INDIAN GOVERNMENT POLICY AND PRODUCER PROFITABILITY IN GUJARAT AND MAHARASHTRA: IMPLICATIONS FOR U.S. COTTON EXPORTS

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Abstract

The increasing role of the Indian cotton sector in international markets is a direct challenge to the US cotton exports, especially in markets like China. Within this context, a better understanding of the Indian cotton production system will allow US cotton producers to assess their competitive position in international markets and allow for long-term strategic marketing planning. In this study, representative farm models of cotton production in two Indian states of Gujarat and Maharashtra were developed from information collected through focus group discussions of cotton farmers. These models were utilized to analyze the impact of Indian government policies like fertilizer subsidies and minimum support price on the profitability of Indian cotton farmers by using stochastic simulation models. The results were further used to understand the potential impact on US cotton sector and its competitiveness in international markets. The results demonstrate that the net income of the cotton farmers will decrease considerably without the presence of fertilizer subsidies. The study also concludes that if prices remain at the levels seen in 2010-11 the minimum support prices of government of India will not have much impact on the profitability of Indian cotton farmers and/or their land allocation decisions to cotton.

Introduction

Cotton is a very important commodity in Indian Agriculture and it has played a major role throughout India's history. Recent technological advances and trade liberalization have made India a major player in international cotton markets. In 2009-10, India was the world's second largest cotton producer, consumer and exporter (FAOSTAT). The increasing role of the Indian cotton sector in international markets is a direct challenge to the US cotton exports, especially in markets like China, which accounts for 40 percent of the total mill use of cotton in the world. The importance of the Chinese market is going to increase in future, as China is expected to import cotton, which is almost double to that of present level (FAPRI, 2010). Within this context, a better understanding of the Indian cotton production system will allow US cotton producers to assess their competitive position in international markets and allow for long-term strategic marketing planning. The overall objective of this paper is to assess the competitiveness of Indian cotton producers and potential implications for India as a competitor in the world cotton market. The focus will be on developing an updated estimate of the costs of production in India and develop representative farm models for cotton production in India. These models will be utilized for understanding the impact of government policies like subsidies to fertilizers and minimum support prices on farm level profitability and ultimately on the competitiveness of Indian cotton in international markets. The results further can be used to understand the potential impact on US cotton sector and its competitiveness in international markets.

In the following section, a brief description of the production, consumption, marketing structure and government policies in the Indian cotton sector is presented. The third section provides a discussion of the data collection and methodology for this study. The final section discusses results and provides conclusions.

Cotton in India

Production

Cotton is an important cash crop for Indian farmers. It is third in total acreage planted among all crops in India behind rice and wheat. In the last decade, cotton acreage increased by almost 1.4 million hectares from 2001 to 2010 (See Table 1). In 2009-10, it was cultivated on about 10.17 million hectares producing 29.2 million bales (1 bale = 170 kilograms). In the last ten years, cotton acreage has been growing at an average annual rate of around 2 percent. In 2009-10 the cotton acreage increased by 8 percent which is attributed to increasing demand in international markets. The increase in acreage led to an increase in the production of cotton in India over the last ten years from

15.8 million bales in 2001-02 to 29.2 million bales in 2009-10, an increase of 109 percent (see Table 1). However, the average cotton yield in India is only 0.49 tons per hectare compared to a world average of 0.73 tons per hectare (ICAC, 2010). The low yields persistent in Indian cotton production have been partially attributed to less intensive farm management practices along with a lack of disease resistant and high yielding varieties. Another factor affecting the yields is the rainfall pattern in India.

About 65 percent of the cotton acreage in India is dependent on rain; the annual variation in monsoon rainfall plays an important role in production and yield for any particular year (Aggarwal, et al., 2008). The planting period for cotton in India is from March to September while harvesting takes place from October to February. The monsoons occur between June and September. Any mismatch in timing of planting operations and occurrence of monsoons impact the yield and hence production of cotton.

Cotton yields have increased on an average by almost 7 percent in the last ten years, but are still considerably lower than world average. The major reasons for this improvement is the increasing usage of high yielding varieties including Bt cotton, improved pest management practices and improved irrigation facilities in some parts of India. The acreage of Bt cotton in India was almost 65 percent of the total cotton acreage in 2007-08 (Qaim and Sadashivappa, 2009), a major reason for increased yields.

Table 1. Area, production and Yield of Cotton in India 2001-10

Year	Area (million ha)	Production (million metric tons)	Yield (tons/ha)
2000-01	8.58	2.38	0.28
2001-02	8.73	2.69	0.31
2002-03	7.67	2.31	0.30
2003-04	7.63	3.04	0.40
2004-05	8.79	4.13	0.47
2005-06	8.68	4.15	0.48
2006-07	9.14	4.76	0.52
2007-08	9.41	5.22	0.55
2008-09	9.41	4.93	0.52
2009-10	10.17	4.96	0.49

