAO, 2016). It wastes water and induces salinity compared to the most recent methods of sprinkler and drip irrigation.
5	**LACK OF CAPACITY, COORDINATION, WATER GOVERNANCE, AND INCLUSIVE PARTICIPATION**	Before its current role as River Basin Authority (RBA), the Awash Basin Authority (AwRBA) was an administrative project office of a state-owned irrigation farm in Middle Awash. It has had to familiarize itself with the role of coordinating activities in the basin and reconciling wishes of the many stakeholders (Havekes et al., 2016). There has been a mismatch between the guiding legislation and on-the-ground capacity to enforce it. For example, AwBA is not executing IWRM activities that are normally within a RBA's mandate. In the Awash basin there is very little synergy between the water development initiatives (such as, basin-level water management and planning) driven by the regional governments and those driven by AwBA – the existing policies and regulations do not sufficiently articulate the specific IWRM roles of the regions and their interactions with basin authorities (Mosello et al, 2015). In light of capacity gaps, cooperation becomes all the more important. During our field survey for this publication, it was revealed that until early 2019 AwRBA was the authority responsible for the overall management of Awash River basin, including tributaries. However, currently its legal autonomy and budget has been stripped and it is demoted to Awash Basin Development office level, responsible for operational activities under Ethiopian River Basins Authority – Ministry of Water, Irrigation, and Energy. In its role most activities are awareness creation on river catchment and management of regional stakeholders, and study dam structures (for example, Awash Park dam and Logia river dam). Previously, it had activities, such as water training, main canal maintenance, water quality, and pollution monitoring. Water training has been outsourced, and water quality testing as well as pollution monitoring activities has been transferred to River Basins Development Authority in the head office under Ministry of Water, Irrigation, and Energy. There is very little participation and consultation of stakeholders in the water issues, including the planning processes of AwBA. Active involvement, such as participation in permit application procedures, is not yet present.
6	**ILLEGAL WATER USE AND DISCHARGE**	Currently, the river basin is affected by illegal water and waste discharges – by law discharging untreated wastewater is illegal. A permit system is being set up that will help regulate water use and discharge. However, the enforcement of these permits especially on a basin-wide scale is not yet realistic (Havekes et al., 2016).
7	**PROSOPIS JULIFORA**	Prosopis julifora has an environmental impact associated with the establishment of the Middle Awash state farm enterprise. The introduction of the invasive thorny shrub named Prosopis julifora; now covers most of the river valley area of upper and middle Awash area, hitherto open land. The land was used for grazing purposes during wet seasons by the surrounding inhabitants and is now covered by the invasive plant. This has affected the accessibility and maintenance of the canal network of the farms and grazing area of local communities (Girma and Awulachew, 2007).

Table 10: Priority issues, challenges and risks in the Awash Valley (Source: Author, 2020)

2.2.3 Water issues in the Omo-Gibe Basin cotton production

In the Omo-Gibe Basin, cotton has been grown for years, particularly in North Omo (Oeko-Institut, 2018). For the 2019 cotton season, the Ethiopia Textile Industry Development Institute (ETIDI) reported that the crop was cultivated on 7,016 ha, out of which 2,078 ha were held by small-scale farmers. Small-scale cotton producers surrounding the private farms have been growing cotton for generations. The region also inhabits a small number of organic cotton farmers and other conventional producers are producing cotton under rain-fed conditions as well (SOFRECO, 2016). Meanwhile, a shift in cropping patterns from cotton to perennial crops, such as bananas, has started on some private farms and by small-holder farmers. This makes the area of banana cultivation evergreen and significantly reduces soil erosion that contribute to siltation problems in the nearby Lake Chamo (Girma and Awulachew, 2007).

Cotton producers in the lower Omo Valley use either gravity-based irrigation from tributaries or direct pumping from Omo River. Bena and Tsemay communities surrounding the commercial cotton farm near the Weyto River, at Birale are well integrated into the commercial farm. The community members own half hectares of irrigated land per household, producing maize, sesame, banana and different vegetable crops. The communities are helped by a supply of available irrigation water from the commercial farm (Solidaridad, 2016).

SOFRECO (2016) found no environmental, social, and water issues in the lower Omo basin particularly in areas of large sugarcane investments and cotton production. Agricultural water demand for irrigation is dominant in lower parts of the basin (Meshesha and Abdi, 2019). For example, Sile Cotton Farm was established when the Government nationalised private farms in 1975. Previously three private farms were operating in the Sile area since the early 1960s. They were nationalized to form the then Sile State Farm (Girma and Awulachew, 2007). In the early 2000s Sile State Farm was privatised and became Sile Cotton Farm. The climate around Sile Cotton Farm and the surrounding areas is semi-arid with an average annual minimum and maximum temperature of 17^{O}C and 32^{O}C, respectively. The rainfall pattern is bimodal with an average annual rainfall of 729.6 mm. Irrigation water is diverted from the Sile River using a simple intake from the bank of the river.

