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Bottlenecks, risks and stresses in the cotton supply chain in Burkina Faso

Recommendations to increase its resilience

Background paper prepared for the “Guidelines to increase
the resilience of agricultural supply chains: Getting on the Right Track
to Stabilize Production and Markets” project

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Bottlenecks, risks and stresses in the cotton supply chain in Burkina Faso

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Abstract

Cotton plays an important role in the economy of Burkina Faso, accounting for about 4 percent of GDP and 14 percent of export earnings. The COVID-19 pandemic had a strong impact on international cotton supply chains, with confinement measures affecting sales of textiles and apparel as well as international logistics, which in turn affected cotton markets and disturbed trade and international prices. In addition, national cotton supply chains are vulnerable to other shocks and stresses such as droughts, pests, storms, and irregular weather patterns resulting from climate change. This study aimed to identify major bottlenecks, risks and stresses affecting the cotton supply chain in Burkina Faso, with the purpose of deriving lessons to strengthen its resilience capacity and development, and with it, to improve the situation of the millions of livelihoods dependent on the cotton supply chain in the country. The study is based on information obtained from: a market data analysis for the estimation of the impact of the COVID-19 pandemic; a survey based on an extensive questionnaire, which has been prepared and distributed among the key stakeholders of the cotton supply chain in Burkina Faso; and the additional use of information obtained from the literature, with additional data analyses and with local electronic articles from news agencies. The study finds that disruption in global cotton markets led to lower domestic cotton purchase prices in Burkina Faso, but that the overall impact on cotton domestic markets was limited. Nonetheless, an important impact on poverty and food security was reported by the questionnaire respondents. Key constraints identified include: low incomes, natural capital, availability and costs of irrigation systems and tractors, and the availability of financial options. In addition, mechanization and labour saving technologies are key tools required in the movement towards increasing areas of production. The main stakeholders in the cotton supply chain also consider the low level of domestic processing of cotton fibre an important bottleneck. The key risks to the cotton supply chain in Burkina Faso are identified as climate change, pests and insecurity. Furthermore, governance issues in the vertical management system of the cotton sector in Burkina Faso are also a major problem affecting farmer's motivation, farming skills, extension services and the availability of financing options.

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Abbreviations

| | |
|-------------------|---|
| AFD | French Development Agency |
| AICB | Inter-professional Association of Cotton Producers of Burkina Faso |
| APROCOB | Professional Association of Cotton Companies of Burkina |
| CFDT | French Company for the Development of Textile Fibers |
| COVID-19 | coronavirus disease |
| FAO | Food and Agriculture Organization of the United Nations |
| FASO COTON | Private company in the cotton sector based in the central zone of Burkina Faso |
| FILSAH | Cotton spinning company of the sahel |
| ICAC | International Cotton Advisory Committee |
| GDP | Cotton producer cooperatives |
| GPC | Groupements des Producteurs du Coton |
| GPCB | Organic cotton producer cooperatives |
| GV | Village-level cooperatives |
| IMF | International Monetary Fund |
| INERA | Institute of Environment and Agricultural Research |
| MAAH | Ministry of Agriculture and Hydraulic Infrastructures |
| MDICAPME | Ministry of Industrial Development, Trade, Handicrafts and Small and Medium Enterprises |
| MECV | Ministry of the Environment and Quality of Life |
| OECD | The Organisation for Economic Co-operation and Development |
| SCOOPS-PC | Simplified cooperative societies of cotton producers |
| SECOBIO | Koudougou Organic Cotton Ginning Company |
| SN CITEC | The new oil and soap company CITEC |
| SOCOMA | Gourma cotton company |
| SOFITEX | Burkinabè textile fibers company |
| SP-SFCL | Permanent secretariat for the monitoring of the liberalized cotton sector |
| UNPCB | National union of cotton producers of Burkina |
| UDPC | Departmental unions of cotton producers |
| UPPC | Provincial unions of cotton producers |
| WTO | World Trade Organization |

1. Introduction

1.1. Problematic

Millions of livelihoods are dependent on the cotton supply chain in Burkina Faso: farmers, input suppliers, credit institutions, research institutes, transporters, processors, traders, the spinning industry, weaving cooperatives, etc. According to (SP-SFCL and AICB, 2019) about 4 million people (about 20 percent of the population) derived their income directly from cotton activities and several other upstream and downstream economic sectors depend on it. In economic terms, the cotton sector accounts for more than 4 percent of the national gross domestic product (GDP) and about 14 percent of the country's export earnings (SP-SFCL and AICB, 2019).

The COVID-19 pandemic resulted, especially in 2020, in an unprecedented change of the global economic conditions, which affected the international cotton markets and supply chains. In 2020, the real global GDP growth rate was of 3.5 percent (IMF, 2021a), the strongest negative value since the 1960s, with implications, among others, for unemployment rates and incomes. For the international cotton supply chains, the pandemic had a strong impact especially from February to May 2020. The confinement measures directly affected the sales of textiles and apparel as well as international logistics, which trickled down to the cotton markets and resulted in significant temporal distortions of trade and international prices; exposing the vulnerabilities of these supply chains.

In addition to the COVID-19 pandemic, national cotton supply chains are very vulnerable to other shocks and stresses such as droughts, pests, storms and irregular weather patterns resulting from climate change. For example, in the 2015/16 market season, production fell in almost all major producing countries worldwide as a consequence of adverse weather, lower world market demand, and policy uncertainty (OECD-FAO, 2016).

Burkina Faso's cotton supply chain is of course not free from risks, suffering several ups and downs in production in the past decade as well as needing to deal with future challenges such as climate change. This study intends to identify its major bottlenecks, risks and stresses with the purpose of deriving lessons to strengthen its resilience capacity and development, and with it, to improve the situation of the millions of livelihoods dependent on the cotton supply chain in the country.

1.2. Purpose

The study has the following objectives with respect to the cotton supply chain in Burkina Faso:

- To assess the impact of the COVID-19 pandemic.
- To identify the main constraints and bottlenecks hindering the development of the supply chain and its capacity to respond to shocks and stresses.
- To identify the major risks.
- To summarize the lessons learned and to derive recommendations to increase the resilience of the supply chain.

1.3. Methodology

In order to achieve the purpose of the study, a combination of three approaches was applied:

- i) A market data analysis for the estimation of the impact of the COVID-19 pandemic: current data (International Cotton Advisory Committee (ICAC) data set from December 2021 (ICAC, 2021) are compared with own estimates for the pre COVID-19 pandemic market balances¹ for the market seasons 2019/20 and 2020/21.²
- ii) An extensive questionnaire, which has been prepared and distributed among the key stakeholders of the cotton supply chain in Burkina Faso. The questionnaire contributes to the assessment of the impacts of the COVID-19 pandemic, the identification of bottlenecks in the cotton supply chain, and the identification of risks.
- iii) The complementation of the information obtained from the questionnaire with information from the literature, with additional data analyses, and with local electronic articles from news agencies.

The questionnaire was distributed among the managers of the key stakeholder institutions of the cotton sector: (i) the national cotton producers' union (National union of cotton producers of Burkina, UNPCB), (ii) the three cotton companies in the country (SOFITEX, FASO COTON and SOCOMA) and the ginning company of organic cotton (SECOBIO), (iii) the national interprofessional association (Inter-professional Association of Cotton Producers of

¹ Estimates of market balances without the effect of the COVID-19 pandemic.

² The market seasons are from August to July of the following year.

Burkina Faso, AICB), (iv) the permanent secretariat for monitoring the liberalized cotton sector (Permanent secretariat for the monitoring of the liberalized cotton sector, SP SFCL), and the National Agricultural Research Centre (Institute of Environment and Agricultural Research, INERA). The AICB and SP SFCL both referred to their representative/observer roles in the cotton supply chain and preferred not to answer the questionnaire. Thus, feedback on the questionnaires was obtained from the remaining institutions, the six key active players in the supply chain.

The FAO Representation in Burkina Faso and the Ministry of Agriculture and Hydraulic Infrastructures (MAAH) supported the implementation of the survey providing guidance on the details of the cotton supply chain, as well as supporting the communication and follow up with the respondents of the questionnaire.

1.4. Organization of the report

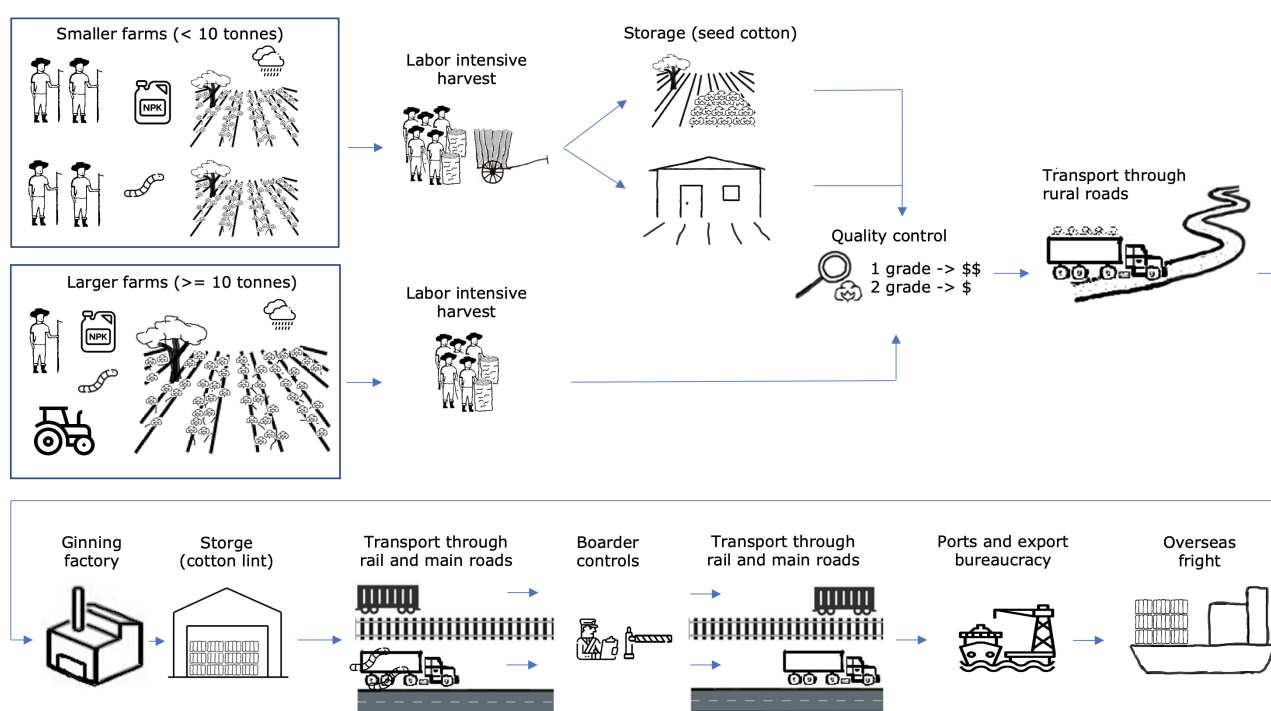
The paper is organized according to the specific objectives, dedicating one section for each of them. Previous to those parts, the section “Description of the cotton supply chain in Burkina Faso” gives a detailed description of the cotton sector in Burkina Faso as a background needed for the identification of the key vulnerabilities of the cotton supply chain in the country. The section “Analysis of the COVID-19 pandemic impact on markets, poverty and food security” presents the analysis of the impact of the COVID-19 pandemic. The sections “Identification of the bottlenecks in the cotton supply chain in Burkina Faso” and “Identification of risks – possible future shocks to the supply chains” identify the major bottlenecks and risks. And the section “Lessons learned” summarizes the lessons learned and derives recommendations to strengthen the resilience of the cotton supply chain.

2. Description of the cotton supply chain in Burkina Faso

2.1. The cotton supply chain

The core cotton supply chain in Burkina Faso is summarized in **Figure 1**.

Figure 1. Core cotton supply chain in Burkina Faso



Source: Author's own design. Some icons designed by Freepik, monkik, Mehwish, and surang from Flaticon.

Approximately 350 000 farmers are involved in the production of rain fed seed cotton (SP-SFCL and AICB, 2019; UNCPB, 2021). Farms produce several crops simultaneously, with cotton often being the key income crop generating crop, which is used to send children to school, pay medical bills, buy clothes, pay for transport, and to settle debts (Gray, Dowd-Urbe and Kaminski, 2018). Other crops are typically food crops, mainly maize but also other cereals (i.e. sorghum and millet), and other crops (legumes, tubers, etc.) (AICB, 2008), for which cotton is the primary source of fertilizer (Gray, Dowd-Urbe and Kaminski, 2018), personal communication with the questionnaire respondents). The cotton companies make contracts with farmer cooperatives providing farming inputs on credit, which are settled when the harvests are paid. These inputs (mainly fertilizer) are partly used in the production of food. Thus, cotton is intimately linked to the access of basic services (education, health, clothing, etc.) and to the production and access to food. Cotton and especially maize are

often produced simultaneously since, on the one side, cotton provides access to the inputs for the production of maize; on the other side, some early maturing varieties of maize can be harvested and sold before the cotton harvest, generating the necessary income to be able to pay people to harvest the seed cotton (Luna, 2020). The average distribution of crops in a cotton farm is of around 35 percent cotton, 56 percent cereals, and 9 percent other crops (WTO, 2015; SP-SFCL and AICB, 2019).

