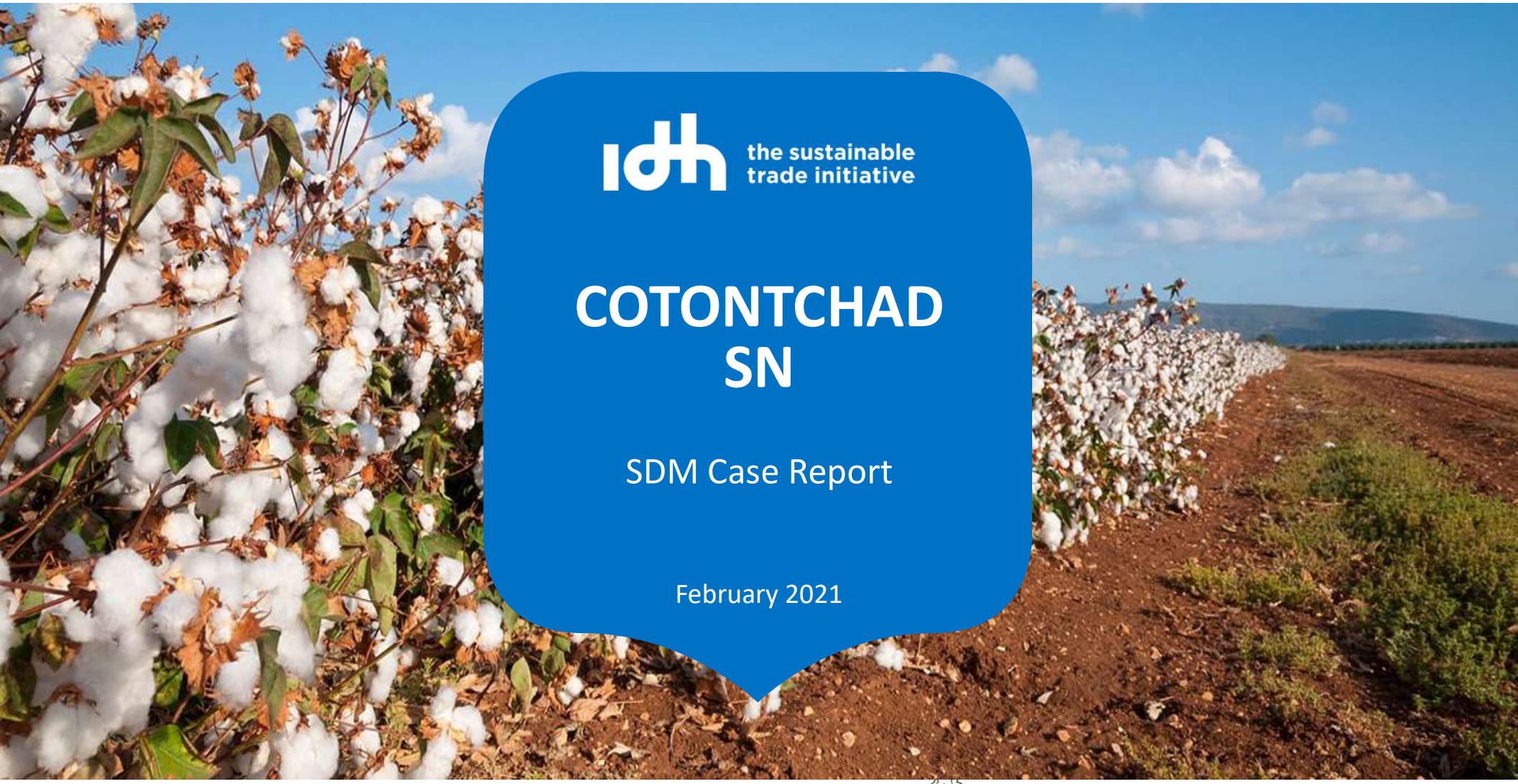


COTONTCHAD SN

SDM Case Report

February 2021

Contents

Introduction

IDH introduction

Importance of Service Delivery

Agriculture plays a key role in the wellbeing of people and planet. 70% of the rural poor rely on the sector for income and employment. Agriculture also contributes to climate change, which threatens the long-term viability of global food supply. To earn adequate livelihoods without contributing to environmental degradation, farmers need access to affordable high-quality goods, services and technologies.

Service Delivery Models (SDMs) are supply chain structures which provide farmers with services such as training, access to inputs, finance and information. SDMs can sustainably increase the performance of farms while providing a business opportunity for the service provider.

A solid understanding of the relation between impact on the farmer and impact on the service provider's business brings new strategies for operating and funding service delivery, making the model more sustainable, less dependent on external funding and more commercially viable.

About this study

To accelerate this process, IDH is leveraging its strength as a convener of key public-private partnerships to gain better insight into the effectiveness of SDMs. IDH developed a systematic, data-driven approach to understand and improve these models. The approach makes the business case for service delivery to investors, service providers, and farmers. By further prototyping efficiency improvements in service delivery, IDH aims to catalyze innovations in service delivery that positively impact people, planet, and profit.

Thanks

IDH would like to express its sincere thanks to Cotontchad SN (CTSN) for their openness and willingness to partner through this study. By providing insight into their model and critical feedback on our approach, CTSN is helping to pave the way for service delivery that is beneficial and sustainable for farmers and providers.

COTONTCHAD Introduction

COTONTCHAD
SOCIETE COTONNIERE DU TCHAD
SOCIETE NOUVELLE

- Cotontchad SN (CTSN) is private company jointly owned by Olam and Chad government that was incorporated in 1971. CTSN operates as an agribusiness company working with smallholder farmers in southern region of Chad. CTSN's principal activities is the aggregation and export of cotton lint produced from ginning seed cotton sourced from farmers.
- Olam owns 60% stake in CTSN, 35% by Chad government and 5% by farmer cooperatives.
- CTSN senior management team comprises of five member- Jacky Riviere (Director), Ibrahim Malloum (Secretary General), El Hadji Diagne (Deputy Director), Oumar Idriss Deby Itno (Deputy Director) and Rohit Kumar (Deputy Director)
- CTSN currently provides smallholder farmers with certified seeds, quality inputs, training, access to markets, mechanization, post-harvest services and support growing of alternate food crops
- The company intends to improve profitability in cotton cultivation and competitive compared to other options for farmers by running an effective service delivery mechanism and simultaneously support farmers grow food crops both for food security and income diversification of farmers
- The company currently works with 210,000 SHF and eventually want to support 270,000 SHFs to grow primarily of high-quality cotton plus supporting of growing of food crops by rotation (maize and peanuts).

Swiss Confederation Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Economic Affairs SECO · Ministry of Foreign Affairs · DANIDA · UKaid from the British people · BILL & MELINDA GATES foundation · COTONTCHAD SOCIETE COTONNIERE DU TCHAD SOCIETE NOUVELLE · Olam · idh the sustainable trade initiative

Executive summary

Executive Summary

- Coton Tchad S.N. (CTSN) is private company jointly owned by Olam International and Chad government that was incorporated in 1971. CTSN operates as an agribusiness company working with smallholder farmers in southern region of Chad. CTSN's principal activities include aggregation of seed cotton from farmers, cotton ginning and export of cotton lint. The company intends to make cotton farming financially viable for farmers by running an effective service delivery mechanism and simultaneously support farmers grow food crops both for food security and income diversification of farmers
- The poor condition of cotton farmers in Chad and hitherto lack of effective service delivery has constrained them to low seed cotton yields (600Kg/ha vs 1200 kg/ha in neighboring countries). Moreover, adverse weather patterns and complete reliance on manual labor (often only from farmer household) severely limits farmers' capacity to cultivate their land
- This study sets out the most important recommendations for Coton Tchad to effectively increase the seed cotton yield and thereby the livelihood of smallholders it sources from, in order to sustainably secure and scale its seed cotton supply. These recommendations are structured along three main topics: (1) having greater impact at farm level cotton, (2) build capacity of cooperatives to augment service delivery , and (3) strengthening CTSN's capacity to operate at scale.

    1. Having greater impact at farm level will increase and sustain cotton supply, which is imperative for farmers to continue cultivating and maintain/increase hectarage of seed cotton in the long-term:
        - Provision of right inputs and extension service package is critical to increasing seed cotton yield
        - Implementing mechanization service (particularly for land preparation) will address key bottleneck for farmers meeting intended hectarage of cotton crop
        - CTSN's support to farmers in growing food crops can increase farmer household income, better food security and diversify farm income
    2. Building capacity of co-operatives will augment reach and effectiveness of CTSN's and cooperatives service delivery:
        - Rewards results driven cooperatives by helping expand and grow their income
        - Village cooperative agent (AVA) model will increase the service delivery capacity of cooperatives
        - Leverage technology solutions to deepen engagement with cooperatives and farmers
    3. Strengthening of CTSN's operational capacity for operating at scale with improved efficiency will make the service delivery model sustainable in the long run:
        - CTSN is positioned to secure adequate working capital required for intensive inputs provision and payments for bigger seed cotton volume
        - Investing to expand gin capacity will result in efficient ginning operations and decreases ginning cost per unit of seed cotton
        - Optimize the mix of own and hired trucks for seed cotton transport for cost efficiency and operational flexibility
- The study reveals that (1) CTSN is expected to positively impact the livelihood of the smallholders it sources from with sustainable intensification of seed cotton production. (2) CTSN can facilitate in implementing of mechanization services, the equipment of which is owned and operated by farmer cooperatives and farmers. Mechanization can unlock significant value for farmers by vastly improving their ability and efficiency in land preparation. CTSN will also benefit through farmers maintenance/increase of cotton hectarage. Finally, (3) CTSN is well positioned to scale and strengthen their organizational capacity through expanding of operational infrastructure and their ability to finance growing scale of operations

Key farmer (and cooperative) segments

Targeted service delivery needs to be designed based on individual/cooperative farmer, size of cooperative and average seed cotton yield per hectare

Individual or Cooperative	Individual large farmer	Cooperative farmers								
Seed cotton yield category	High Yield	High Yield			Average yield			Low yield		
Size of cooperative	N/A	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
Farmer segment	Segment-1	Seg-2	Seg-3	Seg-4	Seg-5	Seg-6	Seg-7	Seg-8	Seg-9	Seg-10
Seed cotton yield per hectare	Above 800 kg per hectare	Above 800 kg per hectare			Between 600 to 800 kg per hectare			Less than 400 kg per hectare		
Total land holding	>10 hectares	4 hectares			4 hectares			4 hectares		
Input's usage	High	High			Medium			Low to Nil		
Non-cotton household income	30% of total income	40% of total income			50% of total income			70% of total income		

Note: no baseline farmer defined in this SDM because there are no cotton growing farmers outside of SDM

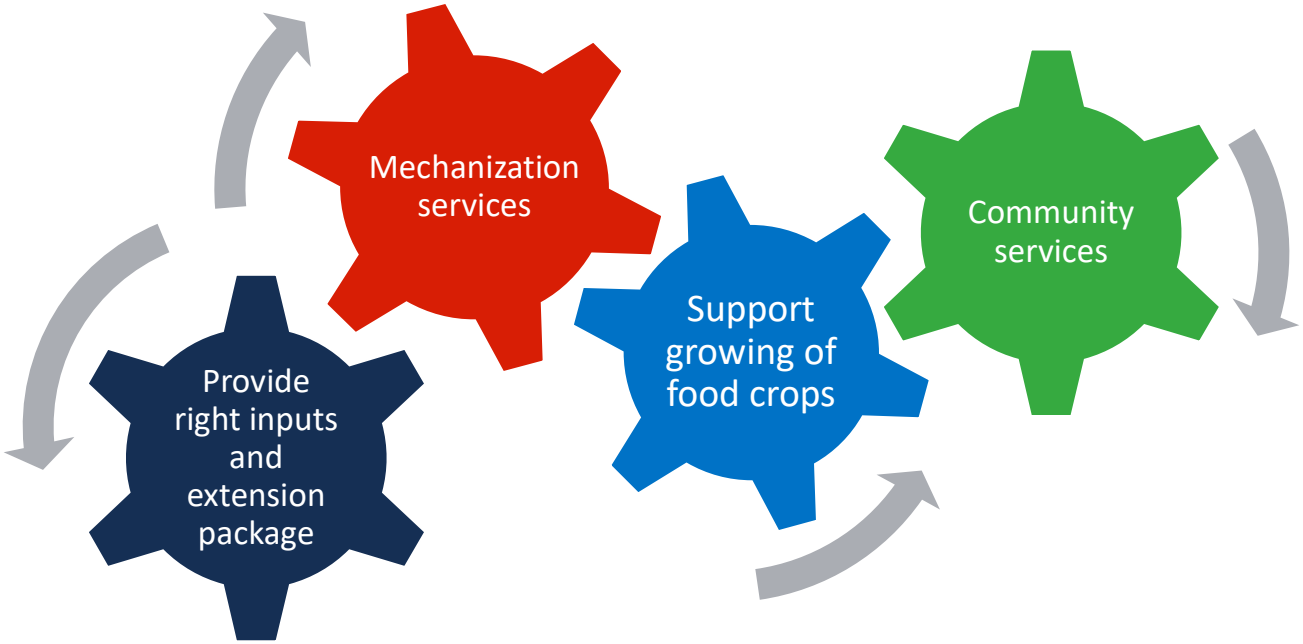
Segment farmers (and cooperatives) to differentiate service delivery and incentivize good performance

- Except for segment-1, cooperatives play a critical role in delivery of CTSN's services to farmers. The size of the cooperatives and average seed cotton yield per hectare are key considerations to segment farmers (and cooperatives) – this will inform CTSN in calibrating the services. For instance, the higher yield cooperatives can be provided higher quantity of fertilizers per hectare and they can also be prioritized in rollout of mechanization services. This in turn will encourage other cooperatives to increase yield and improve their performance
- Within these segments, CTSN can further differentiate by other important parameters such as timely and full repayment of input credit, correct sharing of farm information etc

Recommendations

Having greater impact at farm level will increase and sustain cotton supply

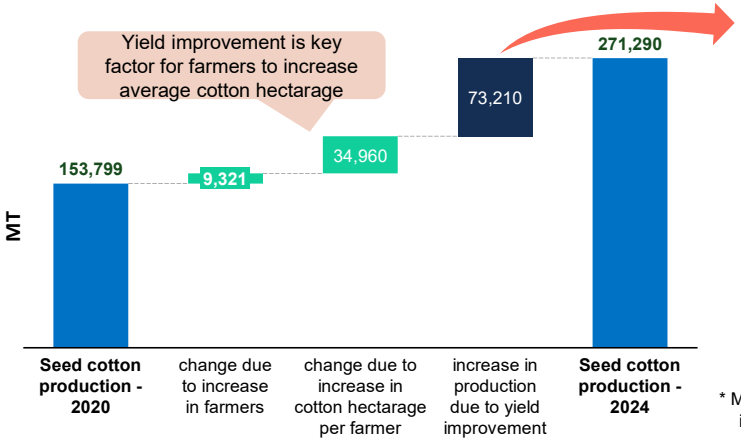
1. Having impact at farm level is imperative for farmers to continue cultivating and maintain/increase hectarage of seed cotton in the long-term



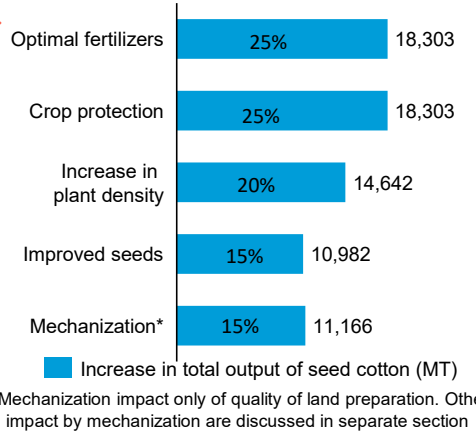
Increase seed cotton yield by suitable intensification