The construction of Gilgel Gibe III dam, and other large-scale developments under irrigation (such as, sugarcane plantations and large-scale cotton production), coupled with rainfall shortage forced local communities in the lower Omo to adapt to a new reality. Traditional pastoralist and agro-pastoralist communities have their own mechanisms to be resilient from environmental adversaries like flooding, drought and erratic rainfall, while they are required to adapt to a more sedentary and urbanised lifestyle (Hodbed, 2019). However, this large-scale investment in agriculture and commercial development can play an important role in addressing food security, clean water supply, job creation, earning foreign exchange, and the development of the regions (Solidaridad, 2016). Hence, pastoral communities should also be empowered to help formulate a more appropriate pastoral legislation that protects their land rights and supports sustainable livelihoods. Scaling up pastoralists' efforts to diversify their livelihoods, allow the communities to grow within the commercial developments, help them to benefit from the existing initiatives, like creation of employment opportunities, community-based ecotourism around the national park and provision of services such as clean water, health and education (Solidaridad, 2016).

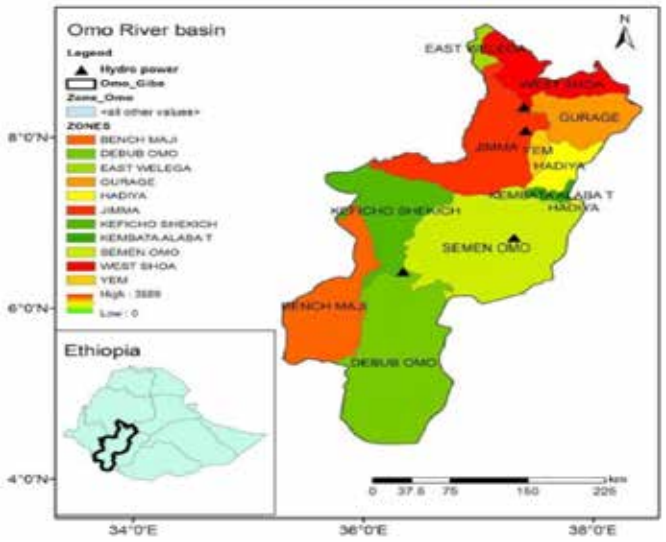


Figure 6: Map of the Omo-Gibe River Basin (Source: Meshesha and Abdi, 2019)

Priority issues, challenges and risks, and root causes in the Omo-Gibe Valley cotton production

#	ISSUES	DESCRIPTION
1	**COMMUNITY ENGAGEMENT AND GOVERNANCE**	Weak community participation in watershed management practices and wrong traditional perspectives in relation to water use is a challenge for the basin. A common perception within the local community is that water is a free gift from God. They are not willing to pay for water access. The community does not consider the opportunity costs of inefficient water usage (Meshesa and Abdi, 2019).
2	**OMO-GIBE RIVER BASIN AUTHORITY (RBA) NOT ESTABLISHED**	Although there are several hydro-power stations, as well as active irrigation for sugarcane and cotton in Omo-Gibe, there is no governing authority to enforce IWRM. The RBA has not been established (Meshesha and Abdi, 2019).
3	**WATER SCARCITY AND FREQUENT DROUGHT**	The water level of the Omo-Gibe has been reported to be decreasing leading to an increasing water shortage.

Table 11: Priority issues, challenges and risks in the Omo-Gibe Valley (Source: Author, 2020)

2.2.4 Water issues in North & North-Western Ethiopia (Humera, Metema, Quara, Benishangul and Gambela)

According to the ETIDI's Report, in the 2019 season North and North-Western Ethiopia produced significant cotton - which reveals a shift from the East to West of Ethiopia, as well as from irrigated to rain fed cotton production. Humera and Dansha in Tigray region produced 3,220 ha, while Metema and Quara in Amhara region produced on 18,751.5 ha. The Benishangul area produced on 4,919 ha and Gambela on 7,221 ha (ETIDI, 2019).

SOFRECO (2016) and Solidaridad (2016) reported that cotton production in West Tigray districts is vulnerable to erratic rainfall (Figure 7). Benishangul, Gambella, and Amhara regions are at lower risk. They could significantly improve if they practice additional water conservation, drainage, and flood prevention. There are only minimal water conservation practices, flood prevention and drainage of water-logged areas under rain-fed conditions in Tigray, Amhara, Benishangul, and Gambella regions. Higher rainfall variability and upward temperature trends across the country will also cause more intense and frequent drought events in such regions (Mosello et al., 2015). ETIDI (2018) reported more than 15,000 ha of failed cotton crop due to shortage of rainfall in the aforementioned areas alone.

Based on experience, farmers anticipate drought every four years and switch to more drought tolerant crops, such as sesame, sorghum and short period crops (for example, Teff). Drought and erratic rainfall are exacerbated by seedling pest attacks (flea beetle), particularly in Humera, Metema, and Benishangul areas.

Priority issues, challenges and risks, and root causes in the North & North-Western cotton production

#	Issues	Description
1	**SOIL EROSION**	Heavy rainfall coupled with less intervention on water and soil management practices intensify soil erosion. A recent GIZ report (2020, unpublished) revealed poor land-use planning and management that exposes the soil for degradation, including large farms in rain-fed areas.
2	**WATER LOGGING**	Water logging is mentioned as one of the major problems affecting farmers' productivity in the Metema area (Bosena et al, 2011). This problem has been reported by small-scale farmers and large farms in Quara district, Benishangul, and Gambela where higher rainfall is coupled with vertisol soil. The soil is not able to absorb large quantities of water and keeps the water on the surface.
3	**SHORTAGE OF RAINFALL AND DROUGHT**	There are a wide range of traditional and modern soil and crop management practices, including water conservation and erosion control (Solidaridad, 2016). Looking for options to improve availability and obtain moisture will offer an opportunity for better productivity even in the face of droughts.