Figure 1 indicates some approximate differences between small and large farms. For example, large farms are often wealthier with better access to inputs and mechanization. Also, for larger farms, the access to labour saving technologies (mechanization) is key, as it allows them to cultivate the larger areas, and to generate larger incomes. Smaller farms often have to use labour to do the work intensive tasks (i.e. ploughing, sowing, weeding, harvesting, etc.), resulting in larger time requirements for the completion of those tasks and making labour availability a constraining factor. In the cotton producing regions, the average total area per farm is of around eight hectares with an average share of three hectares devoted to cotton cultivation (SP-SFCL and AICB, 2019; UNPCB, 2021). The farms have an average of 12 people (often part of one to two households), from which 8 are active agricultural workers, and approximately 2 are literate (MECV, 2011; AICB, 2008). MECV (2011) also groups the farms into “not equipped”, “poorly equipped”, and “highly equipped”, growing in size correspondingly. Not equipped farms are the smallest, while the highly equipped are the largest (in terms of area and people). Cotton cultivation is mainly practiced by farms with small cotton production areas that are not equipped or poorly equipped. MECV (2011), estimated their share to 65 percent, the remaining 35 percent being the highly equipped farms.

An additional difference is that smaller farms have to collect and store their harvests before they undergo a quality control and are transported to the ginning factories. This is a natural consequence of smaller farms taking much longer for the harvest and the need to group the harvest of several farms for transport purposes. For example, approximately 30 days of labour are estimated for the harvesting of one hectare (Luna, 2020). Since smaller farms rely on unpaid or poorly paid (family) labour (Luna, 2020), harvesting is a task which takes several days. In an average farm with 3 hectares of cotton and 8 active agricultural workers, the harvest would be completed in roughly 11 days. During these days, the collected cotton must be stored open air in the fields, or in storage rooms in the farmers’ homes, or in alternative buildings/storage facilities. Furthermore, cotton growers are organized into small cooperatives (SCOOP-PCs) that bring their seed cotton to designated outdoor collection points where the ginning mill trucks will collect it (USDA, 2018). For the transport of the seed cotton from the fields to the on farm storage facilities and then to the collection points, simple animal or man pulled carts are used. For larger farms (i.e. with productions of 10 tonnes or more), the ginning trucks come directly to the farm, reducing the on farm storage requirements and time (personal communication with a cotton expert at the FAO Representation in Burkina Faso).

Each year, around April or May, the AICB fixes the prices for first and second grade seed cotton for the following market season. In that way, farmers can plan how much land to dedicate to cotton, with the certainty of the prices that they will receive for the harvested seed cotton. The conditioning (classification into first and second quality) is done by technicians from each of the three cotton companies in the farm or collection points at the moment of purchase (personal communication with a cotton expert at the FAO Representation in Burkina Faso).

There is past and current evidence that the conditioning and purchase of the seed cotton is accompanied by corruption and late payments, both conditions negatively affecting the motivation of farmers to produce cotton (Gray, 2008; Gray and Dowd-Urbe, 2013; Gray, Dowd-Urbe and Kaminski, 2018; Luna, 2020; Engels, 2021). According to Dowd-Urbe (2014), in principal, the grading is thought as a mechanism to incentivize better production methods and more care during harvest and storage (cotton that is free of leaves and other impurities generally receives a better grade). Dowd-Urbe (2014) continues to explain that most producers assume that they will receive the first grade (as the handpicked Burkinabe cotton is of high quality), but that still, a perverse set of incentives permits cotton conditioners to demand payment for favourable classification. With respect to late payments, harvest normally occurs from November to January but are not paid until much later, with the consequence that farmers need to sell their food crops to gain the much needed cash (Dowd-Urbe, 2014). The classification and transport to the gin also often happen sometime after the harvest, between January and February (Dowd-Urbe, 2014). In consequence, on some occasions, the seed cotton must be stored on farm (at home, in storage rooms, or at open air conditions), running the risks of contamination of the product, degradation of quality, and losses related to bad weather or fires (personal communication with the questionnaire respondents).

After grading, the next step in the supply chain is the transport through rural and secondary roads to the ginning factories. The management and administration of the production of cotton is divided in three zones and assigned to one of the three cotton companies in the country: SOFITEX, FASO COTON and SOCOMA. In each of the zones the corresponding companies are responsible for providing the grading service, transport to the gin, and the payments to the producers. The companies are also responsible for (i) providing production inputs (seeds, fertilizers, and pesticides) on credit at the beginning of the production season, (ii) providing extension services to the farmers, and (iii) the management of short and medium term loans (WTO, 2015). For this purpose, the cotton companies liaise with the SCOOP PCs.

The ginning is done by the cotton companies. SOFITEX, the largest company (approximately 80 percent of the cotton production in Burkina Faso) has 15 ginning factories distributed along the cotton producing regions. FASO COTON and SOCOMA have much smaller volumes of production and thus fewer ginning factories (one and three correspondingly). Each of the

ginning factories has infrastructure facilities to store the produced cotton lint before it is transported to the ports for export. However, after ginning, the purpose is to directly transport the cotton lint to the ports of Abidjan (Côte d'Ivoire), Lomé (Togo) and Cotonou (Benin), either by truck or by rail (USDA, 2018; SP-SFCL and AICB, 2019). According to the OECD-AfDB, (2006), the principal and more economic route is the railway to Abidjan. According to ICAC data (ICAC, 2021) and own calculations on the level of consumption based on the processing levels and dynamic given in Touré (2019) and AT (2021). Fibre exports from Burkina Faso account for approximately 97 percent of the fibres produced. The domestic market for cotton fibre is in its infancy: only about three percent (approximately 6 200 tonnes of cotton lint) are subject to further processing per year. The processing is done in particular by the cotton spinning company of the sahel (FILSAH) but also by other smaller spinning craftsmen and craftswomen (SP-SFCL and AICB, 2019) (see green boxes in [Figure 2](#)).

2.2. Main stakeholders

The current structure of the cotton sector in Burkina Faso was determined during the colonial period. After the Second World War, the French established a vertically integrated export oriented sector (Dowd-Urbe, 2014). The French company, the CFDT (French Company for the Development of Textile Fibers) organized the cotton sectors throughout Francophone Africa (Gergely and Poulton, 2009). The vertical approach solved explicit market failures in credit and input supply and unstable market prices, encouraging farmers to freely engage in a profitable activity, with strong support in research, extension, and assistance to producers' organizations (Gray, Dowd-Urbe and Kaminski, 2018). With the creation of SOFITEX (Burkinabè textile fibers company), a parastatal company, the sector was nationalized in 1979 (Gray, Dowd-Urbe and Kaminski, 2018). Since the 1960s the sector has been growing to become a key sector in the overall economy, such that in the 1990s, problems in the cotton sector directly contributed to macroeconomic instability (high rates of public debt, inflation, foreign exchange shortages) (Kaminski, Headey and Bernard, 2011). As a result, both government and donors (French Development Agency (AFD) and the World Bank), agreed that there was an urgent need to push for reforms (Kaminski, Headey and Bernard, 2011). From the mid 1990s to approximately 2008 the sector underwent several liberalization reforms. The following are perhaps the most relevant: (i) the replacement of large and poorly managed village level cooperatives (Village-level cooperatives, GV) with smaller more flexible market oriented cooperatives based on shared liability (cotton producer cooperatives, GPCs or Simplified cooperative societies of cotton producers (SCOOPS PC), (ii) the creation of the national cotton producers' union (UNPCB) based on the membership of GPCs and their integration into departmental and provincial unions (UDPCs and UPPCs), (iii) the creation of two private companies (FASO COTON and SOCOMA) with assigned cotton zones, and (iv) the establishment of the AICB

as the association managing the cotton sector with representatives from the Professional Association of Cotton Companies of Burkina (APROCOB) and from the UNPCB (Kaminski, 2011). These reforms had the purpose of strengthening producers' organizations while maintaining the benefits of an integrated sector (ICAC, 2012). Thus, the vertically integrated export oriented system established by the French back in the 1960s still persists, albeit in a modified form today.

Figure 2 summarizes the structure and the main stakeholder of the cotton supply chain in Burkina Faso. Additional to the farmers, their cooperatives, the cotton companies and their integration into the AICB, the figure shows how other players are also important in the cotton supply chain, namely: (i) organic cotton production and ginning, (ii) the State, and (iii) other stakeholders (research, financial institutions, and processors of cotton lint and ginning by products).

Since 1996 with the liberalization reforms, farmers are organized in the simplified cooperative societies, the GPCs or SCOOP PCs. This new system allows cotton producers to create their own groups and freely accept and reject new members with the purpose of addressing the problems of debt repayment and free riding often encountered in the past GVs (Gray, Dowd-Urbe and Kaminski, 2018). As mentioned previously, the farmer cooperatives have the responsibility of liaising with the cotton company responsible of the management of cotton production in their cotton zone. Their main functions are the (i) distribution of inputs, (ii) the management of loans, (iii) the organization of the collection and selling of the seed cotton of their members (cotton weighing, payment, etc.), and (iv) other related activities such as managing members' contributions and social welfare (AICB, 2008; WTO, 2015). The SCOOPS, as the interface organization between producers and cotton companies, also liaise with extension agents and organize the extension service provided by the cotton companies; they are also responsible for the transfer of knowledge obtained in regional meetings and workshops that SCOOP PC's presidents or other management members might have attended to (personal communication with cotton experts at the FAO Representation in Burkina Faso and MAAH).

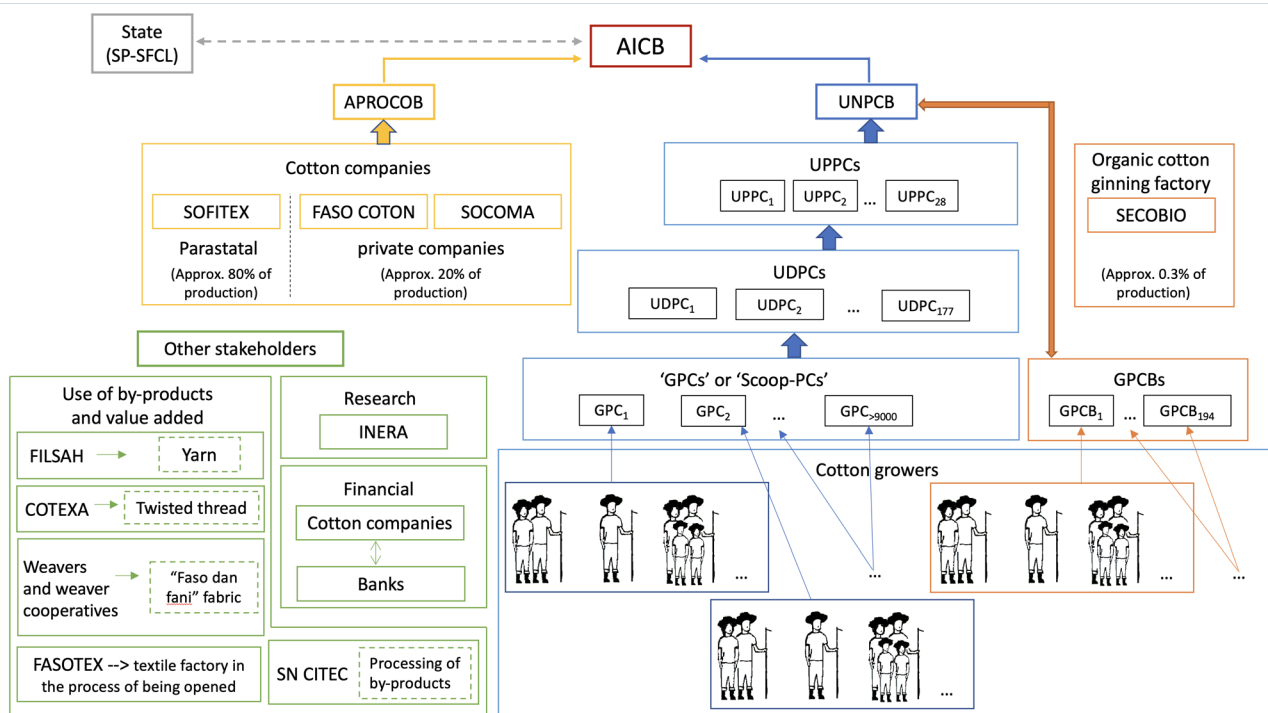
Between 1996 and 2001, the UNPCB was created (with a hierarchical structure) to be the national organization of cotton farmers (Engels, 2021; Kaminski, 2011). The SCOOP PCs (the smallest unit at the local level) elect a board at the department level (UDPCs) and the departmental boards vote for representatives at the provincial level (UPPCs) (Engels, 2021).

