© *The Pakistan Development Review*
62:4 (2023) pp. 539–551
DOI: 10.30541/v62i4pp.539-552

Policy Impacts on Comparative Advantage and Production Protection to Cotton and Its Competing Crops in Pakistan

IRFAN AHMED BAIG, SAMI ULLAH, and SHOAIB NASIR

Agriculture, particularly cotton cultivation, holds paramount significance for the economy of Pakistan. The cotton crop shares 0.6 percent of the gross domestic product and contributes 70 percent to the country's export earnings. Nonetheless, during the last two decades, cotton area and production in the country have declined. Therefore, this study aims to evaluate the economic benefits and competitiveness of cotton and its competitive crops under the current set of relevant policies. We have employed a Policy Analysis Matrix to assess the impact of agricultural policies on cotton and its competing crops. The results show that cotton producers across Pakistan are implicitly taxed, while sugarcane and rice producers are protected under the current policy measures. It has also become evident that large cotton growers are more likely to get a comparative advantage of prevailing policy incentives than medium and small growers. Thus, crop-specific and scale-specific policy interventions are suggested to enhance cotton production. Similarly, exploring and converging on new potential areas for cotton production, especially in Balochistan, can improve the country's overall cotton production.

Keywords: Cotton, Policy Analysis Matrix, Comparative Advantage, DRC, Pakistan

1. INTRODUCTION

State institutions worldwide protect and support the agricultural sector through various policy measures. This support keeps the agriculture sector productive and competitive to ensure food security for the masses, livelihoods for farming entities, and to meet the requirements of agro-based industries (GOP, 2019). These policies broadly deal with farm inputs and outputs, trade facilitation/restrictions, mechanisation of cropping systems, and investment in rural and agricultural infrastructure, including R&D and irrigation. Government interventions have resulted in various advantages for specific crops while creating social and economic externalities for others. Pakistan has also

Irfan Ahmed Baig <irfan.baig@mnsuam.edu.pk> is affiliated with the Department of Agribusiness & Applied Economics, MNS University of Agriculture, Multan. Sami Ullah <sami.ullah@mnsuam.edu.pk> is affiliated with the Department of Agribusiness & Applied Economics, MNS University of Agriculture, Multan. Shoaib Nasir <shoaib.nasir@mnsuam.edu.pk> is affiliated with the Department of Agribusiness & Applied Economics, MNS University of Agriculture, Multan.

Authors' Note: The authors are grateful for the financial support provided by RASTA-PIDE under grant # 02-016.

adopted several policy measures to cater to the needs of farming communities in the changing global scenario. These policies are sometimes crop-specific but, most of the time, are designed to increase total crop productivity (MPDS, 2013).

Agriculture contributes around 22.9 percent of the GDP and almost 34.7 percent of employment in Pakistan (GOP, 2023a). The share of major crops in GDP is nearly 4.32 percent, of which cotton accounts for 0.6 percent of GDP and 3.1 percent of total value addition in agriculture. In the case of cotton, Pakistan is the fifth largest producer globally. Its share is around 0.6 percent of GDP and contributes 2.4 percent of the value added in agriculture (GOP, 2023a). Similarly, cotton has the longest value chain among all crops, contributing significantly to Pakistan's foreign exchange earnings. Pakistan exports $836 million (4.7 percent) of raw cotton and yarn, while cotton-based exports account for $9.5 billion, comprising more than half of the country's total exports (GOP, 2021b). Though cotton is considered the main cash crop in the country with its strong backward and forward linkages, the past couple of decades have observed a dismal cotton performance in many instances. At the same time, the last five years can be considered devastating in terms of cotton area, production, and profitability. Table 1 below reflects the reduction in the cotton area in Punjab (which contributes around 70 percent of the total cotton acreage) and the decline in cotton production and yield. It has been observed that since 2000, cotton has lost 12 percent of its area, while its competing crops have gained the area under cultivation, mainly sugarcane, which followed a 17 percent increase in its area.

The area replacement of cotton crop with its competitive Kharif crops, i.e., sugarcane, maize, and rice, has many interesting insights from a policy perspective. There are diverging opinions at the policy level, whether the downfall of the cotton crop is due to adverse climatic conditions, the development of pest pressure in cotton growing areas, or the frequent distortions in output and input markets. It has been observed that output prices, among all other factors, remain the primary cause of reducing the profitability of the cotton crop.