1.A Providing right inputs and extension services will lead to increase in seed cotton yield and sustain the same, which is the biggest driver of CTSN's seed cotton volumes and farmers' income

Volume of seed cotton production (MT)

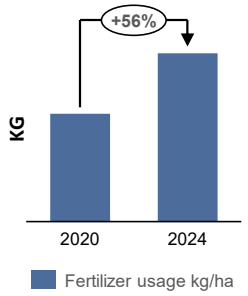


Yield improvement driven by 'Five-Fingers'

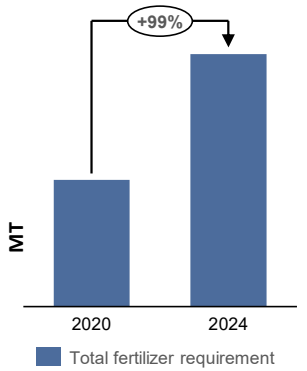


* Mechanization impact only of quality of land preparation. Other impact by mechanization are discussed in separate section

Average usage of fertilizer per ha increases by 56%



..while total fertilizer requirement increases by 99% (per ha + total hectares increase)



Increase in yield primary driver of seed cotton volume

- Increase in seed cotton yield per hectare is a primary driver of total seed cotton volume of CTSN. The yield per hectare at 600Kg in Chad is low compared to nearly 1200-1400 kg/ha yield in neighboring countries
- Considering seed cotton farm-gate price to stay constant or range bound, yield increase is the only way to increase farm income from cotton – net income increases 2-4 times (more details in farmer performance section)

Right inputs at required quantity along with farmer training are cornerstone of 'Five-Fingers' approach

- 40-50% of farmers do not use fertilizers and of those who use the fertilizers, the usage per hectare is much below recommended use for optimal yield
- Motivating farmers to use inputs and adoption of GAP in their farms are critical for increasing the yield of seed cotton. On supply side, CTSN will have to provide requisite amount of improved variety of seeds, fertilizers and crop protection inputs

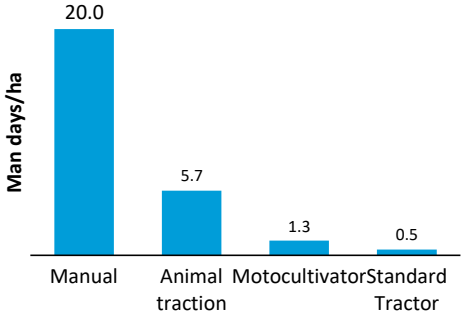
Total fertilizer requirement in 2024 expected to increase more than twice the requirement in 2020

- High and average yield segment farmers from 2020 to 2024 are expected to increase fertilizer usage per ha by 56%. Higher use for inputs per ha increase cost of inputs by 73% for high yield segments which if more than offset by 110% increase in net income
- Total volume of fertilizers to be supplied by CTSN in 2024 is estimated to increase by 99% over 2020 adding to transport and working capital requirements

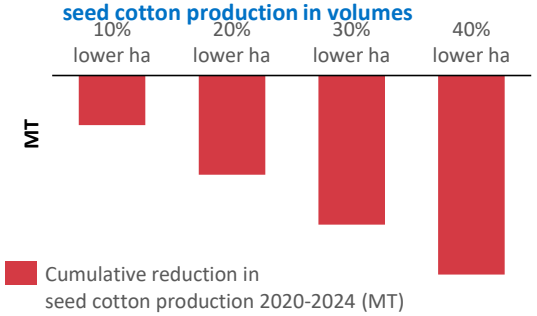
Mechanization services will help maintain cotton hectarage

1.B Providing mechanization services addresses critical bottleneck in land preparation, thereby helping farmers to meet their intended area for cotton crop

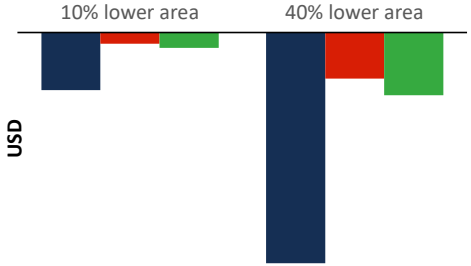
Mechanization requires only a fraction of manpower required for manual land preparation



Lower than intended hectarage due to bottleneck in land preparation decreases seed cotton production in volumes



Reduction in cotton crop hectarage results in significant decrease in potential income of both farmers and CTSN



* At average net income margin of 20%

^ At average gross profit of $110 per MT of seed cotton

Challenges in manual land preparation

- **Laborious**: Manual land preparation (primarily ploughing) is extremely laborious and time consuming often done under scorching hot weather
- **Labor shortage**: Inadequate labor availability for land preparation means the burden is entirely on farmer household
- **Climate change**: Unfavorable rainfall pattern can further constrain and shorten the time window (having sufficient moisture in soil) suitable for land preparation

Reduction in cotton hectarage severely impacts volume of seed cotton produced

- Even a 10% decrease in area of cotton crop will directly hit the overall production of seed cotton
- If farmers manage to maintain hectarage, they **often sow the seeds past the ideal window** for sowing which are likely causes for lower plant density and further reduction in yield per standing plant
- Mechanization is critical to put an end to laborious and inefficient method of manual land preparation and other allied farming activities

Let cooperatives own and operate the mechanization

1.B By selecting the suitable type of mechanized equipment to various cooperatives, optimize the capital expenditure and operational expenses incurred by cooperatives

	Standard Tractor 	Motocultivator 	Animal Traction 
Suitable cooperative segments	Large (150 farmers per cooperative)	Medium (50-60 farmers per cooperative)	Small (20-25 farmers per cooperative)
Ploughing capacity per unit in 20 days (cotton)	80 ha	32 ha	7 ha
Average cotton planted area per cooperative	130-150 ha	45-60 ha	18-25ha
Average land preparation covered by mechanization	80 ha (through tractor and rest by existing animal traction)	35 ha (through tractor and rest by existing animal traction)	10-15 ha
Primary ownership	Cooperative	Cooperative	Individual farmer
No of machines	1	1	2
Additional equipment considered in analysis	Plough, Rotary cutter	Plough, Seed drill	Plough arara and sowing arara

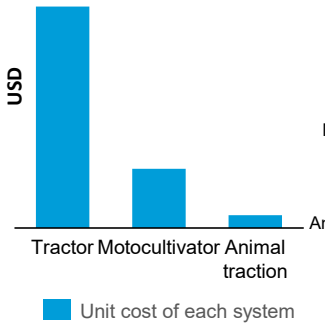
Cooperatives are best suited to own and operate mechanization with CTSN's support

- Considering the area under cultivation for cooperatives of different size (details in table to left), we recommend providing standard tractors to large cooperatives, motocultivators to medium size cooperatives and animal traction to small coops
- Standard tractors and motocultivators emerge as main choice to mechanize land preparation. Given the large amount of them needed, they also require the most capex to acquire
- The sheer scale of mechanization required makes it onerous from both capex and operational complexity for CTSN to directly operate mechanization. Therefore, cooperatives are suitable to own and operate mechanization with support from CTSN on training, maintenance and facilitating of finance

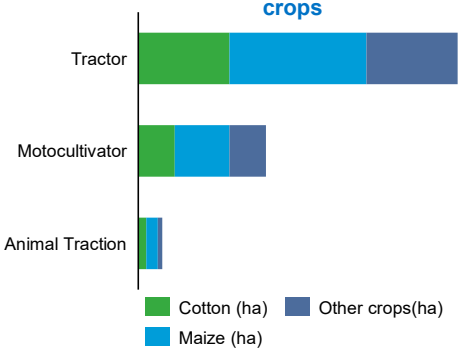
Make mechanization economically viable

1.B Optimal utilization and right pricing of mechanization services will ensure the ability of cooperatives to service the loans availed for mechanization equipment

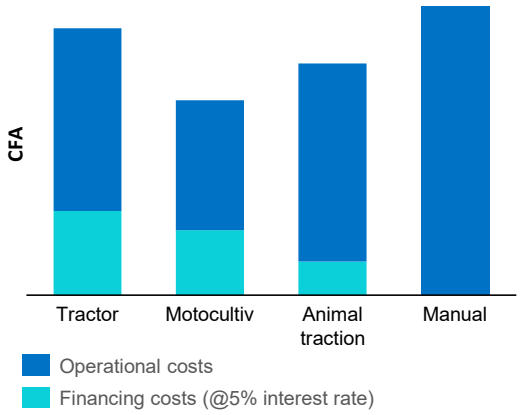
Cost to acquire each unit



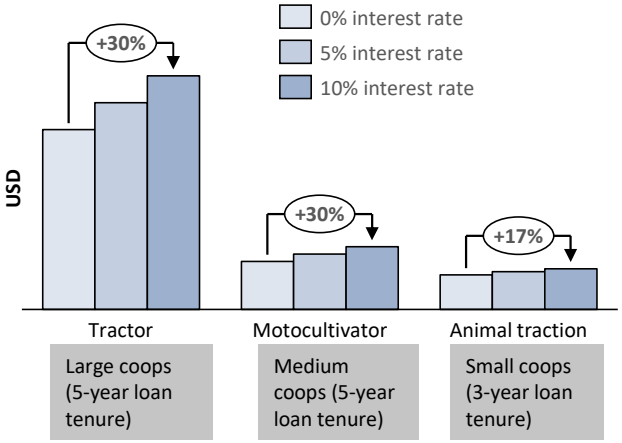
Average ploughing(ha) per year per unit for various crops



Price to farmer for ploughing per hectare



Annual cost of loan payments including principal at different interest rates



Optimum utilization of the equipment

- Mechanization can be used for different farm activities including grubbing, ploughing, sowing, weeding, ridging and transport. Of these activities, ploughing is the core part of land preparation and extensively demanded by farmers.

Get the pricing right to cover all the costs

- Since farmers do not have the experience with economical aspects of operating mechanization, we suggest CTSN take the lead in fixing the price of various mechanized services, training the cooperatives in operational and maintenance requirements
- **Pricing analysis** of ploughing activity shows that even after considering loan principal and interest payment at 5% pa in the pricing structure, the final price to farmer is less than the cost of manual ploughing

Keeping finance costs low can significantly reduce loan payments to be made by cooperatives

- With optimum utilization and right pricing, mechanization can pay for itself and cooperatives can make loan payments from their own accruals
- Explore options to access interest free or interest subsidy on the loan in the initial years to reduce the burden of loan payments on cooperatives. Such an option will reduce the price to farmer, thereby encouraging them to choose mechanization

Rollout mechanization in a phased manner after a successful run of small pilot

1.B Running a pilot project is essential considering the capital involved and operational experience required by cooperatives to manage mechanization

Thoroughly screen the cooperatives selected for mechanization

1. Select frontrunner cooperatives based on their performance, level of maturity, investability, financial management and available staff to operate and manage all aspects of mechanization
2. Cooperatives require continuous support and guidance from CTSN and other partners having expertise in managing mechanization

Establish requisite processes and know-how at CTSN

1. CTSN is required to play a key role in selecting cooperatives and coordinating with financial institutions to make loans available to cooperatives
2. Train cooperatives in operational, maintenance and financial aspects of mechanization equipment ownership
3. Ensure availability of spare parts
4. Operating workshops (mobile and full-fledged) manned by skilled mechanics

Run a small pilot before expanding in phased manner

1. To begin run a small pilot with about 5% of the cooperatives in 2021 ie 38 large coops(38 standard tractors), 116 medium coops (116 motocultivators) and 56 small coops (112 animal tractions)
2. A sum of $2.2 million is required in capital for securing equipment for rolling out the pilot project
3. CTSN and coops can learn of numerous elements critical for operating mechanization while reducing the risk exposure

Support farmers in food crops production

1.C Supporting selected farmer cooperatives in food crop production by providing inputs and extension services will strengthen the CTSN's relationship with cooperatives and farmers

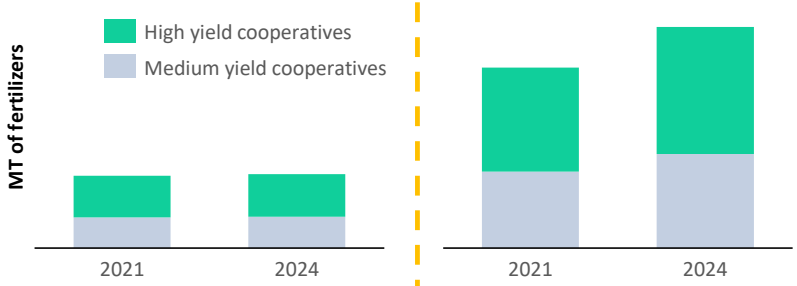
Food crops are critical for farm households

- Chad is a net importer of food which makes purchase of food expensive for poor farmers. So often farmers prioritize growing sufficient food for household over cotton crop
- Any help to farmers in securing food supply and nutrition is bound to have a multiplier effect on their livelihoods and income
- Maize and peanuts are main food crops among the farmers. Food crops also provide fodder for cattle

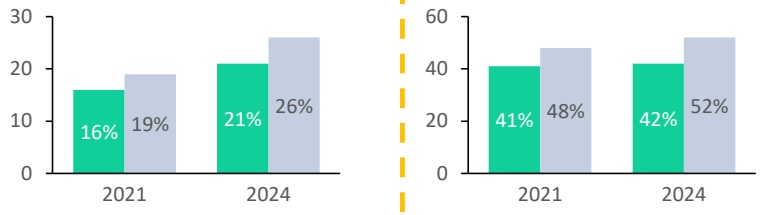
Recommended

Scenario 1
Moderate usage (**25%** of volume per/ha of cotton crop) and narrow supply base (**40%** of high and medium yield cooperatives)

Scenario 2
Intensive usage (**50%** of volume per/ha of cotton crop) and wider supply base(**60%** of high and medium yield cooperatives)



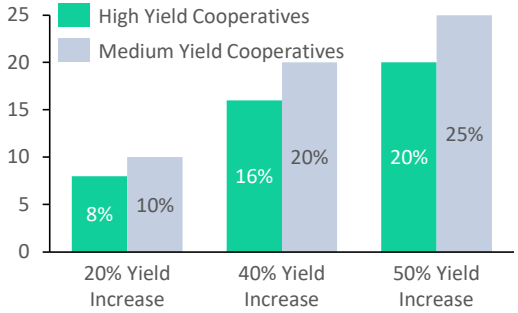
Cost of fertilizers for food crops as % of seed cotton value



We recommend Scenario-1 over scenario-2

- Scenario-1 is less credit intensive and hence limits credit risk exposure of CTSN.

