COUNTRY REPORT OF PAKISTAN
FOR
INTERNATIONAL COTTON ADVISORY COMMITTEE

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1. INTRODUCTION

Cotton is an important cash crop and is primary source of raw material for the textile industry of Pakistan. It contributes 0.8% to GDP and 4.1% to total value addition in agriculture sector. Pakistan is the fifth largest cotton producer in the world after India, China, USA and Brazil. Pakistan's share in the world cotton production in 2019-20 was 6.0 percent. Pakistan is 3rd largest consumer of cotton in the world, 3rd largest yarn producer, 2nd largest yarn exporter and 3rd largest cloth exporter.

Table-1: Cotton Area, Production & Consumption of Pakistan

Year	Area (000 hectares)	Production (000 Metric tons)	Yield (kg per hectare)	Consumption (000 Metric tons)
2014-15	2958	2373	802	2465
2015-16	2902	1686	581	2147
2016-17	2489	1814	729	2220
2017-18	2700	2030	752	2507
2018-19	2373	1676	706	2360
2019-20	2527	1560	617	2204

Source: Pakistan Central Cotton Committee

Table-2: Export, Import & Stock of Raw Cotton. **(000 Metric Tons)**

Years	Exports	Imports	Stocks	
			Carry-over	Ending
2014-15	95	168	119	93
2015-16	49	417	93	0
2016-17	25	506	0	75
2017-18	35	599	75	162
2018-19	13	415	162	185
2019-20*	13	472	185	331

Source: Pakistan Bureau of Statistics, Government of Pakistan

2. Cotton Research Setup in Pakistan

In Pakistan, research on cotton has been given prime importance and a number of organizations are conducting research on various aspects of cotton. Main organizations are:

- Pakistan Central Cotton Committee (PCCC).
- Centre of Excellence in Molecular Biology (CEMB) Punjab University Lahore.
- National Institute of Biotechnology & Genetic Engineering (NIBGE) Faisalabad.
- Nuclear Institute of Agriculture & Biology (NIAB), Pakistan Atomic Energy Commission, Faisalabad.
- Ayub Agricultural Research Institute, Faisalabad.
- Agricultural University Peshawar.
- Nuclear Institute of Agriculture (NIA) Tando Jam, Sindh.
- Department of Agriculture Research, Sindh.
- Sindh Agriculture University Tando Jam.
- Islamia University Bahawalpur.
- Mohammad Nawaz Shareef University of Agriculture, Multan.
- Pakistan Agricultural Research Council (PARC), Islamabad.
- Agriculture Policy Institute, Islamabad.
- Multinational & Private Sector Organizations.

To provide trained human resource to research organizations, six public sector agriculture universities and eight agriculture colleges offer basic and advance courses in agriculture and cotton. In addition, universities with strong biological sciences divisions help in training scientists on various aspects of cotton. The National Textile University and other engineering universities are producing textile engineers for the cotton value chain. These educational and degree awarding institutions have developed linkages with top ranking universities and schools across the globe to be the part of international research teams involved in cotton research.

3. Cotton Breeding Program in Pakistan

a) Seed Cotton Yield and Fiber Quality:

The cotton breeding program in Pakistan strives to develop varieties with high yield potential without compromising on fiber quality parameters. The PCCC in collaboration with Seed Councils has developed minimum fiber quality standards which are given prime importance throughout the breeding and variety approval processes.

The fiber quality parameters enforced by Govt. of Pakistan are:

- Fiber length more than 28mm.
- Lint percentage more than 37.5 and above.
- Fineness 3.8 - 4.9 ug/inch.
- Fiber strength 92 and above (tppsi).
- Uniformity ratio not less than 48%.
- Fiber maturity 80%.

b) Drought Tolerance:

Because of irregular rains and climate change, water reservoirs are not fully replenished to provide sufficient water for cotton and other crops. This shortage of irrigation water in Pakistan has created a demand for drought resistant/tolerant varieties using upland cotton as well as wild *Gossypium* species which are perennial xerophytes shrubs indigenous to desert areas. The latter requires less water and this characteristic is being transferred to cultivated American types of cotton varieties.

c) Heat Tolerance:

The cotton growing areas in Pakistan experience high temperatures (over 45^{o} C). High temperatures become harsh for cotton crop in summer season as a consequence of which flower and fruit shedding results reflect in severe yield losses. To avoid this phenomenon, heat tolerant varieties are being developed.

d) Insects and Diseases Resistance:

The major disease in Pakistan is Pink Bollworm and Cotton Leaf Curl Virus (Burewala strain of cotton virus) which is a serious threat to the economy of Pakistan. Efforts are being made to develop virus resistant genotypes by transferring disease resistant genes from wild species into upland cotton varieties. Scientists are also working to incorporate some morphological traits, like pubescence which could help in non-preference of insects.

e) Testing and Approval of a Variety:

The homozygous selected material (strains) is tested in micro Varietal and Provincial Coordinated Cotton Trial (PCCT) then passed through National Coordinated Varietal Trial (NCVT) to be approved as a variety.

Table-3: Year – Wise List of Varieties Evolved in Pakistan and Fiber Characteristics

No.	Variety	Year of Release	Lint %	Staple length (mm)	Micronaire (ug inch-1)	Strength (tppsi)
1	CRIS-585	2020	39.6	28.6	-	31.2
2	CRIS-543	2020	40.5	28.3	-	30.1
3	BT.CIM-343	2019	40.3	31.1	4.3	95.5
4	BT.CIM-663	2019	38.8	28.8	4.4	103.7
5	CIM-610	2018	40.2	28.8	4.3	101.9
6	BT.CIM-632	2018	41.6	28.8	4.3	100.4
7	CRIS-533	2017	40.5	28.8	4.0	97.8
8	CRIS-510	2017	39.0	28.2	4.0	92.8
9	BT CRIS-508	2017	40.5	28.7	4.7	99.4
10	CIM-598	2017	40.0	29.5	4.6	96.0
11	CYTO-179	2017	40.2	28.2	4.2	107.6
12	SLH-8*	2016	39.0	29.0	4.6	-
13	CIM-620	2016	40.2	28.9	4.6	93.0
14	Cyto-124	2015	42.6	30.3	4.4	92.4
15	Bt.Cyto-177	2015	40.0	29.0	4.3	99.9
16	Bt.CIM-600	2015	40.3	29.0	4.7	94.8
17	CRIS-129	2014	38.5	28.5	-	98.5
18	Bt CIM-595	2013	39.5	29.0	4.7	97.5
19	Bt CIM-599	2013	41.6	28.9	4.6	95.0
20	Bt CIM-602	2013	40.3	29.1	4.2	94.8
21	CIM-608	2013	41.1	28.5	4.6	93.9
22	CIM-573	2012	39.3	31.6	4.6	90.2
23	Bt CIM-598	2012	41.8	29.0	4.3	94.8
24	BH-167	2012	41.1	29.1	4.7	92.7
25	SLH-317	2012	38.0	29.8	4.4	96.7
26	IR-3701	2011	43.6	25.9	5.7	95.6
27	Ali Akbar-703	2011	37.3	28.5	5.0	104.6
28	MG-6	2011	38.2	27.5	5.3	103.3
29	FH-113	2011	39.0	26.0	5.4	94.0
30	Neelum-121	2011	41.9	26.2	5.1	106.0
31	Sitara 008	2011	40.6	25.8	4.8	101.6
32	Ali Akbar-802	2011	37.6	28.3	5.3	105.5
33	IR-1524	2011	38.4	27.3	5.3	102.0
34	CIRS-342	2010	38.5	28.4	4.3	95.5
35	Sindh-I	2010	37.0	28.0	4.5	97.0