Table 1

Major Crops Area in the Cotton-Wheat Zone of Punjab

(000 hectares)

Year	Rice	Sugarcane	Cotton	Maize	Cotton Yield (40kg/acre)
2014-15	2891.89	1141.01	2962.72	1143.01	8.11
2015-16	2740.72	1132.11	2903.19	1192.03	5.88
2016-17	2725.21	1218.14	2490.01	1349.00	7.38
2017-18	2901.89	1342.40	2701.50	1251.96	7.61
2018-19	2811.25	1102.50	2374.06	1374.61	7.15
2019-20	3041.91	985.91	2517.72	1405.02	6.26
2020-21	3337.07	1165.55	2079.83	1418.43	7.08
2021-22	3538.94	1260.85	1937.83	1653.24	7.12

Source: (AMIS.PK, 2023).

Several causes of low cotton production have been reported in the literature, including the higher cost of production, climatic changes, pest attacks, poor seed quality,

adulterated inputs, and conventional farming practices (Aslam, 2016; Khan & Damalas, 2015; Zulfiqar & Thapa, 2018). There are several other factors, like policy divergences, which significantly impact the farmers' decision to grow a specific summer (Kharif) crop in the context of Pakistan. These policies include specific incentives for competitive crops, such as ensuring a consistent supply chain with the support of the private business firms to procure from the farmers, indicative/support price, subsidising the input(s), etc. (GOP, 2019).

A significant number of stakeholders do believe that there is a gradual drift of policy initiatives away from cotton. At the same time, an inclination of support towards competitive crops has resulted in developing a less conducive environment for cotton. When comparing the agricultural policies in the world's major cotton-producing countries (Table 2), Pakistan's cotton sector is least protected by policy support and technological advancements. Major cotton-producing countries like China, India, and the USA provide subsidies on production, while India has a minimum support price system for cotton. Similarly, very little investment in cottonseed technologies has resulted in poor crop performance.

Keeping in view the importance of the cotton crop and the challenges being faced, a holistic analysis of the impact of a set of policies on the competitiveness and efficiency of cotton (w.r.t its competitive crops) and factors affecting the reduction of area under the cotton crop. There is a need for time to explore possibilities to enhance cotton production to strengthen rural communities and ensure raw materials for Pakistan's largest export-oriented sector (textile).

Table 2

Support to the Cotton Sector among Major Cotton-Producing Countries

Country	Cotton Subsidies* (% of Value of Prod.)	Assistance to Growers	MSP	Seed Technology
China	33%	$4.7 billion	No MSP	Fusedg, Cry1Ab, Cry1Ac, Stacked
India	About 10%	$600 million**	Up to 150 % of CoP	Bollgard-II (2006)
USA	Nearly 9 %	$2 billion	No MSP	Bollgard-III (2017)
Pakistan	1% **	–	No MSP	Bollgard-I (2010)

Source: (ICAC, 2020).

** No direct assistance; most subsidies are provided regarding Minimum Support Price.

The economic practicality, competitiveness of production systems, technology adaptation, cost of farm inputs, the productivity of cropping practices, degree of product differentiation, share in the market, market distortions, and government interventions in economic activity are various factors reported in the literature (Kennedy, et al. 1998; Pahle, et al. 2016; Williams, 2010). Several studies have been conducted in Pakistan to evaluate the economic efficiency and profitability of cotton (Abdul & Sadia, 2016; Abro & Awan, 2020; Kannapiran & Fleming, 1999a; Quddus & Mustafa, 2011; Wei, et al. 2020). However, none of the studies have adopted a holistic approach to investigate the impact of agricultural policies on cotton production in Pakistan. The objectives of the study are:

- To evaluate the impact of significant public policies on financial economic benefits and costs associated with cotton production and its competitive crops in the cotton-wheat zone.
- To estimate the financial and economic benefits and costs associated with producing major crops under three different scales of farms.
- Moreover, it will assist policymakers in addressing the challenges to cotton production by designing policies based on empirical findings.

2. REVIEW OF LITERATURE

Dwindling cotton sector performance for years brought unrest among the farming community and relevant governmental organisations, especially in Punjab, to work out any doable recipes to cure the situation. A couple of good policy reports have also been worked over (GOP, 2021b) where national and international experts compiled the review of the prevailing condition in cotton, gauged the institutional strengths and weaknesses, evaluated the policies related to the cotton, and framed a set of recommendations for the policymakers to bring about a structural change on cotton production canvas. Some recent international studies, like ICAC's Cotton Vision 2030 (ICAC, 2020), have employed various econometric tools to evaluate the impact of policy measures in shaping the decisions of cotton growers in Pakistan and different other cotton-growing countries.

