

# COTTON CULTIVATION

- An exploratory study of agricultural opportunities to fight poverty in India

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## **Abstract**

Cotton has over the past years become a less profitable crop to grow. This has affected millions of people cultivating it. In India the struggles of cotton farmers become clear when looking at the high suicide rates amongst them with economic reasons being the most common cause.

In this thesis the aim is to investigate the situation of small cotton farmers in India and define the important factors in deciding their profitability. To be able to achieve this, a qualitative multiple case study in Maharashtra district, India was conducted with farmer interviews as the backbone of the study.

Our contribution through this thesis is to provide an improved understanding of the cotton farmers' situation and the factors that affect their yield. We found that for the farmers in this study insufficient access to water was the most pressing issue. Water is an important factor in deciding the yield of cotton and thus important for the farmers' economy. This finding may not be representative for other cotton growing areas as the issues can vary greatly geographically.

**Keywords:** Economy, suicide, cotton, farmers, India, agriculture, water

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# 1. Introduction

Cotton accounts for nearly half of the world's textile production and is a vital part of many economies (WWF 2013). Cotton production is the main source of income for approximately 100 million families in over 70 countries. However, developing countries are struggling on the cotton market. This is partly due to the world market price of cotton decreasing in recent years; the value of it today is only a third of what it was around 1980. To add to the problem, the cost of growing cotton increased more than the yield between 2007- 2012, which lead to cotton cultivation being less profitable (ICAC 2015). Furthermore, the U.S. government gives agricultural subsidies to their own farmers and a third of what they produce is then sold on the world market below production cost (Fairtrade n.d.). This has hit India hard as a majority of their cotton farmers classify as marginal (less than 1 hectare) or small (between 1-2 hectares). Combined they stand for 85% of all the farmers (Department of Economic Analysis and Research 2014), with an average of 1,5 hectare land holding (Cotton Incorporated 2012).

In the last decade about 300,000 Indian farmers have committed suicide. This makes the suicide rate for farmers approximately 47 percent above average in India (Philpott 2015). The national levels are already high, since India has the 11<sup>th</sup> highest suicide rate in the world (WHO 2016). The most common cause is bankruptcy or indebtedness (Government of India 2012-2015). This means many of the suicides are committed due to poverty.

The contribution of this thesis is to give the farmers view of the situation. As well as define what the important factors to consider are within this field of research.

## 2. Background

### 2.1 Previous research

Previous research on cotton cultivation in India commonly brings up the economic effects of Bt cotton. In 2012, about 93% of all cotton in India was Bt cotton (Clive 2012). The most common subject of the articles is whether or not the yield is higher than that of normal cotton and if it thereby has enhanced or depreciated the economic situation of cotton farmers. Several articles claim that genetically modified cotton (Bt) can increase the return for farmers (Subramanian & Qaim 2010; Morse, Bennett & Ismael 2005; Forster et. al. 2013). Morse, Bennett and Ismael (2005) find that some of the increase of yield for Bt cotton farmers is related to them being in a better position to care for the crop. On the other hand, another study shows that of the researched farmers 71% of the Bt- cotton farmers have had a negative result, in comparison to 18% for the farmers cultivating conventional cotton (Qayam & Sakkhari 2003). The negative effect on the economy by Bt cotton is also supported by Gruère & Sengupta (2011). A case study in China showed that the use of pesticides was less for Bt compared to conventional cotton when farmers had gained more experience in the cultivation process of Bt (Pemsl, Voelker, Wu & Waibel 2011). Mancini, Termorshuizen, Jiggins & Van Bruggen (2008) find that the toxic pesticide use can also be reduced by education without changes in yield.

Qaim (2003) is considering Bt cotton cultivation through the parameters; cost of production, farm-level productivity and technological impacts on pesticide using a field trial method. The study shows that the highly toxic pesticides are reduced and that Bt cotton technology is better than chemical insecticides to control pests. Bt cotton only needs one third of the pesticide used for conventional cotton. The Bt cotton seeds are more expensive than conventional ones. However, this is something that the increased yield can cover, the yield when using Bt cotton is 30-40% higher when bollworm infestation levels are moderate and up to 80% higher when the infestation is heavy. In 2005, the welfare effect of Bt cotton in India was calculated to be more than Rs. 15 billion. Two-thirds of this goes to the cotton farmers and the rest to the private sector (innovating companies) (Qaim 2003).