Table 12: Priority issues, challenges and risks in North and North-Western Ethiopia (Source: Author, 2020)

2.2.5 Availability of drinking water supply

The majority of Ethiopian rural communities rely on groundwater for water supply. The supply of water in rural areas is usually derived from shallow wells, spring development, and deep wells. People who have no access to improved supply usually obtain water from rivers, unprotected springs, hand-dug wells and rainwater harvesting (Awulachew et al., 2007). They are therefore exposed to contaminated water sources. Seyoum and Graham (2016) compared the use of untreated water from 2000-2011 in the Afar region with other regions (Figure 7). This situation could be similar in lower Omo Valley where local nomad communities depend on rivers, lakes, canals and other sources of untreated water supply.

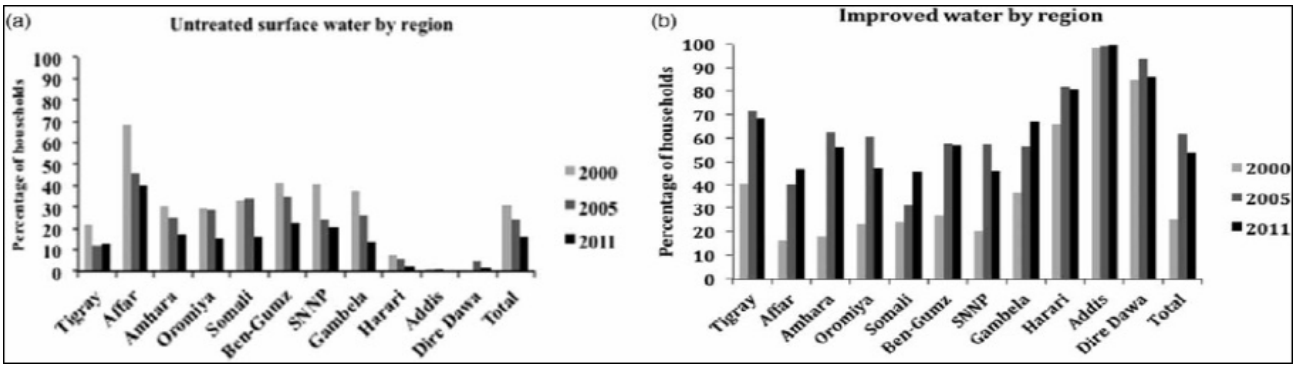


Figure 7: Drinking water regime in the regions (Source: Seyoum and Graham, 2016)

2.2.6 Water, sanitation, and health (WASH)

Nationwide health extension workers are working with households to improve water quality, sanitation, and hygiene in Ethiopia. This contributes to improvements in the supply of treated water and the installation of open toilets. Nonetheless sanitation in the rural households of Ethiopia remains a challenge (Seyoum and Graham, 2016). In the Awash-Basin which hosts 65% of national industrial production, 43% of the population currently lack access to improved clean water supply and 72% lack access to basic sanitation facilities (WRG2030, 2016). Previous studies in Africa with particular focus on Ethiopia conclude that Ethiopia faces a range of challenges in water management, with levels of service provision for water supply and sanitation being among the lowest in the world (Meshesha and Abdi, 2019).

2.2.7 Gender inclusivity

Women and children are the ones mainly responsible for fetching water, even when it requires travelling long distances (that is, even up to half a day) (FAO, 2016; UNESCO, 2004). Although both women and men can register for land ownership, women do not equally get access to farm plots. Women furthermore have less access to extension services and agricultural inputs, including irrigation, as well as a lower bargaining power for changing water schedules. Hence, even with water rights, their crops fail more often just because water was not available on time. As a result, in rain-fed and irrigated agriculture, they produce up to 35% less than men (FAO, 2016).

The involvement of women in formal water management and decision making for watershed management is limited, even though they are the guardians of family health and hygiene and providers of domestic water. Yet, men mostly make decisions on water systems (Meshesha and Abdi, 2019).

3 LOCAL STAKEHOLDERS, BENEFICIARIES, AND EXISTING INITIATIVES

3.1 Stakeholder mapping exercise

Within the cotton production sector in Ethiopia there are a diverse array of stakeholders. A vibrant civic space is necessary to promote systemic change and improved water stewardship in the textile and garment industry in Ethiopia.