Policy Analysis Matrix (PAM) is a computational framework Monke & Scott (1989) developed for measuring the input use efficiency in production, the degree of government interventions, and comparative advantage. Many studies in the past have utilised PAM to evaluate the policy effects and investigated the efficiency of agricultural pricing policies and public interventions that substantially impact consumer satisfaction and domestic prices (Anwar, et al. 2015; Kannapiran & Fleming, 1999b; Mohanty, et al. 2003; Najafi, 2005; Nelson & Panggabean, 2011).

Salam (2012) and Salam & Tufail (2016) reviewed the effect of policies on cotton and rice production in Pakistan by employing secondary data from 2010-12. They found that the competitiveness of cotton production is sensitive to fluctuations in cotton prices and those of farm inputs. (Gürer, et al. 2017a) studied the impact of agricultural policies on cotton production in Turkey by employing PAM. They found that the current set of policies doesn't provide satisfactory support to increase the competitiveness of the cotton sector. A rich body of literature highlights discrete choice modelling for evaluating the farmer's decisions in the specific context of socio-economic conditions, access to information, the available set of policy incentives/disincentives, and political support arguments (Caviglia & Kahn, 2001).

Fang & Babcoc (2003) have quantified the impact of China's agricultural and accession to WTO on cotton production and area in the country. China's cotton policy focuses on the supply and demand of cotton, prices, and textile output. The results suggest that WTO accession would increase cotton imports by 670 thousand metric tons. Quddus & Mustafa (2011) reported that the nominal protection coefficient ranges from 1.33 to 1.99 under an export price parity situation. It shows that the prices received by farmers are more significant than the export parity/economic prices. This leads to the conclusion that sugarcane cultivation for export purposes is not economical.

Suresh, et al. (2014) have studied the impact of technology and policy on cotton sector performance in India. They have concluded that better agricultural policies and modern technologies resulted in a decrease in input use. Sadiq (2015) investigated the impact of India's economic policies on cotton production before and after liberalisation. He concluded that better performance witnessed during liberalisation is mainly attributed to adopting modern technologies and sound political and economic policies. MacDonald, et al. (2015) have concluded that support prices to Chinese cotton farmers resulted in lower cotton production, which resulted in a policy shift: direct subsidies to cotton producers. They have concluded that lower Chinese import quotas would reduce world cotton prices. Gürer, et al. (2017b) have investigated the impact of Turkish agricultural policies on cotton production in the country. Using Policy Analysis Matrix, this study has measured policy transfers, resource utilisation, and costs, private and social profits and concluded that ongoing agricultural policies have turned cotton production into a profitable enterprise, giving Turkey a comparative advantage.

ELsamie, et al. (2020) evaluated the impact of agricultural policies on Egyptian cotton production using Policy Analysis Matrix. They concluded that financial performance was less than the economic performance of cotton growers. However, Egyptian cotton producers have a comparative advantage and earn foreign exchange for the country. Abro & Awan (2020) reported that the profitability of minor crops has been increasing since 2011 compared to major crops. Wei, et al. (2020) estimated the economic cotton viability of growing cotton in Pakistan and reported that smallholders were more prone to economic shocks and had low technical efficiency. They also noted that financial constraints and lack of extension services were the main factors for lower productivity.

Wang, et al. (2021) have analysed the impact of the targeted price policy on cotton production in China. The studies show that implementing targeted price subsidies has stimulated cotton production by increasing the area, but the yield has decreased over time. They suggested that policies should focus on comparative advantages between different crops. The body of literature also has a considerable set of evidence that reflects that various cotton diseases and pests flourish in humid environments. At the same time, the application of excessive water to the crop may also lead to excessive vegetative growth, thus hindering crop protection operations and the rotting of lower fruit. Based on the above studies, it can be inferred that agricultural policies play a major role in crop competitiveness, profitability, and efficiency. This study aims to investigate the impact of major agricultural policies on cotton and its competitive crops and assess the impact of the production of these crops on the overall economy.

3. DATA AND METHODOLOGY

To execute the study, we collected primary data from various districts of three provinces of Pakistan. Details of the data collection and methodology are provided below.

