# Do Voluntary Sustainable Standards Induce Systems Change? Evidence from Sustainable Cotton Farming in Pakistan

**REVIEW**

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# PLAIN-LANGUAGE SUMMARY

### The Core Question

Do **Voluntary Sustainable Standards (VSS)** truly drive systemic change, or just minor, isolated improvements in industries?

### Case Study Focus

This research investigates the impact of the **"Better Cotton"** program on cotton farming in **Pakistan**.

## Key Findings & Implications

### Positive Changes

Better Cotton brought some **positive changes** and increased **awareness** to Pakistani farms.

### Complexity of Change

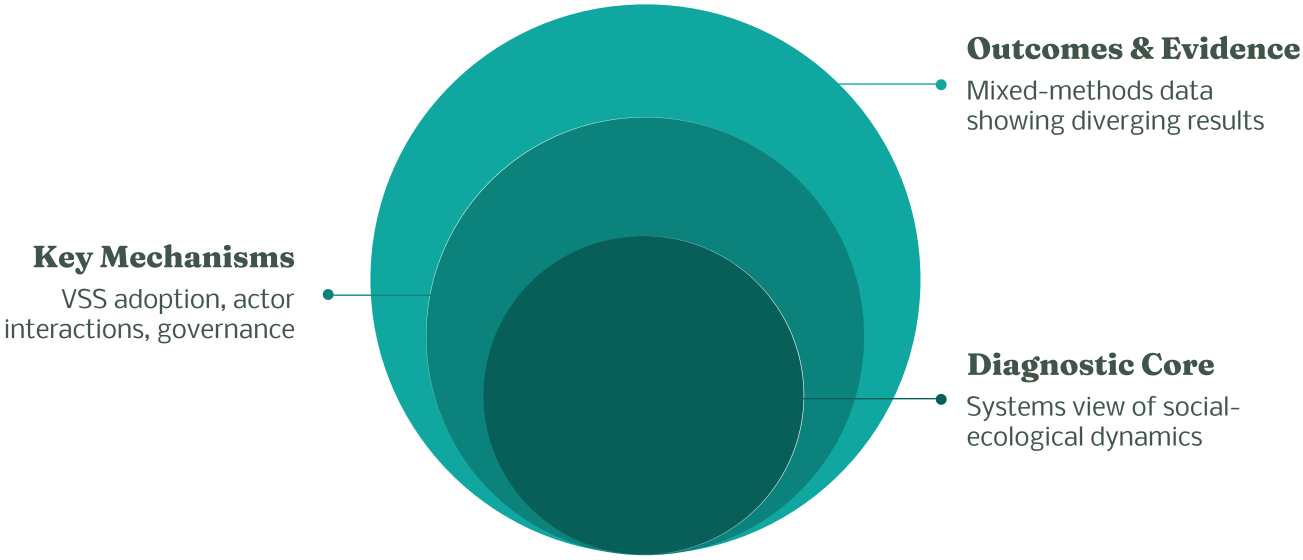
Achieving **comprehensive "systems change"** is far more complex than simply implementing voluntary standards.

### Holistic Approach Needed

Sustainability initiatives must consider **wider issues beyond the farm level** for lasting transformation, focusing on entire systems.

# ABSTRACT

In the study of natural resource use, ecological variables and human activities have been widely analysed to answer the most pressing concerns regarding the future of sustainability. In recent times, a new school of thought has emerged that proposes the idea of applying systems thinking to holistically understand and analyse complex problems related to natural resource use. This approach is based on viewing a system as a whole, and studying the intertwined nature of different components in a system to evaluate the outcomes. By leveraging the systems approach, this study uses a diagnostic social-ecological systems framework to explain the diverging economic and environmental outcomes between conventional and sustainable cotton farmers in Pakistan. The study goes beyond the usual application of linear approaches in evaluating success of voluntary sustainable standards (VSS) in cotton farming to determine causation rather than identifying it. Using a mixed methods approach, data is collected from semi-structured interviews and Better Cotton farm results report (2015-2020) to identify the key factors and their interactions that determine sustainable outcomes. The study found out that this achievement is attributed to second-tier variables from governance systems and crucial interactions with the actors that are facilitated by the adoption of VSS in cotton farming.




**Keywords**: social-ecological systems, voluntary sustainable standards, better cotton, systems change.

# INTRODUCTION

Cotton has long been pivotal to Pakistan's economy, with cultivation dating back to ancient times. Today, Pakistan is the world's fifth-largest cotton producer and ranks fourth in cultivated area (Food and Agriculture Organization of the United Nations, 2025; International Cotton Advisory Committee, n.d.). As a major cash crop, cotton serves as a raw material for the textile industry. This industry employs 17% of the nation's workforce, generates 60% of foreign exchange revenue, and accounts for 8.5% of the national gross domestic product (Rana et al., 2020). To meet textile industry demand and boost cotton production, farmers often use intensive land-use practices. Despite this, the country ranks 41st globally in cotton yield. Researchers link this yield gap to technical, economic, and allocative inefficiencies. Key reasons include unfavorable weather, lack of education, insufficient credit access, and limited government extension services (Wei et al., 2020; Shafiq & Rehman, 2000). As shown in Figure 1, collaborative approaches to education and knowledge sharing are essential for implementing sustainable farming practices.

Intensive land-use in cotton farming creates significant environmental challenges. These are typically associated with excessive use of water, synthetic fertilizers, and pesticides. Consequences include soil health deterioration, pollution of neighboring ecosystems (like water streams and biodiversity), and increased greenhouse gas (GHG) emissions (Memon et al., 2019; Azizullah et al., 2011). Conversely, agriculture, especially cotton farming, is also vulnerable to climate change. Extreme weather, and changes in pests or diseases directly impact crop productivity. This paradox highlights the sector's importance and drives policymakers to seek reliable solutions.