Source: Cotton Corporation of India

Cotton is produced in three zones in India. The Northern zone comprising the states of Punjab, Haryana and Rajasthan, the Central zone comprising the states of Maharashtra, Madhya Pradesh and Gujarat and the Southern zone comprising the states of Andhra Pradesh, Karnataka and Tamil Nadu (Chakraborthy, et al 1999). The states of Gujarat, Maharashtra and Andhra Pradesh contribute about three quarters of the total production. Even though the acreage in Maharashtra is 30 percent more than the state of Gujarat in 2009-10, the production is almost 50 percent more in Gujarat as the yield is more than double that of Maharashtra (See Table 2). Historically, the low yields in the state of Maharashtra are due to irregular rainfall pattern and use of low yielding varieties (Chakraborthy et al, 1999). But, the productivity in the state of Maharashtra is also increasing considerably fast as the adoption rate of Bt cotton is one of the highest compared to many other states even Gujarat in some years. The proportion of Bt cotton as a percentage of total area of cotton increased by almost 10 times more than in Gujarat between 2003-05 (Gandhi and Namboodiri, 2006). It was estimated that if India’s cotton yield reached the world average by 2016/17, its cotton production would dramatically increase by almost 27 percent more than that of a lower yield scenario (Pan, et al., 2007).

Figure1. Map of India

Table 2. Top five states in Cotton Production in India

	2009-10			2008-09		
State	Area	Production	Yield	Area	Production	Yield
Gujarat	2.62	1.67	0.64	2.35	1.53	0.65
Maharashtra	3.50	1.04	0.30	3.14	1.05	0.34
Andhra Pradesh	1.32	0.85	0.64	1.40	0.90	0.64
Madhya Pradesh	0.65	0.25	0.38	0.63	0.31	0.49
Haryana	0.51	0.25	0.50	0.46	0.24	0.52

Notes: Area in million hectares, Production in million bales, Yield in tons per hectare
Source: Cotton Corporation of India

Consumption and Exports

The demand for Indian cotton is largely from the domestic textile industry, which is one of the largest industries in the country and has witnessed great improvements in terms of installed spindlage and yarn production. The total consumption of cotton in India has increased by almost 40 percent from 2000-01 to 2008-09. Currently, India's domestic mill consumption accounts for about 76 percent of production. In the same period the imports of cotton for domestic consumption decreased by almost 75 percent (See Table 3). Cotton production in India is sufficient to meet the demand originating from the domestic textile industry (CCI, 2010). The technological development of Indian cotton processing (ginning and pressing) industry has been on par with development in countries like China aided by government-sponsored programs to improve the efficiency of the processing units. As part of the technological mission on cotton sponsored by Cotton Corporation of India (CCI), about 1000 ginning and pressing facilities in India have been modernized and their capacity has been upgraded (CCI, 2010).

Table 3. Cotton Balance Sheet (Qty in million tons)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Supply									
Opening stock	0.69	0.49	0.68	0.41	0.36	1.22	0.88	0.81	0.73
Crop size	2.38	2.69	2.31	3.04	4.13	4.15	4.76	5.36	5.47
Imports	0.38	0.43	0.30	0.12	0.21	0.07	0.09	0.11	0.09
Total availability	3.44	3.61	3.29	3.57	4.69	5.44	5.74	6.27	6.29
Demand									
Total consumption	2.94	2.92	2.87	3.01	3.32	3.69	3.94	4.10	4.10
Export	0.01	0.01	0.01	0.21	0.16	0.80	0.99	1.45	1.28
Total disappearance	2.95	2.93	2.88	3.22	3.47	4.49	4.93	5.54	5.37
Carry forward	0.49	0.68	0.41	0.36	1.22	0.95	0.81	0.73	0.92

Note: Cotton year from October to September
Source: Cotton Corporation of India

In addition to increased consumption of cotton by the domestic textile industry, India has also become a major exporter of cotton. Indian exports have increased from 0.1 million bales in 2000-01 to 7.5 million bales in 2008-09 (CCI, 2010), with Chinese textile industry being an important importer of Indian cotton (FAOSTAT). The relatively lower cotton prices and convenient transportation contribute to India's competitiveness, whereas the competitiveness of US is attributed to quality and reliability of the supply (USDA, 2010). It is also estimated that if India's cotton yields reach world average by 2016-17, Indian cotton exports would dramatically increase leading to a lower world price as well (Pan, et al., 2007). The usage of cotton in China is 10.3 million tons whereas the production is 6.8 million tons in 2009-10, leaving a huge gap to be filled by major cotton exporters like US and India. In spite of government support to boost cotton production in China, it is limited due in part to dominance of other government polices to increase food and feed grain production. So, the gap between the production and use is expected to continue into the future, forecasted Chinese cotton imports are expected to rise to 29 percent of its domestic use by 2019/20 and over 40% of world trade flows (FAPRI, 2010). Such an increase would make China the dominant destination for cotton trade, leaving the market open for US and Indian cotton exporters to compete with each other. In the first eight months of 2009-10, the share of India in Chinese cotton imports increased significantly to 40 percent while the share of US dropped to 27 percent, but an export ban placed by government of India in response to a steep increase in local cotton prices reduced the share. Although the action has eased supply constraints in India for its domestic textile industry, cotton importers like China have been impacted by higher prices in international markets.