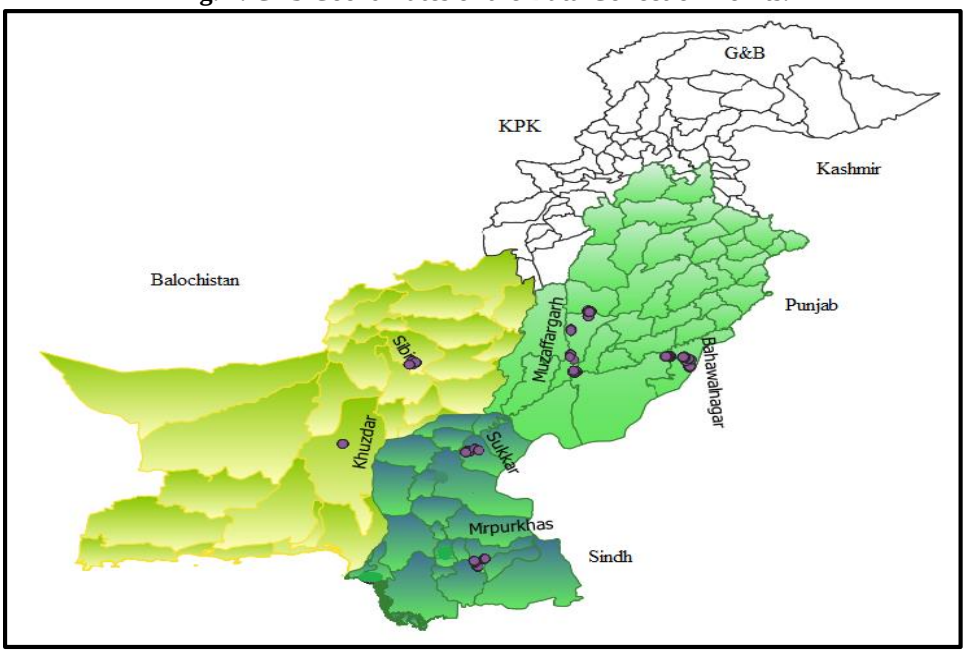
3.1. Data Collection

The primary data was collected through a multistage cluster sampling technique from 881 farmers through well-structured digital questionnaires on cotton and its competing crops from farmers in Punjab, Sindh, and Balochistan provinces. In Punjab,

data was collected from four tehsils, two from each district, Bahawalnagar and Muzaffargarh. From Sindh province—data was collected from two tehsils of Mirpur Khas district and one tehsil of Sukkar district. Similarly, data from Balochistan was collected from one tehsil of each Sibi and Khuzdar district (Figure 1). Though the sample size is generally distributed based on the share of provinces/ areas in the total production, in this study, respondents from Balochistan are included to investigate the policy impacts in new areas (and the potential regions) of cotton production. Secondary data was collected from various published sources.

A detailed questionnaire was developed considering the research objectives, and pre-testing was carried out in Kot Addu Tehsil of District Muzaffargarh. After corrections and modifications, a questionnaire was digitised on the Kobocollect (https://www.kobotoolboxorg/) Android application. To collect data, we selected three teams to serve in each province. Data collection teams were selected from respective provinces to ensure the smooth collection of data by reducing linguistic and cultural barriers. Similarly, teams were trained on survey techniques and data collection methods to ensure data quality.

Fig. 1. GPS Coordinates of the Data Collection Points.



3.2. Econometric Techniques

We have employed various econometric and mathematical techniques to explore the research objectives. Policy Analysis Matrix is crucial to evaluating crops' competitiveness and economic and social profitability. It also reports the comparative advantage of crop production by comparing international prices of the products. We have employed it to analyse the competitiveness of cotton and its competitor crops using a mix of primary and secondary data.

The Policy Analysis Matrix developed by Monke & Pearson (1989) provides an essential insight into analysing the economic systems' competitiveness and efficiency, which describes the degree of protection or (implicit) taxation resulting from the country's overall policies towards the agriculture sector (Table 3). These policies affect the input and output markets and trade of the sector. Some selected indicators are measured in this research.

Table 3

Policy Analysis Matrix

		Costs		
Item	Revenue	Tradeable Inputs	Domestic Factors	Profit
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Divergence	I	J	K	L

Private Profit calculates a given crop's private profitability and competitiveness at market prices. It is calculated as D = A – (B+C), and its positive values show that the crop under consideration is financially viable. Social Profit for a given crop is calculated as H = (E-F-G), and it describes the profit at social/economic prices of inputs and outputs. Its positive sign indicates the viability of the crop.

The Nominal Protection Coefficient (NPC) measures the protection provided to the crop under consideration. It is calculated by getting the ratio between A and E, i.e., dividing the total revenue calculated at actual market prices by the total revenue measured at social prices. When NPC > 1, it means domestic production has protection, and a value of NPC < 1 suggests implicit taxation to domestic producers. The Effective Protection Coefficient (EPC) evaluates the net effect of policy interventions in the inputs and output markets. It is measured by taking a ratio between the values added by a crop at private prices and social prices, i.e., (A – B) / (E-F). EPC is interpreted similarly to that of the NPC.