Subramanian & Qaim (2009) looked at other studies and concluded that many of them only considered direct effects of Bt cotton, such as pesticide and yield effect, changes in the cost of seed and hired labor of Bt cotton and therefore saw the need of a wider perspective and choose an economy-wide framework instead. To better understand the distribution of income they have made a research in one village looking at all economic factors such as production, consumption, savings and investment, income generation and distribution, transfers, external trade, and income flows. The study is made using a micro-social accounting matrix (SAM). From their perspective time management is considered important. Most of the pest control is done by the farmers themselves. The result showed that decreased labor work is needed for pesticide application when using Bt cotton while an increase in labor work is needed for harvesting (Subramanian & Qaim 2009). Compared to conventional cotton labor work return increase by 42% and the returns for hired female labor increase by 55% (Subramanian & Qaim 2010). This supports especially the women's income since they are commonly employed to harvest it. Instead the male labor gets reduced because most of the time they are responsible for the pest control. The saved family labor time can on the other hand be reemployed in other work and thereby increase incomes as well. The saved time is higher in larger farms than in smaller. This is an effect of them being better educated and having better access to resources (Subramanian & Qaim 2009).

An extension of the above research is made by Subramanian & Qaim (2010) using the same data and approach. The difference in the two studies is that this study focuses on the effects of Bt cotton for poor households in India, dividing the SAM into income groups where they analyze the direct and spillover effects of Bt cotton. The result shows that Bt cotton is beneficial and raises the total income even for poor and vulnerable families (most of the farmers in the rural parts of India) and not only for wealthy farmers as often claimed before. The income increases with 134% for vulnerable families using Bt cotton compared to conventional. This study cannot be generalized but the studied economic structure is common in other parts where cotton is grown as well and therefore they considered that Bt cotton could be important in large parts of rural India, contributing to decreased poverty and rural progress.

India struggles with high levels of suicide, among the highest in the world, but the exact numbers vary greatly between different researches. Patel et. al. (2012) did a research of 1.1 million households in India, this study showed that 187 000 people over 15 years old committed suicide in India in 2010. Around half of the suicides were committed by consuming pesticide (Patel et. al. 2012). In 2011 it was noted that it was 47% more common for farmers to commit suicide than for other citizens. This means that approximately every 30 minutes a farmer in India commits suicide (Kaushal 2015).

Since suicide is common in India and a well debated topic, there are many articles available on the subject. According to Kennedy & King (2014) there is a relationship between suicide, cash crop production (a crop that is subject to price fluctuations, for example cotton) and marginal farmers. A marginal farmer is a farmer that has a land holding of maximum 2,5 acres (Kennedy & King 2014). This relationship is supported by other qualitative studies which all blame the agrarian crisis in India. The agrarian crisis refers to the liberalization of the Indian economy that took place during 1990s which led to institutional and policy changes that were especially negative for small and marginal cotton farmers (Kennedy & King 2014). Kennedy & King (2014) claims this relationship is likely to be due to farmers of cash crops, with small land holdings being poor and therefore very affected by the fluctuation in prices. However, Patel et. al. (2012) does not see this relationship. Another article shows that Bt cotton may have indirectly contributed to the suicides of farmers by causing indebtedness. However, the plantations location and environment were shown to contribute more to the failure for the farmers (Gruère & Sengupta 2011).

Sadanandan (2014) is another article that blames the agrarian crisis in India for the created situation and researched why it only was visible in some Indian states through suicides. Through their hypothesis they concluded that the reason was because the banks were very competitive at that time and did not see the agricultural sector as profitable enough to give out loans, especially not to small and marginal landholders. This led to farmers taking loans from private moneylenders with a high interest ranging from 25% to 45%, which sometimes resulted in more loans to be able to repay them (Sadanandan 2014).

Baffes (2011) writes about what he calls “The cotton problem”, referring to the disordered situation of the cotton market. Baffes (2011) primarily brings up the issue of subsidies on cotton in U.S. and Europe. US’s subsidies greatly affect the cotton market price since it accounts for one third of global exports. Europe contributes with much less cotton and therefore does not have as much influence on the price. Baffes (2011) suggest, among other things, that cotton subsidies should be eliminated in all countries applying them and that developing countries should introduce genetically modified cotton to increase their competitiveness. Several other studies agree that the U.S. subsidies of cotton have lowered the world cotton market price (Muhammad, McPhail & Kiawu 2012; Ge, Echevarria, Nolan & Gray 2011; Schmitz, Rossi, & Schmitz 2007).