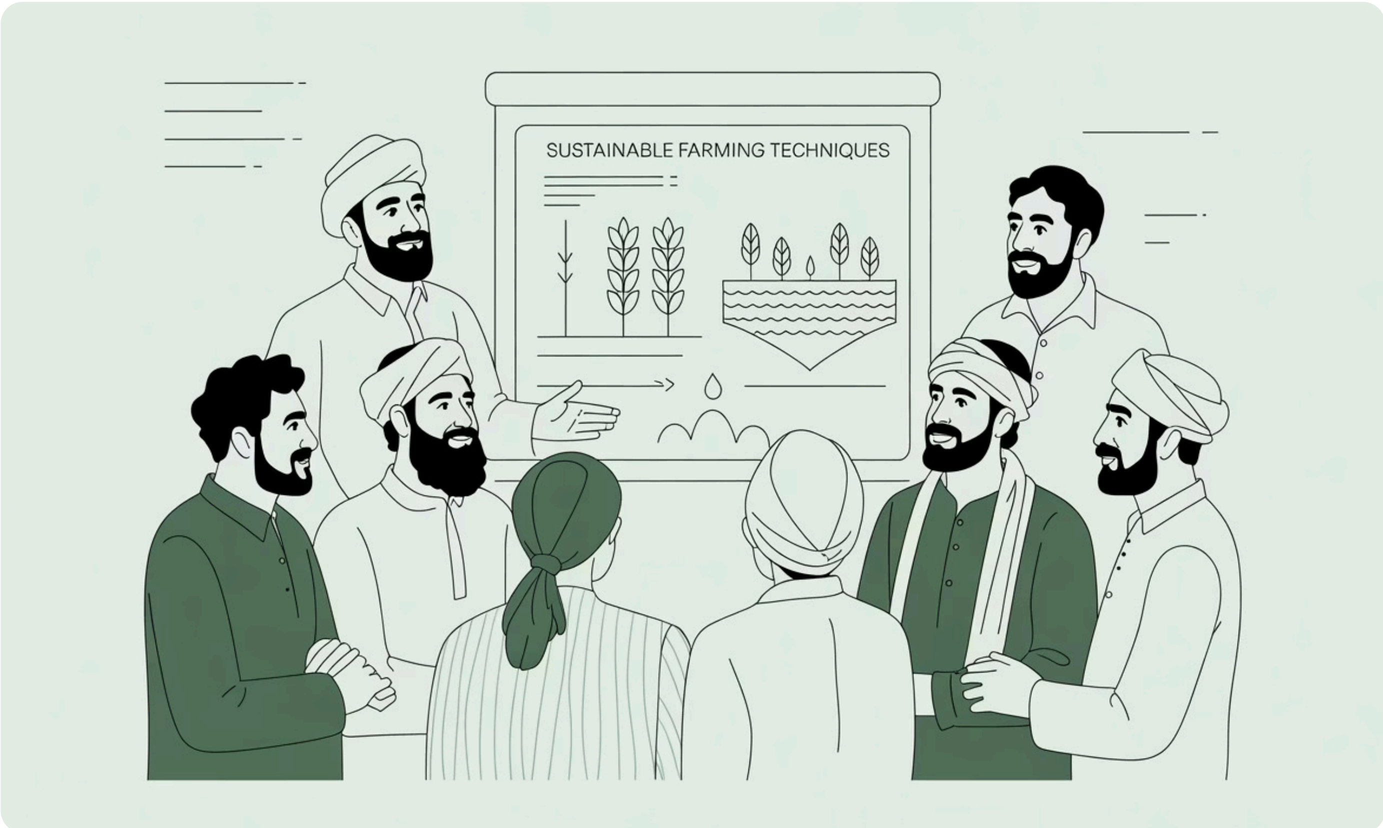



*Figure 1: An Illustration of Pakistani farmers discussing sustainable farming techniques.*

One such potential solution is the adoption of sustainable agriculture practices, especially in the case of developing countries due to their significant dependence on this sector (Yohannes, 2015). According to Food and Agriculture Organization of the United Nations, sustainable agriculture is based on five components: i) meeting the present and future needs for products and services while ensuring ii) profitability iii) non-degradation of environment iv) social equity and v) economic equity (Food and Agriculture Organization of the United Nations, 1988, as cited in Lee, 2005).

Acknowledging these opportunities resulting from and threats to agriculture, Pakistan has made substantial efforts in embracing sustainable agriculture practices for production of cotton. There are several organizations working countrywide to promote these practices through the implementation of voluntary sustainable standards (VSS). Some of the major organizations include Better Cotton, Organic Cotton Accelerator and Responsible Environment Enhanced Livelihood cotton program that serve the mainstream or niche markets according to their objectives respectively.

Several impact studies backed by these initiatives and even independent researches provide evidence on the success of adopting VSS. These studies usually adopt a linear comparative approach and compare conventional and sustainable cotton farmers by collecting quantitative data on input indicators such as use of water, pesticide and fertilisers or outcome indicators such as yield, income and profit. Thus, they do provide abundant empirical evidence proving that adoption of sustainable agriculture practices leads to better farm outcomes pertaining to lower input use, less environmental degradation and higher crop yield (Ahmad et al., 2021; Zulfiqar & Thapa, 2016; Zulfiquar et al., 2019; Yasin et al., 2020). Yet, little is known about how the benefits from adoption of sustainable agriculture practices are achieved and which factors contribute to the success of these VSS (Marx et al., 2022; Lund-Thomsen et al., 2022).

With this background, the aim of this research is to explore why and how adoption of voluntary sustainable standards in cotton farming leads to sustainable resource use as compared to conventional cotton farming in Pakistan. By addressing the aim of this study, existing gaps in the literature on the functioning mechanism of VSS will be filled using the systems theory particularly the diagnostic multitier social-ecological systems framework (Ostrom, 2009). Moreover, the study will test whether the difference in outcomes amongst conventional cotton farmers and those participating in VSS are caused by the presence of a unique system facilitated by the VSS.

# Voluntary Sustainable Standards and Cotton Farming in Pakistan

The governments today, especially in the developing world, face extreme pressures and resource constraints in fulfilling the public's needs, be they related to welfare, security or protecting the environment. Under these circumstances, private sector can be vital in extending support to achieve the sustainability goals. Voluntary Sustainable Standards is an example of one of these initiatives where the private sector drives the production and consumption of sustainable products (Komives & Jackson, 2014). As evident from the name, the adoption of the standards is voluntary and does not rely on the government for operation, regulation or implementation. In principal, VSS is a market-based approach to drive sustainable business and production practices so that the consumer demand for sustainable products are fulfilled. In this way, the production of a product is altered to ensure that it has minimum negative social or environmental impact.

### Standard Definition

Defines good social, economic, and environmental practices for a product or industry.

### Market-Based

Drives sustainable practices by meeting consumer demand for sustainable products.

### Global Impact

Alters production in one country by steering demand in another.

The fundamental component of VSS is a standard that defines good social, economic and environmental practices for a product or a specific industry. Primarily, the purpose of a standard is to outline the principles necessary to ensure sustainable production which is then complimented by other components of the system like capacity building, assurance, traceability and labels. Conventionally, there are two types of standards; practice based or performance based, where the former is based on the adoption of best management practices and the latter relies on achievement of certain targets set for the use of resources such as water. These standards have been a powerful approach in driving sustainability as the practices are altered in one country by steering the demand for the sustainable product in a different country. For instance, the first sustainable product sold in the Dutch markets by Fairtrade International was coffee produced in Mexico.

# Does ‘Better’ Cotton contributes to Sustainable Resource Use in Pakistan?

In the early 21st century, the World Wide Fund for Nature (WWF) led roundtable conferences exploring environmental sustainability across ten agricultural commodities (Riisgaard et al., 2020), including cotton. Following a six-year standard-setting process, Better Cotton was formed as a multi-stakeholder initiative aimed at driving sustainability in the cotton sector. The organization began operations in Pakistan in 2010, striving to sustain cotton communities while restoring and protecting the environment.

This Voluntary Sustainable Standard (VSS) has three strategic aims: promoting sustainable farming practices, enhancing economic viability, and driving sustainable cotton demand globally. The Better Cotton Standard System (BCSS), a practice-based standard system, includes the five previously discussed VSS components, plus an additional one for results and impact. Seven principles and related criteria detail the organization's strategic aims, encompassing crop protection, water stewardship, soil health, biodiversity and land use, fiber quality, decent work, and effective management systems (Better Cotton, 2023). Capacity building, channeled through the Better Cotton Growth and Innovation Fund, supports field-level training programs. An assurance program measures performance against these principles and criteria (Better Cotton, 2019) to ensure core standard indicators are met and identify compliance gaps. Traceability and labels are beyond this research's scope and will not be thoroughly discussed. Better Cotton measures impact at different supply chain levels–farmer, spinner, and retailer–but this paper focuses on farm-level contributions to sustainable livelihoods, an enhanced environment, and a good quality of life for communities.

As illustrated in Figure 2, the quality of cotton produced under sustainable practices is evident in the healthy, fluffy cotton bolls resulting from Better Cotton farming methods.

*Figure 2: Cotton boll in hand with healthy plant background.*

There is substantial empirical evidence that Better Cotton has positive social, economic and environmental impact in the countries where it operates, specifically in the case of Pakistan. For instance, the study conducted by Ahmad et al. (2021) evaluated the impact of conventional and Better Cotton farmers in the Khanewal district of Pakistan and concluded that productivity, environment sustainability and safety were significantly higher in the latter case. The study found out that the adopters of BCSS had less; mean irrigations, pesticide and chemical fertiliser applications and higher; irrigation intervals, organic fertiliser use and non-chemical pest control as opposed to conventional cotton farmers. Furthermore, the dependence on consultation and pest scouting techniques was also significantly higher in comparison to conventional cotton farmers. Similarly, another comparative study in the Bahawalpur district found out that the use of water and inorganic fertilizers or pesticides by Better Cotton farmers was significantly less which ultimately affected the financial performance of the cultivated crop (Zulfiqar & Thapa, 2016). Farmers from this study also reported that the three major reasons to join the Better Cotton program were reduced production costs, environmental sustainability and higher productivity. The findings of a panel data research based on two cropping seasons is also consistent with the aforementioned studies and confirms the environmental and economic efficiency of Better Cotton farmers (Zulfiquar et al., 2019). Moreover, the health impact is captured in the study carried out by Yasin et al. (2020), which concludes that female cotton pickers working in the Better Cotton farms incur fewer costs related to health as compared to those working in the conventional cotton farms.