Increase in farmer household income due to increase in yield of food crops

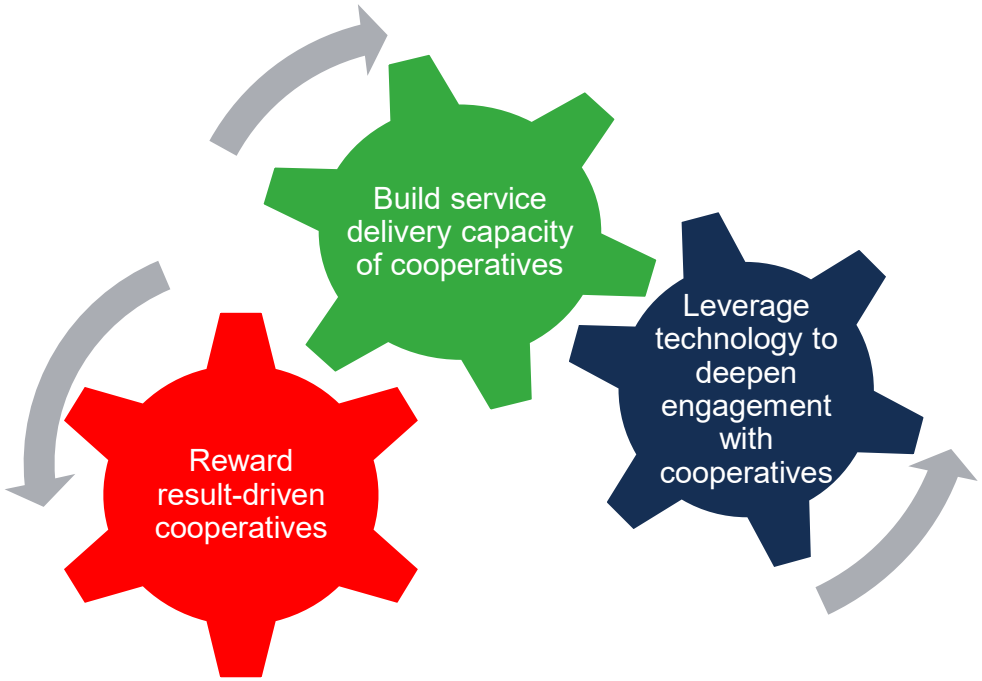


Important considerations in providing fertilizers to food crops

- **High yield and medium yield** cooperatives supply large volume of seed cotton and hence are less risky for additional credit exposure from supply of fertilizers to food crops
- A selective approach to choose the cooperatives with a track record of **timely and complete repayment of credit** over the years
- Limit the value of fertilizers provided on credit as a % of value of seed cotton

Increase capacity of cooperatives

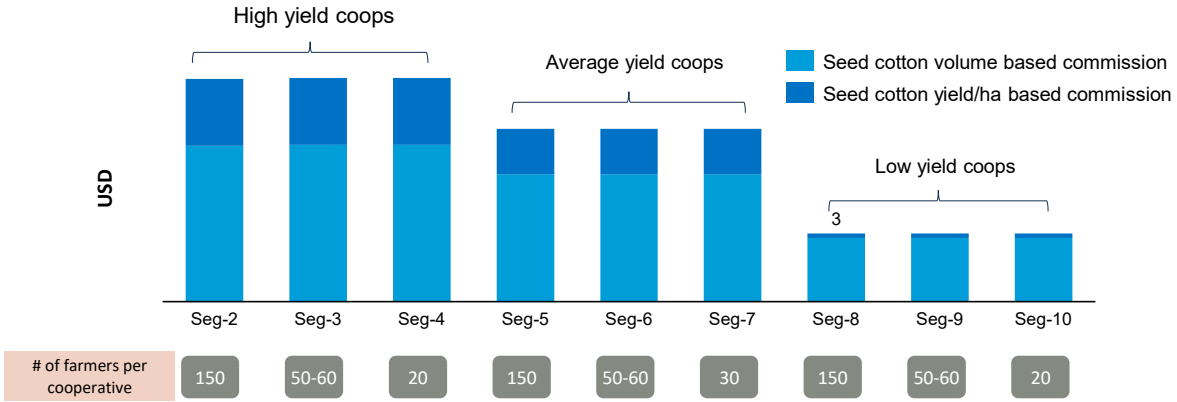
2. Building capacity of co-operatives will augment service delivery reach and effectiveness



Reward results driven cooperatives

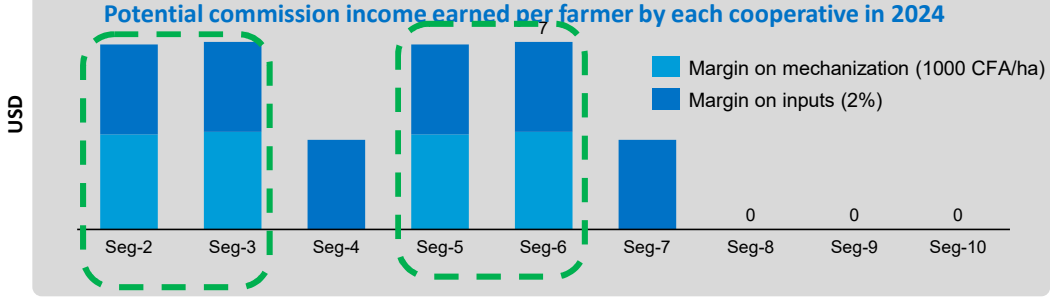
2.A Cooperative commissions linked to volume and yield of seed cotton incentivise coops to drive right behaviour(lower default rate, adopting GAP etc) among farmers

Commission income earned per farmer by each cooperative in 2024



* Seed cotton commission only

Potential commission income earned per farmer by each cooperative in 2024



Commission from seed cotton volume and yield

- Cooperatives currently earn commission in two ways a) per KG of seed cotton b) commission linked to yield per hectare . In effect, **cooperatives are incentivized twice for increasing seed cotton yields.** The commission from (b) is roughly shared in half between cooperative and cooperative agent (AVA) explained in next slide. The per farmer commission chart to left considers only cooperative's share
- High yield cooperatives make nearly 25-30% more in commission than average yield cooperatives for each farmer member. Both high yield and medium yield cooperatives can boost their commission income by achieving higher yields
- Low yield cooperatives make substantially lower commission compared to high/medium yield cooperatives.

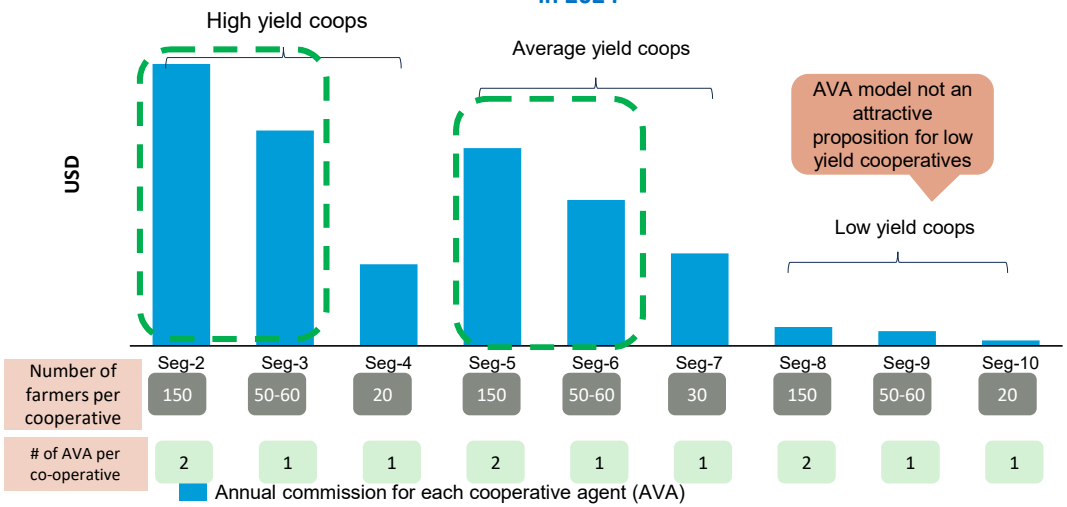
Mechanization margin and inputs commission

- Mechanization can a source of income equivalent to the commission income on seed cotton.
- At just 1000 CFA/ha for ploughing (3.5% and 4.5% of price/ha mentioned in earlier slide for tractor and motocultivator respectively), the cooperatives can earn near equivalent to seed cotton commission
- We recommend CTSN to consider paying commission on inputs distributed to farmers. Even at 2% commission, the cooperatives earn significant commission per farmer

Build service delivery capacity of cooperatives

2.B Cooperative agent model (AVA) enhances service delivery capacity of cooperatives while increasing their accountability to CTSN

Annual commission from yield linked rebate earned by each cooperative agent (AVA) in 2024



AVA model provides annual employment opportunity to nearly **5,000** people by 2024

AVA model can increase the reach of CTSN and bolster the service delivery capacity of cooperatives

- AV Autonomous or AVA: it is a village agent (AV) that sets up in-house of cooperative, one or more agents chosen from among its members for the supervision of the agricultural campaign.
- AVA's are trained by CTSN technical teams in performing different functions such as training farmers, inputs requirement collection and distribution, crop monitoring, seed cotton quality assessment, collecting agricultural statistics, coordinating in collection/storage of seed cotton.
- AVA model is critical for having in place a right incentive structure in engaging with cooperatives by having trained individual accountable for activities of agricultural campaign and their rewards linked to the same.
- With just the commission income linked to yield per hectare (ranging from 0.5 CFA for seed cotton yield of less than 600KG/ha, 2 CFA for 600-800kG/ha to 2.75 CFA for >1,000KG/ha), the agents earn an attractive commission. Additional compensation for other activities undertaken by AVA's can further boost their commission income.
- We recommend CTSN to help AVA's in acquiring motorbike, digital tools (a basic smart phone or tablet) that can increase their efficiency and effective of service delivery

Leverage technology to engage with cooperatives and farmers

2.C Implementing a digital technology plan will guide CTSN in prioritizing and adopting applications which will enhance CTSN's engagement with cooperatives and farmers

Digital technologies for engaging with cooperatives and farmers

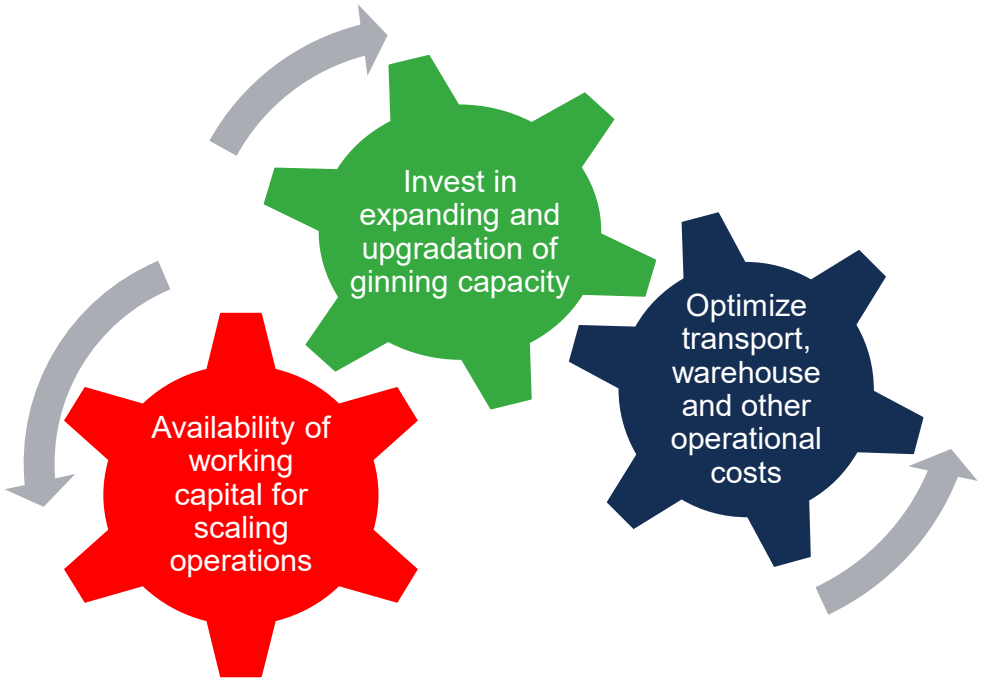
Functional Area	Possible use-cases	Value to CTSN	Value to Cooperatives/ Farmers
Centralized farmer database	• An integrated and central database of cooperatives and farmers for streamlined interaction between CTSN, Cooperatives and farmers • Cooperative staff (AVA) can capture and feed farmer data at various stages of engagement with farmers to keep CTSN informed • Empower Cooperatives by providing relevant and timely actionable information about various activities	High	High
Payments	Digital / mobile payments for: • Loan disbursement and repayments • Payments to farmers for produce • Payments by farmers for services and inputs	High	High
Planning, forecasting and logistics	• Forecasting seeds and input requirements for each of the cooperatives • Coordinating delivery of inputs to cooperatives / farmers • Managing and tracking collections at collections centers	High	Medium
Credit analytics	• A detailed credit database and analytics of cooperatives and farmers • Ability to attract outside capital for farmer loans	High	Medium

Discussion

- Leveraging digital platforms could generate value to both CTSN and cooperatives/farmers.
- Value accrues in the form of efficiency gains, reduced transaction costs and improved direct access to services for farmers and co-operatives.

Improving operational efficiency

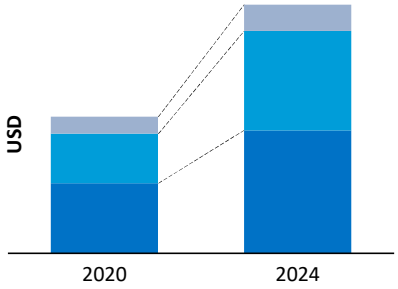
3. Cotton Tchad will improve operational efficiency by investing in processing infrastructure and optimizing operations



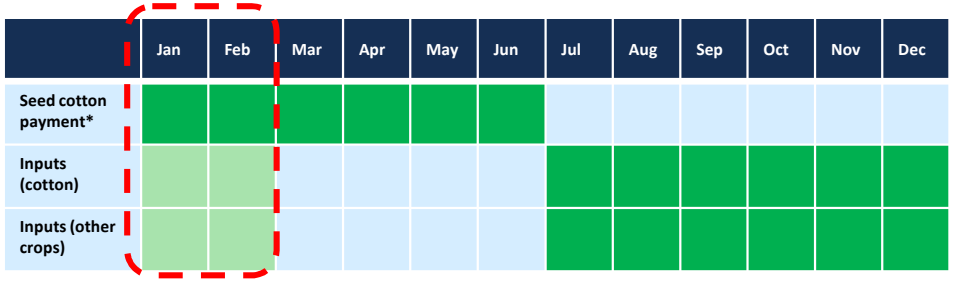
Secure adequate working capital to match increased scale

3.A Reaching higher seed cotton volumes enables CTSN for financing farm inputs (both cotton and other crops) and seed cotton payments (after 1 month)

Total working capital required for farm inputs and payments

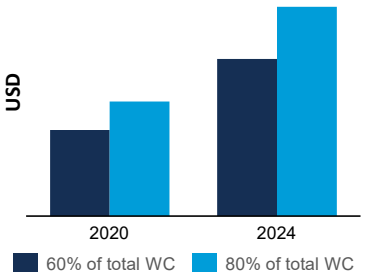


Working capital deployed months differs for various activities



* Seed cotton working capital required assumed at average value of 2.5 months equivalent seed cotton procurement, approximately the duration between payment for seed cotton and receipt of proceeds of cotton lint sales

Peak working capital requirement under varying conditions

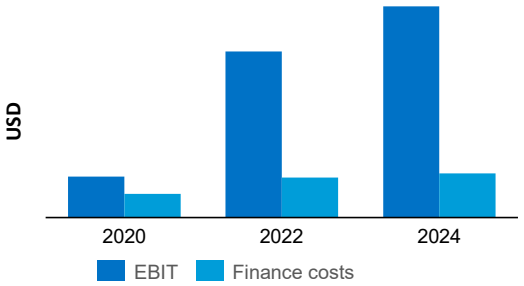


WC for seed cotton payments
WC for inputs (other crops)
WC for inputs (cotton)