	STAKEHOLDER TYPE	STAKEHOLDER ORGANISATIONS
Public	**Government**	**Ministry of Agriculture (MoA):** The Extension and Natural Management department (NRM) of the Federal Government and regional offices support cotton farmers on good agronomic practices and Natural Resource Management which include erosion control and water management. **Ministry of Trade and Industry (MoTI):** Under MoTI, ETIDI has been designated as the national coordinating body for cotton and textile value chain where the mandates include extension support for large scale and small-scale farmers. **Ministry of Water, Irrigation and Electricity:** Basin Development Authority, River Basins Authorities (RBA) and regional water offices (RBO) of the Ministry of Water support farms and farmers on irrigation water supply, flood control. **Forest, Environment, and Climate Change Commission**
	Government led Cotton, Textile and Garment sector bodies	Ethiopian Textile Industry Development Institute (ETIDI) under MoTI Water Resource Management and Environment Basin Development Authority + Individual Catchment Authorities (RBA) Ethiopia Environment Commission under Ministry of Forest, Environment, and Climate Change) Ethiopian Civil Society Association (CSA), regulator of local NGOs and charities
	Development Banks Donor Agencies Multi-laterals UN agencies	African Development Bank Development Bank of Ethiopia World Bank DFID (UK Govt) GIZ (German Govt) 2030 WRG (World Bank) International Trade Centre (UN) UNIDO (UN)
Private	**Private sector led Cotton, Textile and Garment sector bodies**	Ethiopia Cotton and Ginners Association Ethiopian Cotton Producers, Ginners and Exporters Association (ECPGEA) Ethiopia Leather Industries Association Ethiopia Textiles and Garment Manufacturers Association
	Private Sector	**Small scale farmers:** There is an estimated population of 57,000 farmers mainly in Amhara region and the remaining clusters in Tigray, Afar and SNNPRS regions engaged in small scale farming **Large and medium scale farms:** There are more than 1,000 medium and large-scale farms across the seven cotton growing regions of Ethiopia that contribute 70 % of cotton production. **Ginneries:** There are more than 21 ginneries across the 7 cotton growing regions, but the majority are concentrated in the vicinity of Addis and render ginning services differently (toll ginning, buy seed cotton etc.). **Textile mills:** Textile mills directly or indirectly provide market while brands advocate sustainability across the cotton sector. **Traditional spinners and weavers:** Traditional weavers operate across cotton growing regions and provide niche market for cotton producers particularly for small scale farmers Multinationals in textiles, leather and garment sectors: Key players are H&M, IKEA, Kanoria, M&S, PVH, Tchibo, Velocity and other brands. **Ethiopian businesses in textiles, leather and garment sectors** **Influential water-using actors from other business sectors:** Key users from other businesses include for example Brewers (AB InBev, Bavaria, Diageo, Heineken), Bottled Water (Nestle) and Chemicals (Dow)
Community	**Cooperatives/ Unions**	**Cooperatives:** cooperatives and unions supply inputs, provide loans and buy produce of small scale farmers, these include: Dansha Union (Tigray Region) & Metema Union (Amhara Region)
	Communities and Community Representative Bodies	**Communities within the water catchment area of irrigated cotton production farms** affected by their water withdrawal for irrigation and effected by potential salination **Communities within the catchment area of farms** affected by wastewater released by cotton farming including pesticides
	NGOs (Standard-setting and Advocacy organisations)	Aid by Trade Foundation (AbTF)/ Cotton made in Africa (CmiA) Alliance for Water Stewardship/ Water Witness International Better Cotton Initiative (BCI) IDH Trade Initiative PAN Ethiopia Solidaridad WaterAid WWF
Academia	**Academic and research**	**Academic** Addis Ababa University Arbaminch University Axum University Bahir Dar University – the EiTEX Programme Hawassa University Kombolcha Institute of Technology Mekele University **Ethiopian research centres** Ethiopian Institute of Agricultural Research (EIAR) Regional Research Centres (e.g. Samara Research Center in Afar, Gondar Research Centre in Amhara, Humera Research Centre in Tigray) **International research centres** International Water Management Institute (IWMI)

Table 13: Stakeholders operating in the cotton production sector in Ethiopia (Source: AbTF water security scan data (adjusted and extended), 2020)

3.2 Priority concerns and interests for sector stakeholders

The cotton sector stakeholders can be classified as public, private, communities, non-government organizations (NGOs), development partners, and academia (Table 13). The primary concern and interest of water users (large-scale farms, small-scale farmers, and local communities) are water shortages and flooding, while water authorities deal with both structural (coordination, capacity, finance, and regulation) and acute water problems (quantity, quality, pollution, flood etc.) for which better management/governance of the spatial and temporal variation of water could reduce water shortages (Havekes et al., 2016).

International brands, sustainability initiatives, and NGOs focus on water stewardship - using water in a way that is socially equitable, environmentally sustainable and economically beneficial to all those active throughout the entire cotton value-chain (BCI, 2020; FAO and ICAC, 2015), to local communities and the ecosystem. An overview of selected stakeholders and their interest regarding water usage, water management and the cotton production sector is presented in the table below.

Ethical consumption has allowed for the set-up of alternative niche markets for farmers. A significantly increasing demand for certified textiles could indeed create a 'fashion revolution' if it were to replace the current system (Partzsch et al., 2019). This will benefit brands and textile mills. The ecosystem could be improved if concerns and interests of local communities would be recognized and respected.