Domestic Resource Cost (DRC) describes the ratio between the cost of domestic factors and value added at social prices of a crop, i.e., G / (E-F). If the value of DRC > 1, it shows that the country does not have a comparative advantage in the domestic production of that crop, while DRC < 1 shows that the country has a comparative advantage.

3.3. Descriptive Analysis

We collected data from 881 farmers from three provinces and six districts of Pakistan. Details are given in Table 4 below.

Table 4

Province/ District/Tehsil-wise Data Collection (n=881)

Punjab				Sindh			Balochistan	
Muzaffargarh		Bahawalnagar		Mirpur Khas		Sukkar	Sibi	Khuzdar
Kot Addu	Ali Pur	Chishtian	Haroonabad	Kot Ghulam Mohammad	Digri	Rohri	Kurak	Khuzdar
122	125	103	101	115	115	95	55	50

Table 5 describes the socioeconomic characteristics of farmers. It shows that the average education, age, farming experience, and cotton cultivation experience are 5.59, 41.9, 22.6, and 20 years respectively, in the study area. At the same time, the average distance from the metaled road is 2.6 kilometres.

Table 5

Socioeconomic Indicators of Cotton Producers

Variables	Mean	St. Dev.	Min.	Max.
Education (Years)	5.59	5.07	0	18
Age (Years)	41.91	12.85	17	78
Farming Experience (Years)	22.66	12.85	1	60
Cotton Cultivation Experience (Years)	19.98	13.42	1	60
Distance to Agricultural Market (km)	11.66	7.49	0	35
Distance to City (km)	11.33	7.54	1	35
Distance to the Metaled Road (km)	2.62	3.04	0	27

We have observed that 22 percent of the farmers are registered with the agriculture department, and 35 percent of the farmers receive a message from the agriculture department through SMS. Only 15 percent of farmers have received training regarding agricultural practices, and 30 percent of farmers have access to loans (Table 6).

Table 6

Access to Services

Services / Access	Yes	No
Registered with Agriculture Dept.*	22%	78%
Farmer Card*	10%	90%
Avail Subsidy on Fertilisers and Seed	11%	89%
Subsidy on Machinery	2%	98%
Receive SMS Regarding Farming Services	35%	65%
Access to Weather Information	46%	54%
Training on Cultivation Practices	15%	85%
Training on Cotton Cultivation	12%	88%
Access to Loan Facilities	30%	70%

*Only in Punjab.

The average area, production, and yield of the cotton, sugarcane, rice, and maize farmers are reported in Table 7. It shows that the average area of cotton and sugarcane in the study area is almost the same. After that, the acreage (3.22) of rice and maize (2.66) is reported.

Table 7

Area, Yield, and Revenue of Crops

Variables	Cotton	Sugarcane	Rice	Maize
Avg. Area (acres)	6.89	6.76	3.22	2.66
Avg. Yield (Mounds)	19.0	896	53	81
Avg. Price of Output (Rs. /40kg)	6372	260	1583	1500
Avg. Cost of Production (Without Land Rent)	41393	108579	52563.58	65673
Avg. Revenue	119364	234432	115751.5	117000
Avg. Profit	77970	125852	63187.96	51326

4. RESULTS AND DISCUSSION

The nominal protection coefficient (NPC) represents the unit domestic price (DP) and the foreign price ratio (PP), with both prices expressed in national currency. Table 8 illustrates the NPC of 1.02, 1.44, and 1.06 for cotton, sugarcane, and rice, respectively. It shows that the cotton crop is least protected under the existing policies, while sugarcane is highly protected. At the same time, the cotton protection level among provinces is almost the same. However, sugarcane is more protected in Sindh as compared to Punjab. While rice is almost equally protected in Punjab and Sindh. The maize NPC is 1.06. These results coincide with the estimates of Abdul & Sadia (2016). However, the protection of sugarcane has increased over time compared to previous studies (Quddus & Mustafa, 2011).