Yield growth driven seed cotton volume increases positions CTSN to secure adequate working capital

- CTSN requires working capital for paying farmers for seed cotton (a month after procurement) and providing inputs on credit crop followed by inputs for food crops
- We estimate peak working capital requirement (ie the highest amount of working capital deployed at one point of time) in the range of 60-80% of total working capital requirement.
- CTSN can secure working capital during the crop season through loans from i)local banks ii) from banks outside Chad through parent (Olam) entity guarantee iii) direct loan from parent entity or in a combination of the options discussed
- Our estimates show that in CTSN's finance costs for working capital as % of its EBIT keeps shrinking (in turn reducing debt servicing risk of CTSN) thereby enabling the company to secure additional working capital required for adequate supply of inputs to farmers

Seed cotton volumes drive EBIT growth at a faster rate than finance costs*



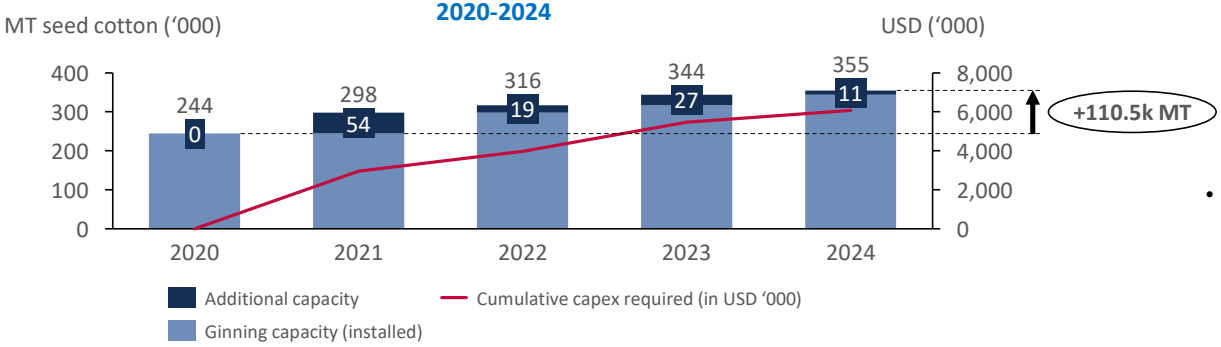
* At 10% interest per annum and duration of loan per above table 'working capital deployed months'

Back to Recommendations

Expand ginning capacity and improve availability

CotonTchad can absorb the costs of enhanced ginning capacity by increasing its ginning effectiveness.

Installed ginning capacity (cumulative) and capital expenditure requirement (cumulative) to absorb growing seed cotton volumes in 2020-2024



Discussion

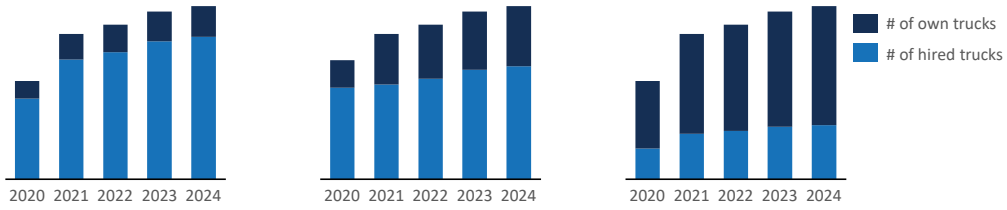
- CotonTchad will require to expand its realized ginning capacity (installed ginning capacity X gin availability X gin utilization) by 70K MT seed cotton in order to meet the 271k MT of seed cotton that will be produced by 2024, incurred by purchasing additional ginning stands or plants.
- Improving the availability rate (= the proportion of time the ginning units are able to be used for their intended purpose) will be an important driver in reducing the ginning capacity required, which reduces total capital expenditure costs.

Back to Recommendations

Optimize seed cotton transport operations

To absorb the projected increases in seed cotton volume, the transport capacity needs to be enhanced.

Number of trucks needed 'own (17 MT) : hired (16 MT)' scenario projections*



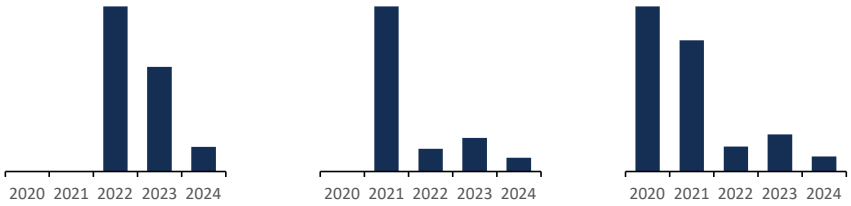
Scenario 1
25% own, 75% hired

Scenario 2 (current)
50% own, 50% hired
Used for future profit projections in other analyses

Scenario 3
75% own, 25% hired

**For 'own' trucks, a utilization rate of 83% was taken. For 'hired' trucks, no utilization rate was taken. Note that in practice, the number of "Hired trucks" may vary based on availability, contract conditions and operational conditions..*
***Based on the assumptions that an 'own' truck currently makes 1.01 trip/day (of 52 km) and a 'hired' truck makes 0.5 trip/day (of 110 km). Projections from 2021 onwards include this difference in distance covered. E.g. if 75% of seed cotton volume is transported by 'own' trucks in 2021, it is assumed that 25% hereof is carried over a distance of 110 km.*

Annual capex costs for purchasing new trucks (USD) for purchasing new Polyben trucks



Scenario 1
25% own, 75% hired

Scenario 2 (current)
50% own, 50% hired

Scenario 3
75% own, 25% hired

Truck capacity

- The expansion of the SDM and total production requires CTSN to expand its truck fleet to be able to carry the enhanced volumes of seed cotton from farm to ginning factory.
- Current projections estimate that at the current own:hired ratio, where 50% of seed cotton is carried by own trucks and 50% by hired trucks
- Note that in the scenario of CT's own trucks carrying only 25% of total seed cotton, given the current capacity of 35 'own' trucks, CTSN can only start hiring trucks for 75% capacity in 2023 while making use of all existing own trucks.

Annex

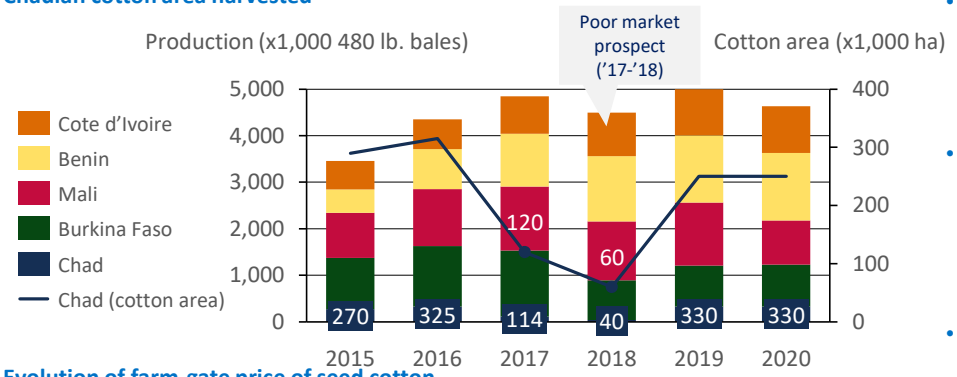
1. CONTEXT

Introducing the cotton sector in Chad, its challenges and priorities

Regional context

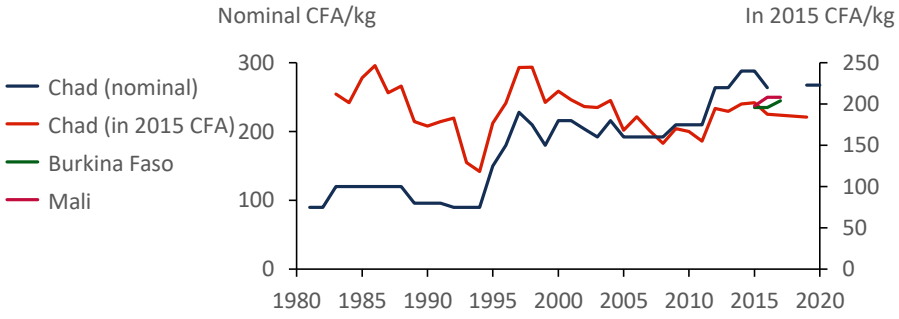
Chad has lost its position as a major cotton producer compared to the other C-4 countries

Annual global cotton production of major African cotton producers and Chadian cotton area harvested[1]



Evolution of farm-gate price of seed cotton

In F CFA/kg seed cotton



State of the sector

- **Declining production |** Chad has lots its position as the largest producer among other leading cotton exporting countries (Benin, Burkina Faso, Cote d'Ivoire, Mali). With an annual production of 330,000 480 lb. bales in 2020, it is the worst performing country of the four. This is especially low compared to its peak years, when production reached levels of 500,000 480 lb. bales (in 1997).
- **Fluctuating production |** Production fluctuates highly because of changes in the cotton area that is planted every year. Although cotton is a perennial crop, it is re-planted every year to minimize the risk of pests and diseases. One consequence is that farmers tend to switch crops easily depending on the market prospect. E.g. in the 2017-18 season, when many farmers did not receive payment from CotonTchad SN, many switched to other crops such as corn, peanuts or sorghum. As a result, total cotton area was halved from 120,000 ha to 60,000 ha.[6]
- **Exports & Importance |** Despite its declining performance, cotton still plays an important role in the economy of Chad. 96% of production is exported in the form of cotton lint, accounting for 42.1% of total value of agricultural exports during the period 2005-2011.[5] It is Chad's third largest export product, after crude oil and livestock. The cotton sector employs 250,000 producers and helps to sustain 3 million people.[2]
- **Monopoly |** Given the importance of the sector to the country, Chad has a monopsonist and monopolistic market structure. The public-private company, Cotton Tchad Ltd, exercises a monopoly over the purchase of raw cotton, processing and sale of cotton.[4] In 2018, the Chadian government sold 60% of its stake to Olam International. Olam now financially supports the rehabilitation of the cotton sector.[3]
- **Producer prices |** Farm-gate prices for cotton are fixed by CotonTchad, and based on the annual market price, representing ~60% of the FOB price. In nominal terms, prices have steadily increased since 1980, from 75 to 223 F CFA/kg today (~0.40 USD/kg). However, when adjusted for price increases, real prices expressed in 2015 CFA (221 CFA/kg) are lower than in 1983 (254 CFA/kg).

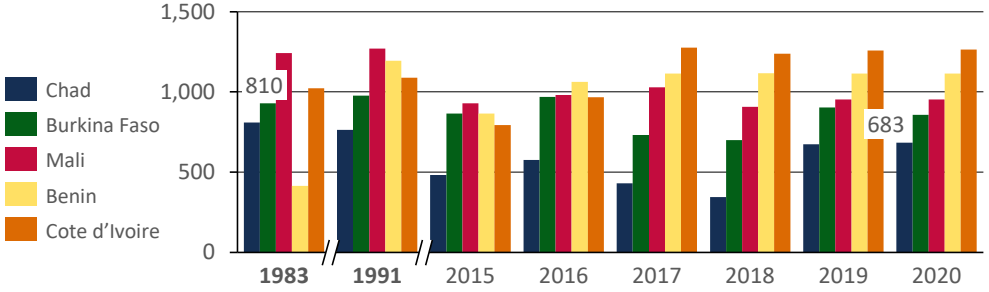
Sources: [1] USDA, 2018, USDA, 2020, for Benin: Indexmundi, 2020, for Cote d'Ivoire: Indexmundi, 2020; [2 & 3] Ecofin, 2018; [4] Suyama, 2014; [5] Boansi, 2014; [6] USDA, 2018; [7] Padacke, 2016

Regional context: Yield

Chad has lost its position as a major cotton producer compared to the other C-4 countries

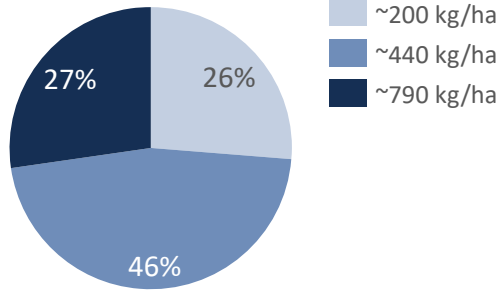
Annual yield of cotton in major African cotton producing countries[1]

Production in kg seed cotton/ha



Share of farmers per yield level in Chad, 2019[4]

Yield in kg seed cotton/ha, total of 235k farmers



Production & Yield compared to other countries

- **Declining yields |** Whereas yields in most countries have remained equal or increased (e.g. Benin, from 414 kg/ha in 1983 to 1,114 kg/ha in 2020), Chadian cotton yield has declined from 810 kg/ha (1983) to 683 kg/ha (2020).
- **Benin |** While Cote d'Ivoire still shows the highest yield levels, Benin has taken over the position to become leading cotton producer in the 'Franc Zone' (10 countries in Africa, including Burkina Faso, Mali, Benin, and Cote d'Ivoire). Benin's yield trend has also increased fastest in recent years, with a five-year average yield of 435 kg/ha. This is the product of recent investments in modernization of the cotton supply chain, and more timely supply of seed and fertilizer inputs.[3]
- **C4 |** Chad and three West African countries (Benin, Burkina Faso, Mali) are organized in the Cotton Four (C4). In 2017, the C4 created the Cotton Roadmap Project to enhance production and value-added activities across countries.[2]

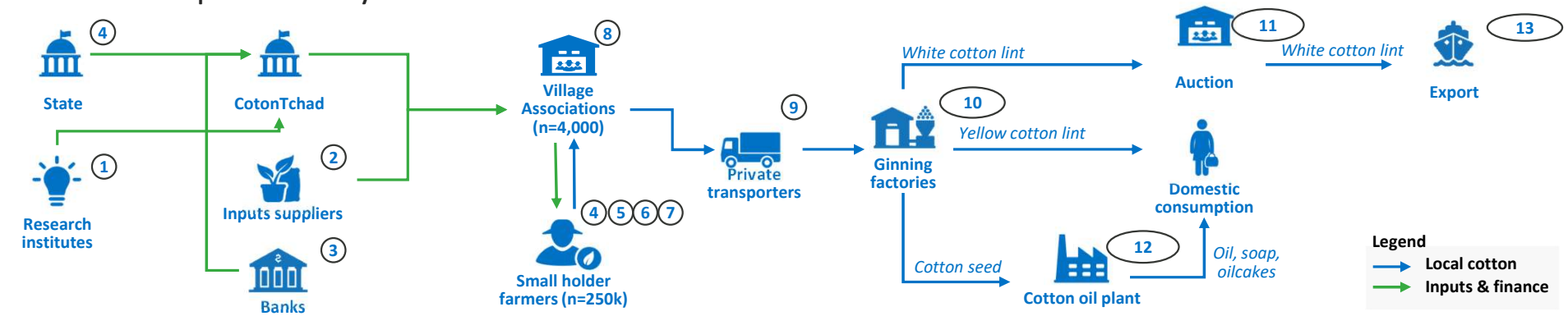
Yield levels per segment

- **Reliance on cotton |** More productive farmers tend to have a greater reliance on cotton as a share of their total income (>60% of net income), whereas farmers with lower yield levels rely less on cotton (30-50% of net income) as they spread their income sources over other crops, cattle, or off-farm income.