Sector	Institution	Water-related Interest of Stakeholders							
		Flood Control	Quantity	Quality	Pollution	Water Permit	WASH	Efficient irrigation	Resilient rainfed production
Public	Ministry of Agriculture	+	+	+	+	-	+	+	+
	Ministry of Trade and Industry	-	+	+	+	-	-	-	+
	Ministry of Water, Irrigation and Electricity	+	+	+	-	-	+	+	-
	Ministry of Social and Labour Affairs	-	-	-	+	-	+	-	-
	Standards focused bodies	+	+	+	+	+	+	+	+
	Ethiopian Cotton Development Authority (ECDA)								
	Basin Development Authority	+	+	+	-	+	+	+	-
	River Basin Authority	+	+	+	+	+	+	+	-
	Ethiopian Industrial Input Development Enterprise (EIIDE)	-	-	-	-	-	-	-	+
	Individual Catchment Authorities (RBA)	+	+	+	-	+	+	+	-
Private	Ethiopia Cotton and Ginners Association	+	+	+	+	+	+	+	+
	Large scale farm	+	+	+	+	+	+	+	-
	Small scale farmers (rainfed)	+	+	+	-	-	+	-	+
	Large scale farms (rainfed)	+	+	+	+	-	+	-	+
	Small scale farmers (irrigated)	+	+	+	+	+	+	+	-
	Large scale farms (irrigated)	+	+	+	+	+	+	+	-
	Ginneries	+	+	+	+	+	+	+	+
	Textile mills	-	+	+	+	+	+	+	+
	Apparel brands	-	+	+	+	+	+	+	+
	Traditional spinners and weavers:	-	-	-	-	-	-	-	+
	Multinationals	O	O	O	O	O	O	O	O
	Ethiopian business in textiles, leather & garment	-	+	+	+	-	+	+	+
	Influential water-using actors from other business	+	+	+	+	+	+	+	-
Communities	Communities affected by irrigated cotton farms water withdrawal	+	+	+	+	-	+	-	-
	Communities within the catchment area of farms effected by pesticides	+	+	+	+	-	+	-	-
SDC consortium partners	Aid by Trade Foundation (AbTF) / Cotton made in Africa (CmiA)	+	+	+	+	+	+	-	+
	Alliance for Water Stewardship / Water Witness International	+	+	+	+	+	+	+	+
	Solidaridad	+	+	+	+	+	+	+	+
Academia	International Water Management Institute (IWMI)	+	+	+	+	+	+	+	+

Table 14: Stakeholders Priority Concerns and Interest in Water Stewardship (+ = Stake; O = Neutral; - = No Interest) (Source: Authors, 2020)

3.3 Practices and policy change to enable improved water stewardship

The introduction of better irrigation practices such as water use efficiency, conservation technologies and community/farmer engagement in the adoption of best practices is highly essential (Solidaridad, 2016). Of special importance furthermore is the promotion of sustainable rain-fed cotton production. The necessity of implementing a multi-stakeholder partnership culture and community engagement by river basin authorities is well appreciated (Havekes et al., 2016). A directive is required to offset confusion raised by water users, river basin authorities, and administrative boundary authorities of the regions and zones (Havekes et al. 2016). Meshesha and Abdi (2019) recommended the establishment of the Omo-Gibe River Basin Authority for proper management. Local and international partners have started to engage in identifying the challenges and opportunities of water stewardship.

3.4 Existing initiatives and lessons learnt on sustainability and water-related issues

Environmental, social, and economic voluntary schemes that address water-related issues in Ethiopia are well documented and have flourished over the last 15 years. However, only recently have such initiatives and international brands started eyeing the Ethiopian cotton and garment sector and the Government has prioritized attracting foreign direct investments (Partzsch et al., 2019). Some of the initiatives that have been active in promoting sustainable cotton production while addressing water management issues and water stewardship are explored below.

3.4.1 Water Governance by AwRBA

The AwRBA has been implementing water governance practices aimed at improving IWRM across the basin (Haveskes, 2016), improving their internal capacity (personnel, expertise, finance), enhancing coordination, and fostering inclusive participation and consultation of all related stakeholders in the Awash-Basin.

3.4.2 Cotton Made in Africa (CmiA)

The Cotton made in Africa (CmiA) initiative established by the Aid by Trade Foundation (AbTF) has supported the implementation of sustainable cotton production by small-scale farmers in Ethiopia through its local partner ECPGEA in Amhara 2014-2019 (Zerihun, 2019; Berhanu and Asefa, 2014; Berhanu and Asefa, 2018). As part of the “tackling pollution from the apparel sector through engaging small and medium enterprises (SMEs) in water stewardship” project co-funded by the Swiss Development Cooperation (SDC), where AbTF is a consortium partner, the organization has: i) promoted conservation agriculture (minimizing erosion, facilitating water infiltration, fostering conservation of protected forest and wildlife areas); ii) supported under the CmiA Standards rain-fed cotton production only; iii) prohibited the use of certain hazardous pesticides (active ingredients listed under the Annexes to PIC and POPs Conventions, WHO class Ia/Ib); iv) prevented the run-off of pesticides into the environment and bodies of water; and v) addressed social issues, including WASH for workers in ginneries.