Although, with this overwhelming empirical evidence it may be deduced that the adoption of BCSS can lead to sustainable resource use, there still are some gaps in the literature. The studies have mainly focused on the outcomes of standard adoption and an investigation in to its operational mechanism is still limited. Previous studies also confirm that there is little evidence on how VSS and governance of standard systems influence learning, adoption and sustainability outcomes (Marx et al., 2022; Lund-Thomsen et al., 2022). An in-depth review of impact studies on certification standards by Jellema et al. (2022), found out that an overwhelming majority (around 70%) of such studies adopted a linear approach identifying causation rather than determining it. Critically analysing both the linear and 'configurational' approach, their study argues that future research should be carried out using a system-based approach to create a balance in the literature as well as provide a holistic understanding of the mechanisms driving the impact.

# Systems Theory: Introduction to Social-Ecological Systems Approach

Traditionally, researchers have recognised ecological variables and human activities as drivers of ecological systems. While, the former has been widely researched but the latter was much less studied until recently. Though, these two fields developed independently but the lack of linkages amongst the two makes it problematic to understand the inextricable links of human activities and ecological dynamics (Norgaard, 2008). The levels of non-linearity, uncertainty and interactions associated with the changing dynamics of the environment further add up to the complexity of the issue. These limitations can be addressed by the systems theory that evolved during the mid-twentieth century. Systems can basically be described as a set of elements with interconnected parts that generate and sustain their own patterns of behaviour over time. One such system is complex adaptive system, which is a distinctive case of systems theory as it allows for changes within the system over time due to the interactions amongst its separable components (Preiser et al., 2018).

Developed in the 1990s, the social ecological systems (SES) is an emerging concept which is a type of complex adaptive system and provides an understanding on the intertwined ecological and social sustainability issues (Berkes et al., 2003; Biggs et al., 2003). Redman et al. (2004) defines the SES as a coherent, dynamic and complex system based on social and biophysical factors with regular interactions set in several organizational, spatial and temporal scales. This structure is also regulated by the independent components of social and ecological systems that are continuously adapting. The ecological system is driven by multiple elements such as geological setting and their variations whereas the social system is concerned with human activities that influence the SES. The components of these individual systems are also multiple and diverse, for instance the social system itself is comprised of social institutions, orders and cycles. The interactions and feedbacks amongst the components in a SES distinguishes it from other theoretical approaches applied in this field of study. This is a unique approach that provides a comprehensive understanding of the complex system created by the interactions in a SES and has been widely used to study the sustainability issues in the field of natural resource sciences with applications varying from lakes, forests, fisheries and irrigations systems (Fleischman et al., 2014; Palomo & Hernandez-Flores, 2019; Cox, 2014). According to Colding & Barthel (2019), the research on SES is mainly based on two types of frameworks. The first one is the descriptive SES framework which deals with establishing links amongst social and ecological systems. While, the second is a diagnostic framework which analyses the robustness and sustainability of these systems.

# The Diagnostic Multitier Social-Ecological Systems Framework

Building on her earlier works, Ostrom (2009) proposed a diagnostic multitier SES framework. She challenged the notion of simple answers to complex problems, advocating for embracing complexity in natural resource studies. This framework helps researchers organize multivariate complex systems and analyze interactions among their components. As its name suggests, the framework has multiple levels: first-level core subsystems and second-level variables. These operate within a larger social, economic, and political context.

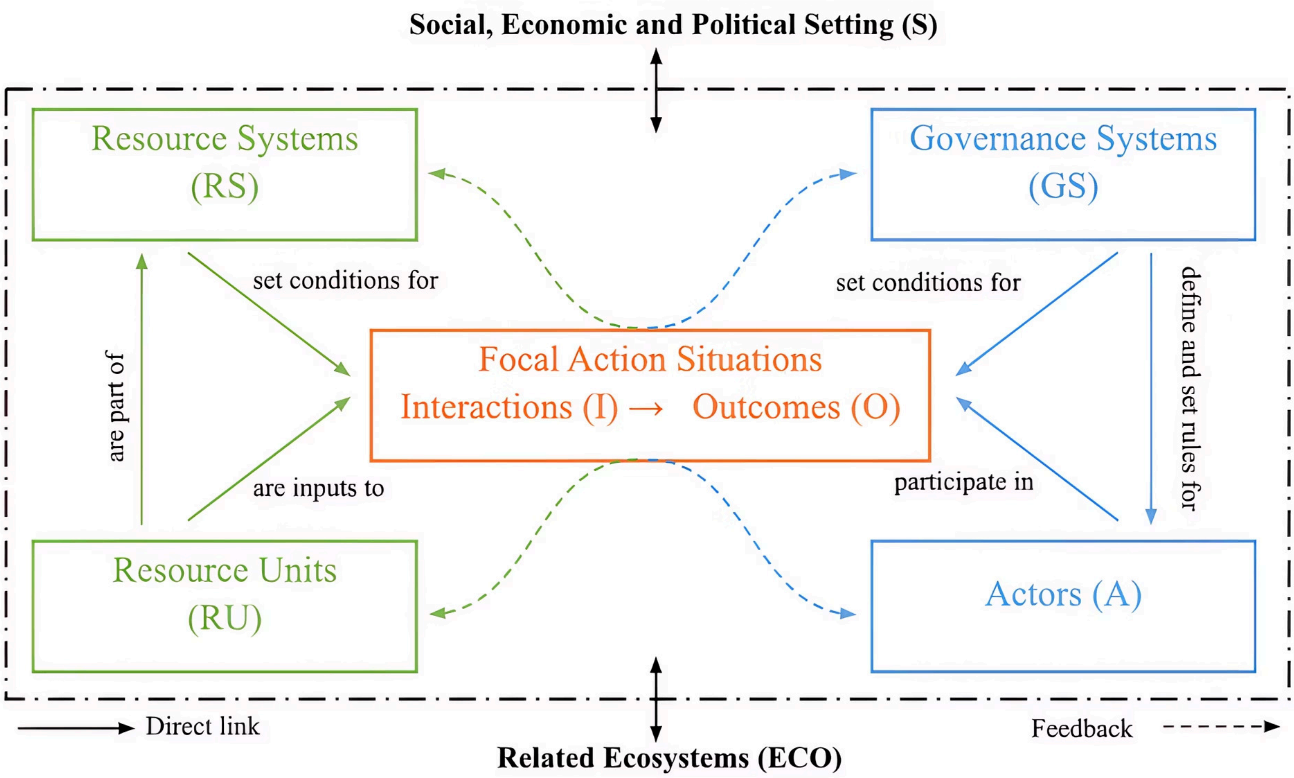



*Figure 3: Conceptual diagram of the multitier SES framework (illustrative)*

The first-level core subsystem in the multitier SES framework includes natural and social components (Figure 3). Natural components comprise Resource Systems (RS) and Resource Units (RU). Social components include Governance Systems (GS) and Actors (A). These subsystems are denoted by solid boxes (Figure 3). The action situation represents Interactions (I) among them, transforming inputs into Outcomes (O). Dashed lines show feedback from these action situations, influencing individual SES components. The entire system is enclosed by a dotted-and-dashed line, indicating a logical and complete structure. This structure is influenced by exogenous first-tier components like the political setting or related ecosystems. These influences can stem from interactions within a larger SES compared to the focal SES. While the conceptual diagram may appear static, it is a dynamic process with constant interactions and feedback affecting both outcomes and individual SES components.