As already mentioned, the cotton companies manage the production of cotton in three separate cotton zones. By liaising with the SCOOP PCs they provide production inputs on credit, extension services, the collection and conditioning of the seed cotton, and the purchase

and transport. The cotton companies are also responsible for the ginning of the seed cotton and the marketing of the cotton lint (AICB, 2008; WTO, 2015). Representatives from the cotton companies make-up the Professional Association of Cotton Companies of Burkina (APROCOB).

The AICB officially governs the sector (Dowd-Urbe, 2014). The governing body is a board composed of 12 members selected by the UNPCB and APROCOB (Dowd-Urbe, 2014), and personal communication with cotton experts at the FAO representation in Burkina Faso and MAAH). As mentioned before, a key responsibility of the AICB is the fixing of the purchase prices for the first and second quality of seed cotton at the beginning of the crop seasons. It also sets the prices for agricultural inputs and research priorities (Dowd-Urbe, 2014).

Figure 2. Structure and main stakeholders in the cotton supply chain



Note: The abbreviations stand for the following: GPCs (cotton producer cooperatives), SCOOP PCs (Simplified cooperative societies of cotton producers), UDPCs (Departmental unions of cotton producers), UPPCs (Provincial unions of cotton producers), UNPCB (National union of cotton producers of Burkina), AICB (Inter-professional Association of Cotton Producers of Burkina Faso), APROCOB (association of cotton companies), SP SFCL (Permanent secretariat for the monitoring of the liberalized cotton sector), FILSAH (cotton spinning company of the sahel), COTEXA (a twisting and knitting plant), INERA (Institute of Environment and Agricultural Research), SN CITEC (The new oil and soap company CITEC).

Source: Author's own elaboration.

Organic cotton is an alternative cotton production programme that started in 2004 (Métouolé Méda *et al.*, 2018). Emphasis has been placed on reaching women and other groups marginal to the conventional cotton sector, not on converting conventional farmers to organic (Luna, Hernandez and Sawadogo, 2021). In the last four market seasons (from 2017/18 to 2020/21) the share of women was close to 60 percent (based on data provided by the UNPCB, the institution in charge of running the organic programme in Burkina Faso). Similar to how it is done for conventional cotton, producers are organized in small village cooperatives (organic cotton producer cooperatives, GPCB) who coordinate with the UNPCB. Their seed cotton is currently all processed by SECOBIO, the organic cotton ginning factory (personal communication with the questionnaire respondents), which was inaugurated in January 2020 (Yaméogo, 2020). Organic cotton represents a source of income for a small number of farmers (between 5 000 and 9 000) and its production has oscillated between 1 000 and 2 500 tonnes (approx. 0.3 percent of total production), both in the period between 2011/12 and 2020/21. There are several factors (institutional, economic, and cultural) that play a role on the low rate of adoption of organic cotton. According to Métouolé Méda *et al.*, (2018), the provision of subsidized synthetic fertilizer on credit is a relevant incentive that keeps the farmers in the conventional programme. As mentioned above, fertilizer is also key for the production of food crops. According to Luna, Hernandez and Sawadogo (2021), even though profit margins per hectare may be similar between organic and conventional Vognan *et al.*, (2017) or even slightly higher for the organic cotton (Barthmaier, 2020), still conventional farmers can more easily scale up, to increase profits. Finally, labour constraints (i.e. kids go to school and are not available for farm labours) in combination with the view that organic cotton is less modern and labour intensive (hand weeding rather than herbicides, or handmade compost rather than fertilizer) speak rather for the conventional programme (Luna, Hernandez and Sawadogo, 2021).

After the liberalization reforms, the Burkinabe state still participates in the sector, through the design of agricultural policies, the development of infrastructure, and the development and implementation of its regulatory framework (AICB, 2008). At the state level, the management of the cotton sector is carried out by a permanent secretariat (SP-SFCL) (see [Figure 2](#)). Interestingly, (Dowd-Urbe, 2014) states that with the reforms the Burkinabe state has paradoxically retained and even consolidated its power, that SOFITEX (the state run cotton parastatal) still retains a monopoly of approximately 80 percent of total national cotton production, and that the state is still the major shareholder of SOFITEX (in 2007 the company recapitalized, and the state increased its total percentage of shares from 30 percent to 65 percent).

Finally, Figure 2 also shows “other stakeholders” in the cotton supply chain. These are not directly involved in the production of cotton but are key strategic partners. INERA is the national agricultural research centre (Institute of Environment and Agricultural Research). In 2008, the AICB already stated that INERA had played an essential role for more than 20 years. It contributed to the sector with varietal improvements and research on farming (soil fertility, fertilizers, plant protection, plant nutrition, etc.) and farm management. In the recent past, it collaborated with Monsanto on a 5 year programme of field testing of Bollgard II®, a second generation of *Bacillus thuringiensis* (Bt) improved cotton, and on making recommendations to farmers (Sanou *et al.*, 2018). Also, it has of course continued to support the sector with research on current issues, as for example on soil and water management, or on organic farming.

The banks mainly liaise with the cotton companies on: (i) the financing of the campaign credits, basically for the purchase of seeds and inputs, and (ii) the financing of industrial investments, for example for the construction of plants or the purchase of transport trucks (AICB, 2008). The cotton companies, in turn, provide the seeds and inputs on credit to the farmers. In some cases, the banks directly provide credits to producers, i.e. for the acquisition of equipment (AICB, 2008).

As mentioned before, the domestic market for cotton fibre is in its infancy with only about 3 percent subject to further processing, but it is developing. The Sahel spinning mill FILSAH is the largest spinning factory, with a current production of 5 000 tonnes of yarn per year (Touré, 2019). The equivalent in cotton fibre (6 300 tonnes)³ is practically the total amount of lint kept in the country for domestic processing mentioned by the (SP-SFCL and AICB, 2019). However, several other smaller spinning units exist (SP-SFCL and AICB, 2019), and personal communication with cotton experts at the FAO Representation in Burkina Faso). Part of the yarn produced by FILSAH (approximately 1 200 tonnes) is transformed into twisted thread and fabrics by COTEXA, a new twisting and knitting plant, which opened in 2020 (Lankoandé, 2021). COTEXA produces 100 percent local fabrics and is part of a governmental project of labelling local products. “Faso Danfani” is the label for local fabrics, which means “woven loincloth of the homeland” (Touré, 2018). This denotes not only the new dynamism of the local textile sector, but also the renewed patriotism for local products that has been promoted by the current government (AT, 2021). The woven loincloth sector is important for the national economy due to the labour possibilities that it offers, and especially because most of them are occupied by women (95 percent) (AT, 2021). Also, it actively participates in the improvement of the trade balance through the substitution of imports by the domestic production of the woven loincloth (AT, 2021). Further projects which have been launched are: (i) the strengthening of

³ Assuming a loss rate of 20 percent.

FILSAH's production capacity, which now stands at 10 000 tonnes of yarn per year, (ii) the reopening of the former FASO FANI factory (now named FASOTEX): following the failure to reopen with a new partner, the State committed, November 2020, to continue the process of its reopening, and (iii) foreign investments on two new cotton processing plants in Bobo Dioulasso and Ouagadougou (AT, 2021).

SN CITEC is a company for the crushing of oilseeds (specialized in cottonseeds) that was established in 1941. In the course of time, it has had several major shareholders. Currently, it is property of the Géocoton Holding Group, who is also owner of the SOCOMA company. Its industrial activities are mainly concerned with the production of cottonseed oil and soap. With the residues it also produces cattle feed and cotton seed meal. It has a total cottonseed crushing capacity of 120 000 tonnes per year (SNCitec., 2021). Assuming a seed to fibre ratio of 1.41 (Dowd, Pelitire and Delhom, 2018), Burkina Faso produces around 350 000 tonnes of cottonseed per year (average 2013/14–2021/22). SN CITEC has the capacity of processing approximately 35 percent of the total cottonseed production in the country.

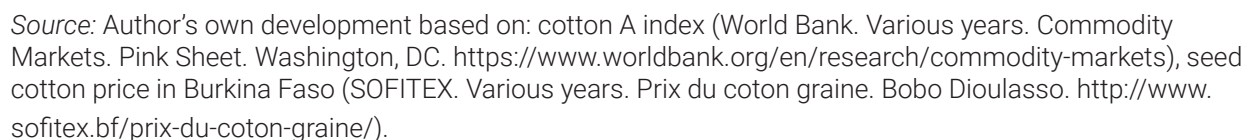
3. Analysis of the COVID-19 pandemic impact on markets, poverty and food security

3.1. Strong impact on prices and logistics from February to May 2020, however limited impact on domestic markets when evaluated in the context of the entire market year 2019/20

Against our expectations, for the 2019/20 and 2020/21 market seasons, the market data analysis reveals that the impact of the COVID-19 pandemic on the cotton market in Burkina Faso was limited (see [Figure 5](#) below). As explained in the methodology section, current market data (ICAC, 2021) are compared with own estimates of pre COVID pandemic market balances (see note to 5 for the explanation of the computation of the own estimates). When conducting the comparison with previous “current” data sets (ICAC, 2021), the analysis always showed much larger implications. However, the market balances for Burkina Faso (for 2019/20 and 2020/21) were updated in the December 2021 data set and the analysis now confirms the messages captured in the questionnaires: that the impact was limited.

Apparently, the strong impact of the global insecurity and confinement measures from February to May 2020 on the international apparel, textiles, and cotton markets, reflected in the cotton world market prices ([Figure 3](#)), remained temporal in the country. In Burkina Faso, the exports must have decreased significantly at least in April and May. The port of Abidjan, the principal and more economic export route for Burkina Faso, suffered a drop in traffic, partly explained by the quarantine imposed on crews and ships (Desse, Charrier and Issang, 2021). From April 2020, as elsewhere in the world, all ports in West Africa were affected (Desse, Charrier and Issang, 2021). However, the countries which Burkina Faso exports its cotton, started to reopen their economies around May 2020. For example, on 7 May, the authorities in Côte d'Ivoire announced the relaxation of the containment measures, which were further eased on 14 May; in Benin the authorities announced measures to gradually start reopening the economy, with the cordon sanitaire lifted on 6 May; in Togo, the country with the most stringent measures in the region, the initial curfew affecting Lomé and its surroundings was lifted in June 2020 (IMF, 2021b). Burkina Faso's cotton trade partners (i.e. France and Switzerland; see [Figure 4](#)) also started to ease the first round of containment measures around mid May (IMF, 2021b). In general, Notteboom and Pallis (2021) report that the share of worldwide ports facing a significant drop (over 25 percent) in container vessel calls was the highest in May 2020 and that it started to recover from June 2020, maintaining afterwards lower levels of ports with significant drops (their survey goes until April 2021). The

Figure 3. Normalized monthly nominal prices of the Cotton A Index and the seed cotton producer price in Burkina Faso



The chart displays the number of international students in Belgium from 2010 to 2019, measured in thousands. The total number of students shows a general upward trend, peaking in 2016 at approximately 305,000, before declining to around 200,000 in 2018 and then slightly increasing to 215,000 in 2019. The largest contributors to the total are 'Other countries' (dark blue), the 'United Kingdom of Great Britain and Northern Ireland' (teal), and 'France' (medium blue). The 'United Kingdom' and 'France' show significant peaks in 2016. 'Other countries' also shows a peak in 2016 and a notable increase in 2019. 'China' (light blue) shows a steady increase from 2010 to 2018, peaking at around 80,000, before declining in 2019. 'Belgium' (dark blue) and 'Switzerland' (grey) represent smaller but consistent portions of the total. 'Netherlands (Kingdom of the)' (light grey) also shows a steady increase over the period.

| Year | Belgium | China | France | Netherlands (Kingdom of the) | Singapore | Switzerland | United Kingdom of Great Britain and Northern Ireland | Other countries |
|------|---------|-------|--------|------------------------------|-----------|-------------|--|-----------------|
| 2010 | 10 | 10 | 20 | 10 | 10 | 20 | 10 | 40 |
| 2011 | 10 | 20 | 40 | 10 | 10 | 20 | 20 | 50 |
| 2012 | 10 | 10 | 40 | 10 | 10 | 20 | 20 | 60 |
| 2013 | 10 | 60 | 40 | 10 | 10 | 20 | 20 | 100 |
| 2014 | 10 | 10 | 60 | 10 | 10 | 20 | 20 | 120 |
| 2015 | 10 | 10 | 40 | 10 | 10 | 20 | 20 | 100 |
| 2016 | 10 | 10 | 40 | 10 | 10 | 20 | 120 | 100 |
| 2017 | 10 | 10 | 40 | 10 | 10 | 20 | 20 | 100 |
| 2018 | 10 | 80 | 40 | 10 | 10 | 20 | 20 | 60 |
| 2019 | 10 | 10 | 40 | 10 | 10 | 20 | 20 | 110 |