Source: [1] Indexmundi, 2020; [2] WTO, 2017; [3] USDA, 2020; [4] SDM data CotonTchad (confidential)

Value chain

Although the Chadian cotton value chain is well-regulated, shortage of inputs and finance continues to affect farmer productivity and income



Inputs

1. Research institutes explore and disseminate innovations on seed varieties, and controls tenders for fertilizer and pesticides. Currently used cotton varieties are often low-yielding.

2. High costs of inputs (fertilizer and pesticides)

3. Banks provide agricultural credit to CotonTchad, for the collection of cottonseed, ginning and marketing tasks.

4. The state endorses bank credits, subsidizes factors of production and exonerates the cotton sector from certain taxes.

Production

4. Production is limited by small farm size: Cotton is predominantly a smallholder-based production system, with an average cotton farm size of 1-2 ha.

5. Reduced yields due to pests such as bollworm and whiteflies, and adverse weather events

6. Poor soil management due to lack of organic matter and fertilizer

7. Low capture of value-added activities (such as ginning within Village Associations)

8. Nearly all cotton farmers are organized in Village Associations (VAs), through which they are entitled to inputs, finance and guaranteed purchase. VA size varies between 50 – 500 members.

9. Transportation is sub-contracted by CotonTchad to a private party. Poor infrastructure and road quality between producer, ginning factory and warehouse restrain transportation between producer and factory.

Ginning & Marketing

10. Chad has 7 ginning factories, which transform the raw cotton into (1) cotton lint, and (2) seed with a Ginning Out-turn Ratio (GOT) of 42%. The number of ginning factories is relatively low compared to the C4 + CDI countries, who possess between 14-19 ginning factories (as of 2015)[1]

11. The white cotton lint is sold via open auction, to international buyers, whereas the lower quality yellow cotton is sold on the domestic market.

12. Cotton seed (i.e. the remaining substance after ginning) is processed into cottonseed oil and cake in the seed oil mill, which is mostly consumed locally. Whereas there is only 1 such plant in Chad, the potential to add value is often claimed to be much greater.

Export

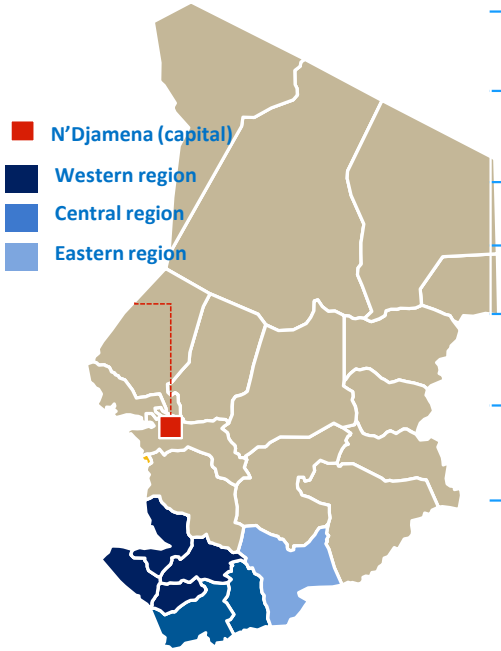
13. As Chad is a landlocked country, most cotton is shipped to its destination via neighboring country Cameroon.

Source: [1] UEMOA, 2015

Production regions

Despite the importance of cotton to Chad's economy, majority of Chadian farmers cannot sustain their livelihoods

Geographical distribution and regional differences in of cotton production in Chad[3]



Indicators	Western	Central	Eastern
# cotton farmers	147,000	70,000	98,000
# coops	1,212	962	1,354
Cotton culture	Strong	Average	Average
Cash crop competition	Low	Average	Average
Infrastructure & connectivity	Poor	Average	Average

Production distribution in Chad

- **Production regions |** Cotton is predominantly produced in the southern parts of the country, where precipitation rates are favorable for cotton production (800-1,200 mm p/year). The average cotton farm size is 0.5-2 ha[2] of 2-5 ha farms in total.[4]
- **Sub-national differences (1) |** Differences per production region should be considered when improving the SDM. E.g. whereas in the West, cotton culture is strongest, and most cotton farmers (147k) are located there, the infrastructure and connectivity are weakest of all three regions.[3] SDM investments in infrastructure therefore need to consider this.
- **Sub-national differences (2) |** In Central and Eastern parts, cash crop competition is stronger than in the West. Annual variability in the area sown with cotton may therefore be greatest in those regions, as farmers turn to other crops (sorghum; peanut) in times of poor market prospects. The Central-Eastern parts may therefore account most strongly for the annual fluctuations in Chadian cotton production. To secure a steady supply of cotton, the SDM needs to integrate these factors.

Households

- **Household size |** The average household size is 9, consisting of 2 parents and 7 children. In combination with the increasing demographic pressure, food security remains a concern for most families.
- **Income |** The average Chadian farmer earns far below the level required for a decent living. Per capita GDP is 950 USD/year, with 47% of the population living below the World Bank poverty line.[5]

Sources: [2] Int'l Cotton Advisory Committee, 2019, 32; [3] Client's information 'Chad Cotton Information, June20'; [4] IFAD, 2017; [5] World Bank, 2018

Enabling environment (1/2)

The current enabling environment does not match with aspirations to grow production and improve livelihoods

Risk level: Low | Average | High

Definition	Situation	Impact on SDM
Technology	• Poor internet & mobile connectivity (Chad Cotton Information, June 2019) • Compared to C4 (+CDI)[5], Chad has relatively little technological capacity to adopt new genetic cotton-seed varieties.[1] E.g. Burkina Faso has been experimenting with genetically modified cotton, which adds to its successful production levels[2]	• Enhancing the volume of high-yielding, genetically modified 1st generation seeds may enlarge the opportunity for farmers to reach higher productivity of seed cotton.
Environment	• Land management in Chad is one of the most unsustainable in the world. On the UNCCD Land Management Index of 2018, Chad took the 180th position (out of 181).[3] • Compared to C4 (+CDI), Chad compares worst in sustainable land management.	• Sustainable, long-term productivity needs to be accompanied by proper land management and the prevention of land degradation.
Infrastructure	• Poor roads between farmers and ginning factories render transportation of cotton difficult. It is estimated that at least ca. 4,608 km of village tracks are in need of rehabilitation.[4]	• Difficult accessibility between farmers, ginning factories and input providers (CotonTchad or Village Associations) renders both the marketing of cotton, as well as delivery of services to farmers difficult.
Labor	• Most labor is required for harvesting, (manual) deweeding and planting. For the majority of cotton farmers (80-85%), almost all labor is unpaid family or community labor.	• Mechanization by cattle or tractor can replace a significant part of the manual labor farmers currently need to conduct.
Inputs & Financing	• Provision of inputs, such as planting seeds, fertilizer and pesticides, are all supplied by CotonTchad or its subsidiaries. No other organization has authority to produce or market planting seeds. • Planting seeds are supplied to producers free of charge. Fertilizers and pesticides are paid for on credit, at a price to be recovered when farmers sell their cotton to CotonTchad. • The use of fertilizer fluctuates highly per year (between 1 – 97 kg NPKSB and 0-26 kg Urea in the period 1996-2015) and is always below the norm of 150 kg/ha (NPKSB) and 50 kg/ha (Urea).[1] • Compared to C4 (+CDI), where 250 kg/ha fertilizer is used, use of fertilizer in Chad tends to be lower.[1]	• Lack of quality inputs and financing to pay for those inputs affects farm yields

Sources: [1] Padacke, 2016; [2] Ebia, 2018; [3] Baltissen, 2018; [4] Financial Afrik, 2020 [5] C4 (+CDI) includes Benin, Burkina Faso, Mali and Cote d'Ivoire ('CDI')

Enabling environment (2/2)

The linear, transparent trading system does have potential to implement a well-functioning SDM

Risk level: Low | Average | High

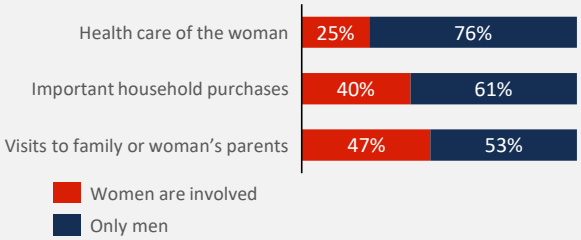
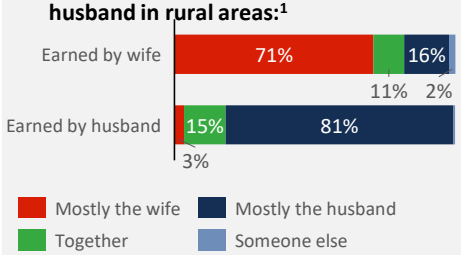
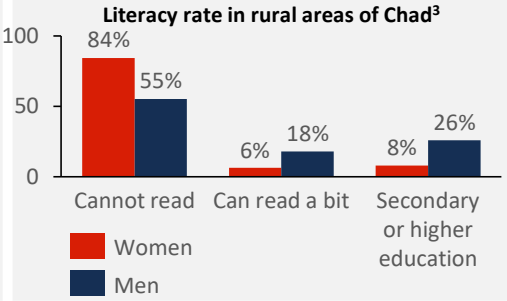
Definition	Situation	Impact on SDM
Trading System	• CotonTchad exercises a monopsony over the purchase and processing of raw cotton, and a monopoly over exporting it to international markets. Because of this structure, there are relatively few middlemen/intermediaries that capture part of the value.[1] • Since 1992, cotton farmers have to be a member of a Village Association to be guaranteed procurement of their cotton, as well as to get access to seeds, loans and other inputs.[2] • This trading system is similar to West African countries Mali, Benin and Burkina Faso.	• The monopsonic procurement system between CotonTchad and farmers makes the latter highly dependent on the financial health of CotonTchad. In the past, this has resulted in delayed payments to farmers or debts towards cotton carriers and suppliers, disincentivizing farmers and other value chain actors to stay in cotton production.
Pricing & Competition	• Prices are fixed annually by CotonTchad, but there is some differentiation based on quality. The price difference between the highest quality (A51, KERO, KARA) and lowest quality (BOKE) is only 6 cts/lb (in 2020) lint which is partially calculated into the farm-gate price. • Prices are also fixed in the other C4 + CDI countries, but differ per country (e.g. Benin is at 265 CFA/kg while Mali is at 200 CFA/kg)[4]	• Farmer income is relatively vulnerable to global cotton price fluctuations
Institutional Stability	• Chad is a highly unstable country, although there is relatively less unrest in the Southern, cotton-producing regions. • Corruption is widespread in Chad, scoring 26 out of 100 (=strongest policies and practices) on the Anti-corruption and Accountability index.[3] • Scoring -1.34 on the World Bank political stability index (-2.5 weak; 2.5 strong), Chad is considered more stable than Mali (-2.15) but less stable than Burkina Faso, Cote d'Ivoire and especially Benin, which is considered most stable and also the best performing cotton producer (-0.35).[5]	• Institutional instability creates a weak enabling environment for services to be delivered.
Land Tenure	• Cotton farmers own most of the land they work on. There are no official documents that recognize land ownership, since this is predominantly administered by the chiefs of local kins. Conflict over land is therefore scarce.[7] • Property rights in Chad are least protected and enforced, compared to the other C4 + CDI countries. It scores 32 on the Property rights Index (0-100), with the best performing countries being Burkina Faso (47) and Cote d'Ivoire (49).[6]	• Land conflicts has not posed an issue within the sourcing program of CotonTchad.
Social Norms	• There is a strong cotton farming culture among farmers and its financial potential gives producers credibility (Padacke, 2016) • This cotton culture is equally strong in the other C4 + CDI countries.	• The strong cotton culture increases the chances of a steady, long-term supply of cotton.

Sources: [1] Medard et al., 2015; [2] Padacke, 2016; [3] Baltissen, 2018; [4] Burkina Faso, FAO, 2017; Benin, Ressources-magazine, 2020; Mali, Ressources-magazine, 2020; Cote d'Ivoire, 2010; [5] Political Stability Index, 2019; [6] Heritage Foundation, 2020; [7] Expert interview, 23/12/2020.

Gender

Farm and household activity is structured around traditional gender roles

Gender Dynamics:

Category	Decision making	Decision making on Productive activities	Women in Leadership
Score	**Bad**	**Average**	**Bad**
Data	**Women's involvement in decisions in rural areas:[1]**  	**Control of income earned by wife or husband in rural areas:[1]**  	**Literacy rate in rural areas of Chad[3]** 

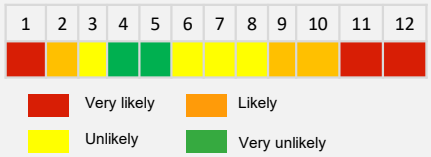
Category	Description of involvement	Detailed description of risk
Involvement in household Activity	**Activities undertaken:** • Regular household activities	
Involvement in Farm Activity	**Activities undertaken:** • 5-10% of total cotton farmers in Chad is female (around 25 to 30 thousand)[2] • Over 46% of women in rural areas does not work for remuneration, compared to 8.1% of men.[1]	• Women typically undertake the less labor-intensive, less-risky activities on the cotton farm, such as planting/sowing and harvesting. • Men execute tasks such as chemicals/pesticide application.

[1] DHS, 2015 [2] SDM Farm data, and FAO, 2015 [3] DHS, 2015, numbers don't add up to 100% as not all variables are noted here.