These core components are further constructed on several second-tier variables. McGinnis & Ostrom (2014), developed a diagnostic SES framework with a subset of these variables that are commonly studied to examine the sustainability of a SES as shown in Table 1. Within this framework, ten frequently observed second-tier variables are identified (marked with an asterisk in Table 1) that positively or negatively influence the likelihood of self-organization amongst users resulting in sustainable resource use (Ostrom, 2009).

Different studies have used this framework to analyse why some SES are sustainable and which variables or interactions play a decisive role in driving sustainability. Palomo & Hernandez-Flores (2019) analysed the sustainability of a multiple resource system involving commercial fishing, recreational fishing and eco-tourism. Their findings concluded that the governance systems are essential in achieving sustainable resource use. An important interaction in this SES was knowledge sharing which was enabled by the exchanges amongst operational choice rules, collective choice rules and the actors. Although, this study highlights the significance of governance systems in a SES with multiple resource systems but the ecological outcomes were underemphasized. Another study conducted by Leslie et al. (2014), used a quantitative approach under the multitier SES framework to test whether the subsystems of fisheries in the region of Baja California are correlated or not. Deploying an interesting yet complicated method –calculating performance scores for each subsystem– the study could only identify a correlation between the performance scores of governance systems and resource units, whereas all other subsystems were uncorrelated. This implies that either efficient governance systems lead to sustainable management of resource units or governance systems are likely to be implemented in places with productive resource units. While the importance of governance systems was partially apparent in the research, it can be argued that the results from this study might change significantly given that a different set of second tier variables are included or different indicators are used to calculate the performance scores.

Applying a similar SES framework, Cox (2014) investigated the Taos Valley irrigation system, which has survived for several hundred years in a high desert environment and addressed the gaps in the literature of common pool resources; underemphasized biophysical features and insufficient examination of relationships amongst independent variables which influence the outcomes. The success of this system was attributed to two factors. On the one hand, the study confirmed the presence of essential features identified in the common pool resource management theory such as small group size, high resource dependence, multiple levels of governance and sanctioning mechanisms that increase the likelihood of collective action. On the other hand, the findings also verify the importance of biophysical features such as harsh environment and the interactions which influence sustainability of the SES. Nonetheless, the study did not assess productivity of the system (RS5) and knowledge of SES (A7) which are frequently observed variables in influencing the likelihood of self-organization in sustainable resource use (Ostrom, 2009).

# MATERIALS AND METHODS

To address the limitation of understanding the functional mechanism of the VSS, mixed-methods approach was used for data collection along with the application of SES framework for analysis. The qualitative data was collected from semi-structured interviews with seven key informants involved in implementing BCSS across Pakistan. These participants were selected based on their expertise on the subject matter, their professional role, relevant experience and to ensure representation of key partners involved in implementing the BCSS in Pakistan. The quantitative data was gathered from Better Cotton annual impact studies (2015 to 2020), to visualize a repeated cross-sectional trend analysis of farm inputs and outcomes amongst conventional and sustainable cotton farmers in Pakistan (Better Cotton, n.d., n.d.a, n.d.b, n.d.c, n.d.d). These annual impact reports compare the farm inputs and outputs of conventional and Better Cotton farmers operating in the same geographical area, which is also the premise for selecting relevant second-tier variables discussed later in this section.

To address limitations of determining causation in the VSS literature, this research method is designed using the multitier diagnostic SES framework developed by McGinnis & Ostrom (2014). Since the aim of this research is to explore why the adoption of VSS leads to sustainable resource use, it is hypothesized that the SES in which Better Cotton farmers operate is fundamentally different from that in which conventional cotton farmers are operating. Hence, the focal level of analysis is narrowed down to the evaluation of additional second-tier variables and their interactions in the SES where VSS is operational. The objective here is to identify dissimilarities amongst the components of SES in sustainable cotton farming compared to conventional cotton farming that can plausibly explain the different outcomes. Hence, during the first step of variable selection, the common contextual factors (such as first-tier variable S and second-tier variables including but not limited to RS1, RS9 and GS1) amongst both type of farmers were excluded. In the seond step, only those second-tier variables were selected for examination which could potentially vary according to the respective SES (highlighted in Table 1). Based on this, 22 out of 56 second-tier variables were identified from the framework for further investigation in the study.

**Table**: List of second-tier variables under a Social-Ecological System.

| First-tier variables | Second-tier variables | Reasons for selection/rejection |
|---|---|---|
| Social, economic, and political settings (S) | S1 - Economic development | No appreciable variation |
| | S2 - Demographic trends | No appreciable variation |
| | S3 - Political stability | No appreciable variation |
| | S4 - Other governance systems | No appreciable variation |
| | S5 - Markets | No appreciable variation |
| | S6 - Media organizations | No appreciable variation |
| | S7 - Technology | No appreciable variation |
| Resource systems (RS) | RS1 - Sector (e.g., water, forests, pasture, fish) | No appreciable variation |
| | RS2 - Clarity of system boundaries | No appreciable variation |
| | RS3 - Size of resource system* | No appreciable variation |
| | **RS4 - Human-constructed facilities** | Potential variation expected |
| | **RS5 - Productivity of system*** | Potential variation expected |
| | RS6 - Equilibrium properties | No appreciable variation |
| | RS7 - Predictability of system dynamics* | No appreciable variation |
| | RS8 - Storage characteristics | No appreciable variation |
| | RS9 - Location | No appreciable variation |

| First-tier variables | Second-tier variables | Reasons for selection/rejection |
|---|---|---|
| Governance systems (GS) | GS1 - Government organizations | No appreciable variation |
| | **GS2 - Nongovernment organizations** | Potential variation expected |
| | **GS3 - Network structure** | Potential variation expected |
| | GS4 - Property-rights systems | No appreciable variation |
| | **GS5 - Operational-choice rules** | Potential variation expected |
| | **GS6 - Collective-choice rules*** | Potential variation expected |
| | GS7 - Constitutional-choice rules | No appreciable variation |
| | **GS8 - Monitoring and sanctioning rules** | Potential variation expected |
| Resource units (RU) | RU1 - Resource unit mobility* | No appreciable variation |
| | RU2 - Growth or replacement rate | No appreciable variation |
| | RU3 - Interaction among resource units | No appreciable variation |
| | RU4 - Economic value | No appreciable variation |
| | **RU5 - Number of units** | Potential variation expected |
| | RU6 - Distinctive characteristics | No appreciable variation |
| | RU7 - Spatial and temporal distribution | No appreciable variation |

| First-tier variables | Second-tier variables | Reasons for selection/rejection |
|---|---|---|
| Actors (A) | **A1 - Number of relevant actors*** | Potential variation expected |
| | A2 - Socioeconomic attributes | No appreciable variation |
| | A3 - History or past experiences | No appreciable variation |
| | A4 - Location | No appreciable variation |
| | **A5 - Leadership/entrepreneurship*** | Potential variation expected |
| | A6 - Norms (trust-reciprocity)/social capital* | No appreciable variation |
| | **A7 - Knowledge of SES/mental models*** | Potential variation expected |
| | A8 - Importance of resource (dependence)* | No appreciable variation |
| | **A9 - Technologies available** | Potential variation expected |
| Action situations: Interactions (I) & Outcomes (O) | I1 - Harvesting | No appreciable variation |
| | **I2 - Information sharing** | Potential variation expected |
| | **I3 - Deliberation processes** | Potential variation expected |
| | I4 - Conflicts | No appreciable variation |
| | **I5 - Investment activities** | Potential variation expected |
| | **I6 - Lobbying activities** | Potential variation expected |

| First-tier variables | Second-tier variables | Reasons for selection/rejection |
|---|---|---|
| | **I8 - Networking activities** | Potential variation expected |
| | **I9 - Monitoring activities** | Potential variation expected |
| | **I10 - Evaluative activities** | Potential variation expected |
| | **O1 - Social performance measures** | Potential variation expected |
| | **O2 - Ecological performance measures** | Potential variation expected |
| | **O3 - Externalities to other SESs** | Potential variation expected |
| Related ecosystems (ECO) | ECO1 - Climate patterns | No appreciable variation |
| | ECO2 - Pollution patterns | No appreciable variation |
| | ECO3 - Flows into and out of focal SES | No appreciable variation |

*Source: Adapted from McGinnis & Ostrom (2014, tab. 1). Variables indicated by '*' are frequently identified second-tier variables that influence self-organization in a SES. Highlighted variables were selected for investigation in this study.*

# RESULTS AND DISCUSSION

Different variables were mapped from the SES framework and analysed in terms of their potential role in facilitating sustainable resource management amongst Better Cotton farmers. The first-tier variables identified were resource unit (cotton plant), resource systems (soil system, water system and biodiversity system), actors (mainly farmers) and governance system (BCSS). These subsystems and their interactions that structure the SES facilitated by VSS are comprehensively discussed in the below sections.