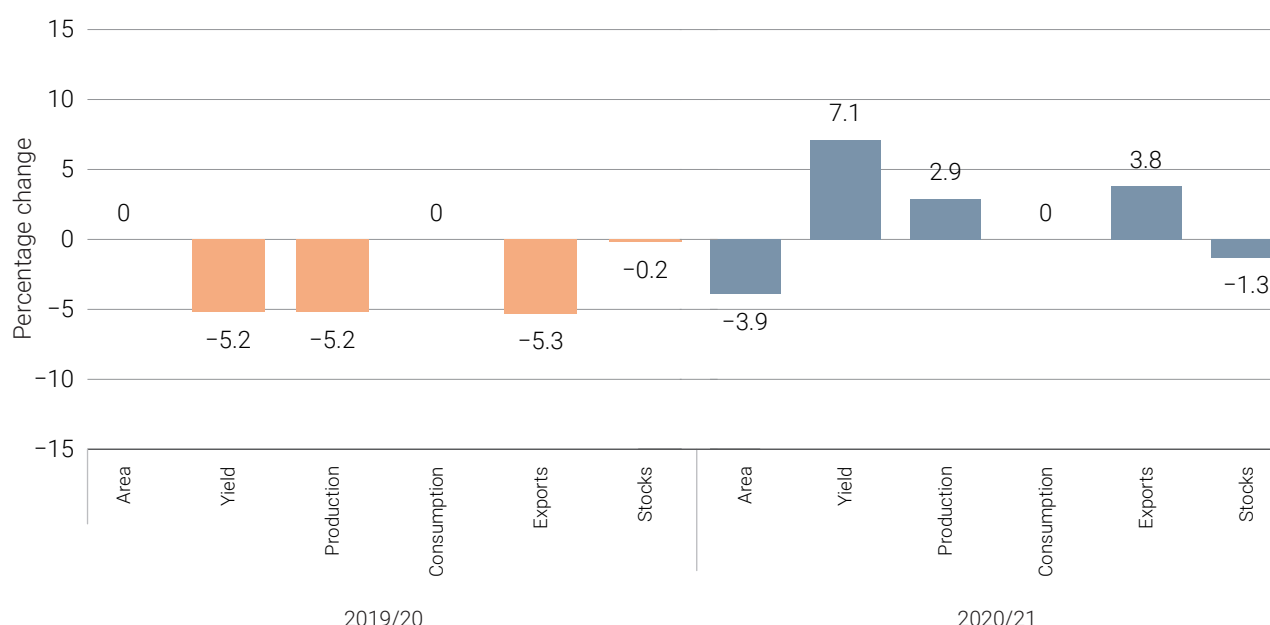
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3.2. Cotton was already harvested in the 2019/20 season when the pandemic stroke; in 2020/21 domestic prices were set at lower levels, some export distortions remained, and the impact of the COVID-19 pandemic was exacerbated by high energy and fertilizer prices

According to the market data analysis (**Figure 5**), in the 2019/20 season, the area planted was not affected, since the initial containment measures and logistic restrictions in West Africa were put in place in March 2020 when the crop was already harvested. As mentioned previously, harvests occur from November to January while the classification and transport to the gin often happen between January and February (Dowd-Urbe, 2014). However, the analysis estimates a decrease of close to five percent for the average yield and production. The questionnaire respondents (**Figure 6**) state that logistics were affected in the 2019/20, which might have had a small impact on the transport of the seed cotton to the ginning factories, which in turn might be reflected in the yield and production statistics. Some respondents also mention an impact of the pandemic on production, supporting the findings of the market data analysis. Domestic consumption represents only a small share of production (around three percent), and it is assumed to have not been affected (at levels of 6 300 and 6 600 tonnes cotton lint in 2019/20 and 2020/21, respectively). Exports are estimated to go along with the changes in yields and production, decreasing in 2019/20 and increasing in 2020/21. Finally, for 2019/20 the impact of the pandemic on stocks appears to have been only temporal and cannot be detected in the analysis considering the full market year (**Figure 5**). For 2020/21 stocks are estimated to have decreased slightly in response to slightly higher increases in exports than in production.

Even though the impact of the COVID-19 pandemic was limited, we would like to highlight that if the drop in world demand and the disruptions on container shipping would have taken longer, then the impact on exports and stocks would have been more noticeable. Also, when deriving your own conclusions on the impact of the pandemic, it must be kept in mind that the analysis is based on estimates of the pre COVID-19 pandemic market values and that these can only give an approximation of how the situation would have been without the influence of the COVID-19 pandemic, and that factors other than the COVID-19 pandemic might have also played a role.

Figure 5. The COVID-19 pandemic impact on the cotton market in Burkina Faso: results from the market data analysis



Note: The COVID-19 pandemic impact on production, yields, exports, and stocks is computed by comparing the current data with estimates of the pre COVID-19 pandemic market balances. The ICAC database from December 2021 (ICAC, 2021) is used for the current data for both market seasons; only the stocks are estimated based on the formula: [beginning stocks + (production – domestic consumption - exports)]. The own pre COVID-19 pandemic estimates for the market season 2019/20 are computed as follows (i) area: the planted area (as reported in the ICAC data from December 2021), (ii) yield: the average of the previous three market seasons (2016/17 – 2018/19), (iii) production: [area*average yield], (iv) consumption: assumed to be at the level of 6,300 tonnes of cotton lint based on the information obtained from the literature (Touré, 2019; AT, 2021) and on a conversion rate (fibre to yarn) of 0.8, (v) stocks: [beginning stocks + production - domestic consumption - exports]. The pre COVID-19 pandemic estimates for 2020/21 are assumed to be at the same level as those for 2019/20, only consumption has a different value reflecting an assumed increase of 5 percent based on the current dynamics of the ginning and weaving sectors (AT, 2021).

Source: Author's own elaborations based on: **AT.** 2021. Industries: les recettes pour faire décoller le secteur. In: *L'Economiste du Faso. Ouagadougou*. [Cited September 2021]. <https://www.leconomistedufaso.bf/2021/08/03/industries-les-recettes-pour-faire-decoller-le-secteur-2/>; **ICAC.** 2012. *Domestic cotton sector and other reforms (revisions). Director-General's consultative framework mechanism on cotton. WT/CFMC/30/Rev.2, Communication from the International Cotton Advisory Committee (ICAC).* Geneva, WTO; **Touré, H.** 2019. Valorisation du Faso danfani: La Filature du Sahel (FILSAH) habille Air Burkina. In: *lefaso.net2. Ouagadougou*. [Cited July 2021]. <https://lefaso.net/spip.php?article92705>.

In 2020/21 the area planted decreased to 3.9 percent when compared to the pre COVID-19 pandemic estimates. According to comments from questionnaire respondents, that decrease is the product of two factors: (i) the problem of insecurity (terrorism) that affects country since 2019, which has led to the abandonment of farms and migration (this problem is especially felt in the SOCOMA zone where the total area planted decreased by 40 percent), and (ii) the

decrease of the purchase price for seed cotton for 2020/2021, which is set administratively⁴. The price decreased as a result of the drop in world market prices from March and April 2020 (see **Figure 3**). However, the impact of insecurity on area was the dominant factor.

Also in 2020/21, yields recovered by 7.1 percent (when compared to the estimates of the pre COVID-19 pandemic values), even though, as stated by the questionnaire respondents (**Figure 6**), inputs (distribution and prices) and labour have been affected by the pandemic. A positive factor on yields has been the continued implementation of the recommendations of a “National Workshop for the Sustainable Revival of Cotton” (l’Atelier national de relance durable de la production cotonnière au Burkina). The workshop was carried out from 11 to 13 March 2019 and gathered all actors in the cotton sector with the purpose of developing strategies to improve its agronomic and socio economic performance (UNPCB, 2019). These concerned for example the availability in quantity and quality of phytosanitary treatment products, the installation of cotton seeds previously treated with systemic insecticides and the strengthening of the quality control of fertilizers and insecticides (MDICAPME, 2021).

Even though area planted decreased in 2020/21, production increased by 2.9 percent on the back of improved yields. Exports increased more than production (+3.8 percent). Thus, stocks decreased slightly by a total of 1.3 percent.

The responses to the questionnaire (**Figure 6**) reveal how the impact of the pandemic were predominantly on logistics (which suffered a significant temporal disruption) in 2019/20, while in 2020/21 the major impact were those in the local purchase prices and on inputs and labour markets. These in turn had an impact on production. It should be noted that the experienced changes on input markets were predominantly the result of the gas and crude oil crisis which had a strong impact on fertilizer and other agrochemical prices and also resulted in a shortage of the global supply. It is interesting that respondents also report an impact on exports in 2020/21, even though this cannot be directly derived from the analysis of the market data. Still, this is plausible as container vessel shipping has continued to be affected (Notteboom and Pallis, 2021). Thus, the increase in exports with respect to the pre COVID-19 pandemic estimates could have been larger, responding to the high international prices observed in the 2020/21.

⁴ Since 2006, each year around April or May, the AICB (Inter-professional Association of Cotton Producers of Burkina Faso) sets fixed purchase prices for seed cotton for the following market season. The price setting is based on a mathematical formula that considers the previous international prices and it is combined with a smoothing fund which provides a security in the case that world markets prices are below the set prices.

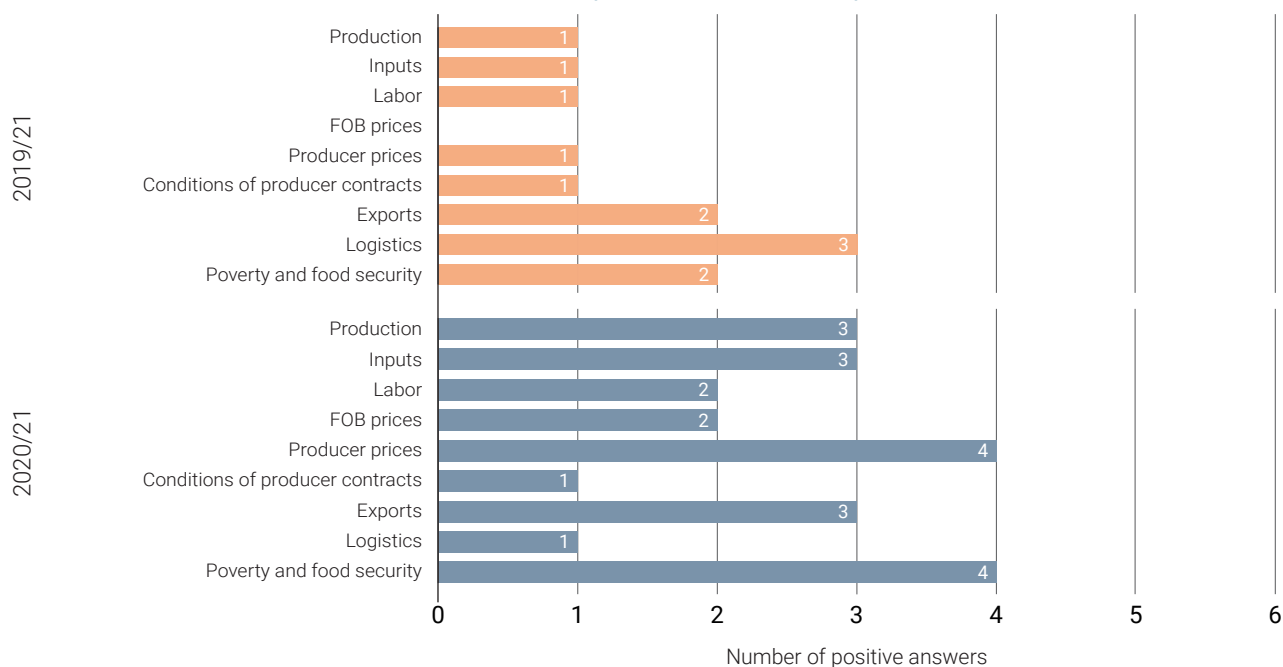
Questionnaire respondents agree that the pandemic had a clear impact on poverty and food security. As mentioned above, the economy of Burkina Faso suffered a significant contraction in 2020, growing by only two percent, compared to the six percent achieved prior to the pandemic striking (IMF, 2019; IMF, 2021c). This general economic contraction affected the poverty and food security situation in both cotton market seasons 2019/20 and 2020/21. However, based on findings from the market data analysis and from the questionnaire, we conclude that the impact originated mainly through links to other sectors of the economy (i.e. tourism, hospitality sectors, transport, and catering) and not through the impact on the cotton supply chains in Burkina Faso.