Another study researches if cotton farmers in rural India would benefit from a reduction in protectionist policies, such as subsidies, in the European Union and the U.S. The study shows that international market variations in price is converted to some extent to rural markets in India even though they have strict regulations. If the world market price on cotton increases with 10%, the cotton price will increase by 7.28% in the short run in India. The price response can also be seen in the supply of cotton, mostly in the long run where a 10% price rise will increase the area of planted cotton by 9.14%. The results show that the price of the cotton in rural India would increase by 4.77% to as much as 15.18% if no subsidies were allowed. Three scenarios are used, with subsidies elimination and different tariff decreases showing similar result in excess for farmers, from 5.2% in the short run to 8.7% in the long run. They do not believe that subsidies reduction or elimination is the most important for the cotton farmers in rural India, for example improving the infrastructure and input markets could be more beneficial (Mittal & Reimer 2008). Improvements in infrastructure together with access to education and financial markets is also mentioned by Subramanian & Qaim (2009) as things that could help the overall economic progress. (Mittal & Reimer 2008).

Another article on the topic of the farmers' economical situation make a comparative study in West Africa looking at influencing factors on national and regional level that decide what the farmers at the end receive from the world market price. Some actions have been taken by the cotton farmers themselves and the government to fight poverty. The most important meeting for a cotton farmer is considered to be the producer price setting meeting where they are able to fight for a fare price and piece of the cake (Bassett 2014). The meetings in 2011-12 reflect that it did not go so well even after some changes were made. The changes required an agreement between cotton growers and ginners about the world market price. This lead to injustice regarding power relations and privileged information and did not necessarily contribute to the farmers getting a larger share of the margins anyway (Bassett 2014).

A study using formal and informal survey methods made in Uzbekistan is looking at the cotton value chain to see if it could be possible for the farmers to get paid more. Supported by their empirical study they concluded that it is not possible as the situation is today. There are many people involved in the process that take part of the revenue and many changes have to be made if the farmers should be able to receive a better compensation. The cotton farmers would gain from for example private ginners that price compete with each other and private laboratories that determined the quality of cotton, as to not get underpaid. Modernization of the ginners facilities so they could be more efficient and changes in the export procedures are other mentioned improvements for the cotton farmers' economy (Rudenko, Lamers & Grote 2009).

Khan, Akram, ul Husnain, Padda, & Qureshi (2011) conduct a research in Pakistan, the research has discovered a link between the economic situation of a farmer and health issues related to pesticides. A farmer with a weak economy will have more health issues related to pesticides than a farmer with a strong economy. Common health issues reported by the farmers in the study were skin irritation, eye irritation, dizziness, headaches, shortness of breath and vomiting after use of pesticides (Khan, Akram, ul Husnain, Padda, Qureshi 2011). The study also showed that poor farmers used less protective gear.

Another study from Zimbabwe finds that the health issues caused by pesticide used on cotton also affects the farmer's economy (Maumbe & Swinton 2003). Households use on average 64% of what they spend on pesticide, on acute health issues caused by pesticide. They also lost on average three days of work recovering from pesticide related illnesses in a cotton season (Maumbe & Swinton 2003). Lack of protective gear was an important factor and many of the farmers did not understand how dangerous the pesticides were or the pesticide toxicity labels (Maumbe & Swinton 2003). A study in Mozambique also concludes that farmers have poor knowledge of the hazards related to pesticide and do not protect themselves properly when using it (Jones, Mabota & Larson (2009).

One major environmental issue brought up related to cotton cultivation is soil pollution. The cause of this being largely due to use of fertilizers and pesticides in cotton cultivation according to Dai & Dong (2014). Insecticides are also found to pollute the soil as well as the water in the study by Kumari, Madan & Kathpal (2007). Another issue that is brought up is soil erosion, a problem worldwide (Nyakatawa, Reddy & Lemunyon 2001). Nyakatawa, Reddy & Lemunyon (2001) claims that soil erosion leads to chemicals ending up in water and that it depletes the soil of nutrients, resulting in lower yield for the farmer.