3.4.3 Alliance for Water stewardship (AWS)

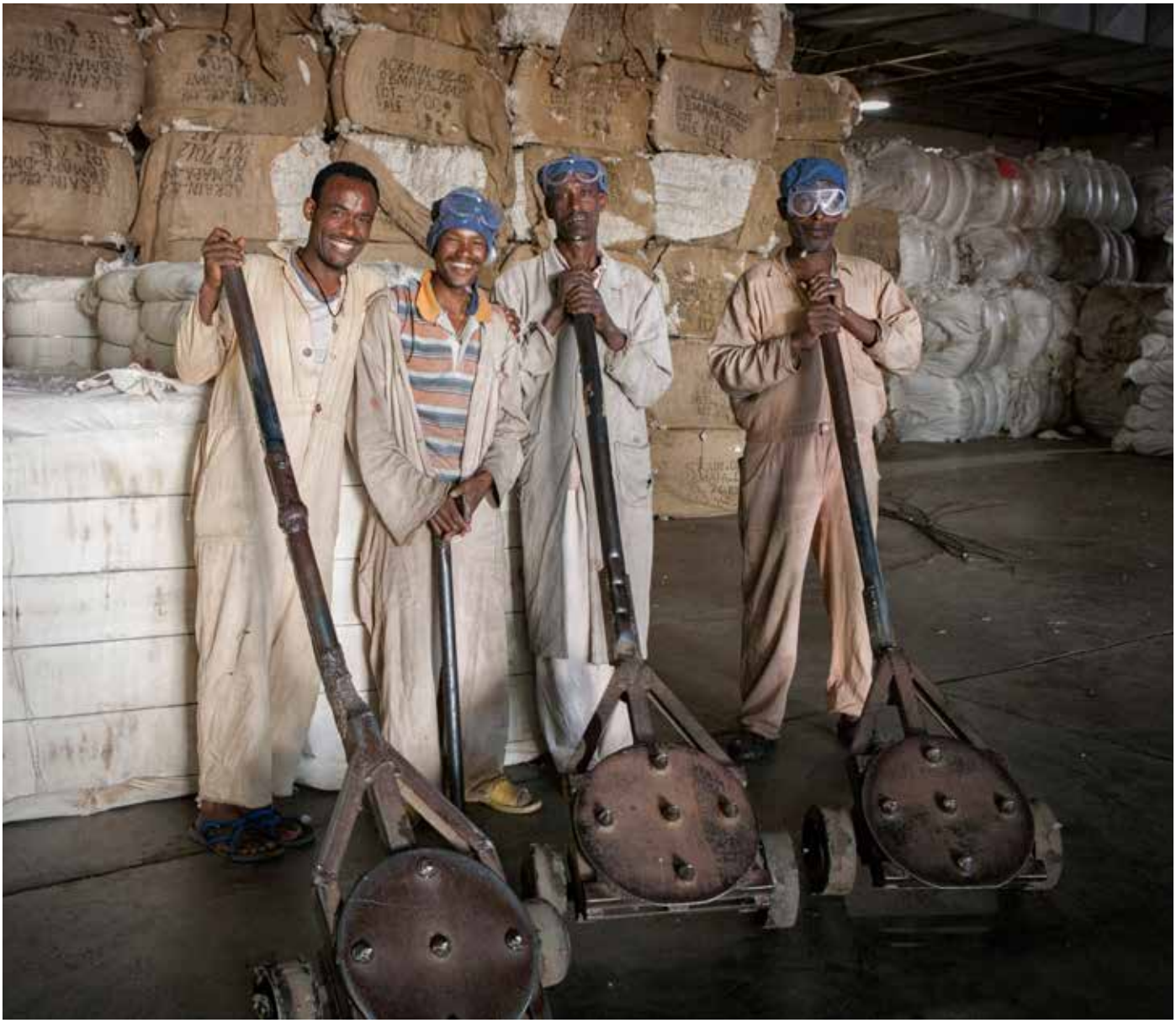
The Alliance for Water Stewardship Standard (AWS Standard) is the only framework for water users that is fully compliant with the stringent guidelines for standards system laid down by ISEAL, the global alliance for credible standard systems. The AWS Standard V2.0 and its implementation can serve as an essential tool to address water mismanagement and contribute to a positive natural resource management. For that purpose it is important to involve the relevant stakeholders at an early stage, including possible implementation partners, under close and continuous exchange to reach common understanding on water stewardship and how to achieve it. The AWS standard promotes water stewardship through five steps: i) gathering and understanding data on shared water challenges; ii) committing and planning to develop water stewardship plans; iii) implementing the site’s water stewardship plans; iv) evaluating performance against the prepared plans; and v) communicating and disclosing the site’s stewardship efforts. AWS is also a consortium partner of the “Putting Water Stewardship to Work: Tackling Water Pollution in the Textile and Apparel Value Chain” project funded by SDC. They actively supported the development of this publication amongst other water stewardship activities.

3.4.4 Better Cotton Initiative (BCI)

Through Solidaridad, the Better Cotton Initiative (BCI) principles are promoted regarding sustainable cotton production by large scale farms in Afar and Western Tigray (Zerihun, 2019). The initiative promotes: i) water stewardship; ii) conservation of biodiversity; and iii) protection of riparian habitat and promote erosion control.