No.	Variety	Year of Release	Lint %	Staple length (mm)	Micronaire (ug inch-1)	Strength (tppsi)
36	Malamal	2010	38.0	30.0	4.0	97.0
37	NIA-Ufaq-2008	2010	38.0	28.5	4.3	97.0
38	CIM-554	2009	41.5	28.5	4.7	96.8
39	CIM-534	2006	40.1	29.0	4.5	97.2
40	Hari Dost	2006	35.0	28.0	4.5	97.0
41	Sadori	2006	38.0	28.3	4.4	97.0
42	CRIS-121	2006	36.8	27.5	4.9	98.5
43	CIM-496	2005	41.1	29.7	4.6	93.5
44	CIM-707	2004	38.1	32.2	4.2	97.5
45	CIM-506	2004	38.5	28.7	4.5	98.9
46	BH-160	2004	39.0	29.5	4.2	95.1
47	NIAB-111	2004	37.5	30.5	4.4	90.1
48	CRIS-467	2004	37.0	27.5	4.6	97.2
49	CRIS-134	2004	36.5	27.5	-	97.5
50	CIM-499	2003	40.2	29.6	4.4	97.3
51	FH-1000	2003	38.8	29.5	4.6	96.9
52	NIAB-999	2003	36.5	28.7	4.6	98.0
53	CIM-473	2002	39.7	29.6	4.3	95.2
54	FDH-228	2002	43.5	13.9	7.3	96.5
55	Marvi CRIS-5A	2001	35.5	26.8	-	97.5
56	Shahbaz	2001	33.5	28.0	4.6-4.8	98.0
57	CIM-482	2000	39.2	28.5	4.5	98.0
58	FH-900	2000	38.0	28.5	4.3	95.1
59	FH-901	2000	38.0	27.5	5.2	92.0
60	BH-118	2000	38.7	27.6	4.6	96.2
61	MNH-552	2000	40.0	27.5	4.9	95.0
62	MNH-554	2000	41.3	28.0	4.2	94.0
63	CIM-443	1998	36.7	27.6	4.9	96.0
64	CIM-446	1998	36.2	27.0	4.7	97.4
65	FVH-53	1998	38.4	28.6	5.2	98.5
66	CIM-1100	1996	38.0	29.0	3.9	94.0
67	CIM-448	1996	38.0	28.5	4.5	93.8
68	FH-634	1996	36.3	28.5	4.2	96.0
69	MNH-329	1996	41.0	28.5	4.2	96.0
70	Rh-112	1996	34.3	27.6	4.6	95.0
71	Karishma	1996	37.4	28.6	5.0	93.3
72	Chandni-95	1996	35.0	30.0	3.9	96.0
73	S-14	1995	43.0	29.5	4.2	93.3
74	SLS-1	1995	35.0	27.4	4.5	95.3
75	FDH-170	1995	40.3	14.1	8.4	94.2
76	CRIS-9	1993	34.5	26.5	-	97.0
77	Gomal	1993	34.5	26.5	4.5	93.0
78	CIM-240	1992	36.5	27.5	4.7	93.7
79	BH-36	1992	38.7	28.0	4.3	100.3
80	FH-682	1992	37.0	28.5	4.3	95.7
81	MNH-147	1992	41.0	28.5	4.4	95.5
82	NIAB-26N	1992	3.0	27.0	4.4	95.0

Continued

No.	Variety	Year of Release	Lint %	Staple length (mm)	Micronaire (ug inch-1)	Strength (tppsi)
83	Reshmi	1991	35.7	31.0	4.1	93.0
84	CIM-109	1990	37.5	27.3	4.4	91.0
85	GOHAR-87	1990	35.0	28.0	4.5	98.6
86	RH-1	1990	36.0	29.8	3.9	93.0
87	NIAB-86	1990	31.8	29.0	4.3	95.2
88	FH-87	1988	34.5	27.8	4.2	96.8
89	S-12	1988	36.8	28.8	4.6	91.3
90	Shaheen	1988	35.0	30.0	3.9	96.0
91	CIM-70	1986	31.5	29.0	4.2	92.5
92	MNH-129	1986	31.1	28.7	4.4	94.5
93	Rohi	1986	39.0	15.9	8.0	96.4
94	SLH-41	1985	36.0	26.4	4.4	95.8
95	Rahmani	1985	35.0	27.0	4.4	90.0
96	MS-84	1983	36.7	33.3	3.9	92.8
97	NIAB-78	1983	34.0	27.0	4.6	91.7
98	Ravi	1982	40.3	14.9	8.0	92.0
99	MNH-93	1980	37.0	28.6	4.5	94.3
100	K-68/9	1977	33.0	30.1	4.2	96.0
101	B-557	1975	37.5	28.1	4.5	90.1
102	Sarmast	1975	34.0	29.0	3.9	90.0
103	SKD 10/19	1975	40.6	15.5	10.1	80.0
104	Qalandri	1974	34.0	28.6	3.8	92.7
105	149-F	1971	35.9	28.0	4.0	85.5
106	MS-39	1970	34.5	31.8	3.6	87.2
107	MS-40	1970	33.5	31.3	4.0	95.4
108	D9	1970	41.0	14.5	8.2	86.7
109	M-100	1963	34.5	29.0	4.0	85.0
110	TD 1	1963	41.0	15.9	9.4	80.0
111	BS-1	1962	34.0	26.0	4.2	85.0
112	362-F	1959	33.8	23.8	4.5	87.0
113	AC-134	1959	33.0	26.5	4.5	80.0
114	Lasani-11	1959	34.5	28.6	4.0	87.8
115	231 R	1959	40.0	15.9	8.4	86.0
116	238 F	1948	31.5	23.8	4.5	80.0
117	268 F	1948	34.1	24.6	4.5	84.5
118	M4	1942	33.3	28.0	-	85.0