## 2.2 India

### 2.2.3 General information

During the last years India's economy has taken a positive direction and the middle class is growing. However, there are still large gaps and many poor people, 23,6% is living in extreme poverty in India according to Globalis (2016a) extreme poverty is referred to as surviving on less than 1,25 dollars per day (Globalis 2016b). Most of the country's poor people live in the slums of big cities or in rural areas (Globalis 2016a).

One of the biggest threats to the growth of the Indian economy is their poor infrastructure. India's infrastructure was for a long time in the hands of the government but in the 1990's it was released to the private sector. However, it is still not up to a satisfactory standard leading to losses of foreign investments just to name one effect. Issues like power failures, non-paved roads and unreliable water networks are not uncommon (Xu & Albert 2014).

### 2.2.4 Agriculture

Agriculture accounts for approximately 57% of land use in India, the rest is forest, desert, cities, pasture or fallow land (Globalis 2016a). Only 0,3 % of India's agricultural sector is organic (Globalis 2016c). Due to India being a large country there is a great variety in the climate. Uncontrolled emissions of toxic waste from the growing industry is one major problem in India, as a result 70% of India's surface water is contaminated (Globalis 2016a).

The agricultural sector together with its sub sectors is the number one livelihood provider in India (india.gov.in 2016). In the 1950's the agricultural sector contributed with around 52% of the GDP in India whilst it today it only contributes with around 18% (Statistics Times 2015). The credit intensity within this sector has gone up substantially. From a credit intensity of approximately 10% from commercial banks in 1999 to around 40% in 2011 (Subbarao 2012). This together with the fact that the average land holding for farmers has gone down from 2.28 hectare per farm in 1970 to 1.23 hectare in 2006 makes the agricultural sector a challenging one for farmer profitability (Press Information Bureau, Government of India 2016). Furthermore, India faces decreases in rainfall according to a study done on the monsoon over the past 60 years (Sharma 2014).

India has 9 million hectares of land under cotton making it the country with the largest area under cotton in the world, accounting for about one fourth of the world cotton area. Production wise it supplies 18% of the world cotton, about 4,59 million tons per year. Cotton crops stand for about 14-16% of the total crops in India and 4,5 million farmers and 60 million people in total get their income from cotton (Agarwal 2007).

Aurangabad is an area in the district of Maharashtra, ranked third in cotton production in India (Sharma 2014). Throughout the year the day-temperatures vary between 29 and 39 degrees Celsius and night temperatures between 12 and 25. The rainfall is heaviest between June and September (World Weather Online n.d.). On average (between 2002-2011) Aurangabad district gets 737.51 mm of rain per year (Central Ground Water Board 2015).

The soil in the area is mainly black cotton soil and high in plant nutrition like lime, magnesia and iron. Black cotton soil is well suited for cotton (Central Ground Water Board 2015).

### **2.2.5 Culture & traditions**

When a daughter gets married in India the bride's parents sometimes give the groom's parents or the groom a dowry (Chandramukhee & Leder 2013). The dowry consists of for example money or property, this is considered necessary to pay as a proof of the marriage. The size of the dowry is decided by how desirable the woman is in terms of for example virginity, domestic skills and physical appearance (Ramasubramanian & Jain 2009). Without the dowry the marriage contract can be void (Chandramukhee & Leder 2013). Furthermore, the cost of the wedding is traditionally the responsibility of the bride's family (Ramasubramanian & Jain 2009). The use of dowries is against the law in India (Roy 2015).

## **3. Problem formulation, purpose & delimitations**

From the reviewed literature one can clearly see that cotton farmers face many challenges across the world. In India a high suicide rate amongst farmers has been noted, with economic issues as the number one reason. Some claim that the agrarian crisis in India has contributed to the situation by policy changes that made it hard, especially for small farmers, to take loans from banks. Instead, many farmers are forced to take high interest loans from moneylenders, that are hard to repay. Another topic that is highly controversial in the world and particularly in India is Bt cotton. Some claim that it has by, deteriorating the economy of farmers, contributed to an increase of suicides. Subsidies is another well debated topic and some claim that subsidies in other countries should be reduced or eliminated, while others claim there is more important things to be done to improve the situation of cotton farmers. While earlier studies commonly only take one or a few factors into account this study will provide a broader perspective by mapping out what all the important profit deciding factors are. By defining these factors, we will provide a framework for future research regarding cotton farmer's economy.

