Land Use Policy 52 (2016) 136–143

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Is 'Better cotton' better than conventional cotton in terms of input use efficiency and financial performance?

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ARTICLE INFO

Article history:
Received 30 June 2015
Received in revised form 2 December 2015
Accepted 14 December 2015

Keywords:
Better cotton
Conventional cotton
Organic and inorganic inputs
Financial return
Propensity score matching
Punjab

ABSTRACT

Based on mainly primary data collected from 302 farmers in Punjab province of Pakistan, this study analyzed inputs use efficiency of and financial return from "better cotton" and conventional cotton. It also sought reasons for cultivation and non-cultivation of "better cotton" based on farmers' socioeconomic characteristics and their direct responses to related questions. The findings of analyses revealed "better cotton" better than conventional cotton in terms of both inputs use efficiency and financial return. Despite being less efficient in terms of inputs use efficiency and financial return, farmers were growing conventional cotton primarily because the government agency responsible for agricultural extension had not paid attention to promotion of "better cotton" as in the BCI project area. Important policy conclusions are drawn and broad recommendations are made for the promotion of "better cotton" in Punjab and elsewhere.

1. Introduction

There is continuing debate on environmental and social vs. economic sustainability of agriculture. In view of social, environmental and economic problems arising from conventional agriculture, environmentalists and ecologists have been emphasizing the promotion of organic agriculture to make agriculture sustainable. Organic agriculture uses only organic fertilizers and pesticides to ensure the sustainability of agro-ecological systems (Samie et al., 2010). However, since the productivity of organic agriculture is often much lower than that of conventional agriculture, it cannot meet the demands of ever growing population for food and fiber. The low yield combined with high cost of labor makes organic agriculture financially unattractive for the farmers who make labor and capital investments in anticipation of good financial return (de Ponti et al., 2012; Rattanasuteerakul and Thapa, 2012). Moreover, a genuine organic agriculture has strict certification requirements entailing farmers to maintain all the record of inputs used and management practices for pest and disease control, which are difficult and costly tasks for them (Chongtham et al., 2010). Therefore, it is almost impossible to make organic agriculture financially better than conventional agriculture unless appropriate policy interventions enabling organic products to fetch premium price are made (Rattanasuteerakul and Thapa, 2012). However, the premium prices are not always adequate to compensate the income from conventional agriculture and certification costs (Calo and Wise, 2005). This is why most farmers in all developing countries are still practicing conventional agriculture.

Conventional agriculture depends highly on external inputs, including seeds, pesticides, fertilizers and irrigation water (Rasul and Thapa, 2003). Similar is the case with cotton in Pakistan. Cotton produced using high amounts of external inputs, including fertilizers and pesticides, and irrigation water has been referred to as "conventional cotton" throughout this article. Cotton is one of the most important crops in Pakistan as it accounts for 1.4% of GDP and 6.7% of the total value of agricultural production (GOP, 2014). Pakistan is world's fourth largest producer of cotton, which is also an important source of scarce foreign currency and raw material for the national textile factories (GOP, 2014; Nadeem et al., 2014; Naheed and Rasul, 2010). Although cotton is making a significant contribution to national and rural economies, the intensive use of irrigation water, inorganic fertilizer and pesticides has impinged severely on environment, public health and financial return. Conventionally, cotton farmers in Pakistan are using high amounts of pesticide to protect crops from pests, insects and diseases (Khan et al., 2011). The pesticide use in cotton was found to be twice the recommended dose in Pakistan, resulting in an economic setback for cotton producers as there was no additional productivity gain (Hasnain, 1999; Banuri, 1998). Besides, the heavy use of pes-

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http://dx.doi.org/10.1016/j.landusepol.2015.12.013
0264-8377/

ticide had adversely affected farmers' as well as consumers' health (Atreya, 2008; Mancini et al., 2005; Pimentel, 2005).

Considering the limitations of both conventional and organic agriculture, scientists and policymakers are arguing for the promotion of an alternative agriculture that can enhance environmental, social and financial sustainability of conventional agriculture. Such agriculture is sometimes termed as Good Agriculture Practice (GAP) (FAO, 2003). Others address it as regenerative, ecological, alternative or better and low input agriculture (Seufert, 2012). Whatever the nomenclature is used to address, the alternative agriculture reduces the use of inorganic inputs and irrigation water, thereby making it better than the conventional agriculture environmentally, socially and economically.

The findings of scientific studies have revealed that crop yields and profits can be maintained by even reducing the amounts of inputs used (Abraham et al., 2014; Coulter et al., 2011). Despite reduced application of inorganic inputs and irrigation water, the yield of "better cotton" was found to be 11, 18 and 15% higher than the yield of conventional cotton in China, India, and Pakistan, respectively. This was attributed to reduction of the use of pesticide, fertilizer and irrigation water (BCI, 2013c). However, crop variety significantly influences the yield and financial return. In Pakistan, the production of Bt cotton (a genetically modified variety) had resulted in significantly lower expenditures, and higher yield and profit margin compared with the conventional cotton (Bakhsh, 2013; Nazli et al., 2012).

