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## Cotton Production Trends in Pakistan: An Integrative Review

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### ABSTRACT

Cotton is regarded as a cash crop in Pakistan and the country is ranked 5<sup>th</sup> in terms of production and 5<sup>th</sup> importer in the world as well. Cotton production in Pakistan is under huge pressure and it's continuously declining over the period. This review aimed at exploring the different reasons for the cotton production decline. This review comprises two major sections. In the first section, percentage change in area, production and yield of cotton in Punjab, Sindh and Pakistan is calculated from 1990-2020. This analysis indicated a drastic decline in area, production and the average yield of cotton in the country. In the second section, previously published literature is consolidated to explore the different constraints causing change in the area, production and average yield of cotton. The major constraints causing the sweeping decline included environmental constraints, climate change, water-related constraints, agronomic constraints and socio-economic related constraints. This study concludes that cotton crop decline is not in favor of cotton associated industry, farming groups and national economy and it is much needed to bring reforms for the revival of cotton crop. This study urges further research on exploring the reasons that are compelling farmers to reduce the cotton area, quitting cotton cultivation or switching to other crops.

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### INTRODUCTION

Pakistan is regarded as 5<sup>th</sup> largest cotton producer after China, India, United States and Brazil and as well as 5<sup>th</sup> leading importer of the cotton in the world after China, Bangladesh, Vietnam and Turkey. In Pakistan, cotton enjoys the status of industrial cash crop and therefore is helpful in supporting the rural livelihoods and national economy as well. Cotton is the chief source of input to textile sector, that is the largest industrial sector of Pakistan absorbing 40 % of total labor force (GOP, 2019). Cotton and related textile products not only earn foreign exchange but are also the protruding source of livelihood for the millions of farmers. Around 1.6 million farmers in Pakistan were cotton growers cultivating cotton on 15 % of total cropped area in Pakistan (USDA, 2019). Cotton has a tremendous role in progress of rural sector

in Pakistan. Because of universal linkages, cotton has a dominating scope towards agricultural development and posing significant impacts on the overall economic development in Pakistan. During 2018-19, cotton added 4.5 % to agriculture value addition (GOP, 2019). Cotton is promising source of fiber around the world and cottonseed offers edible oil to meet the 64 % of the nation's demand for edible oil (Abid *et al.*, 2011). In addition, the cotton seed byproduct commonly known as seed cake is considered as valuable animals' feed. Cotton, being the source of livelihood and reflective contributor to the national economy, had emerged as a topic of national interest as number of researchers of national and international cadre have a keen interest on researching cotton and future developments in cotton sector. For instance, Ashraf *et al.* (2018) forecasted the

area under cotton cultivation, production and yield in Punjab province of Pakistan by using the data from 1990-2017. Their results indicated that area under cotton cultivation and yield of cotton decreased gradually. Whereas this study further highlighted that average yield will continue to decline in Punjab till 2025. There are few more studies on cotton crop such as Ali *et al.* (2013); Ali *et al.* (2015); Tunio *et al.* (2016); Shuli *et al.* (2018) provides important insight into current and future situation of cotton crop in Punjab province in particular. These studies had an agreement that the cotton crop is facing a decline and synergistic work is much needed for its revival.

Plenty of studies focusing on current and future trends of cotton have been conducted in Pakistan. Most of these studies were based on time series data and some were based on primary data collected from the specific study area and small sample size. Despite of conductance of these studies, hardly an in-depth scenario emerged in order to consolidate the ground reasons behind the cotton crop failure in Pakistan. Thus, there was a need for an extensive literature review to underpin and consolidate the different factors contributing to the failure of cotton crop. This review is conducted to bridge the research gap and aims to give readers a consolidated overview on different factors impeding the cotton crop production. This integrative review comprises of major two sections. The first section is to calculate the change in area, production and yield of the cotton in Punjab province, Sindh province and Pakistan, respectively. The second part is based on the critical examination of the literature review to explore the reasons behind this change in area, production and average yield. Environmental, soil fertility, salinity, waterlogging, climate change, agronomic factors, water management related and socio-economic related constraints are critically examined to end up with the conclusions.

#### **Change in Area, production and Yield of Cotton crop**

In this section data regarding area, production and yield of cotton in Punjab, Sindh and Pakistan were collected from different sources like Pakistan Bureau of Statistics from 1990 to 2020. Considering the data, percentage change in an area, production and yield of cotton was calculated. The data in this regard are tabulated in

Tables 1, 2 and 3.