3.3. Cooperatives contribute to the alleviation of the impact of the pandemic; however, there is still room for improvement; important steps in that direction have been taken

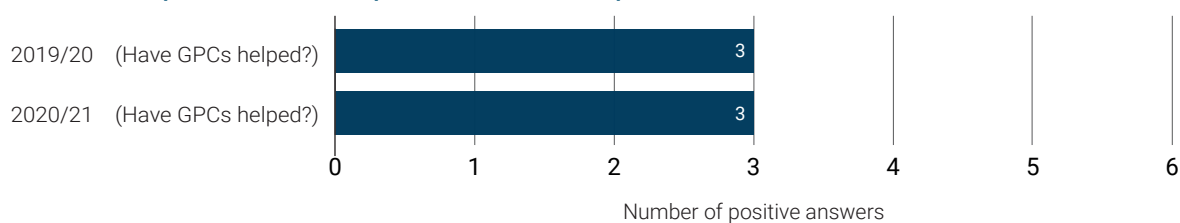
An interesting additional finding is that 50 percent of the respondents are of the opinion that the farmer cooperatives (the SCOOP PCs) contributed to the alleviation of the impact of the pandemic (**Figure 6**, panel B). Among others, cooperatives help to raise awareness and are the link to the cotton companies and the provision of agricultural inputs on credit, extension services, and the management of loans. In some way, the cooperatives are the key that opens the possibility of growing cotton, which is one of the main sources of cash income. As mentioned previously, the cotton crop and the provision of agricultural inputs (especially fertilizers) on credit are intimately linked to the access of basic services (education, health, clothing, etc.) and to food security, as fertilizer is also used in the production of food crops.

Figure 6. Impact of the the COVID-19 pandemic on the cotton supply chain in Burkina Faso (answers from the questionnaire)

A. Have the following elements of the cotton supply chain been affected by the COVID-19 pandemic?



B. Have the GPCs helped alliviate the impact of the COVID-19 pandemic?



Source: Author's own calculations based on results from the questionnaire.

4. Identification of the bottlenecks in the cotton supply chain in Burkina Faso

4.1. Methodological annotations

The questionnaire had one special section dedicated to the identification of the major bottlenecks in the cotton supply chain in Burkina Faso. The questions were elaborated based on the theory of change exposed by Steinbach *et al.*, (2017) that identifies the key pathways associated with absorptive, adaptive and transformative resilience. They focused on how changes in five livelihood capitals (natural, physical, human, social and financial) serve to link a household's wellbeing with their capacity to respond to climate change. We took the five livelihood capitals and identified specific elements of the cotton supply chain which correspond to each of the capitals. For example, for the natural capital we identified 'soil fertility', 'soil degradation', and 'pests' as some of the specific elements. Then, for each of the identified elements, we asked the questionnaire respondents whether these were constraining the development of resilient cotton supply chains. To capture the respondent's evaluations, we used a scale with four options: 'not a constraining factor', 'slightly constraining factor', 'medium constraining factor', and 'strongly constraining factor'. The respondents also had the possibility to add comments to each of their answers, to justify or explain additional details of their assessments.

In addition to the five livelihood capitals from Steinbach *et al.*, (2017), we included elements corresponding to value added markets, such as the absence of cotton processing and the production of cotton products at the local level; institutional capital, such as extension services, food programmes or early warning systems; shocks and stresses, such as the COVID-19 pandemic and climate change. Some of these elements could be matched to the already described livelihood capital categories. For example, cotton processing infrastructure could be considered an element of physical capital. However, we considered that the separate treatment would add clarity to the questionnaire and analysis.

When explaining what the livelihood capitals are, Steinbach *et al.*, (2017) state that poverty is not just a lack of income, that people rely on a combination of capital assets to build sustainable livelihoods. Based on Steinbach *et al.*, (2017) and the extensions applied in this study, the capital categories adapted to the cotton supply chain in Burkina Faso and used in the questionnaire can be described as follows:

- **Shocks and stresses:** these refer to the COVID-19 pandemic and to climate change and are part of the analysis of bottleneck in order to be able to compare the perceived level of constraint of the questionnaire respondents for these shocks and stresses, with respect to the elements of the other livelihood capitals (it can perhaps also be interpreted as a negative livelihood capital).
- **Natural capital:** value that resides in natural resources to produce seed cotton.
- **Physical capital:** value derived from durable and non durable infrastructure, which contributes to the production process of seed cotton and cotton lint, and to the export of the cotton fibre.
- **Human capital:** value derived from skills training, consisting of people's health, skills, knowledge and motivation.
- **Social capital:** value derived from social networks and institutions that improve people's social status and help them maintain and develop human capital in partnership with others.
- **Financial capital:** value derived from income sources, assets and consumption patterns, which enables households to own or trade other capitals.
- **Institutional capital:** value derived from private and public institutions as for example elements of the vertical cotton management system or of public support programmes.
- **Value added markets:** value derived from durable and non durable infrastructure, which contributes to the domestic processing and marketing of the cotton fibre.

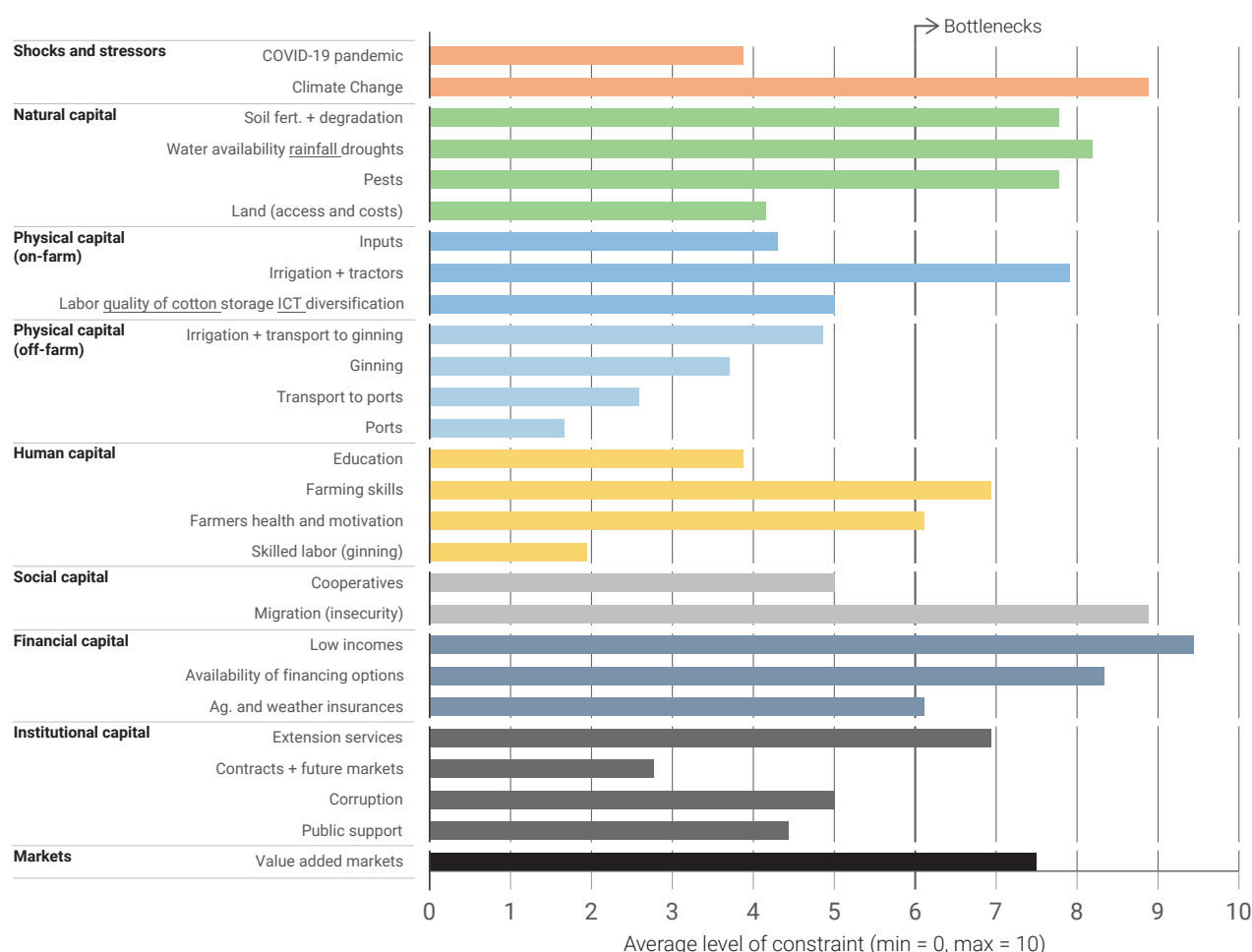
In order to summarize the answers, we first grouped the elements that we considered that belonged together. For example, 'river water availability', 'ground water availability', 'rainfall (quantity, distribution in time)', and 'droughts' were summarized into 'water availability + rainfall + droughts' (see fourth row in **Figure 7**). In a second step, we converted the individual 4 level evaluations ('not a constraining factor' to 'strongly constraining factor') into an average 10 level grade considering all responses (see note to **Figure 7**).

4.2. Identified constraints (bottlenecks)

4.2.1. Low incomes, natural capital, irrigation and tractors, and financial options are the most constraining factors

The evaluation of the summarized results (**Figure 7**) reveals that low incomes, natural capital, irrigation and tractors, and financial options are the most constraining factors holding back the capacity of the stakeholder in the cotton supply chain to respond to shocks and stresses. Interestingly, the shock from the COVID-19 pandemic is not considered as a major constraint by the respondents.

Figure 7. Bottlenecks in the cotton supply chain in Burkina Faso (average level of constraint)



Note: The level 6 is arbitrarily chosen as the threshold used to define the bottlenecks. It is larger than the median in the 10 point scale and not too high to exclude too many factors. The average level of constraint is calculated using the following steps: (i) the average number of positive answers per constraining category (not constraining, slightly, medium, and strongly constraining) and group of capital elements is calculated, (ii) the obtained values per constraining category and group of capital elements are multiplied times 0, 0.333, 0.666, and 10 correspondingly and added, and (iii) the obtained value per group of capital elements is divided by 6, the total number of answers obtained.

Source: Author's own elaboration.

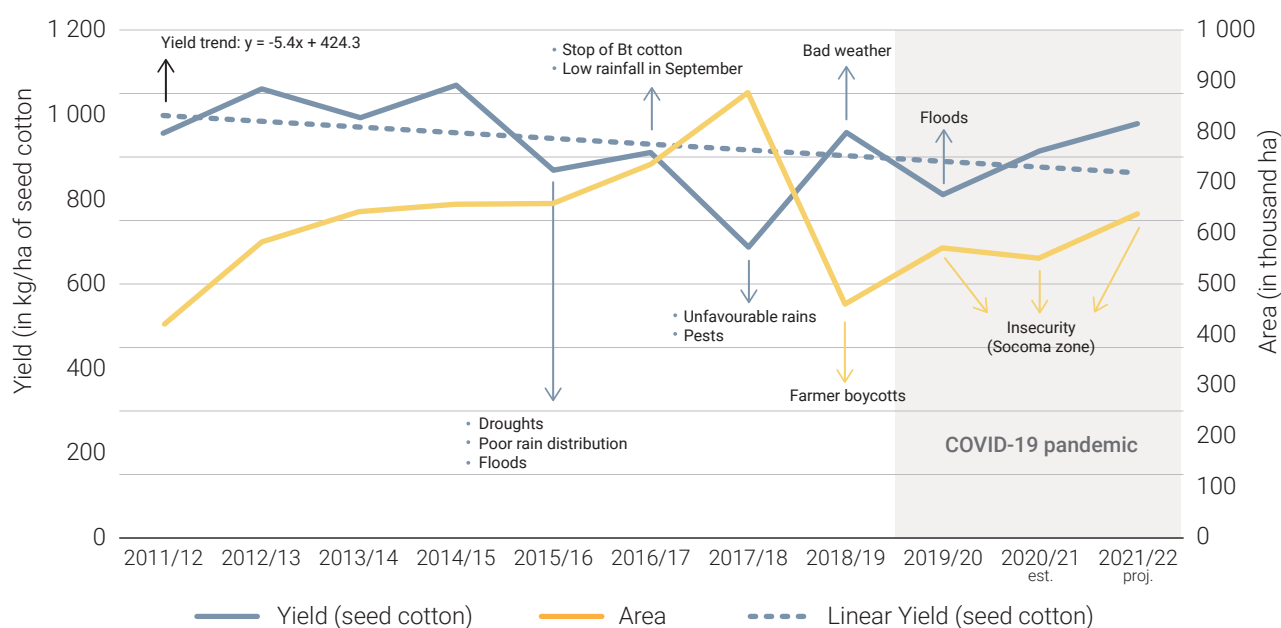
Low incomes are the major bottleneck considered by the respondents. These are of course, an overarching element closely linked to the unfavourable condition in practically all livelihood capital categories, especially the following elements: soil fertility + degradation, water availability + rainfall + droughts, pests, irrigation + tractors (high costs), and to the functioning of the vertical management of cotton production that we link to loans, weather insurances, extension services, farming skills, and motivation.