The effective protection coefficient (EPC) measures the private value added (PVA) compared to the social or economic value added. If the value of EPC is more than one, it shows that the producers generate a value-added higher than under the optimal situation. Due to protection, farmers are economically efficient, while the value of less than one shows that producers are implicitly taxed. It provides a better measure of protection as compared to NPC. Table 8 shows that cotton producers across Pakistan are implicitly taxed in Punjab (10 percent) and Sindh (2 percent), while sugarcane producers are implicitly subsidised (protected) to 63 percent; however, maize producers have mild protection under the current set of policies (2 percent implicit subsidies). The rice growers were found to be neither implicitly taxed nor subsidised in the research area. In the case of sugarcane, it is pretty evident from the EPC value of greater than one that the domestic growers enjoy huge protection as the prices they receive are much higher than the corresponding economic prices as worked back from export prices. Though for cotton, rice, and sugarcane, the results coincide with the previous studies (Abdul & Sadia, 2016; Quddus & Mustafa, 2011), however, the EPC for maize has increased over time as compared to previously reported results, this being the reason, maize area has drastically increased over the time (Hasnain, et al., 2014).

Table 8

Estimates of Policy Analysis Matrix (Based on Export Price Parity)

Economic Efficiency	Region	Cotton	Sugarcane	Rice	Maize
NPC	Pakistan	1.02	1.44	1.06	–
	Punjab	1.00	1.40	1.06	1.08
	Sindh	1.00	1.49	1.05	–
	Balochistan	1.04	–	–	–
EPC	Pakistan	0.98	1.63	1.00	–
	Punjab	0.90	1.60	1.18	1.02
	Sindh	0.97	1.66	1.08	–
	Balochistan	1.00	–	–	–
DRC	Pakistan	0.44	1.05	0.49	–
	Punjab	0.66	1.33	0.71	0.49
	Sindh	0.28	0.80	0.37	–
	Balochistan	0.34	–	–	–

The domestic resource cost (DRC) indicates the opportunity cost of the domestic resources and the social value added per crop unit. The country has a comparative advantage in the product under consideration if the value of DRC is lower than one, and vice versa. The results show that DRC for cotton, sugarcane, rice, and maize are 0.44, 1.05, 0.49, and 0.34, respectively. Pakistan has a comparative advantage in producing all the crops except sugarcane production in Punjab. In this scenario, sugarcane has more DRC, which means it consumes PKR 1.05 units of domestic resources to produce output worth about PKR 1. In other words, we use our foreign exchange earnings to grow sugarcane. We have observed DRC of cotton 0.44, 0.66, 0.28, and 0.34 for Pakistan, Punjab, Sindh, and Balochistan, respectively. It shows that by consuming PKR 0.44, farmers produce cotton worth PKR 1. It further indicates that Sindh has a more comparative advantage in growing cotton crops while Punjab has a less comparative advantage in cotton production. On the other hand, maize has the least DRC, which means it has more comparative advantages than other crops in Punjab. These results coincide with the study of Hasnain, et al. (2014).

To estimate the PAM for three different scales of farmers, we have divided the farmers into small farmers (area ≤ 5 acres), medium farmers (5< acres < area ≥ 25 acres), and larger farmers (area < 25 acres). Table 9 describes the estimates of PAM for major crops under three different scales of farm sizes in Pakistan. The value of NPC is greater than one for cotton, sugarcane, and rice, which shows that small, medium, and large farmers have protection in Pakistan. In the case of cotton, medium farmers are more protected than small farmers, while in the case of sugarcane, small farmers are more protected than medium and large farmers. This may be because small growers are provided with input subsidies. When it comes to EPC, sugarcane farmers are most protected, then comes rice farmers, while cotton farmers have the least or no protection.

Table 9

Estimates of Policy Analysis Matrix (Based on Export Price Parity) for Different Farm Sizes

Economic Efficiency	Farm Size	Cotton	Sugarcane	Rice
NPC	Small	1.04	1.49	1.06
	Medium	1.11	1.39	1.05
	Large	1.04	1.38	1.07
EPC	Small	0.99	1.68	1.14
	Medium	1.08	1.55	1.11
	Large	1.00	1.61	1.27
DRC	Small	0.51	0.92	0.60
	Medium	0.43	1.03	0.45
	Large	0.32	1.26	0.83

Domestic resource cost shows the comparative advantage of a crop. Cotton and rice have a comparative advantage, while sugarcane has a comparative disadvantage. Regarding farm farm-level comparative advantages, large cotton growers have a comparative advantage compared to small growers. It shows that large farmers use PKR 0.32 of domestic resources to produce an output worth PKR 1.00, while medium and

small farmers use more domestic resources to produce output worth PKR 1.00 of cotton. In the case of rice, medium farmers use the least domestic resources (PKR 0.45) to produce an output worth PKR 1.00. While small and large farmers use more domestic resources. The production of sugarcane costs more domestic resources as compared to values of output. Medium and large sugarcane growers use the country's foreign exchange earnings to produce sugarcane. However, small sugarcane growers use PKR 0.92 of domestic resources to produce output worth PKR 1.00.