#### **Change in area of cotton crop**

Table 1. indicates that from 1990-2005 the cotton area observed a continuous increase in Punjab province and in 2005 cotton cultivation was second highest at 2518 000 hectares after reaching at 2526 000 hectares during 2002. After 2005, the area under cotton cultivation continues to fall drastically showing a significant change. From the year 2016-17 to 2019-20 the change in areas was negative implying a major change in areas under cotton cultivation. In those areas, cotton was started to be replaced by alternate crops like sugarcane and maize in the Punjab province. As compared to Punjab, there was a minimum change in area under cotton cultivation in Sindh. However, as for as Pakistan is concerned, change in area of cotton cultivation is negative from the year 2016-17 to 2019-20. This confirms that area under cotton cultivation in the Punjab and Pakistan is decreasing gradually.

#### **Change in production of cotton crop**

Table 2. shows that from the year 1990 to 2020, the production of cotton in Punjab showed negative growth. This implies the obtained production was less than the potential and set target. From 2015-16, cotton crop in Punjab province witnessed a dominating drastic decline in production. It might be said that with the reduction in area under cultivation the production was also decreased. The Sindh province showed promising improvement in production of cotton. Across the Pakistan, production faced a decline as well.

#### **Change in average yield of cotton crop**

Table 3. shows that Punjab province observed a more decline in average yield of cotton as compared to Sindh province where average yield was higher. In Punjab province, for most of the years the change in average yield was negative. Especially from the year 2015, the change in yield was negative indicating a serious decline. During 2015, the average yield in Punjab was recorded at 481 Kg/hectare whereas in Sindh average yield was recorded on 952 kg/hectare in the same year. As for as national average was concerned, 581 Kg/hectare was recorded in 2015. Afterwards, a fluctuation can be observed in national average yield of cotton.

Table 1. Change in cotton area under cultivation in Punjab, Sindh and Pakistan from 1990-2020.

Year	Punjab province		Sindh province		Pakistan	
	Area	% Change	Area	% Change	Area	% Change
1990-1991	2124	-	537	-	2662	-
1991-1992	2287	7.67	548	2.05	2836	6.54
1992-1993	2438	14.78	397	-26.07	2835	6.50
1993-1994	2249	5.89	555	3.35	2804	5.33
1994-1995	2244	5.65	406	-24.39	2653	-0.34
1995-1996	2463	15.96	529	-1.49	2997	12.58
1996-1997	2540	19.59	601	11.92	3148	18.26
1997-1998	2348	10.55	600	11.73	-	0.00
1998-1999	2283	7.49	630	17.32	-	0.00
1999-2000	2329	9.65	634	18.06	2983	12.06
2000-2001	2386	12.34	524	-2.42	2927	9.95
2001-2002	2526	18.93	547	1.86	3115	17.02
2002-2003	2208	3.95	543	1.12	2794	4.96
2003-2004	2387	12.38	561	4.47	2989	12.28
2004-2005	2518	18.55	635	18.25	3192	19.91
2005-2006	2426	14.22	637	18.62	3103	16.57
2006-2007	2463	15.96	570	6.15	3075	15.51
2007-2008	2425	14.17	607	13.04	3054	14.73
2008-2009	2224	4.71	562	4.66	2821	5.97
2009-2010	2436	14.69	635	18.25	3106	16.68
2010-2011	2201	3.63	457	-14.90	2689	1.01
2011-2012	2534	19.30	259	-51.77	2835	6.50
2012-2013	2308	8.66	530	-1.30	2878	8.11
2013-2014	2199	3.53	568	5.77	2806	5.41
2014-2015	2323	9.37	596	10.99	2963	11.31
2015-2016	2243	5.60	621	15.64	2902	9.02
2016-2017	1815	-14.55	637	18.62	2489	-6.50
2017-2018	2053	-3.34	612	13.97	2701	1.47
2018-2019	1888	-11.11	448	-16.57	2373	-10.86
2019-2020*	1889	-11.06	598	11.36	2526	-5.11

Table 2. Change in production of cotton in Punjab, Sindh and Pakistan during from 1990-2020.