## Governance Systems (GS)

The farmers participating in the Better Cotton program are governed under a hierarchical governance system with two levels; at the top level is the Better Cotton Standard System and the second level is taken up by Better Cotton Program Partners (GS2). The structural design for the implementation of the program is provided by the BCSS, whereas the program partners are responsible for implementation of the standard system. These partners can be from the private sector, public sector or belong to various legal entities such as non-governmental organizations, private limited businesses or even research institutes. Forming producer units, building capacity of farmers, monitoring adoption, measuring readiness and collecting data are the roles performed by these partners. While, BCSS defines the sustainability themes recommended for adoption through the Better Cotton Principles & Criteria (GS5). The BCSS further ensures compliance via the Assurance Program (GS8) and, measures result and impact. Additionally, a license or certification validating the sustainable cotton production is also provided to the producer units that are in compliance with the principles and criteria verified during the assessments conducted by Better Cotton.

The operational choice rules (GS5) are facilitated by the Better Cotton principles and criteria and the Assurance Model. BCSS defines seven principles for sustainable cotton farming, divided into 42 criteria and a subcategory of 164 core and improvement indicators .

To receive a license the producer units undergo regular assessments from Better Cotton and must comply with all core indicators, whereas the improvement indicators measure progress for various aspects of sustainable cotton production defined by the principles. For instance, one of the core indicators for Principle 1 (Crop Protection) is that an Integrated Pest Management (IPM) plan is implemented and the corresponding improvement indicator is the proportion of farmers adopting this IPM plan which has to be increased over the years. These criteria and indicators ensure that clear rules are defined for sustainable cotton production. For example, under the above mentioned principle the indicator 1.3.1 states that any pesticide listed in the annexures of Stockholm Convention, Montreal Protocol and Rotterdam convention are not used by the producer units. Failure in compliance with this criteria may lead to denial of certification. Similarly, other indicators are related to water stewardship, soil health, biodiversity and land use which regulates sustainable agriculture practices amongst farmers. By adhering to these principles it is ensured that the Better Cotton farmers must either preserve or restore the resource systems involved in cotton production.

There are multiple types of assessments under the BCSS which ensure monitoring and sanctioning rules (GS8). This includes readiness checks, licensing assessments and surveillance assessments conducted by the program partners, Better Cotton or third party assessors. Principle 7 (Management System) mandates that the producer units record accurate farm data related to inputs which is then verified during such assessments and provides the basis for monitoring and sanctioning rules. Based on this, a farmer or a group of farmers may be sanctioned from participation in the program. Program partners have the liberty to exclude farmers from the producer units if they do not comply with the recommended practices, while a license denial from Better Cotton means that the entire producer unit is not a sustainable cotton producer. The implications from such exclusions imply that the farmers can no longer use the sustainability label to sell their cotton.

The network structure (GS3) formed by BCSS is a hybrid network consisting of two components. The first one is a bus network where information flows from Better Cotton to the program partners. Then the partners have their own hierarchical structure through which the data flows from program management to the field staff –producer unit managers and field facilitators– and onwards to the lead farmers, farmers or workers. The information flows back to the top in a similar manner. The second component of this structure is a mesh network formed between the field staff, farmers and workers. In this network, the information flows freely between the participants. This network can take a formal, informal or a social setting via workshops, demonstration plots, social gatherings or information exchange via smartphone based communication tools. The farmer or worker groups participate in formal trainings to learn about sustainable farming practices that are led by the field facilitators. Informal exchanges are often facilitated by the lead farmer (A5) of a learning group under a producer unit. These formal and informal networks ensure that there is a constant flow of information and a feedback mechanism is in place. Moreover, this also guarantees that the farmers have access to consultation to ensure that the crop health is being regularly monitored. Advisory services like the use of pesticides, fertiliser or water are also channelled through this mechanism.

The network system fosters farmer cooperation, leading to collective-choice rules (GS6). The extent of this cooperation varies by region. However, some groups collectively purchase bulk inputs, such as pesticides and fertilizers, to receive price discounts. This collective approach also applies to hiring labor for activities like land preparation or cotton picking. Similarly, farmers collectively sell their cotton to achieve better prices and reduce transportation costs. The standard system further promotes collective action for sustainable water use, encouraging collaboration among stakeholders. Farmers collaborate with local governments and organizations on sustainable water development projects, including lining water courses.

# Actors (A)

Several actors (A1) are involved in Better Cotton's SES. These include Better Cotton representatives and program partners, who encourage cotton farmers and workers to adopt sustainable farming practices. Some representatives work strategically, ensuring best management practices are adopted. Others, like producer unit managers, field facilitators, monitoring officers, and assessors, actively operate in the field to ensure compliance. The lead farmer (A5) serves as a key contact between farmers and VSS officers. They provide institutional and administrative support, facilitating learning, review, and analysis of VSS implementation. Pesticide and fertilizer agents from private companies also work closely with farmers. While it's hard to determine if they promote organic or synthetic products, overselling is common to meet business targets. VSS-related actors aim to neutralize these efforts, ensuring input use aligns with crop requirements. Field facilitators also reduce farmers' dependence on fertilizer/pesticide sales agents and government agriculture extension departments. Additionally, they act as technical experts, supporting farmers throughout the crop cycle and providing guidance for abnormalities.

The knowledge of SES (A7) is formalized through the VSS's capacity-building component. Farmer knowledge develops based on themes defined by Better Cotton principles. Program partners, sometimes with industry experts, draft training materials from this information. During each crop season, regular training workshops are held for participating farmers. These workshops, conducted by field facilitators, cover sustainable resource use topics like pest scouting before pesticide application, highly hazardous pesticides, the importance of soil tests, and biodiversity. Field facilitators receive training through a 'Train the Trainer' program, where producer unit managers qualify as master trainers. Besides workshops, demonstration plots are exhibited during the crop season. Here, farmers observe practical implementation of sustainable practices and new techniques like drip irrigation systems and pheromone traps.

These demonstration plots significantly contribute to the technological difference (A9) between Better Cotton and conventional cotton farmers. Although technical constraints related to technology adoption are well addressed under this VSS, farmers still manage financial resources independently. Additionally, adopting certain technologies, such as conducting soil tests for each producer unit, is mandatory in this VSS, which regulates input use.

# Resource Systems (RS) & Resource Units (RU)

Several human constructed facilities (RS4) built on the farms participating in the VSS are also unique. Some of these facilities are mandated by the principles whereas the others are a result of demonstration plots and research trials. For instance, Principle 2 (Water Stewardship) requires efficient use of water resources and hence lining of watercourses is quite common amongst Better Cotton farmers. Although, this is also promoted by the government but the VSS makes the process robust by encouraging collaboration amongst different stakeholders. Similarly, Principle 4 contributes to preservation of biodiversity such as trees or beneficial insects as well as promoting restoration of degraded areas. Under these principles, the ownership of preservation and protection is extended to the entire producer unit by linking it with the certification outcome.