4.2.2. The elements of the natural capital are important bottlenecks affecting the productivity of the crop

Even though in the previous and current market seasons (2020/21 and 2021/22 respectively) the seed cotton yields have increased, the overall trend since 2011/12 has been negative (**Figure 8**), as a consequence, among others, of adverse natural capital conditions (soils, rainfall distribution, etc.). Cotton, as a rain fed crop, is very vulnerable to unfavourable weather and pest conditions as occurred in 2015/16, 2017/18, and 2018/19. Furthermore, soil fertility decline has been a major constraint in the cotton and cereals based cropping systems area in Burkina Faso (Traoré *et al.*, 2019). Pests have also been a major constraint. Since 2008 Burkina Faso adopted *Bacillus thuringiensis* (Bt) improved cotton in an effort to provide plant protection against insects. In 2016, however, Burkina Faso dropped out from the programme, citing millions of losses due to inferior lint quality (Luna and Dowd-Urbe, 2020). In summary, according to the respondents and to the literature, low soil fertility, soil degradation, often insufficient and irregular rainfall, and problems with pests are key constraints in the production of cotton in Burkina Faso. These constraints, together with other factors that we will analyse further below, result not only in one of the lowest cotton yields among the main producers worldwide, but also in comparison with West African main producing countries (**Figure 9**). Of course, since cotton is a key source of cash income and it is also intimately linked with the production of food crops, the problem poses a major threat to farmer's income, the satisfaction of basic needs (schooling, medical services, transport, etc.), and to food security.

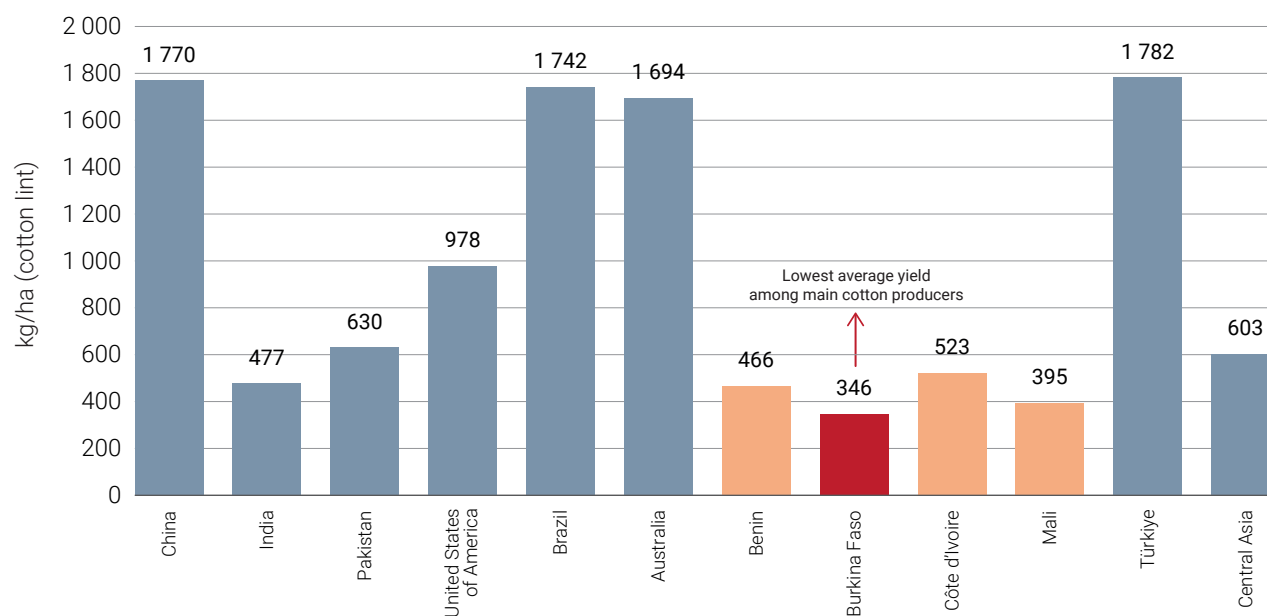
4. Identification of the bottlenecks in the cotton supply chain in Burkina Faso

Figure 8. Area and yields in the production of seed cotton in Burkina Faso (2011/12–2021/22)



Source: Author's own elaboration based on ICAC. 2012. *Domestic cotton sector and other reforms (revisions). Director-General's consultative framework mechanism on cotton. WT/CFMC/30/Rev.2, Communication from the International Cotton Advisory Committee (ICAC). Geneva, WTO.*

Figure 9. Average yields (2017/18–2019/20) in the main cotton producing countries



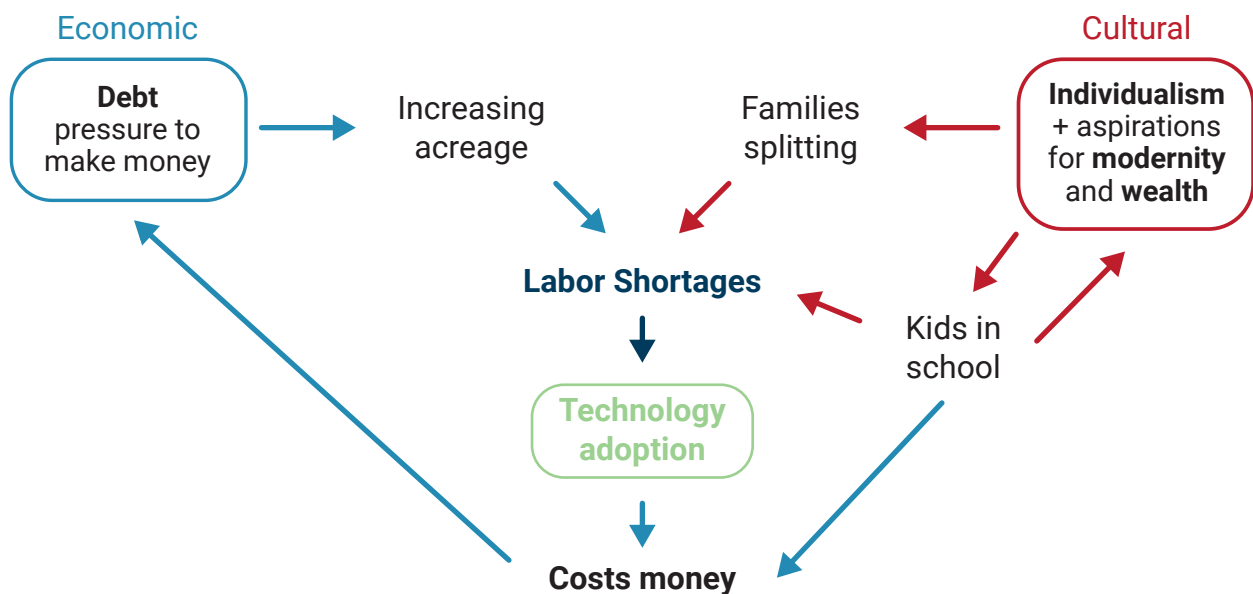
Source: Author's own elaboration based on ICAC. 2021. Publications: Past Issues. In: *Cotton Update*. Washington, DC, International Cotton Advisory Committee. <https://icac.org/Publications/PastIssues?Id=81>.

4.2.3. On-farm irrigation infrastructure and tractors are major bottlenecks

Additional to the constraints in natural capital, the respondents also highlight that the availability and costs of on farm irrigation infrastructure and tractors (mechanization) are major bottlenecks. Given the irregularity of rainfall, resulting in droughts, floods, or the disruption of the timing of different production events, it is understandable that irrigation systems are considered as a key tool for improving the capacity of farmers to respond to rainfall linked stresses.

With respect to mechanization, and in general to the adoption of technology, Luna (2020) explains how Burkinabe farmers are often caught in a cycle of economic pressure, which drives the demand for technology (according to respondents, especially for tractors). Gray and Dowd-Urbe (2013) also speak of a growing need to intensify production as well as a growing divide between wealthier and poorer farmers, as wealthier farmers have better access to agricultural inputs and mechanization and are better able to remain debt free. The income of poor farmers is very tight, and cotton is often the main source of cash, which means that farmers need to administrate their scarce harvest earnings very well all along the year, leading to financial bottlenecks from time to time. For example, it often occurs that poor farmers have to sell the agricultural inputs received on credit from the cotton companies in order to generate cash income to repay debts, buy food, pay school fees, etc. (Luna, 2020). However, the lower amount of inputs leads to lower cotton yields and lower income, causing a stronger financial pressure and problems to pay back the input credits, often resulting in new or larger debts. This problem is further exacerbated by cultural changes as stronger individualism and aspirations for western modernity (i.e. family splitting and higher schooling rates) resulting in labour shortages (Luna, 2020). Often, higher acreage and labour saving technologies are thought to be the way out, even though these mean higher costs. Luna, (2020) cites a farmer and presents a figure (**Figure 10**), which summarize this situation:

"It's debt that pushes farmers to increase their hectares. We think "the only way I can pay back my credit is if I increase my production." But that's not true! We just end up more indebted, continually running to try to pay our debt back! And we increase our acres and we tire ourselves out" (farmer cited by Luna, 2020).

Figure 10. Changing labour dynamics and treadmills of technology adoption in the Burkina Faso cotton sector

Source: Author's own elaboration based on **Luna, J.K.** 2020. 'Pesticides are our children now': cultural change and the technological treadmill in the Burkina Faso cotton sector. *Agriculture and Human Values*, 37(2): 449–462. <https://doi.org/10.1007/s10460-019-09999-y>.

Thus, mechanization and technology adoption appear to be a real need. However, poor farmers have greater difficulties in getting access and might get caught in economic and financial traps. Measures should be developed, addressing these larger difficulties encountered by the poor. With the “National Workshop for the Sustainable Revival of Cotton” from March 2019 and the implementation of the resulting recommendations, the government has taken action dealing with this vicious cycle. For example, the settlement of unpaid invoices from all producers valued at nearly FCFA 11 billion (approximately USD 19.8 million), which has made it possible to restore serenity and tranquillity within cotton producers and companies (Harouna Kaboré, Minister of Industrial Development, Trade, Handicrafts and Small and Medium Enterprises, as cited by AT, 2021)..

4.2.4. Governing issues are also key

Apart from the elements from natural and physical capital, other important bottlenecks mentioned by the stakeholders (**Figure 7**), and that we consider that belong together, are: farming skills/extension services, farmer's motivation, availability of financing options and of agricultural and weather insurances. These are all tasks covered by the vertical management system of the cotton sector, mainly between cotton companies and the SCOOP PCs. The findings of several authors on different aspects of the governance of the cotton sector in Burkina Faso support and complement the outcome of the questionnaire. The papers from

Gray, (2008); Loada, (2012); Gray and Dowd-Urbe (2013); Dowd-Urbe (2014); Gray, Dowd-Urbe and Kaminski (2018); Luna (2020) and Engels (2021) speak of one or some of the following issues:

- i)** corruption in the conditioning of the seed cotton into first and second quality grades,
- ii)** corruption in transportation (i.e. the payment of bribes to pick up cotton early), even though according to Gray and Dowd-Urbe (2013) corruption in transportation has diminished,
- iii)** late payments (i.e. in April, May or even June for cotton that has been classified and transported to the gin in January or February),
- iv)** incentives for corruption and lack of accountability for extension services (i.e., in the distribution of seeds and fertilizers),
- v)** transfer of knowledge and skills from extension services and regional meetings (from cotton companies and from the UNPCB) only applies to a limited number of farmers or leaders,
- vi)** power imbalances between cotton companies and cotton farmers (lack of empowerment of producers, also after the liberalization reforms),
- vii)** distrust from producers in their cooperatives at the local level (i.e. that SCOOP PC'S presidents remain too long in their position, and misuse of SCOOP PC's funds) and at higher levels (i.e. the belief that the UNPCB do not defend the interests of farmers, concerns about collusion of interests between the union and government leaders),
- viii)** negative consequences of shared liability of SCOOP PC members (i.e. large scale exit of poorer/weaker farmers with higher debt problems; or the involvement of family members to endorse and witness their family member's request for inputs, with the understanding that they will be responsible for helping to pay off any incurred debts; monitoring that farmers actually apply the amount of inputs requested; confiscation of household assets – motorcycles, animals, ploughs; abandonment of cotton production before paying the debt of other members),
- ix)** lack of investment in village infrastructural projects (i.e. the ristourne, a bonus payment returned to the producer cooperative in the case that there was a significant increase in the world cotton market price, was put into infrastructural projects during the GV era: village projects (schools, health centres, etc.) or cotton projects (warehouses for cotton inputs, weighing devices for cotton, etc.); however, since the change to GPCs and SCOOP PCs, the ristourne is rarely put into infrastructural investments.