Year	Punjab province		Sindh province		Pakistan	
	Production	% Change	Production	% Change	Production	% Change
1990-1991	8501		1125		9627	33.2
1991-1992	11417	34.3	1403	24.7	12822	-6.0
1992-1993	8237	-3.1	816	-27.5	9054	-16.5
1993-1994	6523	-23.3	1517	34.8	8041	-9.7
1994-1995	7410	-12.8	1282	14.0	8697	10.0

1995-1996	8720	2.6	1861	65.4	10594	-2.6
1996-1997	7103	-16.4	2250	100.0	9374	-4.9
1997-1998	6817	-19.8	2335	107.6	9152	-9.0
1998-1999	6628	-22.0	2134	89.7	8762	16.8
1999-2000	8804	3.6	2377	111.3	11240	11.5
2000-2001	8540	0.5	2141	90.3	10731	10.2
2001-2002	8046	-5.4	2443	117.2	10612	6.1
2002-2003	7664	-9.8	2413	114.5	10212	4.4
2003-2004	7702	-9.4	2243	99.4	10048	48.2
2004-2005	11147	31.1	3017	168.2	14263	35.2
2005-2006	10268	20.8	2648	135.4	13019	33.5
2006-2007	10350	21.8	2398	113.2	12856	21.1
2007-2008	9062	6.6	2536	125.4	11655	22.8
2008-2009	8751	2.9	2978	164.7	11819	34.1
2009-2010	8552	0.6	4271	279.6	12914	19.0
2010-2011	7854	-7.6	3537	214.4	11460	41.2
2011-2012	11129	30.9	2357	109.5	13595	35.3
2012-2013	9526	12.1	3400	202.2	13030	32.6
2013-2014	9145	7.6	3523	213.2	12768	45.0
2014-2015	10277	20.9	3573	217.6	13960	3.0
2015-2016	6343	-25.4	3476	209.0	9918	10.8
2016-2017	6978	-17.9	3597	219.7	10671	24.1
2017-2018	8077	-5.0	3776	235.6	11946	2.4
2018-2019	6826	-19.7	2938	161.2	9861	-4.7
2019-2020*	6336	-25.5	2746	144.1	9178	33.2

Table 3. Change in average yield of cotton in Punjab, Sindh and Pakistan from 1990-2020.

Year	Punjab province		Sindh province		Pakistan	
	Yield	% Change	Yield	% Change	Yield	% Change
1990-91	681		356		615	
1991-92	849	24.67	435	22.2	769	25.0
1992-93	574	-15.71	349	-2.0	543	-11.7
1993-94	493	-27.61	465	30.6	488	-20.7
1994-95	562	-17.47	537	50.8	558	-9.3
1995-96	602	-11.60	598	68.0	601	-2.3
1996-97	476	-30.10	636	78.7	506	-17.7
1997-98	494	-27.46	662	86.0	-	
1998-99	494	-27.46	576	61.8	-	
1999-2000	643	-5.58	637	78.9	641	4.2
2000-2001	608	-10.72	695	95.2	624	1.5
2001-2002	541	-20.56	759	113.2	579	-5.9
2002-2003	590	-13.36	755	112.1	622	1.1

2003-2004	549	-19.38	680	91.0	572	-7.0
2004-2005	753	10.57	808	127.0	760	23.6
2005-2006	720	5.73	707	98.6	714	16.1
2006-2007	714	4.85	715	100.8	711	15.6
2007-2008	635	-6.75	710	99.4	649	5.5
2008-2009	669	-1.76	901	153.1	713	15.9
2009-2010	597	-12.33	1143	221.1	713	15.9
2010-2011	607	-10.87	1316	269.7	724	17.7
2011-2012	747	9.69	1547	334.6	815	32.5
2012-2013	702	3.08	1091	206.5	769	25.0
2013-2014	707	3.82	1054	196.1	774	25.9
2014-2015	752	10.43	1019	186.2	802	30.4
2015-2016	481	-29.37	952	167.4	581	-5.5
2016-2017	654	-3.96	960	169.7	729	18.5
2017-2018	669	-1.76	1049	194.7	752	22.3
2018-2019	615	-9.69	1115	213.2	706	14.8
2019-2020*	570	-16.30	780	119.1	617	0.3

### Factors behind the change in area, production and Yield of the cotton in Pakistan

In this section different factors contributing to change in area, production and yield of cotton in Punjab, Sindh and Pakistan are explored. Scholarly articles were critically examined to consolidate those challenges which are regarded as the key impediments in lowering the production of cotton. Plenty of research studies have been conducted to unveil different challenges thus, the literature was further grouped into different sections such as (i) environmental constraints (ii) water management constraints (iii) agronomic constraints (iv), and socio-economic constraints. Under the environmental constraints, soil salinity and waterlogging, soil fertility depletion and climatic impacts are discussed.