Marketing Structure

Along with the private traders who constitute the majority of the buyers in the local cotton markets in India, the government of India also actively participates in the industry and serves as an umbrella for government agencies like Cotton Corporation of India (CCI) and state marketing federations. (In the state of Maharashtra, the Maharashtra State Cooperative Cotton Growers Marketing Federation (MAHACOT) is responsible for market intervention operations). The CCI is the primary organization engaged in marketing of cotton through regular presence in the markets. Its presence in the markets helps create a competitive environment to the advantage of cotton farmers in realizing prices commensurate with the quality of their produce (Chakraborthy, 1999). The CCI operates more than 300 centers in different cotton growing states, and purchases are made either under Minimum Support Price operations or under commercial operations. In 2008-09, CCI procured about 30 percent of total cotton produced in India through its operations (CCI, 2010).

The government of India fixes the Minimum Support Prices (MSP) for various groups of cotton varieties depending upon their staple length every year. When the open market cotton prices go below the MSP level, the CCI intervenes in the market and makes purchases without any quantitative limits. The actions of the CCI prevent farmers from going for distress sales and helps in retaining their interest in continuing cotton cultivation. The actions of CCI have become all the more important policy amendments in the last few years due in part to the cotton farmer suicides in India (The New York Times, 2006). But, in the last ten years, CCI intervened in the market only twice, as the open market prices were higher than the MSP for many varieties (See Figure 2). During times when the market price is more than the MSP, the CCI undertakes commercial operations to supply their cotton to mills in domestic markets. These operations help in meeting the annual cost of maintaining the necessary infrastructure to be used for price support activities.

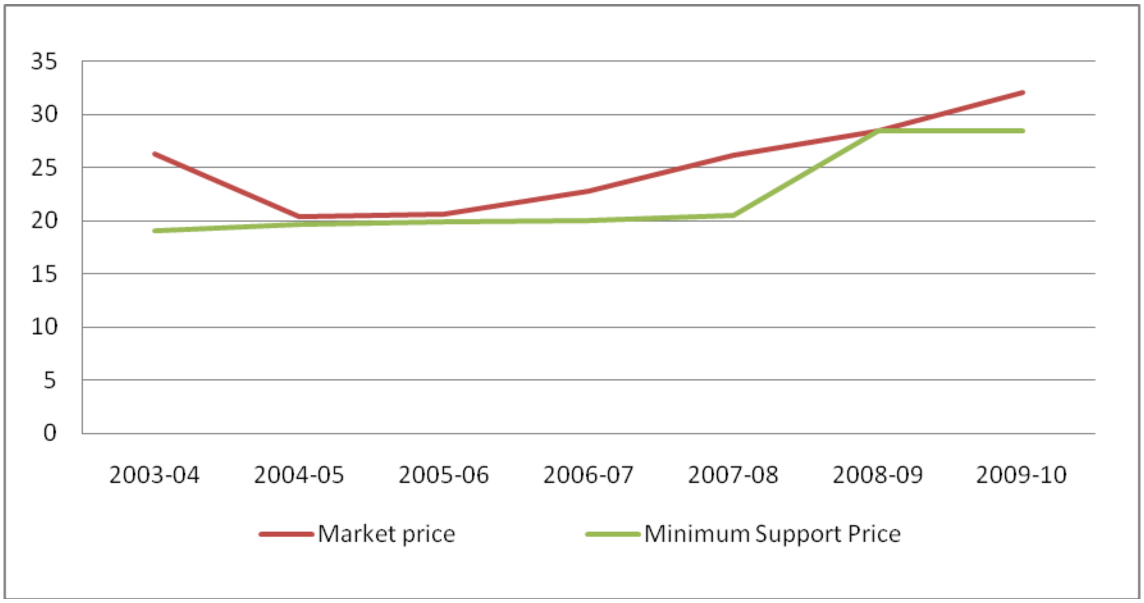

Figure 2. Market Prices and Minimum Support Prices (MSP) for Long Stapled Cotton
(Sankar-6, Sanker-10, H-4 and H-6 are some varieties of long stapled cotton with staple length of 27.5-32 mm)
Source: Cotton Corporation of India

Input Subsidies

Along with the Minimum Support Prices, the government of India also subsidizes fertilizers, power and irrigation. In some areas and for some disadvantaged groups of farmers credit facilities are also offered at subsidized rates. Input subsidies can be beneficial to Indian farmers by improving their profitability and thereby raising their living standards, but the subsidies may also lead to excess use of fertilizers, pesticides and water with potentially negative environmental implications. Among these subsidies, fertilizers comprise the largest group of inputs, and receive the most subsidies. In 2008-09, the fertilizer subsidies disbursed totaled almost $23 billion (Ministry of Fertilizers and Chemicals, 2010). The main objectives of fertilizer subsidies are to provide farmers with fertilizers at affordable prices in order to induce them to use fertilizers to increase production as well as providing adequate return on investments for fertilizer manufacturers. To attain these objectives, the government introduced the Retention Price cum Subsidy scheme (RPS), a cost-plus approach. In this scheme, the retail price of fertilizers was fixed and uniform throughout the country and difference between the retention price of the manufacturer (adjusted for freight and dealer's margin) and the maximum retail price at which the fertilizers were sold to the farmer was paid back to the manufacturer as subsidy. Depending upon the international prices of fertilizers and the cost of production of domestic fertilizer manufacturers, the subsidy payments calculated through retention price scheme (RPS) paid to the importers and domestic manufacturers, which are different from each other. Even though the fertilizer subsidies are beneficial to the farming community, they are becoming very expensive programs for the government (See Table 4). Beginning in the 1990s, the government of India took steps to contain the fertilizer subsidies, but with limited effect (Sharma and Thaker 2009).