3.4.5 Organic Cotton farming

Along the Omo-Gibe Basin around the Arbaminch area, a small number of farmers practice organic cotton production (Oeko-Tex Institute, 2018). The focus is on: i) promoting biodiversity and conserving the natural habitat; ii) promoting water stewardship; and iii) prohibiting the use of chemical pesticides and fertilizers for their effects on the environment and bodies of water.



Credit: Solidaridad

4 OPPORTUNITIES AND BARRIERS FOR IMPROVED WATER STEWARDSHIP

Water stewardship is becoming an increasingly important global topic in the light of rising populations, increasing consumerism, and impacts of climate change affecting water access and quality. The AWS Standard is the only globally recognised and endorsed approach to water stewardship. Increasingly, cotton-focused standards are incorporating stronger water management requirements with some including aspects of water stewardship driving greater awareness across the sector. Technologies are increasingly becoming available for efficient utilization of water resources. Meanwhile its implementation is characterized by a variety of opportunities and challenges on the global as well as case specific local scale.

In the context of Ethiopia, the Government has identified cotton and textiles as top priority sectors. The opportunities and barriers regarding water usage in cotton production outlined above are a subset of broader issues in regard to overall water use for crop cultivation irrespective of type of cultivation (rain-fed or irrigated) and technologies uses (for example, use of diversion, pumps, and source of water used - rivers, runoff surface water). In the coming years, water usage in cotton production is expected to grow.

Important consideration needs to be given for large farms, as well as small-scale farmer issues. Furthermore, a supportive government policy for cotton sector growth on the one hand, and an increasing international demand for sustainable cotton and textile products from Ethiopia on the other, are essential advantages for a sustainable cotton production and for putting improved water stewardship into practice. Existing and established sustainability cotton standards present an opportunity to support water stewardship. The adaptation and promotion of conservation agricultural practices are actively promoted by some of these standards (including those in section 3.4 of this publication). Training of farmers contributes to capacity building, coordination as well as stakeholder involvement and awareness. One practical way to boost sustainable water management is the development of training elements on water stewardship into existing (sustainable) cotton cultivation curricula. Additional components to be integrated into established farmer-trainings can contribute to the mitigation of water-related risks and foster resilience in cotton production. This approach also reflects the Ethiopian Water Resources Management Policy, specifically with regard to enhancing water resources development on rural-centered, decentralized management, and participatory approaches, fostering the participation of user communities and support community self-initiatives in water resources management to ensure social equity, system reliability and sustainability.

4.1 Opportunities and innovations to address water stewardship

A number of opportunities are arising from within the Ethiopian cotton sector regarding improving water stewardship. These include:

- **Water resources** that are perceived to be of abundance and that can be tapped for irrigation use. Positive cause and effect relationship between irrigated cotton and fiber characteristics drive farmers to produce using supplementary irrigation. While irrigation should be addressed in research and higher learning institutions, challenges of irrigated cotton production, especially regarding its impact on other stakeholders in the respective catchment areas and alternatives to irrigation should be equally addressed.
- **Clear government goodwill to support sector growth.** The support prioritizes the textile and garments industry as an important growth sector for Ethiopia. The Government also appears to be catalysing a number of development innovations to improve water stewardship. The GTP II envisions making Ethiopia the textile and apparel manufacturing hub of Africa with high projected annual exports by 2025, and providing employment for millions of people in the several industrial parks is a significant opportunity.
- **Facilitating the development of stronger institutional structures.** Currently, we are not claiming the presence of strong institutional structures, however we propose that strong structures are important in creating harmony in the sector.
- **Improving sector governance.** The proposals to establish the Ethiopian Cotton Development Authority (ECDA) indicate a desire to improve cotton sector governance.
- **Existence of supportive sustainability standards** (such as, CmiA, AWS, BCI etc.) highlights the market demand for the production and consumption of sustainable products. It is also notable that natural resource management and water stewardship are heavily encouraged by the current sustainability standards, while the AWS Standard offers an opportunity for more focused engagement, particularly in water-stressed regions.
- **Improving the enabling environment for private sector engagement.** The NCDS 2017-2032 has proposed different schemes to support the private sector (either financially, with infrastructure, establishing coordinating bodies, and technical expertise etc). With an active and vibrant market ecosystem, it is expected that private sector stakeholders will improve their operations and capacity for the betterment of the sector.

There are strategic innovations emerging to support water stewardship including:

- **Farm insurance schemes:** Fast developing smallholder farm insurance schemes in Eastern and Southern Africa specifically targeting rain-inflicted crop failures contribute to risk-reduction in regard to crop failure and associated economic and social implications.
- **Affordable technologies:** Cotton production in sub-Saharan Africa is favored by an increasing availability of affordable technologies for on-farm measurements covering soil-moisture, humidity, weather forecasting etc. With the maturing of contract farming, cotton farmers increasingly demand accessing such technologies through their pre-financing mechanisms.
- **Adoption of conservation agricultural practices:** Increasing adoption of conservation agricultural practices in the region, integration of climate resilience packages (such as climate smart agriculture), and improving moisture availability will offer a better hope for improved productivity. There are a wide range of traditional and modern soil and crop management practices, including, water conservation and erosion control that can be promoted.