#### Environmental constraints

##### Soil Salinity and waterlogging

Soil salinity refers to the state, when excessive salts accumulate inside the soil and adversely harm the physical, chemical and biological properties of the soil. Around the world, 831Mha was reported as salt affected. Of this total salt-affected area, 397 Mha was saline and 434 Mha was sodic (Hasanuzzaman *et al.*, 2014). For Pakistan, 4.5Mha area was regarded salt affected (Aslam, 2016). Pakistan is an agrarian country where tube well irrigation is seen as more accessible. Due to saline ground water and use of poor-quality tube well water for

irrigation purpose, the level of salinity surged (Qureshi *et al.*, 2008). Findings were endorsed by the report of Pakistan Council of Science and Technology (2003), as the report found 70 percent of the tube wells of Indus basin impelled sodic or saline-sodic water. The total saline or saline sodic area reached to 2.3 Mha. This intense salinity had adverse impacts on growth of plants. Shahzad *et al.* (2019) confined that the escalated level of salinity accompanying the high electrical conductivity (EC) caused dehydration in plant cells, diminished the plant growth and sometimes the death of plants occurred particular those which were considerably less tolerant. Salinity has direct adverse impacts on cotton plant growth process because of its moderate tolerance to salinity. The threshold level of cotton regarding salt tolerance was 7.7 dSm<sup>-1</sup> (Zhang *et al.*, 2013). Soil salinity inversely influence the cotton yield, growth and fiber quality and pertaining to salt stress delayed flowering, less fruiting, fruit shedding and lessening in boll weight could occur eventually (Sharif *et al.*, 2019). Salinity caused 50-90% reduction in cotton yield (Ahmad *et al.*, 2002; Khorsandi and Anaghali, 2009). Cotton crop has poor waterlogging tolerance as well. Waterlogging can potentially reduce the growth and development process of the cotton and its quality, physiological metabolism and the yield at the end (Ashraf *et al.*, 2011; Dodd *et al.*, 2013). Flowering, seedling,

squaring and boll-opening stages were influenced negatively by the waterlogging whereas the yield reduced inclusively. Waterlogging further negatively influenced the quality attributes of the cotton such as uniformity index, elongation, micronaire value, upper-half mean length yellowness and lint quality (Wang, Chen, *et al.*, 2017). According to the findings of Zhang *et al.* (2021), waterlogging conditions reduced the oxygen level in soil, handicap the growth and development stages and led the crop to failure at the end by impairing and blocking the nutrient uptake (Milroy *et al.*, 2009; Dodd *et al.*, 2013; Guang *et al.*, 2012; Najeeb *et al.*, 2015).

### **Soil fertility depletion**

Adequate nutrient-use efficiency is much needed for the plant to grow well. Thus, availability of required nutrients in the root zone of plant is obligatory and helpful for the plant to stand responsive (Havlin and Heiniger, 2020). In case of reduction of soil fertility, the production of the particular crop may go down. Hamid and Ahmad (2001) reported a low fertilizer use efficiency which reduced the soil fertility level further causing a drastic decline in crop production. They further identified that cultivation of crops one after the other depleted the nutrition from soil. Moreover, injudicious and imbalance use of fertilizer as being practices across the Pakistan further depleted the nutritional vigor of land. Solaiman and Ahmed (2006) reported an excessive application of Nitrogen (N) quicker than for Phosphorous (P) or Potassium (K) as P & K are often regarded as an expensive import. Pakistani soils are lacking in all three N, P & K macro-nutrients. Being a less expensive use of N was high and it has increased the yields but yet the yield gap exists because of limited addition of P & K (Solaiman and Ahmed, 2006). Pakistan was ranked fourth in terms of N use but low average yields of the crops (Shahzad *et al.*, 2019).

Apart from these three macro-elements, almost two-third of agricultural soils in Pakistan were deficient in Zn (Rashid, 2005). A fertile soil and balanced availability of macro and micro-nutrients is obligatory for the cotton production and certain quality. Wakeel and Ishfaq (2016) found that majority of the soils (67%) in cotton areas of Pakistan were deficient in P whereas farmers in the cotton growing areas were more inclined towards use of N & P whereas only 16% of farmers had the use of K fertilizer. Cotton growers had inadequate awareness about the balanced use of fertilizers for the cotton (Mahmood *et al.*, 2017). Cotton is considered highly inefficient in nutrients utilization in producing seed

cotton yields (Malik, 1998). Thus, it is much needed for the farmers to sustain the soil fertility and ensure availability of required balanced fertilizers in root zone.