Table 4. Fertilizer Subsidies in India (Rs billions)

	Urea	P&K	Total
2002-03	77.88	32.25	110.13
2003-04	85.09	33.26	118.35
2004-05	109.86	51.42	161.28
2005-06	117.49	65.5	182.99
2006-07	153.54	105.98	259.52
2007-08	232.04	171.34	403.38
2008-09	339.01	655.55	994.56
2009-10*	252.58	317.98	570.56

Source: Ministry of Chemicals & Fertilizers, Govt. of India

Although India is one of the largest producers of fertilizers, the demand surpasses the production capacity leading India to be an importer of fertilizers. Table 5 provides information about the consumption, production and imports of fertilizers according to the nutrient groups.

Table 5. Production, consumption and imports of fertilizers by nutrient (million metric tons)

	Consumption				Production				Imports			
	N	P	K	Total	N	P	K	Total	N	P	K	Total
2000-01	10.9	4.2	1.6	16.7	11.0	3.7	0.0	14.7	0.2	0.4	1.5	2.1
2001-02	11.3	4.4	1.7	17.4	10.8	3.9	0.0	14.6	0.3	0.4	1.7	2.4
2002-03	10.5	4.0	1.6	16.1	10.6	3.9	0.0	14.5	0.1	0.2	1.4	1.7
2003-04	11.1	4.1	1.6	16.8	10.6	3.6	0.0	14.3	0.1	0.3	1.5	2.0
2004-05	11.7	4.6	2.1	18.4	11.3	4.1	0.0	15.4	0.4	0.3	2.0	2.8
2005-06	12.7	5.2	2.4	20.3	11.4	4.2	0.0	15.6	1.4	1.1	2.7	5.3
2006-07	13.8	5.5	2.3	21.7	11.6	4.5	0.0	16.1	2.7	1.3	2.1	6.1
2007-08	14.4	5.5	2.6	22.6	10.9	3.8	0.0	14.7	3.7	1.3	2.7	7.6
2008-09	15.1	6.5	3.3	24.9	10.9	3.5	0.0	14.3	3.8	2.9	3.4	10.2
2009-10	NA	NA	NA	NA	12.0	4.4	0.0	16.3	3.1	2.5	2.5	8.1

Note: N, P and K denote Nitrogen, Phosphorous and Potassium fertilizers respectively.
Source: Ministry of Fertilizers and Chemicals, Govt. of India

Data Collection and Methodology

Data Collection

Data was collected in two cotton producing states of India namely Gujarat and Maharashtra in summer of 2010. These are the top two states in terms of production and acreage in India contributing about 52 percent and 60 percent of the total production and total acreage in India respectively. In each state, information was collected from three focus groups in three different villages and the information was aggregated. Each of the focus group constituted about 7-12 farmers and a survey instrument was used to provide structure to the discussion. Table 6 provides summary information on the cost of cultivation collected in both the states. The cost of production of cotton in Gujarat is 21 percent more than that of Maharashtra due to more usage of fertilizers and micronutrients and greater irrigation costs. Even though the pest control and total labor expenses were higher in Maharashtra than in Gujarat, the higher harvesting expenses in Gujarat made the total cost of cultivation higher in Gujarat. The higher harvesting expenses are due to higher yields in Gujarat, which are almost 50 percent more than in Maharashtra. In focus group discussions, the average yield of seed cotton that was reported in Gujarat was 1500 kg per acre compared to only 1000 kg per acre in Maharashtra. The yield levels can be much lower in many others areas of these two states which were not covered by this study, as the average yields in Gujarat and Maharashtra are 254 Kg per acre and 122 Kg per acre respectively in 2009-10 (CCI, 2010). The gross profit in Gujarat is almost double that of Maharashtra demonstrating the importance of higher yields prevalent in Gujarat. The gross profit excludes returns to family labor and managerial compensation. The cost of production and profitability estimates by various studies sponsored by government of India and the respective state governments are much lower than estimated by our study especially for the state of Gujarat. The differences may be due to the limited coverage area of this study compared to other studies and the higher knowledge and skill levels of the farmers who participated in our focus group discussions. Most of the participants in our focus group discussions are progressive farmers who have higher knowledge and skills in farming than their peers in that area.