The productivity of system (RS5) and number of units (RU5) were also found to be different. Figure 3 shows the use of inputs and resulting yield for five consecutive years from 2015 to 2020 as reported in the Better Cotton annual impact reports. The data was collected from the same regions in Pakistan where Better Cotton and conventional cotton farms were operational and then comparisons were made. It is evident that the Better Cotton farmers used less water, pesticides and fertilisers as compared to conventional cotton farmers, yet had a better yield. Adopting sustainable farming practices advocated by the BCSS such as crop rotation and intercropping, improves soil health and biodiversity in the long run which affects the cost of production and crop yield. This difference in productivity of various resource systems –soil, biodiversity & water– has to be attributed to the interactions enabled by the VSS.

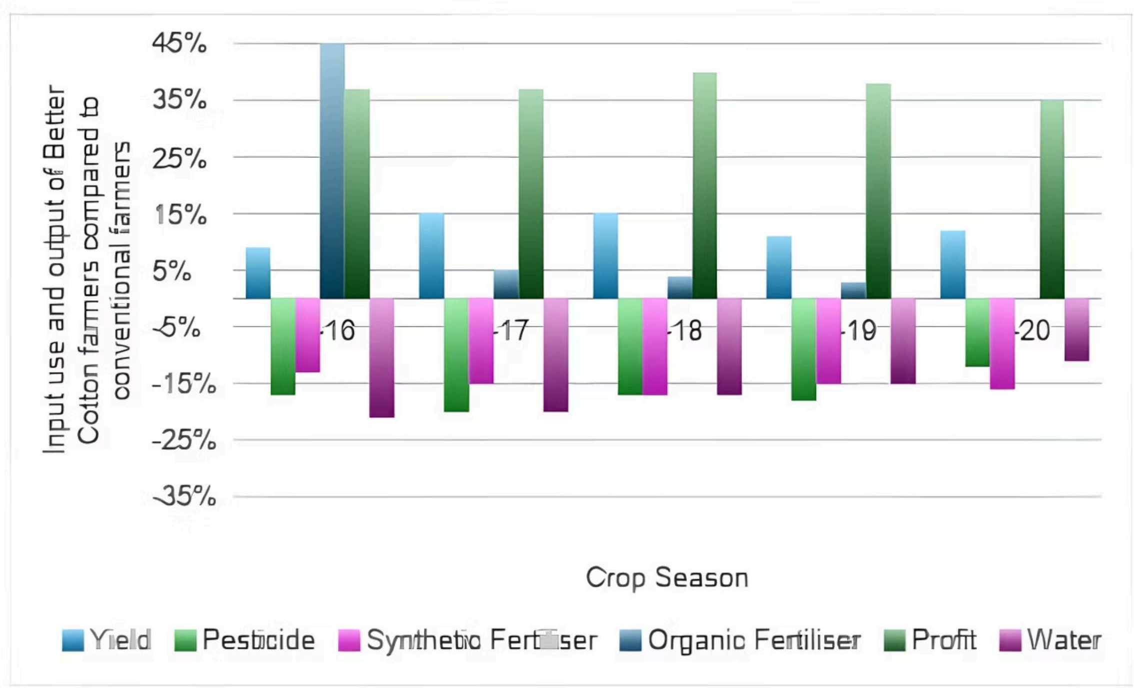



*Figure 3: Comparison of annual farm input and output data for Better Cotton farmers and conventional cotton farmers for selected indicators in percentage from 2015 to 2020.*

# Interactions (I) and Outcomes (O)

Within this SES, BCSS facilitates interactions to achieve sustainable outcomes. Firstly, Better Cotton and Program Partners (GS2) collaborate to create and disseminate knowledge systems to farmers via training workshops (GS3), enabling information sharing (I2).

Secondly, the assurance program (GS8) enforces principles and criteria (GS5), ensuring monitoring (I9) and evaluative activities (I10). For instance, if an indicator shows weak adoption, a continuous improvement plan is developed for the producer unit to address farmer knowledge gaps.

Thirdly, farmers and VSS officials (A1) regularly meet during training workshops or farm visits. These networking activities (I8) foster knowledge transfer (A7), reinforce principles and criteria (GS5), and facilitate monitoring (I9) by allowing farmers to consult experts.

Lastly, investment activities (I5) by the standard system drive the entire social-ecological system. Better Cotton provides technical and financial resources, including assessments (GS8). Farmers invest their time to build knowledge. Overall, these interactions among governance systems, actors, and resource systems lead to sustainable outcomes.

Figure 4 demonstrates that Better Cotton farmers consistently used fewer farm inputs, yet achieved better yield and profits compared to conventional cotton farmers. For example, in 2017-18, Better Cotton farmers had 15% higher yield and 40% higher profit. These outcomes stem from the second-tier variables previously identified, ensuring the SES functions systematically in focal situations, influencing farmer and worker decision-making and activities through program participation.

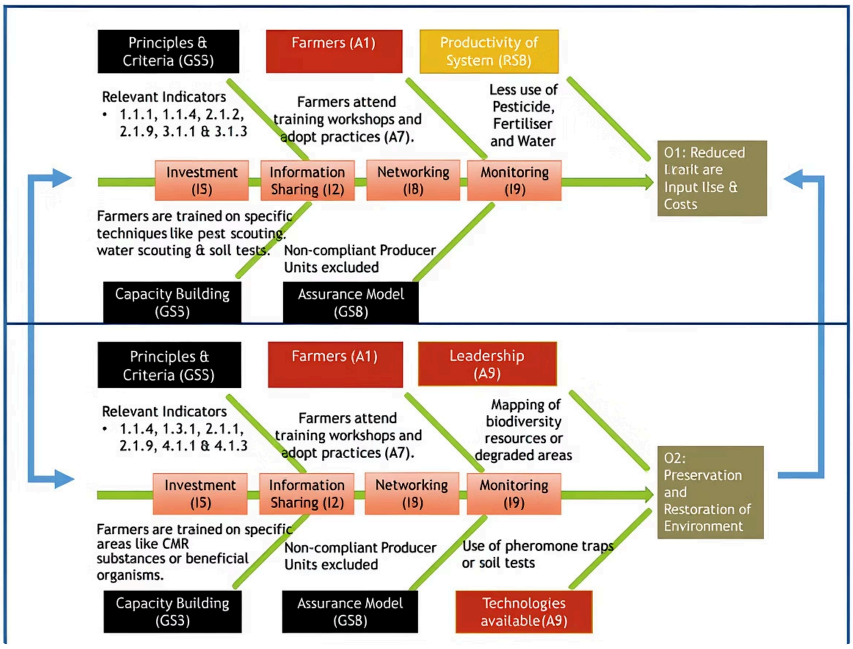



*Figure 4: Comparison of Better Cotton and conventional cotton farm performance metrics.*

The existing literature and available secondary data discussed in the earlier sections confirm that participation in Better Cotton program results in sustainable resource use. This premise is built on the outcomes from the SES facilitated by Better Cotton and can be broadly categorised into three different categories: social performance measures (O1), ecological performance measures (O2) and externalities to other SESs (O3). The findings of the study confirm the hypothesis that when farmers are faced with focal action situations, Better Cotton farmers respond differently as compared to conventional cotton farmers. This response by Better Cotton farmers is facilitated by various second-tier variables and their interactions as discussed in the previous section as well as illustrated in figure 4. The structure is inherently present only in the SES enabled by Better Cotton and is missing in the SES where conventional farmers operate. After few initial years, these practices form a cyclical phenomenon where low

# DISCUSSION

The study addresses the current gaps in literature through application of a systems approach to determine causation of better environmental and economic outcomes as well as sustainable resource use from adoption of VSS. The findings confirm the usefulness of systems theory in general and the SES approach in particular, to explain why some systems are sustainable as compared to others. These findings also elaborated that the interactions amongst the subsystems of a SES significantly influences sustainable management, specifically amongst cotton farmers in Pakistan.