- x) ethnic division and exclusion of minorities (i.e. the SCOOP PC system has motivated the grouping of farmers of the same ethnicity and has resulted in the strong representation of large scale farmers from dominant ethnic groups in new local positions of power, as they already had the experience and power of leading the SCOOP PCs).

By improving the governance of the management system and building trust, key bottlenecks could be addressed. The coverage and quality of the extension services could be enhanced, a key measure with some of the highest returns among agricultural investments in Burkina Faso, improving also the poverty and food security conditions when also extended to the other food crops part of the rotation system (i.e. cereals and other food crops) (Artavia *et al.*, 2020a; Artavia *et al.*, 2020b). By working on increasing the accountability of key players as for example extension agents, conditioners, and farmer cooperative leaders, as well as making adjustments to enhance the representation of farmers interests in the system (i.e. fair cotton and input prices, less or zero corruption, close to harvest transport and payments, etc.), more equilibrated powers between cotton companies and farmers and between wealthier and poorer producers could be established and the motivation of farmers renewed. Furthermore, the advantages of the well-established vertical management system could be used to test individual liability for agricultural input credits and to extend the service to loans for investments (i.e. irrigation or mechanization) and to weather insurances. According to UNPCB (National union of cotton producers of Burkina) (2019), steps in this direction have already been taken: in the framework of the “National Workshop for the Sustainable Revival of Cotton”, SOFITEX has committed to test individual credits with farmers in the 2019/20 campaign. The outcomes are still to be evaluated.

4.2.5. Domestic processing possibilities are a further bottleneck

A remaining constraining element with values higher than 6 in the 10 point scale (**Figure 7**) is the value added markets. As already mentioned before, only a small percentage from total production is used domestically (about three percent). Raising domestic demand would diversify output markets for cotton lint and add value through the processing and marketing of local labels. This would increase the resilience of the cotton supply chain, generate jobs and wealth through the processing stages, and create a sense of identification with local labels and markets. Even though the current level of domestic use of cotton fibre is low, the current dynamism in the processing sector indicates that it will soon be more than double the current value (thus, roughly 12 to 18 thousand tonnes or 6 to 8 percent from production), which would then be a considerable alternative to the export markets of the cotton lint.

4.2.6. Measures targeting other elements of the cotton supply chain in Burkina Faso to be considered supportive and less urgent

Other important elements of the cotton supply chain in Burkina Faso often receiving the attention of policy makers and being the target of public investments as for example input subsidies, feeder and rural roads, and other agricultural supportive programmes (i.e. expenditures on rural education), have not been highlighted by respondents as constraining factors, for example, “inputs”, “irrigation + transport to ginning” (the quality of feeder and rural roads are included in this item), and “public support” in Figure 7. Thus, according to the results of the questionnaire, measures targeting these capital elements could be considered as “supportive” and less urgent.

5. Identification of risks – possible future shocks to the supply chains

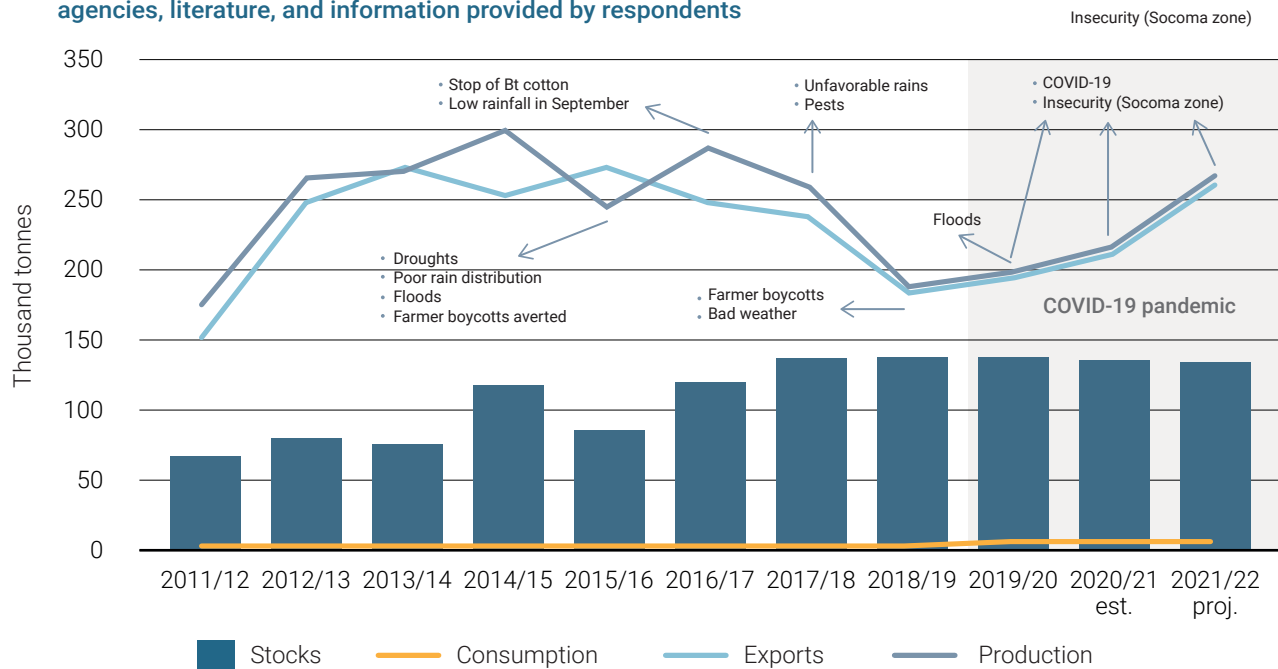
For the identification of the risks and possible future shocks to the cotton supply chain in Burkina Faso, a combination of data analysis, questionnaire responses and a review of the literature and digital articles from news agencies was used (**Figure 11**). We also use Figure 7 and Figure 8. Figure 7 captures the level of constraint that the respondents assign to the shocks and risks posed by the COVID-19 pandemic, climate change, and insecurity. Figure 8 provides information on the area and yield levels in combination with weather and other shocks, shedding some light on the magnitude of their implications.

5.1. Unfavourable weather conditions, droughts, pests, and climate change are the major risks and possible future shocks, with clear implications on production, poverty and food security

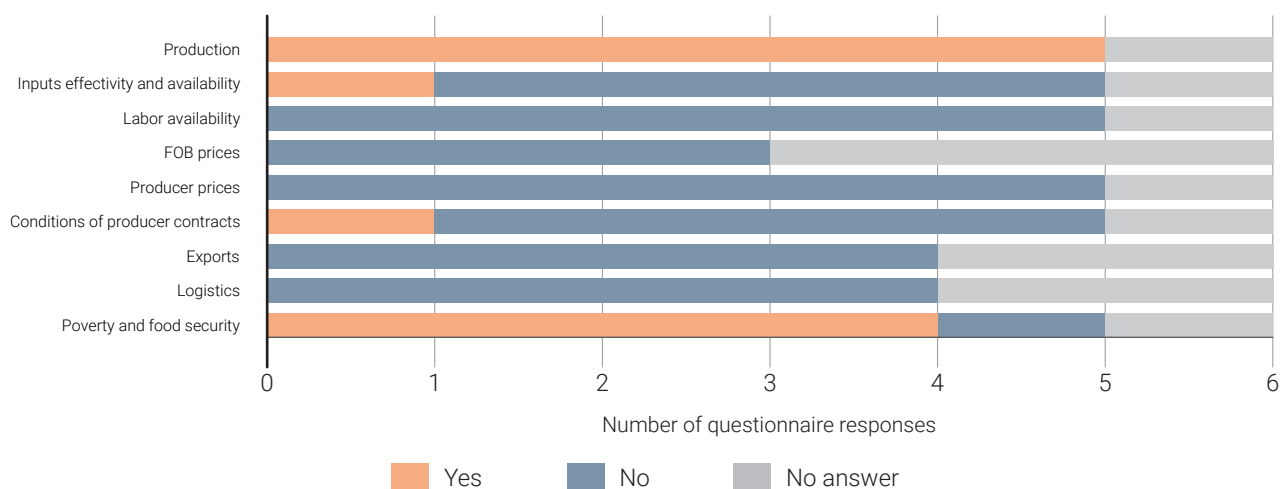
Panel A, in Figure 11 shows that bad weather conditions, droughts, and pests are common in the cotton production in Burkina Faso. In 5 out of 10 years (2011/12–2020/21; for 2021/2022 evaluations of the season are still not available), unfavourable weather conditions were cited as one of the major reasons for the low yields (see **Figure 8** on the level of yields) (Akinocho, 2016; Nassa, 2016; Ololo, 2017; RFI, 2018; DJA, 2019; Boudani, 2020; Lankoandé, 2020). Panel B reveals that the respondents to the questionnaire clearly identify production, poverty and food security as the variables affected by natural disasters (including floods, droughts, and extreme weather). As already mentioned, cotton is intimately linked to: (i) the incidence of poverty, as it is often the major source of cash income for cotton farmers and thus key for the access to basic services (schooling, medical services, transport, buying of food, etc.) and (ii) to food security, since cotton is cropped in rotational systems in combination with food crops, and cotton companies provide access to agricultural inputs on credit. Thus, conditions that have a negative impact on cotton production will also have a negative impact on poverty and food security.

Figure 11. Cotton market development and identified shocks/risks and their impact

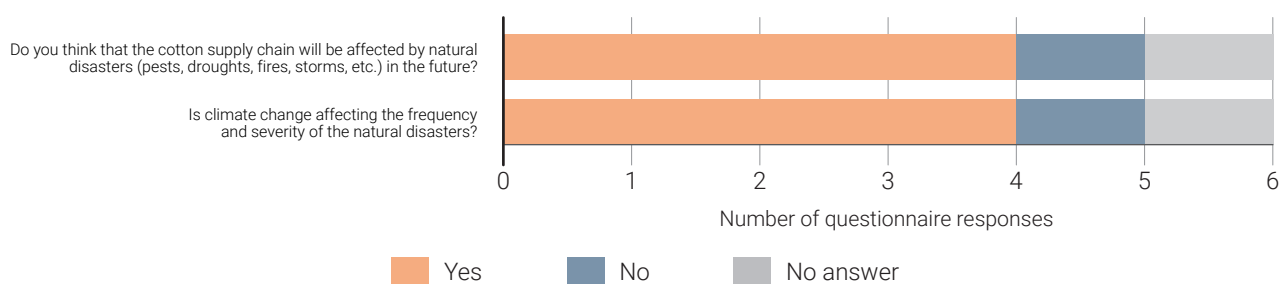
A. Market development and identification of shocks/risks based on the review of past reports from news agencies, literature, and information provided by respondents



B. Have the following factors of the cotton supply chain been affected by natural disasters in the past 10 years?








C. Natural disasters in the future



Source: Author's own elaboration based on ICAC. 2012. *Domestic cotton sector and other reforms (revisions). Director-General's consultative framework mechanism on cotton. WT/CFMC/30/Rev.2, Communication from the International Cotton Advisory Committee (ICAC). Geneva, WTO*

The respondents are aware that climate change will continue and increasingly affect the production of cotton (**Figure 11**). Also, Figure 7 shows that the respondents consider it one of the major current constraining factors to the development of the cotton sector. But what does climate change imply for Burkina Faso? Röhrig *et al.*, (2021) provide the following overview (**Figure 12**). Tomalka *et al.*, (2021) further specify that depending on the climate scenario, (i) temperature in Burkina Faso is projected to rise by between 1.9 and 4.2 °C by 2080 (compared to pre industrial levels), with higher temperatures and more temperature extremes projected for the south-western part of the country, and (ii) even though trends for total annual rainfall are less certain, future dry and wet periods are likely to become more extreme. Similar projections are presented by Diarra *et al.*, (2017) (i.e. higher temperatures with high certainty and increasing rainfall with medium certainty; they do not make any projection on the frequency of extreme events).

Figure 12. Past and projected future climate changes for Burkina Faso

| Climate Impact | Past Trend | Future Trend | Certainty |
|--|----------------------------|--|--------------|
|  Mean annual temperature | Increasing | Increasing | Very high |
|  Number of very hot days and tropical nights | Increasing | Increasing | Very high |
|  Heavy rainfall intensity and frequency | Increasing | High emissions scenario: increasing Low emissions scenario: no clear trend | High High |
|  Mean annual rainfall sums | Increasing since the 1980s | Increasing | Medium |
|  Rainy season onset | No clear trend | High emissions scenario: no clear trend Low emissions scenario: later onset | Low |

Source: Author's own elaboration based on Röhrig, F., Gloy, N., von Loeben, S. Arumugam, P. Aschenbrenner, P., Baek, H., Bado, I., Chemura, A. Habtemariam, L. Kaufmann, J., Koch, H. et al. 2021. *Executive Summary: Climate Risk Analysis for Identifying and Weighing Adaptation Strategies in Burkina Faso's Agricultural Sector. A summary elaborated from a scientific report prepared by the Potsdam Institute for Climate Impact Research (PIK) in coopera.* https://www.pik-potsdam.de/en/institute/departments/climate-resilience/projects/project-pages/agrica/cra_burkina-faso_executive-summary.