Table 6. Cost of Cultivation and Gross Profit in Maharashtra and Gujarat ($ per Acre)

	Gujarat	Maharashtra
Fertilizers (including FYM)	104.65	79.81
Herbicide	5.23	-
Micronutrients, water soluble fertilizers, PGR, etc.	22.43	5.97
Irrigation	32.53	15.70
Pest Control (Insecticides, fungicides, etc.)	36.68	63.11
Seed	30.85	30.85
Total Material Costs (A)	232.36	195.44
Labor Expenses:		
Land preparation	40.38	23.91
Fertilizer application	3.37	11.04
Seed sowing	9.71	11.58
Pesticide Application	20.19	10.45
Manual Weeding	21.67	41.50
Total Labor Costs (B)	95.32	98.49
Total Harvest Costs (C)	131.24	85.99
Total Production Cost/Acre (A+B+C)	458.93	379.91
Yield (Kg per Acre)	1500	1000
Price Per Kg ($)	0.74	0.72
Revenue	1110.49	720.00
Gross Profit	651.56	340.09

The cost of production in the above table does not include transportation expenses from farm to processor. In both the locations, the buyer/broker who buys cotton from the farmers is responsible for the transportation. He also checks quality at the time of transaction. In the areas covered by this study, the role of cooperatives and government agencies like Cotton Corporation of India (CCI) is minimal. Almost all the transactions of the farmers are with private dealers who in turn may represent cotton ginners.

Methodology

Stochastic simulation models are used to generate a large random sample of outcomes for a dependent variable where that dependent variable is a function of some selected set of explanatory variables. A unique feature of these types of models is that there is an explicit recognition that the independent variables have some probability distribution around their mean values.

The forecast of the dependent variable is thus a function of the probability distributions of the explanatory variables as well as their mean value. The simulated distribution of the dependent variables thus captures the variability or risk associated with forecasting the dependent variable that cannot be obtained by using simply the mean value of the explanatory variables. If the explanatory variables are uncorrelated, an appropriate univariate probability distribution is chosen (e.g. normal, Poisson, empirical, etc).

It is also possible to capture the joint variability of two or more correlated explanatory variables on the dependent variable. The joint variability can be captured by determining the multivariate probability distribution (e.g. multivariate normal, multivariate empirical, etc.) for the two or more correlated explanatory variables. The multivariate probability distribution is developed much the same as the univariate probability distribution but includes information in the correlation matrix to account for the correlation between the independent variables. A detailed discussion on modeling stochastic simulation models including determination of the appropriate probability distributions and its construction can be found in Simulation for Applied Risk Management by James Richardson, Texas A & M University.

The simulated forecast of dependent variables using either univariate or multivariate probability distributions of the explanatory variables is very useful in informing decision makers of the variability or risk in the dependent variable forecast, the skewness of the forecast, and the probability of a specific outcome for the dependent variable. Most stochastic simulation models have more than one dependent variable. The dependent variables in a stochastic simulation models are often referred to as Key Output Variables (KOV's).

From the sample of farms in the rapid assessment study, the impact of fertilizer subsidies and minimum support prices (MSP) on the profitability of Indian cotton farms can be analyzed. Two Indian cotton representative farm simulation models have been developed for the states of Gujarat and Maharashtra using information collected through focus groups. Representative farm models are stochastic simulation models that are used to analyze the impacts of current and changing market conditions and government policies on a number of KOV's. Examples of KOV's in a representative farm models are yearly net income, cash flow position, financial ratios such as debt to equity or liquidity, and net present values of net income.

These models can be used for several purposes. They simulate the producer's income statement, statement of cash flows, and balance sheet as well as any financial indicator calculated from those three statements. From there, we can analyze the impact a new policy may have on a producer's net income or net present value before implementation. They can also determine the impact a change in production practices may have on the producer's financial statements before actually changing practices. In other words, these models act as decision-making tools. The models are constructed in a way that allows for easy analysis of several variables.

By using a stoplight chart, one of the graphical capabilities of the model, we can compare probabilities for one or more alternatives for the target values of net present values of net income. In order to generate the stoplight chart, two value targets, lower and upper, are chosen from observed returns. The stoplight function calculates the probabilities of: (a) exceeding the upper target (green), (b) being less than the lower target (red), and (c) observing values between the targets (yellow).

In this study, the stochastic simulation models are used to analyze the impact of fertilizer subsidies on the net income of cotton representative farms in the states of Gujarat and Maharashtra. The analysis forecasts the net income for a period of two years from 2011-13. In a second scenario, the impact of minimum support price (MSP) on the net income of cotton farms in the above-mentioned states is analyzed.