4.2 Knowledge needed to overcome barriers to implement water stewardship

Understanding of crop water requirements, water quality, water pollution, equitable distribution models, use of digital tools and database management, weather information, and adoption of technologies for measurement of water use efficiency, are areas to be addressed by all stakeholders to ensure improved water stewardship. However, the initial cost of technologies are still very high causing very low adoption rates in Ethiopia (and Africa in general). In addition, stakeholder capacities are still low among main actors and partners.

The general principle should be to utilize and strengthen existing structures to seize the identified opportunities and innovations, generate learning, and overcome barriers to better water stewardship. The Ethiopian cotton sector functioning is comparatively complex with traditional links to often inefficient but inevitable cooperative structures. Building on a sector-wide stakeholder mapping and dialogue including key players implementing the NCDS 2017-2032 will be necessary. Part of the dialogue should focus on Ethiopia harmonizing best practices in the region, especially redefining the role of the ginning/textile companies as promoters of knowledge and skills along the value chain. Stakeholder consensus that public sector extension plays only a complementary /supportive role will be necessary. The cotton companies / textile mills would then feel incentivized to avail own and/or sourced resources for investment in knowledge and skills promotion – leading to improved sector performance through integrated packages, including water stewardship.

4.3 Leveraging the resources and approaches available to programme partners

A great opportunity for Ethiopia to promote essential knowledge regarding water stewardship in the field of cotton production is through the implementation of sustainability standards (for example, CmiA, AWS and BCI). This especially refers to knowledge related to farmer level production and ginneries - then all upstream levels in the textile and garment value chain could build on this knowledge. Water stewardship related learnings are promoted and can furthermore be promoted by the standards implementation processes to ensure environmental, social, and economic safety as well as sensitizing stakeholders about water stewardship. There are however barriers to overcome including: i) policies that are not supportive of contract farming, with a high tendency to suffocate private sector investments in farm training; ii) unfavourable pricing mechanisms providing negligible/no incentives for both smallholders to stick to sustainability recommendations; iii) unregulated marketing that distorts seed cotton prices especially by private traders in Ethiopia; iv) cultural beliefs of some communities for example in Afar, where people believe that water is a free God-given resource; and v) limited coverage of the cotton production sector by established standards and respective training on improved water stewardship due to lacking availability of capable and willing partners.

4.4 Aligning with existing/new initiatives and collaboration to improve water stewardship

Closely linked to suggestions in section 4.1 to 4.3, the conceptual and functional framework for collaboration allows for a number of stakeholders to access sustainability standards – this is necessary for their functionality and improved sector performance. The related advantages of prioritizing the sustainability standards are that the standards: i) are already in compliance with market demands for sustainable products, and the integrated aspects of water stewardship only add value to their products; and ii) have made headway in the process of either aligning or proposing changes to standing policies and regulations. For example, CmiA already has an established capacity in terms of developed materials for training of various segments of the cotton-ginners aspect of the value chain. Through this mechanism, water stewardship practices could be integrated and fast tracked through the same audit systems.

In addition, the entire agricultural extension system needs review and realignment. The pesticide regulatory frameworks will also need to align fully to international conventions regulating pesticide use as these have direct link to water stewardship especially under the irrigated productions system where long persistence pesticide would pause more risks to food webs.

Credit: Solidaridad

5 CONCLUSION AND RECOMMENDATIONS

Rapid development and population growth, poverty, environmental degradation, changing topographies, climate variability, lack of governance or capacity to coordinate, conflicts of interest over natural resources, gender disparity, and unwise use of financial resources, are hindering factors of proper water stewardship. A general lack of information on water stewardship and outdated information on WASH issues across cotton producing areas shows the focus on water needs improvement. Improving climate smart agricultural practices, compliance with sustainability standards, inclusive stakeholder engagement, and clear incentive models could be useful to promote water stewardship amongst small-scale and large-scale cotton producers.

The general recommendations of this publication include but are not limited to:

1. **Ensure dyke maintenance and good water governance to offset flooding:** Unprecedented flooding has been occurring in different river basins and needs appropriate interventions and management.
2. **Community engagement:** Participation of all stakeholders (including, local communities, women and youth) in water management and decision making is indispensable.
3. **Capacity building and coordination:** River basin authorities and regional water bureaus need to build their capacity to provide coordinated and equitable services for water users, to monitor the quality of water including pollution discharge.
4. **Improve efficiency of water use:** Through investment in technology and water permit system, water use efficiency could be improved significantly to realize Ethiopia's ambitions to become the top cotton producer in Africa, as well as achieve equitable and sustainable water access for local communities.
5. **Drought and climate change mitigation:** Mitigation measures and effective disaster risk planning is needed to offset impacts of drought and erratic rainfall in small-scale cotton production.
6. **Access to drinking water and WASH:** Should be promoted for cotton producers and cotton growing communities along cotton production areas.
7. **Advocacy of IWRM and water governance:** Is essential to implement the policies and regulations of the Government of Ethiopia.
8. **Development and implementation of water-related training segments for farmers on water stewardship.** They need to be easily integrated into the existing training-schemes promoted by sustainability standards on cotton – as such they could contribute to the mitigation of risks and foster resilience in cotton production. This reflects an approach that uses rural-centered, decentralized management, and participatory approaches, to foster private sector and end-user engagement.

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