4. Collection and Maintenance of Cotton Germplasm

PCCC has also developed sub-zero cotton seed storage facility for long term storage at CCRI Multan that comprises of more than 5000 accessions collected from various national and international resources. The seed of different varieties is preserved for short / long term basis and to be used by researchers to develop new varieties and shared with various local / international organizations / universities for breeding purpose. The detail of cotton germplasm collected and maintained at CCRI, Multan during the year 2019-20. is as under:-

Name	Quantity
Local genotypes	1190
Exotic genotypes	4933
Total	**6123**
Species – Wise Detail	
Gossypium herbaceum L	556
Gossypium arboretum L	1025
Gossypium hirsutum L	4433
Gossypium barbadense L	109
Total	**6123**

5. Standardization

- In order to ensure qualitative improvement in cotton production and marketing,
- the government has undertaken the following measures:
- Cotton Standardization Ordinance, 2002.
- Cotton Standards Institute has been established.
- National Cotton Grades have been developed and approved.
- Intervention price (if announced) of seed cotton being fixed on grade basis.
- Karachi Cotton Association is now issuing spot rates on grade and staple basis.
- Contamination free cotton production programs were launched with visible success.
- HVI equipped fiber testing labs in major cotton growing districts are working.

6. Number of Quality Laboratories in the Country

Pakistan Cotton Standards Institute (PCSI) has set up 10 fiber testing labs throughout the country duly equipped with High Volume Instrument (HVI). This has helped in testing, evaluation and monitoring cotton fiber quality. Moreover, Pakistan Central Cotton Committee (PCCC) has also set up two quality laboratories at Karachi and Multan for the purpose. Similarly, Synthetic Fiber Development & Application Center (SFDAC), Karachi, Textile Institute of Pakistan (TIP), University of Agriculture, Faisalabad, National Textile University, Faisalabad, Nuclear Institute of Agriculture &

Biology (NIAB), Faisalabad, National Institute of Biotechnology & Genetic Engineering (NIBGE), Faisalabad and private sector have also set up quality labs for fiber testing and analysis.

7. Extension services

Pakistan has a well established extension network in each province working under the provincial Agriculture Departments. The extension agents (Agriculture Officers) are supported by technicians (Field Assistants). These Agriculture Departments in coordination with the Agriculture Research wings devise extension programs for cotton and arrange training courses for Extension Agents and Technicians regarding new innovation in cotton production technology. These refresher training programs continue during the cropping and harvesting season as well. In addition to Agriculture Departments, all Cotton Research Institutes and Stations have technology transfer units, where extension agents, progressive farmers, field staff of NGOs and members of civil society are trained about new research based techniques. The research scientists develop extension brochures and participate in field visits to address farmers' problems. The private sector agro based companies also devise special extension services plans during cotton season in addition to their sale and marketing work.

8. Cotton Ginning Industry in Pakistan

The ginning factory plays a pivotal role for determining quality of cotton fibre as raw material for downstream industry. There are 1,221 ginning factories in Pakistan. The ginning industry operates in 80-120 saws type. However, the majority of ginning factories have saw gins of 90 saw blades type. The production capacity of ginning industry in Pakistan ranges from 12 million bales to 35 million bales. The Government is taking some serious steps to upgrade this sector of the industry. Establishment of cotton standards through Pakistan Cotton Standard Institute (PCSI), setting up of a Ginning Institute in public sector are positive steps towards the right direction.