Results and Conclusion

Impact of fertilizer subsidies

As fertilizer subsidies constitute a major proportion of the total subsidies given to farmers by Indian government, a counterfactual scenario forecasts the net income of Indian farmers without the fertilizer subsidies for a two-year period from 2011-13. In the counterfactual scenario, only the subsidies to Urea, Di-ammonium Phosphate (DAP), Murate of Potash (MOP) and NPK complex fertilizers are considered. The subsidies given to other fertilizers are not considered, as their proportion in the total fertilizer subsidies is meager. The subsidies given to Urea, DAP and MOP are obtained by calculating the difference between the international prices (CFR Mumbai prices for DAP, MOP and Urea) and the maximum retail prices of those fertilizers in India. The subsidies to NPK complex fertilizers are calculated depending on the proportion of N, P and K nutrients and applying the same rate of subsidies as that of Urea, DAP and MOP. Although the subsidies given by government of India to indigenous manufactures are different from the subsidies given to imported fertilizers (Ministry of Fertilizers and Chemicals, 2010), this scenario considers them as equal and takes into account only the international prices of the fertilizers. Table 7 compares the international prices and maximum retail prices of fertilizers in India.

India is one of the largest importers of the fertilizers in the world and entry of India in world markets as an importer influences world prices significantly (Sharma and Thaker, 2009). However, this study assumes that imports by India from the world fertilizer market would not affect world prices and world fertilizer markets are perfectly competitive. In other words, India is considered a small country whose markets are not going to influence the world market for purposes of this analysis.

Table 7. Comparison of International and domestic prices of fertilizers

	International price ($ per metric ton)	Maximum retail price in India ($ per metric ton)
DAP	499.13	209.76
MOP	381.25	99.94
Urea FOB	306.88	108.36

Source: Ministry of Fertilizers and Chemicals, Govt. of India

In the first scenario, the fertilizer expenditure is calculated taking international prices (prices without fertilizer subsidies) into consideration for Gujarat and Maharashtra. The fertilizer expenditure without subsidies is almost double to that of fertilizer expenditure with subsidies. In Maharashtra, the fertilizer expenditure per acre with subsidies is $79.4, whereas it is $178.86 without subsidies. Similarly, the fertilizer expenditure per acre with subsidies in Gujarat is $104.64, whereas it is $201.92 without subsidies. The fertilizer expenditures without subsidies are incorporated into the representative farm models of cotton in both the states of Gujarat and Maharashtra to get the results of the first scenario.

The results of the simulations of baseline model and counterfactual model are analyzed for any differences in the cost of production, net income and net present value of sum of income streams of both years 2011 and 2012. The two year forecast shown in Table 8 estimates that the present value of the net income of the farmers decreases by 36 percent and 18 percent in Maharashtra and Gujarat respectively. Even though the total cost of production has increased by 26 percent and 21 percent in Maharashtra and Gujarat respectively during both the years due to removal of fertilizer subsidies, the percentage decrease in net income in Maharashtra is more than double that of Gujarat due to the higher yield and resulting revenue per acre in Gujarat.

Table 8. Comparison of results with baseline forecast

($ Per Acre)	Baseline		Without fertilizer subsidies		Without MSP	
	2011	2012	2011	2012	2011	2012
Gujarat						
Net Income	533.71	567.79	436.44	468.83	440.44	482.57
Production Cost	463.58	479.97	560.86	578.93	463.58	479.97
Net present value (Sum of income stream 2011-2012)	994.73		817.38		833.12	
Maharashtra						
Net Income	266.73	286.32	167.68	185.56	197.89	220.64
Production Cost	381.75	395.26	480.80	496.03	381.75	395.26
Net present value (Sum of income stream 2011-2012)	499.37		318.78		377.66	

Charts 1A and 1B in Figure 3 provide a comparison of the simulated probability distributions of net present value of sum of net income after taxes per acre in years 2011 and 2012 with and without subsidy in the state of Gujarat. The removal of fertilizer subsidies reduces the probability of earning a net income of more than $1200 per acre by 17 percent whereas the probability of earning a net income between $750 and $1200 increases by 5 percent and also the probability of earning less than $750 per acre increases by 11 percent.