Maharashtra has the highest number of farmer suicides in India (The Sanhati Collective 2012), which makes it interesting to research for agricultural opportunities to fight poverty. *The aim of this study is to investigate the economic situation of small cotton farmers in Vaijapur, Maharashtra to find the relevant factors that affect their economy.* The study will be conducted using a multiple case study method based on the question:

-What are the important factors in deciding the profitability of cotton farmers in Vaijapur, India and thereby contributing to high rates of suicide?

In this thesis the farmers' perspective is considered and not the entire supply chain. The reasons for farmer suicide has already been researched by several previous studies and will therefore not be further investigated in this study. An assumption has been made that previous research, regarding the connection between economic issues and suicide, is correct.

## **4. Disposition**

Based on the purpose and research questions the thesis is disposed as follows. First we will introduce you to the issue and present you with previous research as well as some basic information about India's agriculture, economy and culture. Next a presentation of the problem, research question and aim of the research is provided. Followed by the methodology chapter which is an extension of previous research and will provide you with a foundation for the rest of your read. In the empirics you will find all the data collected at the farmer interviews and in the analysis we will compare the empirics to the framework. We will finish the essay with a conclusion, a discussion and suggestions for further research.

## **5. Methodology**

### **5.1 Case study method**

For this thesis we have used a multiple case study research method. This is also a common approach for similar studies within this area of research (Forster et. al. 2013; Bevilacqua, Ciarapica, Mazzuto & Paciarotti 2014; Kumbamu 2006). "The case study is a research strategy which focuses on understanding the dynamics present within single settings" (Eisenhardt 1989, p.534). It can be done on single or multiple cases (Eisenhardt 1989). Our case study involves several cases of farmers situated in Vaijpur, Aurangabad. A case study method is suitable when the subject is too complex to be answered through other methods, for example surveys (Yin 2006), which only scratches on the surface. Surveys commonly try to find patterns in a larger amounts of units. Since case studies looks at fewer units a deeper understanding can be reached through case studies (Denscombe 2000) and the research questions "how" and "what" can be answered (Saunders, Lewis & Thornhill 2007). Denscombe (2000) says that a case study gives the researcher the opportunity to find how the situation occurred and not only show the results as such (Denscombe 2000). The aim with this study is to create a broader understanding and to see if there could be any new findings to add to the phenomena, for this Yin (2007) present case studies as one suitable method.

Yin (2006) also claims that it is an adequate method for questions that need to be researched in its context. Our study is very dependent on the context and too comprehensive to be covered in a survey and therefore this is a suitable method (Eriksson 2015). By using a case study method, a better understanding for the situation is possible and more information can be obtained by asking complex questions as well as follow- up questions. In a case study different resources and methods are often used to research the complexity in relationships and processes (Denscombe 2000). This gives a deeper understanding of the situation and contributes to the study being more reliable (Yin 2006). By using a case study method, we were able to create an understanding of the farmer's situation and perspective.

## 5.2 Data collection method

To gather the needed data a qualitative method was used. This method is less strict than a quantitative method and more flexible, which was necessary in this research where the aim was to get thick descriptions of the farmer's situation. Earlier researches are limited in the area and Bryman & Bell (2007) then claim that the phenomena should be studied through observations in a natural environment and by using semi-structured interviews. This study is based on several sources of data, the main source being in depth interviews with farmers in Aurangabad in the district of Maharashtra, India. These interviews were semi-structured, which is a more flexible method allowing for adjusting of questions and their order (Bryman & Bell 2011). This method also enables deviations from the questions and may lead to better understanding of the respondent's perspective (Bryman & Bell 2011). Since we did not know what we were going to find in our research we used this method which allowed us to adjust the questions. For our case study, surveys would have been impossible because it uses closed questions which not support follow-up questions and deeper analysis of the data. It creates a stricter discussion not suitable when you want thick descriptions of the situations (Christensen, Andersson, Carlsson & Haglund 2001).

To complement the primary data secondary data from mostly peer reviewed articles have been used in for example the literature review and framework. These were collected from the school database Summon or google scholar. Furthermore, books and webpages have been utilized. The advantages of secondary data are that it is timesaving because they are already collected and written down (Bryman & Bell 2007). One disadvantage with secondary data mentioned by Bryman & Bell (2007) is that the aim of the earlier literature may take other directions than your own study. This is something we encountered and therefore a broader perspective of the topic sometimes was necessary. However, the data was carefully analyzed to suit the study as well as possible, something that is considered important when using secondary data (Merriam 1998).