According to the reviewed literature and to the best of the author's knowledge, this is the first application of social-ecological systems framework on sustainable cotton farming in Pakistan. Hence, comparison of results with research on similar cases is highly constrained. Nonetheless, the analysis of the results inform that the most influential first level subsystem in determining different outcomes is governance system as five out of twelve second-tier subsystem variables evaluated in the study belong to this group. Moreover, these variables related to governance system were the foundation stone for other second-tier variables under evaluation such as knowledge of SES (A7), technologies available (A9) and human-constructed facilities (RS4) that influenced the cotton farmers (A1). These results are consistent with the study conducted by Palomo & Hernandez-Flores (2019), which also acknowledged the importance of governance systems in ensuring sustainable resource use and facilitating interactions with other key variables. Additionally, the correlation between governance system and resource units observed in the study on fisheries by Leslie et al. (2014) is also evident in this case, as yield (RU5) was high for Better Cotton farmers.

Out of the 10 frequently occurring second-tier variables that influence self-organization in a SES (Ostrom, 2007), only five variables were helpful in explaining the differences amongst Better Cotton and conventional farmers. The remaining five variables were excluded for investigation during the selection phase as they were expected to be similar amongst both type of farmers. On the one hand, the notion of frequently occurring variables is confirmed as 50% of the variables were present in this case. Simultaneously however, this brings attention to other important second-tier variables which can be crucial to drive sustainability in the absence of self-organization activities (I7). These second-tier variables include human constructed facilities (RS4), network structure (GS3), operational choice rules (GS5), monitoring, and sanctioning rules (GS8) and technologies available (A9), which were crucial in the case of sustainable management facilitated by Better Cotton. Thus, in the design of private sustainability initiatives especially in countries with weak political governance system, consideration should be given to operational choice rules (GS5) and monitoring & sanctioning rules (GS8). This finding is consistent with the study on Taos valley irrigation system (Cox, 2014) which signifies the role of local governance systems in influencing the SES.

Principally, achievement of this sustainable SES in cotton farming depends on the adoption of practices by farmers amongst other factors. Therefore, participation of farmers in the program is a critical component. In absence of the financial incentives such as premium prices for Better Cotton, farmer’s willingness to participate in the program is solely driven by knowledge of SES (A7) and technology (A9). Hence, to keep the farmers engaged in the achievement of a sustainable SES these second-tier variables are worthy of substantial consideration.

During the mapping of this SES, it was observed that the direct linkage between farmers and Better Cotton was weak with no direct feedback channel. Since, the success of the program hinges on farmer support, hence it is essential to strengthen this link so that the farmers are directly connected to the strategy defined by Better Cotton. Two interactions –lobbying activities (I6) and deliberation process (I3) – though existed weakly but were not operationalized to their full extent. For instance, practices like stakeholder workshops and knowledge management were being regularly exercised but the policy level support from important stakeholders such as government agencies or textile mills association was found to be missing.

# CONCLUSION

The aim of this research was to explore why adoption of VSS in cotton farming leads to sustainable resource use as compared to conventional cotton farming in Pakistan. This study demonstrates that governance system facilitated by adoption of VSS played a dominant role in sustainable resource use, which in turn influenced several other variables and focal action situations. Using the systems theory and diagnostic SES framework, this study identified that the reason for better environmental and economic outcomes generated from adoption of VSS is explained by the presence of a different SES. The difference is mainly attributed to the additional second-tier variables especially under the two core subsystems (governance system and actors) and their interactions facilitated by the VSS. These findings imply that the voluntary standards can be useful in driving sustainability provided that they are cautiously designed to target the weak components in a pre-existing SES.

This study highlights the importance of governance systems and related second-tier variables in influencing farmer behaviour to achieve sustainable use of resources. VSS-based governance systems enabled knowledge transfer, adoption of technology and accountability which ultimately built the capacity of farmers to make informed decisions during critical focal action situations. Although, both type of farmers operated under the same socio-economic conditions and political settings, presence of the VSS differentiated the outcomes. This raises a critical question for the future studies to test and answer that whether market-based solutions can be successful in governing sustainable resource use especially in regions with weak local (such as private property rights) and community-based governance systems?

Additionally, role of actors in this SES was also found to be significant to drive sustainability. Though, the participation of farmers in the program was voluntary, nevertheless it was observed that there were some elements like knowledge systems and technology which influenced their participation. Thus, it is recommended not to be misled by the term “voluntary” sustainable standards as participation of the actors is subject to certain benefits which should be considered for the successful implementation of these standards.

By acknowledging the notion of complexity, this study goes beyond the usual investigation of identifying causation and complements linear evaluations by determining causation through identification of unique second-tier variables and constructing causal pathways amongst them. The study examined the combination of variables and interactions that made the difference in steering sustainable economic and environmental outcomes amongst cotton farmers in Pakistan. Thus, programs and policies aimed to ensure long term sustainability of agriculture systems in general and cotton production systems in particular, should prioritize improving governance capacity, engagement with farmers, setting up monitoring mechanisms and promoting knowledge transfer,

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# CONFLICTS OF INTEREST

The author declares a potential conflict of interest, as they have previously collaborated with the organisation discussed in the research article. However, the author affirms that the research findings and conclusions are based on objective analysis and are not influenced by past associations.

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# REFERENCES


Ahmad, S., Huifang, W., Akhtar, S., Imran, S., Yousaf, H., Wang, C., & Akhtar, M. S. (2021). Impact assessment of better management practices of cotton: A sociological study of Southern Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences, 58*(1). https://doi.org/10.21162/PAKJAS/21.227

Azizullah, A., Khattak, M. N. K., Richter, P., & Häder, D. (2011). Water pollution in Pakistan and its impact on public health – A review. *Environment International, 37*(2), 479-497. https://doi.org/10.1016/j.envint.2010.10.007

Berkes, F., Colding, J., & Folke, C. (2003). Introduction. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating Social Ecological Systems: Building Resilience for Complexity and Change* (pp. 1-31). Cambridge: Cambridge University Press.

Better Cotton. (2019). *Better Cotton Principles and Criteria V2.1*. https://bettercotton.org/wp-content/uploads/2019/05/Better-Cotton-Principles-Criteria-V2.1.pdf

Better Cotton. (2023, April 19). *Defining "Better": the Better Cotton Principles and Criteria*. https://bettercotton.org/what-we-do/defining-better-our-standard/

Better Cotton. (n.d.). *2020 Impact Report*. Retrieved July 9, 2023, from https://indd.adobe.com/view/7aaaa212-431c-4939-b753-fbf2d8993e47

Better Cotton. (n.d.a). *Farm Results 2016-17 Season*. Retrieved July 9, 2023, from https://bettercotton.org/wp-content/uploads/2018/11/BCI-Farmer-Results-2016-17_Communicating-Results.pdf

Better Cotton. (n.d.b). *Farm Results 2017-18 Season*. Retrieved July 9, 2023, from https://bettercotton.org/wp-content/uploads/2019/10/BCI-Farmer-Results_2017-18_Combined.pdf

Better Cotton. (n.d.c). *Farm Results 2018-19 Cotton Season*. Retrieved July 9, 2023, from https://bettercotton.org/wp-content/uploads/2021/08/BCI-Farmer-Results-2018-19_Overview.pdf

Better Cotton. (n.d.d). *Farm Results*. Retrieved July 9, 2023, from https://bettercotton.org/wp-content/uploads/2021/08/201516_Farm-tableV3.pdf

Biggs, R., Clements, H., de Vos, A., Folke, C., Manyani, A., Maciejewski, K., Lopez, B. M., Preiser, R., Selomane, O., & Schluter, M. (2022). What are social-ecological systems and social-ecological systems research? In R. Biggs, A. de Vos, R. Preiser, H. Clements, K. Maciejewski, & M. Schluter (Eds.), *The Routledge Handbook of Research Methods for Social Ecological Systems* (pp. 3-26). New York: Routledge.