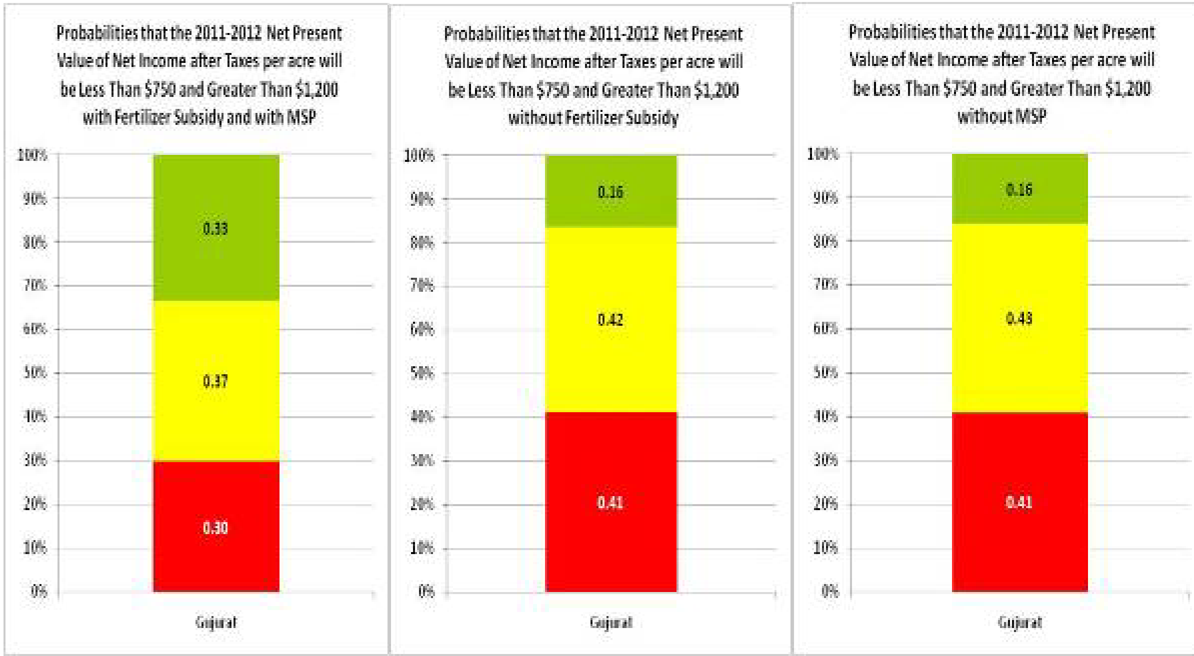

Chart 1A Chart 1B Chart 1C

Figure 3. Stop-light charts for the state of Gujarat

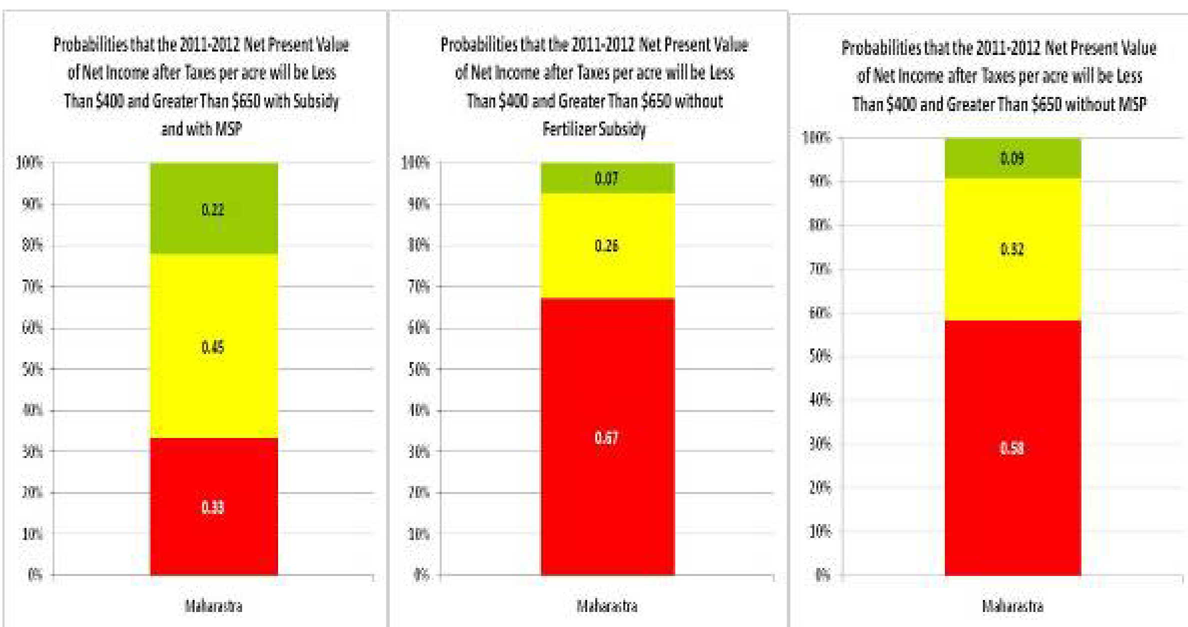

Chart 2A Chart 2B Chart 2C

Figure 4. Stop-light charts for the state of Maharashtra

Charts 2A and 2B in Figure 4 provide a similar comparison of the simulated probability distributions of net present value of sum of net income after taxes per acre in years 2011 and 2012 with and without subsidy in the state of Maharashtra. The removal of fertilizer subsidies reduces the probability of earning a net income of more than $650 per acre by 15 percent and reduces the probability of earning a net income between $400 and $650 by 19 percent. The results show that the probability of earning less than $400 per acre increases by 34 percent when subsidies were removed. The analysis can be also extended to obtain the impact of fertilizer subsidies to cotton farmers in India on international markets and the resulting changes in trade between countries by using an international trade model.

Impact of Minimum Support Price (MSP)

The government of India sets the Minimum Support price (MSP) for cotton every year, which represents the price at which the Cotton Corporation of India (government agency) intervenes in the market by purchasing cotton, when the market prices are not remunerative enough. In the last ten years, the government of India intervened in the markets only twice as the open market prices are always above the MSP for many varieties. In order for the impact of MSP on the net income of the farmers to be significant, the market prices would need to be considerably less than the present level of prices prevalent in the market. To illustrate the potential impacts, this scenario analyzes the impact of MSP on the net income of cotton farmers in the states of Gujarat and Maharashtra. The model assumes that the market prices did not increase to such a high level in 2010 as was observed everywhere. The model estimates the market price for 2010 by taking into consideration the same trend as seen in the last ten years. In this background, a MSP of $0.64/ kg of seed cotton (Rs 28.50 per Kg @Rs 44.575 per US Dollar) was incorporated into the representative farm models of both Gujarat and Maharashtra for the years 2011 and 2012 and the net incomes were analyzed with and without the introduction of MSP.