Tomalka *et al.*, (2021) conclude that agriculture, biodiversity, health, infrastructure and water are highly vulnerable to climate change and that there is a strong need for adaptation. With respect to cotton in Burkina Faso, Diarra *et al.*, (2017) find that further increases in global temperature would significantly reduce the yields and that future changes in rainfall also affect cotton production, however compared with the effects of temperature, the effect of

rainfall is relatively small. Thus, they conclude that strategies for reducing the impacts of climate change on cotton production should emphasize the development of heat resistant rather than drought resistant cultivars.

5.2. Governance issues are also an important risk for the cotton supply chain in Burkina Faso

Farmer's discontent has accompanied the cotton production in Burkina Faso for several years. Panel A in Figure 11, mentions two occasions in which farmer boycotts were planned or applied. In 2015/16 the farmers from Boucle du Mouhoun announced a blank year for the production of cotton if the president of the UNPCB, whom they accused of fraud and mismanagement, was not removed from office (Coulibaly and Zoungrana, 2015). In 2018/19 farmers denounced the poor quality of inputs (Bassolé, 2018) and largely boycotted the production of cotton with enormous losses (a decrease in area planted of approximately 200 000 hectares (26 percent of the area planted in the 2015/17–2017/18) (DJA, 2019). Engels (2021) summarizes the situation by stating that in the 2010s, the cotton sector in Burkina Faso became a field of contention, with small farmers mobilizing collective action. The section on "Lessons learned" summarizes a series of governance issues of the vertical management system of the cotton sector highlighted in the literature.

As also mentioned in Section "Analysis of the COVID-19 impact on markets, poverty and food security," the "National Workshop for the Sustainable Revival of Cotton" and the creation of a high level committee to monitor the implementation of the recommendations from the workshop (i.e. the improvement on the availability and quality of seeds, fertilizers, and insecticides and the settlement of producer debts) have been important steps taken by the government, which have restored serenity in the sector (Harouna Kaboré, Industrial Development, Trade, Handicrafts and Small and Medium Enterprises, as cited by AT, 2021). Still, further regular participative approaches as the National Workshop with monitored implementation of outcomes are recommended. These will hopefully enable the early detection of future discontents and the development of participative solutions, promoting transparent, fair, inclusive, and stable producing conditions.

5.3. Insecurity (terrorism), a worrying problem

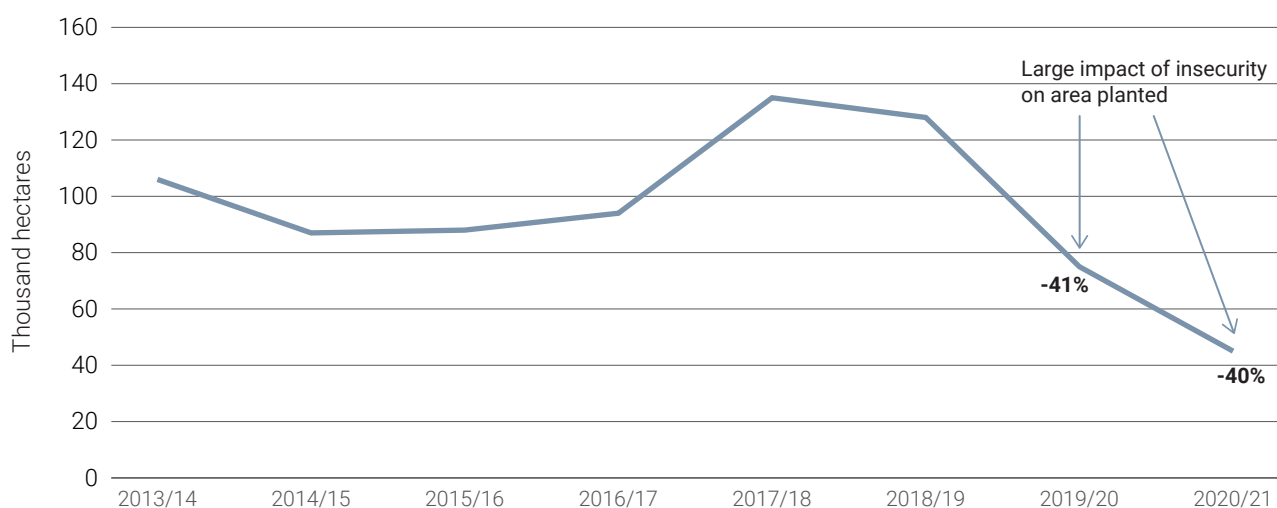
The problem of insecurity is a very different one. It is a worrying strong shock and future risk for the development of the cotton supply chain in Burkina Faso. Until now, it has mainly

affected the SOCOMA zone. Boudani (2020) cites Ali Compaoré, the general manager of the SOCOMA cotton company, as follows:

“You have cotton fields that have been abandoned, you have villages where people had finished harvesting and were waiting to market the cotton, but who had to leave the villages without being able to market this cotton. So there is cotton stored in the villages which could not be evacuated.” (Ali Compaoré, cited by Boudani, 2020).

It started to have an impact on cotton production in 2018/19, but the most marked effects have been in 2019/20 and 2020/21, with reductions of 41 percent and 40 percent, respectively, in the area planted in the SOCOMA zone (**Figure 13**).

Figure 13. Area planted in the SOCOMA zone (2013/14–2020/21)



Source: data provided by INERA and SOCOMA

This is a complex problem, which needs to be analysed in detail and solution strategies carefully designed. It should be addressed with the highest priority, as it has the potential to evolve to a disaster affecting the cotton supply chain and other sectors.

6. Lessons learned

Based on the implemented questionnaire among the six main stakeholders from the cotton supply chain in Burkina Faso, the exchange with respondents, the analysis of market data, and the review of the literature and digital news archives, the main lessons learned are embodied in the main findings and the derived recommendations.

6.1. Main findings

With respect to the assessment of the impact of the COVID-19 pandemic:

- In the global market, there was a strong impact on prices and logistics from February to May 2020 that temporally affected the exports of cotton from Burkina Faso and resulted in the decrease of the domestic cotton purchase price for the 2020/21 market season. Still, the annual market data analysis and the answers from the questionnaire reveal that the overall impact on cotton domestic markets was limited. Nonetheless, an important impact on poverty and food security was reported by the questionnaire respondents. This must be the result of the links between the livelihoods of the farm households with the rest of the economy, which had suffered a significant decline, especially in 2020.

With respect to the identification of the main constraints and bottlenecks hindering the development of the supply chain and its capacity to respond to shocks and stresses:

- Low incomes, natural capital (soil fertility and degradation, rainfall patterns, and pests), availability and costs of irrigation systems and tractors, and the availability of financial options are the most constraining factors.
- The elements of the natural capital are important bottlenecks significantly affecting the productivity of the crop. Since cotton is often the main source of cash income, lower production strongly affects poverty and food security.
- Mechanization and labour saving technologies are key tools required in the movement towards increasing areas of production. This is often seen as the way out of debts or tight financial situations. These technologies also provide a solution to labour shortages appearing as a result of cultural changes toward stronger individualism and aspirations for western modernity. However, tractors and other technologies are costly.

- Governance issues in the vertical management system of the cotton sector in Burkina Faso are also a major problem affecting farmer's motivation, farming skills, extension services, and the availability of financing options. The discontent of farmers has even turned into strong shocks to the system in the form of farmer boycotts.
- The main stakeholders in the cotton supply chain consider the low level of domestic processing of cotton fibre an important bottleneck. The cotton sector has traditionally been export oriented and currently, only about 3 percent of the cotton lint is subject to further processing.
- Insecurity is a serious and worrying problem that is currently having a strong, negative, impact on cotton production in the SOCOMA zone.

With respect to the identification of risks to the cotton supply chain in Burkina Faso:

- Climate change is the major risk. Temperatures and extreme weather are projected to increase in the future and unfavourable weather conditions are already the most frequent shock to the cotton supply chain with implications on production, poverty and food security.
- Pests are also an important risk. The implications of climate change on pests should be evaluated. For example, more frequent heavy rainfalls and floods might have an impact on the incidence of pests.
- Insecurity (terrorism) is a major bottleneck and risk. Abandonment of land and migration are some of the consequences. Its development and implications for the cotton supply chain and other sectors are uncertain and worrisome.
- Governance issues in the industry are also a bottleneck and risk at the same time. If the problem is not addressed adequately future boycotts are probable, with very strong negative impacts on production.

6.2. Recommendations to increase the resilience of the cotton supply chain in Burkina Faso

Responding to the identified bottlenecks and risks we make the following recommendations, dividing them according to the main resilience components that they address.

Building absorptive resilience through larger income margins:

- **Improve the low income situation of cotton farmers** through for example: (i) making the production of cotton more profitable (higher cotton purchase prices, lower fertilizer prices, increasing productivity, etc.); or (ii) providing customized financial options which allow the purchase of agricultural inputs, the investment in mechanization options and other technologies, and/or the adoption of innovations. The customized financial options could, for example, be individual credits between the cotton companies and the farmers (instead of the current common liability system with the SCOOP PCs); the use of warrantage systems, which provide, for example, the possibility of storing harvests and receiving cash loans based on the value of the deposits (Badiori *et al.*, 2018); or the development of saving groups or Village Savings and Loan Associations (VSLAs), a mechanism of mobilizing small savings of the resource poor by group formation (Dagunga *et al.*, 2020); for the application of group savings projects in Burkina Faso see Ali and Siembou (2022). All these measures are important in delivering absorptive resilience, and to a lesser extent adaptive or transformative resilience, since they play an important role in maintaining and increasing household level consumption and income, increasing their capacity to withstand temporal shocks and stresses.

Building adaptive resilience through changes in natural, physical, human, social, financial, and institutional capital:

- Develop customized **Integrated Soil Fertility Management (ISFM)** and **Integrated Pest Management (IPM)** programmes for cotton producers in Burkina Faso, including for example, sustainable land use intensification and the rehabilitation of degraded soils (Röhrig *et al.*, 2021), or affordable and environmentally friendly pest management approaches. An example of the latter include promoting indigenous natural enemies, planting directly after the main rainfalls, and using microbial bio-pesticides rather than already identified ineffective chemicals to combat the fall armyworm (Ahissou *et al.*, 2021). Like Röhrig *et al.*, (2021), we also recommend combining the measures with monitoring and evaluation mechanisms since these can help to promote the uptake of ISFM and IPM.
- Work on providing **low cost irrigation options** with low maintenance requirements across Burkina Faso, where water resources are available (Röhring *et al.*, 2021). These authors explain how *“irrigation has the potential to mitigate climate risks in Burkina Faso as well as to help diversify diets and ensure food security, but needs the provision of support services to avoid over-exploitation of already scarce water resources in the long-term. Raising awareness about water-saving irrigation management is crucial to ensure a long-term responsible use of natural resources.”*
- Study different customized **mechanization options**, especially for poor farmers (i.e. two wheel tractors, animal draft power, etc.), and offer different options to provide access (i.e.

rental markets, cooperative exchange, or saving groups and VSLAs). The already well established vertical management system providing credits to cooperatives is an asset in Burkina Faso, which can be used to develop options to provide access combining the provision of credits with the possibility of cooperative services to share machinery. This measure delivers adaptive resilience, enhancing the capacity to cope with economic and cultural changes leading to labour shortages.

- Improve the **governance of the vertical management system** of the cotton sector, build trust in the governing institutions, and encourage a more equitable distribution of powers between cotton companies and farmers and between wealthy and poor farmers.

Building transformative resilience through the generation of value added products, market diversification and the preparation for climate change:

- Continue to develop, (i) the capacities for the **domestic processing of cotton fibres** into value added products and (ii) **local textile and garment labels** and their domestic and international marketing. Through the diversification of output markets, the generation of value, and creation of products and labels that hopefully result in pride and motivation, the cotton sector would slowly build on strengthening its transformative capacity. Through the diversification of markets, the adaptive capacity would also be reinforced.
- Invest in **Climate Information Services (CIS)** that help farmers to make informed decisions and thereby raise yields with little additional efforts (Röhring *et al.*, 2021). These authors explain that CIS represents a highly beneficial climate change adaptation strategy with a rather small scale investment and a positive return, but that it requires high institutional support for optimal application and timely communication that is actionable and targeted to end users needs. We consider that this measure is creating a fundamentally new information based production system with strong communication networks and thus classify it as a transformative capacity. However, it also contributes to improving the preventive/anticipative and the adaptive capacities
- Research and create **improved crop varieties**. These present high risk mitigation potential to climate change and are high cost effectiveness (Röhrig *et al.*, 2021). Diarra *et al.*, (2017) emphasizes the development of heat resistant cultivars, rather than drought resistance.

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