9. Strength, Weakness, Opportunity and Threat (SWOT) in Pakistan

a) Current Strengths in Cotton Production

Historically cotton has been cultivated in the region for thousands of years. However since independence of Pakistan in 1947, the production of cotton has risen steadily. The area increased from 1.23 million hectares in 1947 to 3.20 million hectares with concurrent production from 1.1 million bales to 14.00 million bales of 170 kg. This phenomenal growth in production is attributed to introduction of high yielding varieties having better fiber quality characteristics, heat tolerant, wider adaptability and introduction of improved cotton production technologies, across the cotton belt.

b) Opportunities Enhancing Productivity

The landscape of cotton research and development is being transformed to Gene Revolution. Many advances have been made at the advent of emerging technologies Genetic Engineering and Molecular Biology. The cultivation of transgenic cotton commonly known as BT (*Bacillus thuringiensis*) has revolutionized the research and development of cotton crop. The gene transformation technology has paved the way in the development of cotton varieties having in built tolerance/resistance against biotic and abiotic stresses. The application of Molecular Marker Assisted Selection (MAS) technique has put the breeding program on fast track rather than Classical Combining Ability Technique. The frontiers of MAS Techniques have extended to genetic finger printing, introgression of alien genes and identification of chromosomal regions associated with Quantitative Trait Loci (QTL). Furthermore, great opportunities exist in promotion of integrated pest management (IPM) technology with emphasis on biological control through mass release of predators and parasites. This will result in reducing cost of production and environmental pollution.

c) Weakness of Cotton Production

In Pakistan, less-availability of certified seed for the entire cultivated area is the most important weakness. There is a wide yield gap between the progressive and non-progressive growers and this gap needs to be narrowed to the maximum level.

d) Threats for Cotton Production

Despite an improvement in the size of cotton crop, the lower per hectare yield may be attributed to the ravages of Pink Bollworm, Cotton Leaf Curl Virus (CLCV) disease, poor management practices due to lower crop prices, climate change, irrigation water shortage and small and uneconomic land holdings. Pink bollworm is major threat in Pakistan. It has caused a huge economic loss to cotton crop during 2015-16 season. Strategies to combat pink bollworm taken by Pakistan Central Cotton Committee (PCCC) are elaborated as below:

10. Strategies and Programs by PCCC to Combat Pink Boll Worm

Pakistan Central Cotton Committee (PCCC) along provincial agricultural department launched a comprehensive program to combat infestation of Pink Bollworm and to educate farmers in order to save the next cotton crop. National seminars were conducted and farmer meetings were arranged at the door step of the growers.

a) Short Term Strategy

Pakistan Central Cotton Committee conducted around 100 seminars and farmer meetings at different places throughout the cotton belt of Pakistan. The immediate objective of the meetings with farmers was to create awareness and adopt some general practices which are beneficial and can help in reducing growth of Pink Bollworm. Following were the main points of the message of the short term strategy:

- Keep the sticks in upright position, in small bundles and in open during May-June
- Cutting of sticks, plough-up and irrigate field immediately after harvest
- Dispose off the ginning waste lying in the ginning factories
- Early planting should be prohibited (not before May)
- Use certified seed
- Always use seed delinted with sulphuric acid
- Ratoon cotton should not be allowed
- Pest scouting twice a week and apply insecticide only when insect threshold level achieved
- Careful pest scouting by observing small bollworms larvae

b) Medium & Long Term Strategies

- Thorough investigations are required to establish if bollworm has developed resistance
- Further studies are needed either the Pink bollworm survival is due to insufficient dose of toxins
- Revise IPM strategy for Bt cotton
- Develop synergies/agreements to bring new genes for cotton breeding system in Pakistan.

The future cotton policy envisages a number of strategies which include germplasm improvements, development of new cotton seeds, much improved and better farm and crop management, bringing additional area under cultivation, especially in the provinces of Baluchistan and Khyber Pakhtunkha, and minimizing post-harvest losses. Cultivation of organic cotton is also being encouraged, particularly in the virgin, fertile and pest free lands of Baluchistan. Necessary legislative and regulatory frameworks are being strengthened like the Plant Breeder's Act and Seed Act.