Food security

Food security is increasingly an issue in Chad

Farmer's overall Food Security status

Category	Cash-flow (Stability & Access)	Food Security (Access & Availability)	Assets (Stability)
Score	**Bad**	**Bad**	**Average**
Data	**CASH FLOW** Percent of farmers that likely are cash-strapped during this month of the year. Farmers are very likely to be cash-strapped in Nov-Jan (see 'Farm Performance' slide) 	**FOOD SECURITY** • **District level nutrition status:** Malnutrition is high. E.g. 20.3% of women is underweight,[1] and Chad comes at the 74th place (out of 113 countries) on the Global Food Security Index.[2] 45% of the population suffers food insecurity.[2] • **National average dietary energy supply adequacy:** 2,098 kcal/capita/day (as of 2017-2019)[3]	• **Ownership:** Owns land, either individually or as 'kin' • **Farm size:** 2-5 hectares • **Cassava farm size:** 0.5-2 ha (~25-40% of total land) • **Other crops:** Sorghum, peanuts, maize • **Animals:** Cattle

Category	Income (Access & Availability)	Market (Availability)	Health & Sanitation (Utilization)
Score	**Good**	**Average**	**Bad**
Data	• **Cotton sold:** 100% • **Crop loss:** 0% • **Own consumption:** 0% • **Price:** 232 CFA/kg seed cotton (in 2020) • **Price volatility:** Low, due to fixed prices • **Domestic food price index: xx** • **Income from crop:** 30-70% of total income • **Income from other crops:** 30-70% of total income • **National poverty line:** 38.1% lives below the poverty line of $1.90 a day (2011 PPP) (as of 2011)[5]. • **Household size:** 9 people (2 parents, 7 children)	• **Per capita food production variability:** 23,100 Int'l USD per capita[4] • **Global production**: ~25 million tonnes of lint (in 2019). Largest producers are all non-African countries: India, China, the United States, Pakistan and Brazil. • **Export vs Import:** Chad is a net exporter of cotton. • **Local market:** Yes, mostly for cotton oil and oilcake. Cotton lint is predominately meant for export.	• **Access to clean water:** No (52.7% of population in rural areas) while 47% does have access to pumps or public tap-water.[1] • **Access to toilets:** No. In rural areas, 85.3% has no access to toilets at all, and 9.9% uses cesspits.[1]

[1] DHS, 2016; [2] IFAD, 2017; [3] FAOSTAT, 2020; [4] FAOSTAT, 2020; [5] World Bank, 2020

Climate resilience

Chadian cotton farmers are increasingly vulnerable to the effects of climate change

Farmer sensitivity and exposure to:	Exposure	Sensitivity	Detailed description of risk	Expected impact
Changing temperatures	**High**	**High**	• Temperatures in Chad have increased 0.8°C since 1981-2020 and are expected to rise 3-4°C by 2100.[1]	• Rising temperatures will lead to water scarcity, food insecurity and a growing pressure on farmer productivity
Changing rainfall patterns and soil conditions	**High**	**High**	• Excessive rainfall increasingly results in flooding • Increasing rain irregularity and shortening of rainy seasons means an early or late onset of rains, or long, dry sequences. • In combination with low irrigation rates (1% of total (agricultural area), farmers are very exposed.	• Cotton production is vulnerable to flooding. E.g. in the 2017/18 season, 28,680 ha (or 25% of total cotton area) was affected by flooding. This reduced production significantly. • Long dry sequences during the vegetative and/or fruiting period of cotton plants damage production. E.g. a two-week drought rupture during the principal sowing period (June) resulted in lower yields.[2]

Farmer adaptive capacity			
Category	**Income & cash-flow**	**Assets**	**Access to services**
Adaptive capacity	**Average**	**Average**	**Average**
Data	• **Financial resilience:** Low. Low net incomes throughout the year render saving money limited. • **Insurance**: Farmers do not have access to a structural weather insurance.	• **Ownership:** Individual or by kin • **All land owned:** Yes • **Cotton farm size:** 0.9-4 ha • **Other crops:** Peanuts, sorghum, corn • **Animals:** Yes	• **Inputs:** Fertilizer (UREA, NPKSB) • **Seeds:** 1st generation and 2nd generation seed supply • **Credit:** Partial access to credit • **Training:** Training in good agricultural practices • **Future:** Mechanization (animal traction or tractor)

Sources: [1] IFAD, 2017; 2 Badacke, 2016

2. STRATEGY

Understanding the SDM's strategy and business model

Strategy

CTSN seeks to profitably grow in the Chad cotton value chain, while contributing to poverty eradication, climate resilience and food security of cotton farmers in Chad through diversification in food crops

Goals & Aspirations

- Stabilize and entrench cotton crop among farmers aiming to benefit both farmers and CTSN
- Growth aspirations for 2024-25:
  - ✓268,200 cotton farmers from 260,000 in 2020
  - ✓264,916 MT of seed cotton from 152,504 MT in 2020
- Increase the average seed cotton yield per hectare from the current 653 kg/ha (2020-'21) to 900 kg/ha (2024-'25) through various interventions (better seeds, fertilizer usage and GAP)
- Contribute to farmers' livelihoods by increasing their productivity and diversification, thereby their income and food security

Where to Play

High priority areas

- Ensure farmers increase usage of fertilizers and agrochemicals that are critical to increase the yield
- Work directly with large farmers (>10 ha) for driving faster adaptation of yield-enhancing good agricultural practices
- Enhance service offerings with mechanization services which will help maintain cotton acreage

Low priority areas

- Support growing of food crops such as peanuts and maize towards food security of farmers
- Providing of agri-equipment to farmers
- Enhance the use of technology in farmer engagement

How to Win

Points of Differentiation

- Providing mechanization services will remove critical bottleneck in maintaining cotton hectarage
- Reward results driven cooperatives
- Implementation of AVA model will enhance capacity of service delivery and accountability of cooperatives
- Optimize operational costs particularly in seed cotton transport and ginning to improve profitability

Points of parity

- Maintaining a close relationship with farmer cooperatives to ensure farmer loyalty
- Good relationships with key stakeholders such as end-buyers and government agencies which provides access to timely services

Capabilities Required

Critical capabilities

- Staff skilled at scaling operations efficiently and effectively
- Operational efficiency of the ginning plant by increasing the utilization and availability of ginnery
- Efficient plan of logistical operations for transporting seed cotton from farmers to gins

Supporting capabilities

- Comprehensive farmer database to better understand them and communicate frequently through use of technology
- Farmer monitoring system to keep track of farmer actions and follow-up

Scope and scale

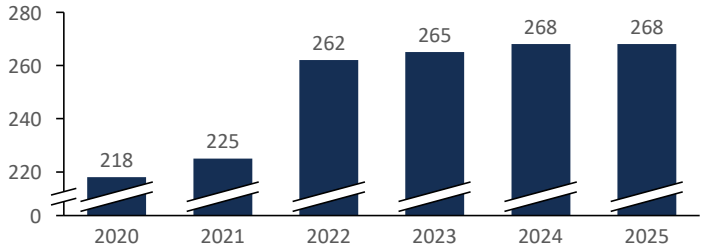
CTSN purchases and gins the seed cotton of all cotton farmers in Chad

CTSN's sourcing model

- CTSN predominantly sources cotton from smallholder farmers in southern Chad regions.
- The company currently sources cotton from 218,000 farmers, who are organized in 3,837 cooperatives (as of 2020).
- The program is currently run by 150 field officers within CTSN. Each field officer is located within the farming communities and manages an average of 1500-1800 farmers.
- The company is expanding its sourcing program and aims to source from 268,000 farmers by 2025. CTSN also aims to merge and scale the cooperatives, moving away from cooperatives with a size of 0-100 members towards cooperatives with a size of 400-1,000 members on average.
- The company also aims to enable farmers increase their average yields from ~650 to ~900 kg seed cotton/ha, as well as a slight increase in cotton area from 1.2 ha/farm to 1.4 ha/farm (on average).

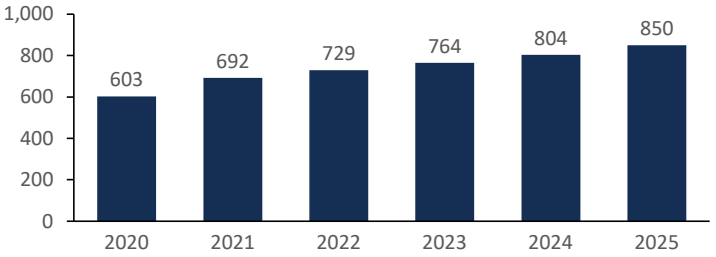
Scale of sourcing program

Number of cotton farmers per year (in '000)



Average yield of med-high performing farmers

In kg seed cotton/ha



Business model

CTSN operates a fully integrated cotton value chain with its core operations being sourcing and ginning of cotton from small holder farmers

Overhead (management, HR, legal, utilities, etc.)

Processing & Marketing

Processing
- CTSN operates 7 cotton gins in various regions of Chad with an *installed* ginning capacity of 244k MT of seed cotton per annum.
- In practice, this means it can gin around 153k MT of seed cotton per annum.
- CTSN has 1 seed oil mill which processes the remaining cotton seed into seed oil and cake.

Marketing
- CTSN markets its cotton in Europe and Asian markets through open auction of finished cotton bales
- CTSN has established relationships with many large buyers and leverages Olam's cotton trade expertise

Supporting activities

Collection centers
- Farmers deliver their produce to the nearest collection center (buying unit) managed by the co-operative in their community. CTSN collects the produce during harvest season from the collection centers.

Farmer organization
- CTSN has nearly 150 field officers who are dedicated to the management of the cooperatives and farmers. They work closely with cooperative leadership to organize farmers and work through them for effective service delivery and sourcing of seed cotton.

Production services

Seeds
- CTSN, through its own farms and fee selected farmers, is involved in seed multiplication which are supplied to farmers
- The bulk (90%) of seeds is obtained from the ginning process

Inputs
- CTSN supplies fertilizers (UREA, NPKSB) and agrochemicals to cooperatives, who in turn distribute them to farmers at the beginning of crop season

Mechanization
- CTSN encourages the uptake of mechanized farming through the promotion of tractors, motocultivators and animal traction
- Loans are provided to coops to finance mechanization

Training
- 21 zonal trainers dedicated to farmer trainings
- During each season 7 trainings are done per cooperative
- GAP training include better land preparation, maintaining plant density, optimal usage of fertilizers and agrochemicals and post-harvest handling and storage

Access to market
- CTSN guarantees the offtake of the farmers produce
- There is a fixed pricing and sourcing agreement between CTSN and the farmers that is renegotiated annually
- CTSN pays farmers on - time per season (Jan-Jun)

Technology and ICT
- There is limited uptake of technology.

Margin

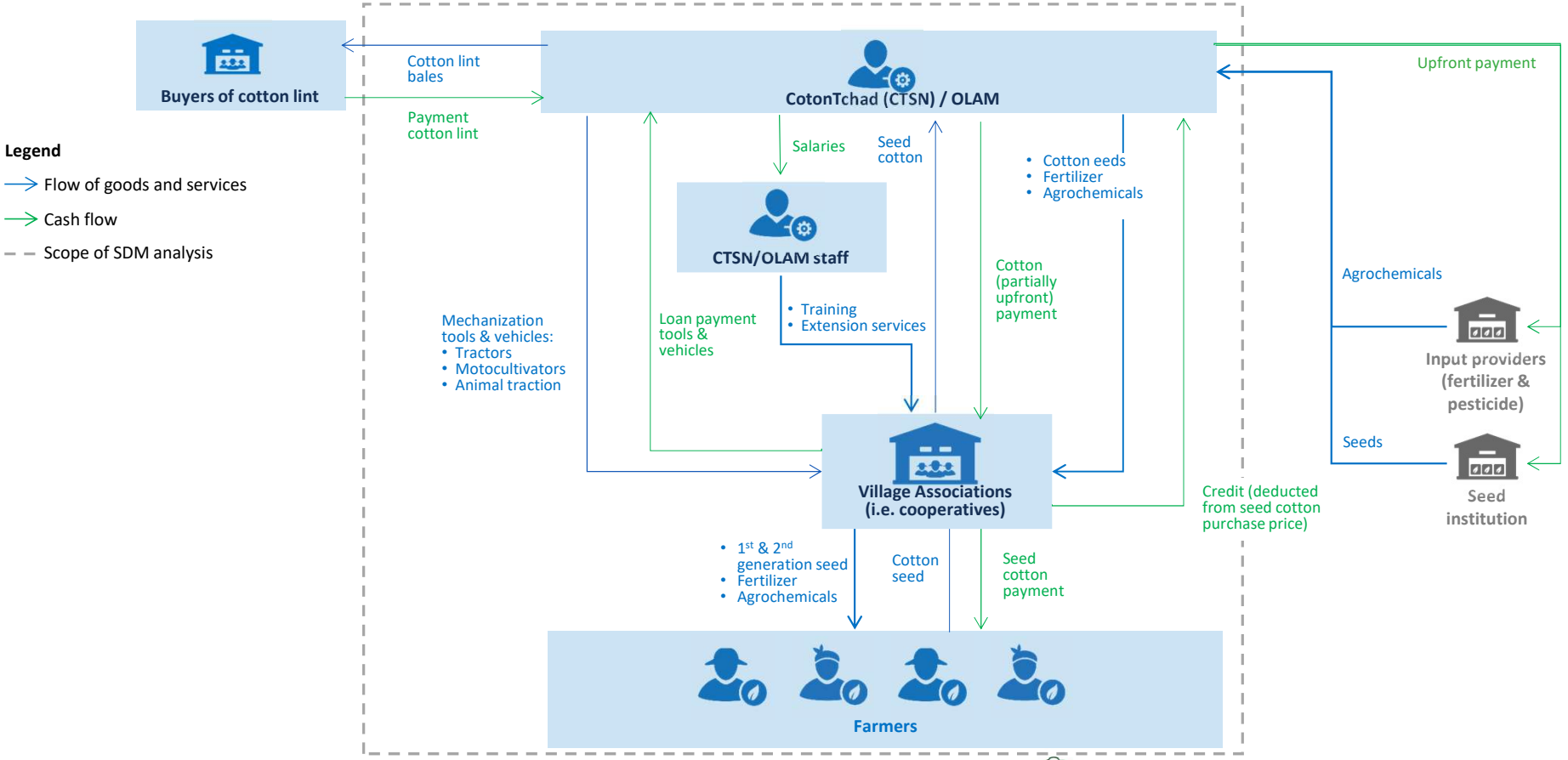
Partnerships

CotonTchad's key partners are the following:

Actors	Legal Status	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (within this SDM)
Seed providers	Research university (ITRAD)	• Research and production of 1st generation seeds	• Directly linked to CotonTchad	• Bring into practice the results of research
Input providers	External suppliers	• Sell crop protection and fertilizers to farmers via CotonTchad	• n/a	• Increased sales volumes
Financial institutions	Private limited company	• Provide capital to CTSN	• Payment of interest by farmers	• Increased credit offtake by CTSN
Lint buyers	Lint buyers	• Off-takes cotton from CTSN farmers	• n/a	• Availability of cotton lint
Government of Chad	Local, regional and national government	• Part owner of the company	• Share of profits	• Increase farmer incomes • Earn scarce foreign exchange
Village Associations	Cooperative organizations, and National Union of Cotton Producers of Chad (UNPCT)	• Main intermediate between farmers and CotonTchad, responsible for training, input provision, seed cotton purchasing	• Commissions	• Effective service delivery to farmers • Commission on facilitation of services

Key channels

Understanding farmer needs is critical in identifying how best to service the farmers



SWOT analysis

CTSN has a virtual monopoly and incumbent advantage in Chad cotton trade which, if leveraged well, can help CTSN almost double their cotton volume by 2023-24

	Helpful	Harmful
Internal	**Strength** • Monopoly of CTSN with 7 gins and 1 oil mill, there are no other notable gins operated in the country • Strong co-operative model of farmer organization with around 4,000 village associations reaching nearly 270,000 farmers • Cotton crop is an important source of forex to Chad and Chad national government owns 35% stake in CTSN, which are key factors for the Government to support cotton crop in the country	**Weakness** • In previous years before current management, farmers faced difficulties in selling their seed cotton and in realizing stable prices for the same – this has made many farmers to move away from cotton crop • Low availability and utilization of gins due to frequent breakdowns and unavailability of spare parts in timely manner • Lack of sufficient seed cotton storage facility at the gins lead to logistical challenges between sourcing and ginning of seed cotton
External	**Opportunities** • Farmers in the region have a strong cotton growing culture. The yield of cotton can be significantly increased by supply of proper seeds, fertilizers, crop protection along with regular GAP • Creation of buffer fund at the cooperative level coupled with crop insurance could safeguard long-term sustainability of cotton crop and farmer incomes • Crop rotation of cotton with peanuts could effectively enhance soil fertility, reduce fertilizer costs and diversify farmer incomes	**Threat** • Migration to food crops due to food insecurity • Poor road infrastructure hinders transport of inputs to farmers and source seed cotton from farmers • Poor mobile and internet connectivity limits application of ICT to effectively engage with farmers in training, communication, payments and other services

SWOT

3. SDM PERFORMANCE

Assessing the SDM's financial performance and opportunities for improvement

Back to Recommendations

Financial sustainability of Service Delivery Model

CotonTchad is targeting to increase the volumes of seed cotton sourced by 76%, mostly driven by increasing yields

Sourcing targets

- CotonTchad's target is to source 270k MT seed cotton by 2024.
- The increased supply is mainly driven by:

(1) Higher yields

- Yields are projected to increase across all segments, from an average of 650 kg/ha to 900 kg/ha.