Colding, J., & Barthel, S. (2019). Exploring the social-ecological systems discourse 20 years later. *Ecology and Society, 24*(1). https://doi.org/10.5751/es-10598-240102

Cox, M. (2014). Applying social ecological systems framework to the study of the Taos valley irrigation system. *Human Ecology, 42*, 311-324. https://doi.org/10.1007/s10745-014-9651-y

de Vos, A., Maciejewski, K., Bodin, O., Norstrom, A., Schluter, M. & Tengo, M. (2022). The practice and design of social-ecological systems research. In R. Biggs, A. de Vos, R. Preiser, H. Clements, K. Maciejewski, & M. Schluter (Eds.), *The Routledge Handbook of Research Methods for Social Ecological Systems* (pp. 47-63). New York: Routledge.

Fleischman, F., Ban, N. C., Evans, L., Epstein, G. S., García-López, G. A., & Villamayor-Tomas, S. (2014). Governing large-scale social-ecological systems: Lessons from five cases. *The International Journal of the Commons, 8*(2), 428. https://doi.org/10.18352/ijc.416

Food and Agriculture Organization of the United Nations. (2017). *What is Climate Smart Agriculture?* https://www.fao.org/documents/card/en/c/fd5f38a2-7c90-4f01-adf8-f68db81e6800

Food and Agriculture Organization of the United Nations. (2025). *FAOSTAT: Commodities by country rankings*. Retrieved July 4, 2025, from https://www.fao.org/faostat/en/#rankings/commodities_by_country

International Cotton Advisory Committee. (n.d.). *Data Portal* [Dataset]. Retrieved July 9, 2023, from https://icac.org/DataPortal/DataPortal?Units=Yeild&Year=2021/22%20proj

Jellema, S. F., Werner, M. D., Rasche, A., & Cornelissen, J. (2022). Questioning impact: A cross-disciplinary review of certification standards for sustainability. *Business & Society, 61*(5), 1042-1082. https://doi.org/10.1177/00076503211056332

Komives, K., & Jackson, A. S. (2014). Introduction to voluntary sustainability standard systems. In M., Schmidt, D., Giovannucci, D., Palekhov, & B., Hansmann (Eds.), *Natural Resource Management in Transition* (pp. 3-19). Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-642-35716-9_1

Lee, D. J. (2005). Agricultural sustainability and technology adoption: Issues and policies for developing countries. *American Journal of Agricultural Economics, 87*(5), 1325-1334. https://doi.org/10.1111/j.1467-8276.2005.00826.x

Leslie, H. M., Basurto, X., Nenadovic, M., Sievanen, L., Cavanaugh, K. C., Cota-Nieto, J. J., Erisman, B., Finkbeiner, E. M., Hinojosa-Arango, G., Moreno-Báez, M., Nagavarapu, S., Reddy, S. R., Sánchez-Rodríguez, A., Siegel, K. J., Ulibarria-Valenzuela, J. J., Weaver, A. L., & Aburto-Oropeza, O. (2015). Operationalizing the social-ecological systems framework to assess sustainability. *Proceedings of the National Academy of Sciences, 112*(19), 5979 - 5984. https://doi.org/10.1073/pnas.1414640112

Lund-Thomsen, P., Gallemore, C., Ghori, S., Riisgaard, L., & Singh, S. (2022). Compliance and cooperation in global value chains: The effects of the Better Cotton Initiative in Pakistan and India. *Ecological Economics, 193*, 107312. https://doi.org/10.1016/j.ecolecon.2021.107312

Marx, A., Depoorter, C., & Vanhaecht, R. (2022). Voluntary sustainability standards: State of the art and future research. *Standards, 2*(1), 14 - 31. https://doi.org/10.3390/standards2010002

McGinnis, M. D., & Ostrom, E. (2014). Social-ecological system framework: initial changes and continuing challenges. *Ecology and Society, 19*(2). http://www.jstor.org/stable/26269580

Memon, Q. U. A., Wagan, S. A., Chunyu, D., Shuangxi, X., Jingdong, L., & Damalas, C. A. (2019). Health problems from pesticide exposure and personal protective measures among women cotton workers in southern Pakistan. *Science of the Total Environment, 685*, 659 - 666. https://doi.org/10.1016/j.scitotenv.2019.05.173

Norgaard, R. B. (2008). Finding hope in the millennium ecosystem assessment. *Conservation Biology, 22*(4), 862 - 869. https://doi.org/10.1111/j.1523-1739.2008.00922.x

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences of the United States of America, 104*, 15181-15187. https://doi.org/10.1073/pnas.0702288104

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science, 325*(5939), 419 - 422. https://doi.org/10.1126/science.1172133

Palomo, L. & Hernandez-Flores, A. (2019). Application of the Ostrom framework in the analysis of a social-ecological system with multiple resources in a marine protected area. *PeerJ, 7*. https://doi.org/10.7717/peerj.7374.

Preiser, R., Biggs, R., de Vos., A., & Folke, C. (2018). Social-ecological systems as complex adaptive systems : organizing principles for advancing research methods and approaches. *Ecology and Society, 23*(4). https://doi.org/10.5751/ES-10558-230446

Rana, A. Q., Ejaz, A., & Shikoh, S. H. (2020). Cotton crop: A situational analysis of Pakistan (PACE Policy Working Paper). International Food Policy Research Institute. https://doi.org/10.2499/p15738coll2.133702

Redman, C. L., Grove, J. E., & Kuby, L. (2004). Integrating social science into the long-term ecological research (LTER) network: social dimensions of ecological change and ecological dimensions of social change. *Ecosystems, 7*(2). https://doi.org/10.1007/s10021-003-0215-z

Riisgaard, L., Lund-Thomsen, P., & Coe, N. M. (2020). Multistakeholder Initiatives in global production networks: naturalizing specific understandings of sustainability through the Better Cotton Initiative. *Global Networks, 20*(2), 211-236. https://doi.org/10.1111/glob.12251

Shafiq, M., & Rehman, T. (2000). The extent of resource use inefficiencies in cotton production in Pakistan's Punjab: an application of Data Envelopment Analysis. *Agricultural Economics, 22*(3), 321 - 330. https://doi.org/10.1111/j.1574-0862.2000.tb00078.x

Wei, W., Mushtaq, Z., Ikram, A., Faisal, M., Wanli, Z., & Ahmad, M. (2020). Estimating the Economic Viability of Cotton Growers in Punjab Province, Pakistan. *SAGE Open, 10*(2), 215824402092931. https://doi.org/10.1177/2158244020929310

Yasin, M., Bakhsh, K., Ali, R., & Hussain, S. (2021). Impact of better cotton initiative on health cost and pesticide exposure of women cotton pickers in Punjab, Pakistan. *Environmental Science and Pollution Research, 28*(2), 2074 - 2081. https://doi.org/10.1007/s11356-020-10582-w

Yohannes, H. (2015). A review on relationship between climate change and agriculture. *Journal of Earth Science & Climatic Change, 7*(2). https://doi.org/10.4172/2157-7617.1000335.

Zulfiqar, F., & Thapa, G. B. (2016). Is 'Better cotton' better than conventional cotton in terms of input use efficiency and financial performance? *Land Use Policy, 52*, 136 - 143. https://doi.org/10.1016/j.landusepol.2015.12.013

Zulfiquar, S., Yasin, M., Bakhsh, K., Ali, R., Samiullah, & Munir, S. A. (2019). Environmental and economic impacts of better cotton: a panel data analysis. *Environmental Science and Pollution Research, 26*(18), 18113 - 18123. https://doi.org/10.1007/s11356-019-05109-x

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