The results of the simulations with MSP and without MSP are shown in Table 8. The net income in Gujarat decreased by 18 percent and 15 percent in 2011 and 2012 respectively when MSP is removed, whereas the net income decreased by 26 percent and 23 percent in 2011 and 2012 respectively in Maharashtra. The net present value of the sum of the net incomes in 2011 and 2012 decreased by 16 and 24 percent in Gujarat and Maharashtra.

Charts 1A and 1C in Figure 3 provide a comparison of the simulated probability distributions of net present value of sum of net income after taxes per acre in years 2011 and 2012 with and without minimum support price (MSP) in the state of Gujarat. The removal of MSP reduces the probability of earning a net income of more than $1200 per acre by 17 percent whereas the probability of earning a net income between $750 and $1200 increases by 6 percent and also the probability of earning less than $750 per acre increases by 11 percent.

Charts 2A and 2C in Figure 4 provide a similar comparison of the simulated probability distributions of net present value of sum of net income after taxes per acre in years 2011 and 2012 with and without minimum support price (MSP) in the state of Maharashtra. The removal of MSP reduces the probability of earning a net income of more than $650 per acre by 13 percent and reduces the probability of earning a net income between $400 and $650 also by 13 percent. The results show that the probability of earning less than $400 per acre increases by 25 percent when MSP is removed.

Conclusion

In this article, we have analyzed the impact of fertilizer subsidies and minimum support prices (MSP) on the net income of Indian cotton farmers. We have used information collected from focus group discussions of farmers in top two cotton growing states of India. Indian government provides various subsidies to farmers to improve the profitability of their farming enterprises and to increase their living standards. However, due to the growing fiscal deficit in the Indian economy, the government is changing the fertilizer policy. It has started decontrolling the fertilizer prices (Sharma and Thaker, 2009). Though the decontrolling of fertilizer prices is not to the fullest, this study analyzes the impact on profitability of Indian cotton farms if the domestic prices of India were equal to international prices. This study analyses the profitability of cotton farms in the states of Gujarat and Maharashtra with and without the fertilizer subsidies. The results demonstrate that the net income of the cotton farmers represented from this study group will decrease considerably (up to a maximum of 36 percent) without the presence of fertilizer subsidies. The results also show that the probability of earning a lower net income increases, whereas the probability of earning a higher net income decreases when fertilizer subsidies are removed as shown in the stop light charts. This may lead to a shift in cultivation patterns of cotton farmers and they may shift to other crops. However, as the fertilizer subsidies are not product specific, the shift in cropping patterns may be minimal as the impact of fertilizer subsidies is going to be similar on all the crops where fertilizers are used intensively. Therefore, crops where fertilizers are not used as intensively as in cotton would be candidates for an increased allocation of land at the expense of cotton. In order to understand the more in detail about the shift in cropping patterns, we need to understand the profitability of other substituting and competing crops of cotton in those areas. On the other hand, as fertilizers become expensive, the farmers may use fewer fertilizers than before leading to lesser yields in cotton.

The lesser yields may lead to decrease in profitability of cotton farming. In this scenario, the results suggest that the US farmers may benefit from decreasing export competition as surplus cotton production declines.

Another major factor affecting the profitability of Indian cotton farmers is the presence of Minimum Support prices (MSP). The MSP tends to create a sense of protection among Indian farmers and thereby having an impact on how they make land allocation decisions to various crops. The results show that without the presence of MSP, the net income of farmers represented in this study may decrease up to a maximum of 26 percent. The results also show that the probability of earning a lower net income increases, whereas the probability of earning a higher net income decreases when MSP is removed as seen in stop light charts. This may affect the production of cotton in India, as farmers may tend to shift to other crops where there are more returns for their investment. The conclusion is similar to that of the study by Pan, et al (2009) where the MSP of government of India has a positive influence on the acreage and production of cotton in India. Recent spikes in cotton prices result in the MSP implemented by government of India being lower than the open market prices and so the MSP will have very little effect on the farmers' land allocation decision. This study suggests if prices remain at the levels seen in 2010-11, the minimum support prices of government of India will not have much impact on the profitability of Indian cotton farmers and/or their land allocation decisions to cotton. Accordingly, the MSP would have little impact on the competitive position of Indian cotton in international markets. If prices return to more historically average levels, the MSP provides an effective support mechanism for and stimulus to Indian cotton production.

This study can be expanded to better understand the shifts in cropping patterns due to policy changes by building representative farms for other competing crops. The results can be also made more robust if a larger and geographically dispersed sample can be obtained for focus group discussions. The results can be used to draw more concrete implications for international market prices of cotton and its impact on cotton farmers worldwide by using dynamic international trade models.

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