(2) Increase in farm size

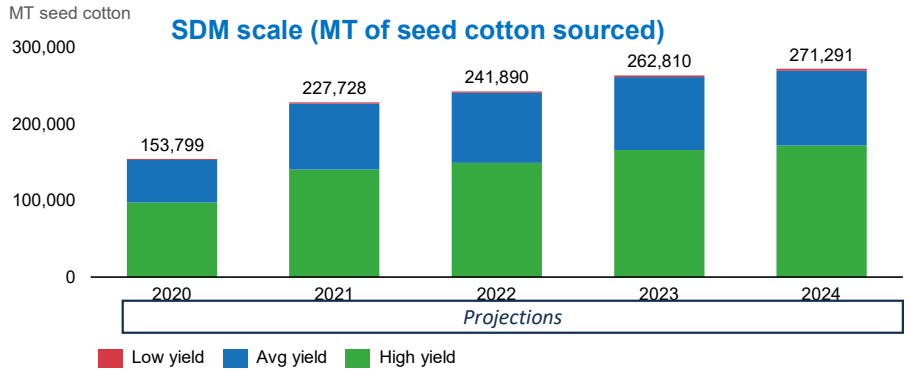
- Increase in the farm size dedicated to cotton, from an average of 31% (1.2 hectares) to 40% (1.6 hectares).

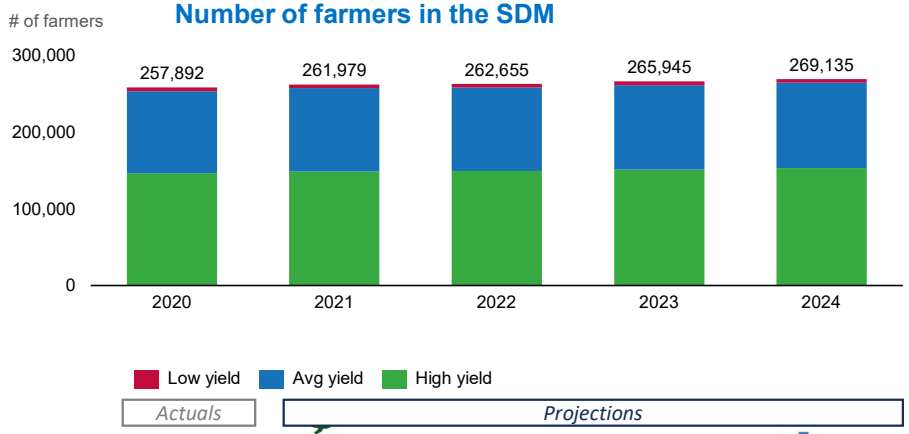
(3) Increase in farmer base

- Increase in the number of farmers that grow cotton, from 257k (2020) to 269k (2024), particularly encouraging the access of high-yielding farmers.
- Growing the number of large cotton farmers with 10 hectares or more, from zero (2019) to 2,000 (2024) farmers.

Number of farmers

- CotonTchad aims to increase the overall number of farmers by 4.5% from 257k in 2020 to 269k in 2024.
- The share of low-yield farmers (segments 8-10, 200 kg/ha yield) is projected to reduce, either because an increase in their yields to average yields, or because of an entrance of new average to high-yielding farmers (segments 1-7, 400-800 kg/ha).





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Financial sustainability of SDM

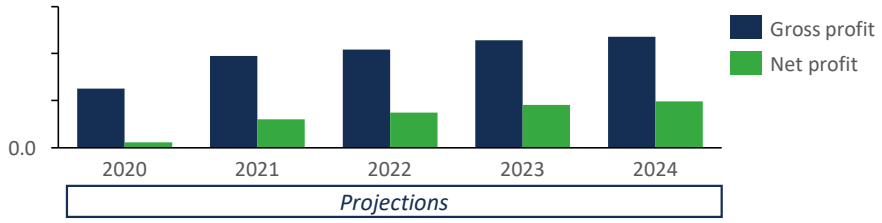
Net profits are expected to grow , primarily driven by increased volume of cotton lint.

Financial sustainability

- With the current projections of lint trade, CotonTchad can increase both its gross profit and net profit from 2020 to 2024.
- Gross profits per MT of seed cotton sourced are also expected to increase, although slightly. This means that revenues per MT of seed cotton produced, ginned and transported will increase progressively.
- The principal driver of the expected profit increase is the expected growth in seed cotton produced. Revenues per MT seed cotton are expected to grow slightly faster than the costs per MT seed cotton,
  - Revenues from selling cotton lint are projected to increase by **1.76x** from 2020 to 2024.
  - Direct costs (purchasing seed cotton, ginning, transport) are expected to increase by **1.76x** whilst total costs (incl overhead, financing) projected to increase by **1.69x** from 2020 to 2024.
  - Over time, this results in an higher net profit margin.

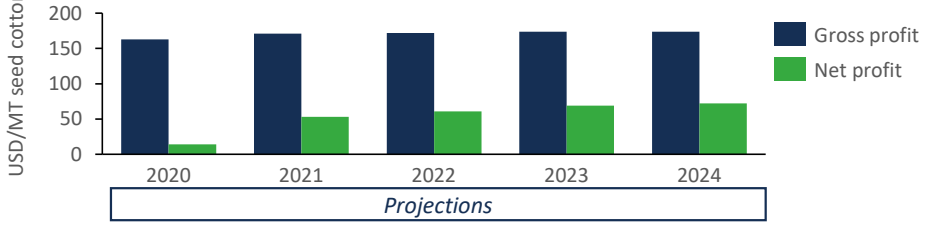
Gross and net annual profit over time

In USD, 2020-2024



Gross and net annual profit per MT seed cotton sourced

In USD, 2020-2024



Back to Recommendations

Financial sustainability of Service Delivery Model

CotonTchad can make an average of USD 10 million annual net profit from 2019-2024, if it continues to expand its service delivery to cotton farmers.

Revenue drivers

- A significant part of the revenue comes from selling cotton lint, while crude cotton oil and cake sales complement the revenue streams.

Cost drivers

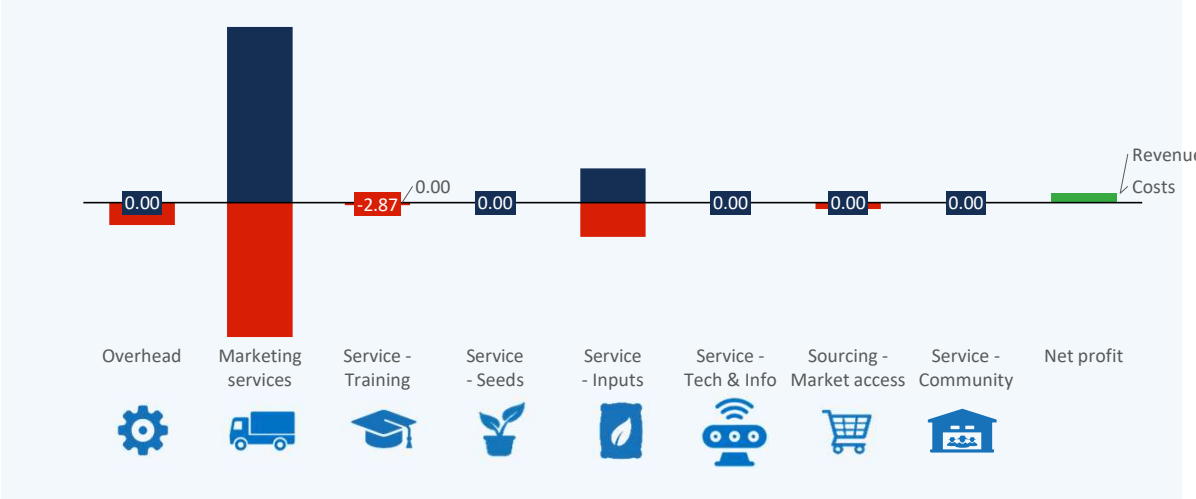
- Between 2019-2024, materials & equipment are projected to be the largest cost driver for CotonTchad, making up two-thirds of total costs. This is primarily driven by the costs of purchasing seed cotton (60% of total materials & equipment costs), as well as ginning, baling and milling
- Transport & logistics accounts for 18% of total costs, including transport of seed cotton to the ginning plants, and lint from Chad to the Cameroon ports.

Expense categories

*Annual average in USD of the period 2019-2024**

Overview of sourcing and service profitability

Annual average in USD of the period 2019 - 2024



*Excludes costs for inputs (fertilizer, crop protection) as they are reimbursed by the farmers

Back to Recommendations

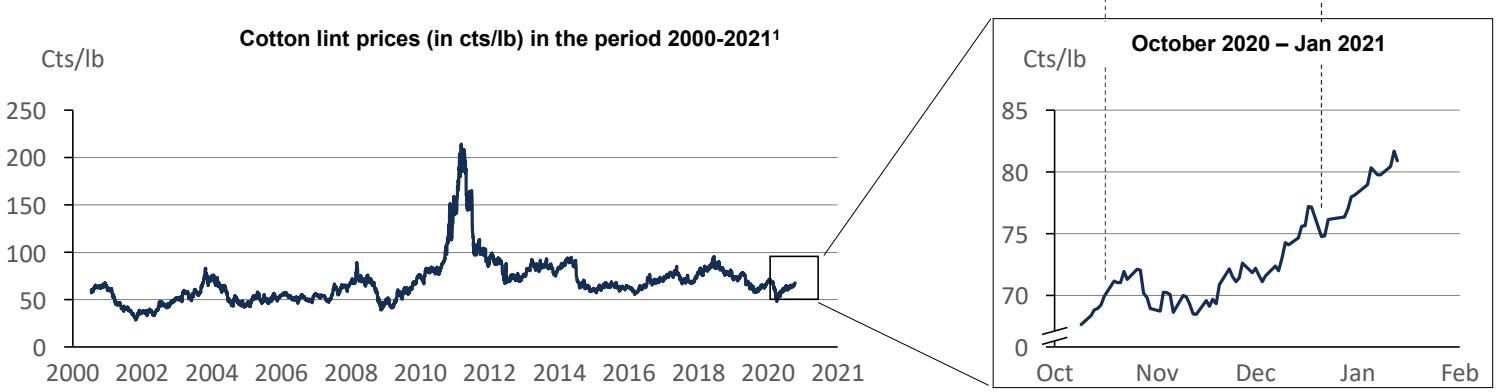
Sensitivity analysis of SDM profitability

CotonTchad's profit projections are highly sensitive to the cotton lint price.

Price fluctuations

- Historically, cotton world market prices are highly volatile. Between 2000 and 2021, global cotton prices have fluctuated between 30 cts/lb (2002) and 214 cts/lb (2011).
- The profitability of the service delivery model will therefore still rely significantly on market price fluctuations. Whereas at current prices (~77 cts/lb), gross profit would be 163 USD/MT seed cotton, this reduces to 85 USD/MT seed cotton at October prices (69 cts/lb). Conversely, should prices surge to Aug'2018 levels (85 cts/lb), gross profits may increase to 233 USD/MT seed cotton.

	FOB price (Cts/lb lint)	Gross profit (USD/MT seed cotton)
Oct'20	69	85
	73	122
Dec'20	77	163
	81	196
	85	233



Sources: [1] Macrotrends.net (Jan 2021)

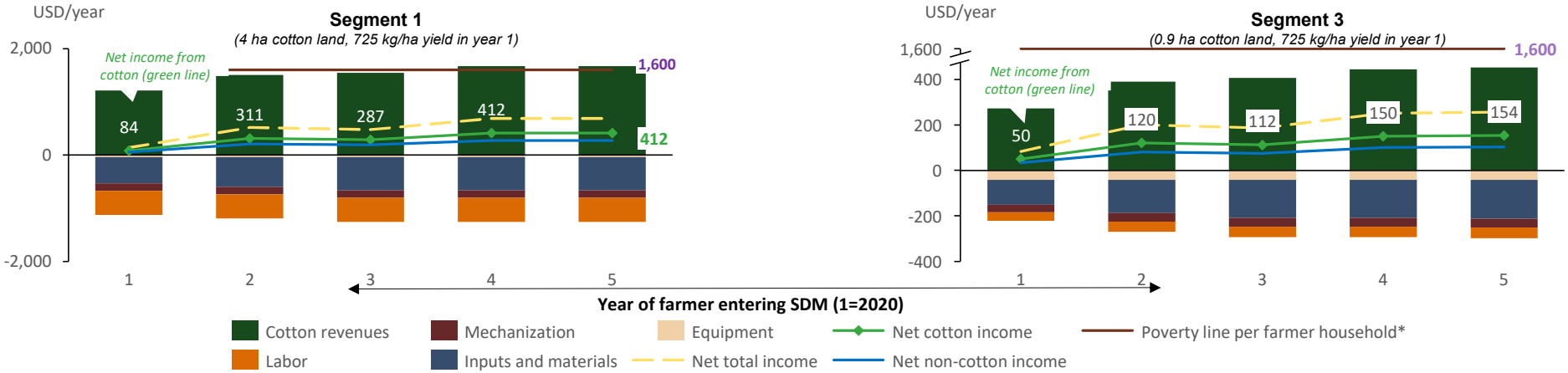
4. FARMER PERFOMANCE

Assessing farmer impact and opportunities for improvement

Back to Recommendations
Go to Farmer Assumptions

Cotton farmer net income – over time (1/2)

Farmers are expected to raise their net income from cotton from expanding the SDM



Economic sustainability at farm level

- Both Segment 1 (4ha cotton land) and Segment 3 (0.9ha cotton land) high-yielding farmers are expected to benefit from the SDM over time, reflected in rising incomes both from cotton and other sources.
- For Segment 1, net income from cotton is projected to increase from 84 USD in year 1 to 412 USD in year 5. Even if complemented by non-cotton income (30% of total income), this farmer is not able to reach the Chad poverty line (1,600 USD/year, PPP 2018).
- For Segment 3, net income from cotton is projected to triple from 50 USD in year 1 to 154 USD in year 5. His total income of 256 USD (40% from other income sources) will however remain far below the poverty line.

See slide 55 for an explanation on how the poverty line was obtained.

Revenue drivers

- While yields are similar for S1 and S3 farmers (at 725 kg/ha), S1 farmers are more profitable due to their large land size dedicated to cotton cultivation (4 ha versus 0.9 ha).
- While for both segments, yields are projected to increase (to ~850-900 kg/ha by year 5), S3 is also expected to increase its cotton farm size to 1.6 ha by year 5, which provides additional income from cotton.

Cost drivers

- **Inputs |** Costs of inputs mainly consist of fertilizer, herbicides and pesticides. For both S1 and 3 farmers, fertilizer use is still suboptimal. Both segments are expected to increase the applied NPKSB dose from 100 kg/ha to 150 kg/ha (recommended), whilst UREA volume remains at 50 kg/ha (recommended). This will drive expenses over the years..
- **Labor |** For S1 farmers, labor expenses are largest in absolute terms, due to the large farm size (>4 ha of land is dedicated to cotton). In combination with their high rates of paid labor (only 25% is 'own' labor), costs of land preparation, planting and harvesting are particularly large.