### **Climatic impacts**

Cotton crop has ecstatic resilience level to high temperature and drought conditions because of its vertical tap root system. Cotton is perennial shrub that necessitates warm days and night for optimal growth and development. Boyer (1982) had reported that cotton was sensitive to fluctuating temperature and readiness of water at the flowering and boll formation stage. Pakistan is turning water scarce which may originate the delay in land preparation and delayed sowing of cotton which further lowered the number of bolls, dry matter, fiber quality and cottonseed yield (Arshad *et al.*, 2021; Wang, Deng, *et al.*, 2017; Wang *et al.*, 2014). Abbas (2020) was of the view that increasing temperature in Pakistan was not increasing the production of cotton. Sowing of cotton, emergence, flowering and maturity stages were inversely correlated with the temperature. This implies that with the increase in temperature the yield of cotton was not promising.

There is more evidence that has reported an adverse impact of climate change on cotton crops. Iqbal *et al.* (2017) and Amin *et al.* (2018) agreed that cotton production declined due to climate change and cotton production management techniques appeared unproductive in wake of climate change (Zulfiqar and Thapa, 2018; Zulfiqar *et al.*, 2017). According to the findings of Zhang *et al.* (2008) and Amin *et al.* (2018), owing to indeterminate growth patterns of cotton, the crop attains a composite set of fruits, which are regarded as extremely vulnerable to the erratic weather and eventually ending to production discrepancy.

### **Water management constraints**

Water is a key element for the optimum growth of the cotton (Sahito *et al.*, 2015). Cotton requires balanced irrigation to mature whereas excessive of inadequate irrigations can lower its production. Some studies such as Patel *et al.* (1995), El-Shahawy and Abd-El-Malik (2005) and Abd-El-Malak and Radwan (1998) found that growth and yield component of cotton were significantly influenced by the irrigation frequencies. The findings of the Sahito *et al.* (2015) had the same view that growth attributes and yield components of cotton were significantly associated with the frequency of irrigations. Adequate application of irrigation ensured enhanced boll formation and development (Ertek and Kanber, 2003).

This implies that over irrigation in the cotton should be avoided (Abd-El-Malak and Radwan, 1998; Rajput, 2006; Enciso *et al.*, 2003). These studies concluded that moderate level of water is adequate for the cotton whereas excessive application of water can hinder the growth parameters. Some more studies such as Makhdum (2011) and Nazli (2012) have reported that excessive irrigation applied by the farmers had negative impacts on the production of cotton in Pakistan. This excessive usage of water in cotton crop, excessive use of groundwater as most of the farmers use tube wells and deterioration of natural resources were not only influencing the cotton yield but also pressurizing the sustainability of the system (Watto and Mugeru, 2015; Zulfiqar and Thapa, 2018; Zhu *et al.*, 2013; Watto, 2013).

#### **Agronomic constraints**

Agronomic aspects are regarded important in the increased production of cotton. In case agronomic aspects are not understood well the production of cotton crop may face a drastic decline for many reasons. According to Ali *et al.* (2009) of the many agronomic aspects responsible for the low production of cotton, planting technique was the key. It helps the plant to grow well and offers a good crop stand and eventually ensuring the good production. Farmers in Pakistan are usually found practicing traditional methods of sowing cotton which earned them poor production. On contrary, the modern techniques could have given them the higher level of production. Boquet (2005) found that wider plant spacing in cotton crop gave an increase in number of bolls, increased boll weight and escalated lint yield. Whereas, in low plant density, Stephenson IV *et al.* (2011) found an optimum plant height, a greater number of monopodial and sympodial branches and an increase in number of bolls. Shahzad *et al.* (2019) recommended the sowing of cotton on 25 cm apart rows for the best fiber quality and more production.