5. CONCLUSION AND RECOMMENDATIONS

Cotton plays an essential role in the national economy by providing raw materials to export-oriented industries and employment to the rural communities by delivering 100 billion rupees in terms of payments to labour. However, during the last two decades, the area under cotton has declined to nearly 12 percent. It has threatened the provision of raw materials for industry and resulted in reduced employment opportunities for rural labour, especially women. Similarly, Pakistan may lose well-experienced cotton growers if the trend continues. Considering the challenges, the current study has adopted a holistic approach to evaluating the economic importance of cotton and its competing crops for rural communities and their competitiveness and profitability under the current policies.

The estimates of the Policy Analysis Matrix showed that cotton is the least protected major crop in terms of Nominal Protection Coefficient under the current scenario. In addition, the Effective Protection Coefficient (EPC) showed that cotton growers were implicitly taxed by 2 percent while maize and sugarcane growers were implicitly subsidised by 2 percent and 63 percent, respectively. However, rice growers in the research were neither protected nor taxed. Results showed that cotton growers received a maximum protection of 4 percent in Balochistan. However, they were implicitly taxed to 10 percent in Punjab but received no protection in this central cotton sone. The Domestic Resource Cost showed that cotton has a comparative advantage over sugarcane and rice despite all this. The growers produced one unit of cotton by consuming PKR 0.44, while sugarcane growers produced one unit by consuming PKR 1.05. When it comes to protection provided to crops by farm size, small cotton and rice growers are less protected compared to medium and large growers. In the case of sugarcane, small growers are more protected as compared to medium and large growers. Regarding the domestic resource cost (comparative advantage) of cotton, large farmers have a comparative advantage over small and medium farmers. When it comes to sugarcane and rice, small and medium farmers have comparative advantage, respectively.

Based on these empirical findings, we suggest providing crop-specific and farm-scale-specific incentives to farmers so that farmers could be inclined towards producing those crops that use fewer domestic resources to produce output. Similarly, there should be efforts to reduce price fluctuations in input and output markets, especially in the case of cotton prices to encourage farmers to produce cotton in cotton-wheat zone. Balochistan has a comparative advantage in producing cotton production so efforts should be made to strengthen the market structure to expand cotton production.

REFERENCES

Abdul, S. & Sadia, T. (2016). Economic efficiency and distortions to incentives in production of cotton and rice crops in Punjab. *NUST Journal of Social Science and Humanities*, *2*(1), 29–49.

Abro, A. A. & Awan, N. W. (2020). Comparative analysis of profitability of major and minor crops in Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *19*(7), 476–481. https://doi.org/10.1016/j.jssas.2020.09.001

AMIS.PK. (2023). *Agri Statistics*. www.Amis.Pk. http://www.amis.pk/Agristatistics/Statistics.aspx

Anwar, M. M., Farooqi, S., & Qureshi, Y. (2015). *Agriculture sector performance : An analysis through the role of agriculture Sector share in GDP*. *3*(3), 270–275.

Aslam, M. (2016). Agricultural productivity current scenario, constraints and future prospects in Pakistan. *Sarhad Journal of Agriculture*, *32*(4), 289–303. https://doi.org/10.17582/journal.sja/2016.32.4.289.303

Caviglia, J. L. & Kahn, J. R. (2001). Diffusion of sustainable agriculture in the Brazilian tropical rain forest: A discrete choice analysis. *Economic Development and Cultural Change*, *49*(2), 311–333. https://doi.org/10.1086/452504

ELsamie, M. A., Ali, T., & Eliw, M. (2020). Impact of agricultural policies on the Egyptian cotton sector using policy analysis matrix. *Asian Journal of Economics, Business and Accounting*, *May*, 50–59. https://doi.org/10.9734/ajeba/2020/v15i130207

Fang, C. & Babcoc, B. A. (2003). *China's cotton policy and the impact of China's WTO accession and Bt cotton adoption on the chinese and U.S. cotton sectors*. http://www.card.iastate.edu/publications/dbs/pdffiles/03wp322.pdf

GOP (2019). *Economic Survey of Pakistan 2018-19*. www.finance.gove.pk

GOP (2023a). *Economic Survey of Pakistan*. Government of Pakistan.

GOP (2021b). *Economic Survey of Pakistan*. https://www.finance.gov.pk/survey_1920.html

Gürer, B., Türkekul, B., Ören, M. N., Abay, C., & Özalp, B. (2017). The impact of Turkish agricultural policy on competitiveness of cotton production. *International Journal of Food and Beverage Manufacturing and Business Models*, *2*(1), 20–30. https://doi.org/10.4018/ijfbmbm.2017010102

Hasnain, S., Akhtar, W., & Akmal, N. (2014). Competiveness of maize crop in Pakistan. *Maize for Food, Feed, Nutrition and Environmental Security*, *October*, 475.