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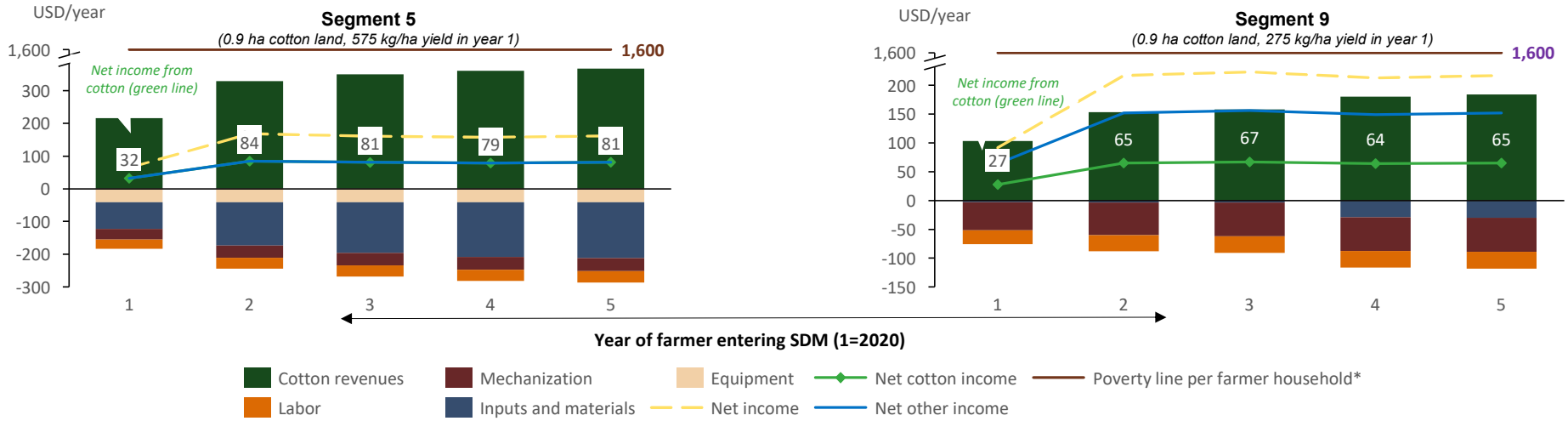
Go to Farmer Assumptions

Cotton farmer net income – over time (2/2)

Farmers are expected to raise their net income from cotton from expanding the SDM



Economic sustainability at farm level

- Both Segment 5 and Segment 9 (both 0.9ha cotton land) farmers are expected to benefit from participating in the SDM over time, reflected in rising incomes both from cotton and other sources.
- For Segment 5, net income from cotton is projected to increase from 32 USD in year 1 to 81 USD in year 5. Complemented by non-cotton income (50% of total net income), this farmer is however not able to reach the Chad poverty line (1,600 USD)
- For Segment 9, net income from cotton is projected to rise from 29 USD in year 1 to 65 USD in year 5. Non-cotton income constitutes 70% of total net income. This won't be sufficient to reach the poverty line.

Revenue drivers

- For both S5 and S9, increasing revenues from cotton are primarily driven by climbing yields. S5 is expected to increase yields from 575 kg/ha (year 1) to 800 kg/ha (year 5) while S9 is projected to rise from 275 kg/ha (year 1) to 400 kg/ha (year 5).

Cost drivers

- **Inputs |** For Segment 5 farmers, inputs (fertilizer, herbicides, pesticides) constitute the largest expense bucket (47%). Segment 9 farmers currently use almost no inputs, but are expected to raise their use of crop protection pesticides from year 3 onwards, adding to their expenses and stagnating their net cotton income.
- **Labor |** Labor constitutes another significant part of total expenses, although the majority (80%) of labor is informal, unpaid labor.

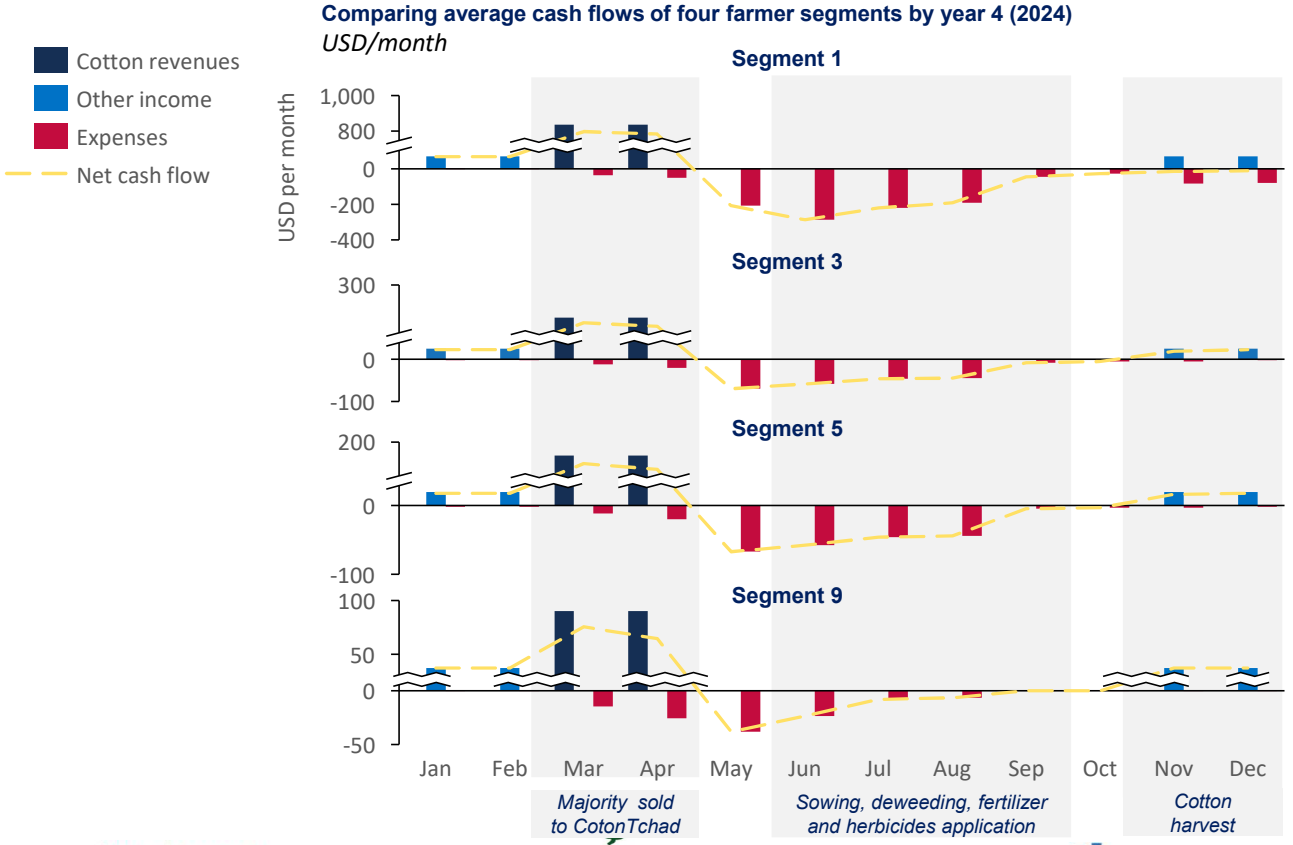
*See slide 53 for an explanation on how the poverty line was obtained.

Cotton farmer annual cash-flow

Farmers are expected to be cash-strapped in the months August-December

Cash flow

- For all farmer segments, the highest monthly income is earned in April and May. This results from payment of seed cotton by CotonTchad, which occurs between January – June as a one-time take-off. Majority of seed cotton is sold in the months April and May.
- Highest monthly expenditure is incurred in the months June – September, when the growing season takes place. Costs exist of activities such as planting, fertilizer & crop protection application and deweeding.
- Other income flows in between November and February, when most of the other crops (maize, peanuts) are harvested.
- Across segments, farmers are expected to be cash-strapped in the months August-December, when most reserves built up during the March-April will have dried up.



Cotton farmer net income – Resilience

Cotton farmers are highly dependent on yield and farm-gate price , yield increase can absorb some of the price shocks

Total net income of a cotton farmer derived from cotton- and non-cotton income, at varying price and yield rates.
In USD/year, in 2020

Segment 1 (2020)

Farm-gate price (CFA/kg seed cotton) →

Yield (kg/ha) ↓

	208	220	232	244	256
587	(413)	(329)	(244)	(160)	(75)
653	(250)	(157)	(63)	31	125
725	(70)	35	139	244	348
798	111	226	341	456	571
877	310	437	563	689	816

Segment 3 (2020)

Farm-gate price (CFA/kg seed cotton) →

	208	220	232	244	256
587	(41)	(22)	(3)	16	35
653	(4)	17	38	59	80
725	36	60	83	107	130
798	77	103	129	155	181
877	122	150	179	207	236

Current projection

Segment 5 (2020)

Farm-gate price (CFA/kg seed cotton) →

Yield (kg/ha) ↓

	208	220	232	244	256
466	(54)	(36)	(18)	0	19
518	(19)	1	21	41	62
575	20	42	64	87	109
633	59	83	108	132	157
696	101	128	155	182	209

Segment 9 (2020)

Farm-gate price (CFA/kg seed cotton) →

	208	220	232	244	256
223	(3)	12	26	41	55
248	25	41	57	73	89
275	56	74	92	109	127
303	87	106	126	146	165
333	121	142	164	185	207

Discussion

- The tables on the left show the sensitivity of cotton farmers' net income on factors **price** and **yield**.
- Due to the set-up of the current pricing system, where farmer share of FOB price is fixed at 60%, the farm-gate price is almost directly related to fluctuations in world cotton price. This renders farmers vulnerable to global price volatility.
- Across segments, higher yield levels can absorb part of the price fluctuations. For example, a segment 3 farmer with 877 kg/ha yield (instead of 725 kg/ha) can still earn 1.5x its current income, even in times when prices drop to 208 CFA/kg (instead of 232 CFA/kg).
- High-yielding **segment 1** farmers are most vulnerable to price fluctuations, due to their high dependence on cotton (60% of total net income) and relatively high expenses on inputs. They need a minimum amount of revenues to compensate for the relatively high expenses on inputs (44.4%).
- Lower yield segments (5, 9) are less dependent on yield and cotton price fluctuations, as they only depend for 30-50% of their total income on cotton production. A significant part of their income comes from other crops, cattle or off-farm activities.

**Based on World Bank poverty line of 1.90 USD/person/day, and converted to the income required for the average Chadian family (5.3 persons). The number is adjusted to Chad PPP conversion factor, private consumption (which was 241.9 in 2018), and converted back to USD using the exchange rate USD:CFA 1:555.6 (Nov 16, 2020).*

Back to Recommendations

Drivers for income growth of cotton farmers

To reach the poverty line, farmers require a significant increase in yield, price and/or farm size.

High sales revenues clearly balance out costs

- The table on the right shows the % change required per income driver to reach the Chad poverty line of 1,600 USD/year, by *only income derived from cotton*.
- High-yielding (segment 3) and medium-yielding farmers require a significant increase in yield, farm-gate price and/or cotton farm size to reach the national poverty line level (USD 1,600). Changing any of these drivers alone will not feasibly increase their income to the poverty line level.
- Currently, a high-yielding farmer (segment 2-4) and medium-yielding farmer (segment 5-7) depend on cotton for 60% and 50% of their total income, respectively. The sensitivity analysis shows that diversification will continue to be required for farmers to complement their income by other income sources, such as peanuts, maize, cattle, or off-farm activities.

Change required per driver to reach poverty line (using numbers from year 2020)

To identify the key drivers of the farm P&L, a sensitivity analysis is done for segment 3 and 5 cotton farmers. It tests to what extent a single variable must change for the net ***cotton*** income per smallholder to reach a certain value, all else equal.

Segment 3 farmer (high yield)

Income driver	Unit	Starting assumption	Required assumption to attain poverty line *by only cotton income* (USD 1,600 PPP 2018*)	Change required
Yield	*Kg/ha*	725	4,850	**+ 569 %**
Farm-gate price	*USD/kg seed cotton*	0.42	2.79	**+ 569 %**
Cotton farm size *(assuming revenues and expenses increase concomittanly)*	*Ha*	0.9	28.77	**+ 3,097 %**

Segment 5 farmer (medium yield)

Income driver	Unit	Starting assumption	Required assumption to attain poverty line *by only cotton income* (USD 1,600 PPP 2018*)	Change required
Yield	*Kg/ha*	575	4,748	**+ 726%**
Farm-gate price	*USD/kg seed cotton*	0.42	3.52	**+ 744%**
Cotton farm size *(assuming revenues and expenses increase concomittanly)*	*Ha*	0.9	44.67	**+4,863%**

*The Chad poverty line of USD 1,600 PPP 2018 is obtained from the World Bank poverty line of USD 1.90 per person per day. When adjusted for purchasing power parity (241.91 in 2018), and assuming an average of 5.3 persons per household, the annual poverty line of CFA 889,140 is obtained, which equals USD 1,600 (based on CFA/USD exchange rate of 0.0018 as of 16 Nov 2020).

5. ASSUMPTIONS

Key assumptions and background data and analyses

Glossary

Abbreviation	Meaning
AV	Associations Villageoise or cooperatives in Chad
AVA	Cooperative Agent Model (AV Autonomes)
Capex	Capital expenditure
Cts	US Dollar cents
CFA	Central African CFA franc
CTSN	CotonTchad Société Nouvelle
Lb	Pounds
Ha	Hectares
P&L	Profit & Loss overview
SDM	Service Delivery Model
MT	Metric tonne
USD	United States Dollar

Sources

Source	Link (if publicly available)
Baltissen (2018) Country Profile Chad	https://edepot.wur.nl/464103
Boansi (2014) Determinants of Agricultural Export Trade: A Co-Integration Analysis for Cotton Lint Exports from Chad, Pp 61	https://www.researchgate.net/publication/264116905_Determinants_of_Agricultural_Export_Trade_Case_of_Fresh_Pineapple_Exports_from_Ghana
DHS (2014-15) Enquête Démographique et de Santé et à Indicateurs Multiples au Tchad	https://dhsprogram.com/pubs/pdf/FR317/FR317.pdf
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Key assumptions – SDM

Seed cotton	
# farmers	**2019:** 234,000, **2020:** 218,000, **2025:** 268,000
Loyalty rates (c.%)	**2019-2025:** 100%
Volumes sourced (MT/year)	**2020:** 152,000 MT, **2025:** 285,000 MT (seed cotton)
Product pricing	Farm-gate cotton seed: 0.40 USD/kg (232 CFA/kg seed cotton) Cotton lint: 1.70 USD/kg (77 cts/lb lint)
Demo plots	**2020**: 161 **; 2021:** 140
Conversions	
1 kg seed cotton	0.42 kg cotton lint; 0.58 cotton seed.
Exchange rate (CFA to USD)	1:0.0018
PPP conversion factor, private consumption (CFA per international $), 2018	241.91

Key assumptions – Cotton Farmer

As of 2020			Segment 1	Segment 3	Segment 6	Segment 9
Segments: *Distinct groups of SDM beneficiaries that differ on* ***farm characteristics*** *and/or* ***services received***	Characteristics	**Farm size (ha)**	>10 ha	4 ha	4 ha	4 ha
		Cotton farm size (ha) (in 2020)	4 ha	0.9 ha	0.9 ha	0.9 ha
		Yield (kg/ha)	725 kg/ha	725 kg/ha	575 kg/ha	275 kg/ha
		% if income from cotton	70%	60%	50%	30%
		# seasons / year	1	1	1	1
		Farm-gate price (CFA/kg seed cotton)	232 CFA/kg	232 CFA/kg	232 CFA/kg	232 CFA/kg
		Member of cooperative	Yes	Yes	Yes	Yes
	Services	**Mechanization**	High	Limited	Limited	Minimal
		Fertilizer	High	High	Limited	None
		Crop protection	High	High	Limited	Minimal

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