The Better Cotton Initiative (BCI), which is an international not-for-profit organization stewarding the global standards for Better Cotton, had introduced "better cotton" in Punjab province of Pakistan in 2009 to mitigate socioeconomic and environmental costs of conventional cotton (BCI, 2010). Production of "better cotton" is being promoted in Pakistan by BCI through the World Wild Fund Pakistan (WWF-P). WWF-P has mandated four non-government organizations (NGOs), namely, Kashtkar Development Organization, Marriam Rural Welfare Organization, Rural Sustainable Development Organization, and Sustainable Development Organization to implement needed activities in the study area. It is produced under the guiding principles and criteria developed by BCI, emphasizing crop protection, improved water use efficiency and soil management, natural habitat conservation, fiber quality improvement, and promotion of decent work (BCI, 2013a). The support provided to farmers by concerned NGOs include provision of extension services, training, on-field demonstration, information on new technologies and certification. A certificate is issued only after farmers are found complying with the criteria stipulated by BCI. Such dedication of private companies to promote "better cotton" stems from their motivation to increase income by adding more value to their products by improving the quality of the cotton and by reducing the cost of production.

Nearly 90% of the cotton grown in Pakistan as of 2014 was Bt cotton (James, 2014). Irrespective of location, most farmers produced Bt cotton as it was far better than the traditional variety of cotton in terms of yield and financial return. Even in our study area, including the villages with and without "better cotton", most farmers were found growing Bt cotton, and this was corroborated by the findings of our analysis, which revealed insignificant variation in yields of conventional and "better cotton". What made the difference between the conventional and "better cotton" was management practices and use of inputs including fertilizers, pesticides and irrigation water. The basic aim of promoting "better cotton" by BCI was to reduce the use of pesticides, fertilizer and irrigation water without compromising on the yield, thereby increasing farmers' net income (BCI, 2013c). At the same time BCI could increase financial benefit by capitalizing on the ever increasing national and international demand for cleaner agricultural products. Since its introduction, the area under "better cotton" and the number of farmers growing such cotton had increased by 395 and 288%, respectively (BCI, 2013c). However, the majority of cotton farmers were still growing conventional cotton. In 2013 only 2.14% of the total cotton farmers in Pakistan were growing "better cotton" and BCI aimed at increasing this to 30% by 2020 (BCI, 2013c). To our knowledge, the research on "better cotton" had so far been carried out by BCI itself or agencies/individuals commissioned by it. The focus of those researches was general profitability of "better cotton" (BCI, 2013c, 2010). They did not analyze financial benefit controlling farmer characteristics and returns to inputs used. Moreover, they did not investigate as to why the overwhelming majority of farmers were still growing conventional cotton if "better cotton" was financially better. Therefore, this study aims at seeking answer to two questions: (1) whether the "better cotton" is really better than the conventional cotton in terms of input use efficiency and profitability; and (2) if it is, as to why majority of farmers are still growing conventional cotton. The findings of the study have important policy implications for the promotion of "better agriculture" in Pakistan and elsewhere, which would contribute to mitigate adverse environmental effects of conventional agriculture as well as help to improve farmers' financial benefit.

2. Study area and research methods

2.1. Study area

This study was carried out in Punjab province of Pakistan, accounting for 80% of the cotton growing area and 73% of the national cotton production (GOP, 2013). It is based on mainly primary data collected through a household survey for which a multistage sampling was used. First, Bahawalpur district of Punjab was purposively selected for the household survey as BCI project was implemented in this district since 2009 (BCI, 2010) and most farmers, irrespective of area with and without "better cotton" were growing Bt cotton. As mentioned above, the difference in the areas with and without BCI intervention was in crop management, and use of fertilizers, pesticides and irrigation water. This district also ranked first in the province in terms of both area under cotton and amount of production (GOP, 2012). Of the five sub-districts of this district, Bahawalpur, Ahmadpur and Yazman sub-districts were purposively selected for the household survey because these were the largest sub-districts in terms of the number of farm households. The selected sub-districts comprised 89 union councils, which are the lowest administrative units in Pakistan. As it was not possible to survey all union councils, 13, 12 and 10 union councils were selected for survey from Bahawalpur, Ahmadpur and Yazman sub-districts, respectively. The number was directly proportional to the total number of union councils in each sub-district. Only the rural union councils were randomly selected for the survey.

2.2. Household sampling

There were 244,613 farm households in three surveyed sub-districts of the study area in 2014. Considering this as population, a sample size of 302 was determined using the formula developed by Yamane (1967). The sample size based on this formula, widely used by researchers (Ullah et al., 2015; Hussain and Thapa, 2012; Qasim et al., 2011), depends on the population size and the level of precision. The sample size for this study was determined at 10% confidence level (Table 1).

Of the sample size of 302, 161 was allocated to "better cotton" farmers and 141 conventional cotton farmers. This was consistent with the fact that the surveyed union councils had slightly more than 50% of farmers growing "better cotton".