ICAC (2020). *Cotton Vision 2030: Vol. XXXVIII* (Issue 4). https://doi.org/https://icac.org/Content/PublicationsPdf%20Files/0af264f4_67ee_47c4_98f2_8df5d02693d4/RECORDER-December-2020-V1.pdf.pdf

Kannapiran, C. A., & Fleming, E. M. (1999). Competitiveness and Comparative Advantage of Tree Crop Smallholdings in Papua New Guinea by Chinna A . Kannapiran and Euan M . Fleming. *Agricultural and Resource Economics*, *February*, 1–40.

Kennedy, P. L., Harrison, R. W., & Piedra, M. A. (1998). Analyzing agribusiness competitiveness: The case of the United States sugar industry. *International Food and Agribusiness Management Review*, *1*(2), 245–257. https://doi.org/10.1016/s1096-7508(99)80038-x

Khan, M., & Damalas, C. A. (2015). Farmers' knowledge about common pests and pesticide safety in conventional cotton production in Pakistan. *Crop Protection*, *77*, 45–51. https://doi.org/10.1016/j.cropro.2015.07.014

MacDonald, S., Gale, F., & Hansen, J. (2015). Cotton policy in China. *Cotton and Wool Outlook No. CWS-15C-01*, *March*, 1–37.

Mohanty, S., Fang, C., & Chaudhary, J. (2003). Assessing the competitiveness of Indian cotton production: A policy analysis matrix approach. *Journal of Cotton Science*, *7*(3), 65–74.

Monke, E. A., & Pearson, S. R. (1989). *The Policy Analysis Matrix for Agricultural Development Outreach Programme*. Cornell University Press.

MPDS. (2013). *Food Security and Agricultural Development Pakistan: 11th Five Year Plan of Pakistan (2013-18)*. https://www.pc.gov.pk/uploads/plans/Ch21-Agricultural-development1.pdf

Najafi, B. (2005). Effects of government policies on wheat production in Iran: the application of policy matrix analysis. *Economic Research Forum, 12th Annual Conference*.

Nelson, G. C. & Panggabean, M. (2011). *Matrix Policy: Approach Analysis. 73*(3), 703–712.

Pahle, M., Pachauri, S., & Steinbacher, K. (2016). Can the green economy deliver it all? Experiences of renewable energy policies with socio-economic objectives. *Applied Energy*, *179*(642147), 1331–1341. https://doi.org/10.1016/j.apenergy.2016.06.073

Quddus, M. & Mustafa, U. (2011). Comparative advantage of major crops production in Punjab: An application of policy analysis matrix. *The Lahore Journal of Economics*, *16*(1), 63–94. https://doi.org/10.35536/lje.2011.v16.i1.a3

Sadiq, M. S. (2015). Impact of India economic policies on cotton production vis-à-vis comparison between pre-economic liberalisation policy period and economic liberalisation policy period. *Agro-Economist*, *2*(1), 57. https://doi.org/10.5958/2394-8159.2015.00010.9

Salam, A. (2012). *Review of input and output policies for cereal production in Pakistan* (Issue July).

Salam, A. & Tufail, S. (2016). Economic efficiency and distortions to incentives in production of cotton and rice crops in Punjab. *NUST Journal of Social Sciences and Humanities*, *2*(1), 29–49.

Suresh, A., Josily, S., Shwetal, W., & P., R. (2014). Cotton cultivation in India since the green revolution: Technology, policy, and performance. *Review of Agrarian Studies*, *4*(2). http://ras.org.in/cotton_cultivation_in_india_since_the_green_revolution

Wang, W., Zhang, C., Song, J., & Xu, D. (2021). The impact of target price policy on cotton cultivation: Analysis of county-level panel data from China. *Agriculture (Switzerland)*, *11*(10), 1–18. https://doi.org/10.3390/agriculture11100988

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

Williams, D. (2010). Industrial policy. *Local Economy*, *25*(8), 612–621. https://doi.org/10.1080/02690942.2010.533425

Zulfiqar, F., & Thapa, G. B. (2018). Determinants and intensity of adoption of "better cotton" as an innovative cleaner production alternative. *Journal of Cleaner Production*, *172*, 3468–3478. https://doi.org/10.1016/j.jclepro.2017.09.024