Apart from the sowing technique, cotton production was influenced by the incidence of pests, outbreak of diseases, weeds infestation, soil salinity, degradation of soil, and development of herbicides resistance in weeds were other agronomic reasons behind the low production of cotton (Mollae *et al.*, 2019). In another study, Ali *et al.* (2019) have reported that insects pests attack was the main suppressor of cotton production and application of insecticides was the only way possible to control the insects' pests. They further explored that, non-availability of quality seed, diseases outbreak, heat and drought

stress and unpredictable market prices were strong reasons behind poor production of cotton. Poor quality seed created germination problems and the plant coming out of soil remain weak and stays susceptible to number of insects pests and diseases; ultimately leading to a hilarious crop failure (Atique ur *et al.*, 2020). Fusarium wilt, boll rot, bacterial blight, leaf curl disease and Alternaria leaf spot were the common diseases contributing extensively in crop failure (Chohan *et al.*, 2020). Forrester (2009) arbitrated that Pakistan lacks in professional seed industry, which is a mammoth factor hindering the production of cotton in Pakistan. Saeed *et al.* (2020) described that majority of seed growers in Pakistan didn't receive any formal training and vast majority didn't have the information regarding the safe storage and handling of the seed. While use substandard quality seed, not only the germination is influenced, but the cost of the production was also increased. Balaji and Kumar (2016) specifically highlighted that cost of production for the farmers was increased which cut their net profits. The report of Government of Pakistan (2019) reported the same findings that due to increased cost the benefits of farmers were compromised. In a study conducted by Raghavan (2008), he found that rise in input costs followed by erratic marketing and inadequate source for livelihoods hindered the cotton productivities.

#### **Socio-Economic constraints**

Socio-economic attributes of the farmers are augmented vital in the process of technological upscaling (Ahmad *et al.*, 2021). Socio-economic conditions of the farmers had significant association with the cotton crop upscaling (Hashmi *et al.*, 2016). They found that the size of the farm was statistically significant with the cotton crop production. In Pakistan, 1.6 million farmers were cotton growers. Whereas, 81% farmers are small landholders bearing average land less than 5.7 hectares (USDA, 2019). Contrary, the large farmers in Pakistan were reported as more influential and had more and easy access to the resources and the modern technology as reported by Kousar *et al.* (2017). On other hand, the small farmers had limited access to the services and resources they have were limited as well. This is worth mentioning that farmers decisions were associated with the access to resources, extension services (Nyairo *et al.*, 2021), inputs availability, government support and affordability (USDA, 2019). Thus, the small farmers were unable to make decisions much needed to improve the cotton productivity. Non-availability of required information,

high prices of inputs like pesticides, soil reclamation materials, organic manures, and poor technical knowledge aggravated the constraints and influenced the cotton production Gohil (2016). In another study, Raghavan (2008) rising input costs, sluggish marketing system and lack of sources to support livelihoods were barriers in wake of cotton production. Pertaining to many plights, farmers were ineffective in getting targeted yield of cotton. Financial limitations, exertion in accessing the credit, access to extension advisory services and inadequate level of formal education were factors suppressing the cotton yield (Wei *et al.*, 2020). Saeed *et al.* (2020) found that farmers had lack of information regarding agricultural inputs (Hassan *et al.*, 2021) and their use hindered farmers to prepare quality seed for the cotton crop. Number of research studies such as Makhdum (2011), Watto and Mugeru (2015) and Zulfiqar and Thapa (2016) have reported that majority of the farming masses in Pakistan are still practicing traditional agriculture. Farmers are also producing cotton production through traditional production practices (using excessive inputs, high dose of fertilizers and excessive application of water for irrigation). Consequently, the cost of production has increased excessively, and resources use efficiency remained very low (Makhdum, 2011; Watto and Mugeru, 2015; Zulfiqar *et al.*, 2017).

### CONCLUSION AND RECOMMENDATIONS

The economic value of the cotton crop for Pakistan is momentous and to facilitate the cotton led industry and the livelihoods of the farmers, the emergent need is to expedite the cotton production. The area, production and yield of the cotton in Punjab province and Pakistan is gradually changing inversely. The area has started to decline continuously and production is facing the same decline in Punjab province particularly. The average yield in the Punjab province has drastically declined. Whereas, In Pakistan, the area, production and yield are declining a well. This implies that Pakistan may become cotton scarce and dependence on imports will increase to run textile sector. From 2015, the change in area, production and yield declined more severely. Environmental constraints especially climatic changes had more adverse impacts on the cotton production. However, the abrupt decrease in area under cotton cultivation turned the situation perplexed. The decline in production and yield of cotton can be associated with different agronomic, water

related, environmental and socio-economic related constraints. The change in area is yet required to be explored that what reasons are behind causing the decline in area under cultivation. Possibility exists that pertaining to numerous constraints farmers have quit cotton cultivation or switched to other crops. This is suggested that further studies are required to critically examine the reasons of change in area under cotton cultivations. Moreover, the reasons should be explored that why farmers have quit cotton cultivation and what factors are compelling farmers to switch to other crops.

### CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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