For this thesis five case studies were made with small Bt cotton farmers, cultivating less than 5 acres of land. A total of 19 farmers were involved in answering the questions and several other people were present. The sample method used to find the farmers in this study was convenience sampling. A convenience sample is a sample that is easily accessible to the researcher (Bryman & Bell 2011). Interview questions regarding investment cost, yield of crop, land use, selling price of the crop, chemical use, health issues, water use and suicide were asked to the farmers, to name a few. All interview questions were asked in a neutral way as to not be indicative (Dervin & Dewdney 1986).

A Marathi interpreter was employed to not loose any important information at the farms since many in the rural parts of India are not fluent in English. Xian (2008) argues that not only the technical issues should be taken into consideration; a translator should also mediate cultural differences. The interpreter used for this research was from India and assisted in understanding the appropriate way to behave in the farmer's homes. Both researchers attended the interviews as this can contribute to a more relaxed atmosphere (Bryman & Bell 2011). The aim was to complement what was said by conducting observations at the farms but it was not the right season for cotton and hence there was not much to observe.

### 5.3 Course of action

The idea for this study was born in our interest in cotton farmers situation. However, the purpose of the research was formulated after watching three documentaries on cotton farmer suicides in India; “Bitter seeds” (Micha X. Peled 2011), “Indian nightmare: GMO killer-cotton” (Indian nightmare: GMO killer-cotton 2015) and “100% cotton. Made in India: Farmers commit suicides after planting GMO cotton” (100% cotton. Made in India: Farmers commit suicides after planting GMO cotton 2015.) All three of the documentaries portrayed Bt- cotton (Genetically modified cotton) as the number one reason for cotton farmers being in a tough economical situation leading to suicides. The two documentaries; “Indian nightmare: GMO killer-cotton” and “100% cotton. Made in India” are both created by the company RT. RT is a company that brings up global news for people that want to question more. On their webpage you can read “RT provides an alternative perspective on major global events, and acquaints international audience with a Russian viewpoint.” (RT 2005-2016). In this documentary Bt cotton is deemed guilty for the situation in India, as mentioned before. Since Bt cotton is created by the American company Monsanto it is possible that the documentary has an exaggerated negative view of the situation due to its Russian viewpoint (Göteborgs-Posten 2015).

The producer and director of “Bitter Seed” is Micha X. Peled who emigrated to the United States from Israel (PBS n.d.). He is the founder of the nonprofit organization Teddy Bear film who made this documentary. Teddy Bear film is “dedicated to the fine art of story telling through documentary filmmaking”. During the years Micha X. Peled has made different movies for example in the movement for peace and the documentary “STORE WARS” about Walmart (Teddy bear films 2016) and therefore the “Bitter seed” documentary could be angled in a certain way. We wanted to see if the documentaries were right and research what it is that really created their economic situation for the farmers and how the business could get lucrative. With our project plan we applied for a minor field study scholarship from SIDA, which we received. We organized for a two month stay in India to be able to conduct the case study.

The research started by interviewing farmers to be able to get their point of view. To find the respondents for the farmer interviews the plan was to use snowball sampling which is a form of convenience sampling. However, we were told that it might not be a good method as we might not be so well received; in rural India it is preferable to know someone. We received a contact list of about 10 farmers from one of the international coordinators at NITIE College, Mumbai. He had received this list from a friend. These farmers were all located in a small area called Vaijapur located in Aurangabad, Maharashtra. After receiving the list NITIE College also helped us get in contact with an interpreter that spoke both English and Marathi, the local language of people in Maharashtra. Furthermore, NITIE organized a chauffeur for our four-day trip to Aurangabad.

The interview questions were sent to the interpreter and one of the students at NITIE, whose father was a farmer. This was made to test and improve the instrument. Preferably we would also have sent the questions to the farmers before our visit but we were not able to this, due to time limitations, the farmers not having internet and their limited understanding of English.

On our arrival in Aurangabad our interpreter set up an interview for us the following day. Only one call had to be made since the first farmer on the list agreed to meet with us. The next day we went for the interview with said farmer and were received by 14 farmers as he had

invited some friends. This interview, interview 1 lasted for approximately 2 hours. Our one to one interview turned into a group interview. In the evening our interpreter set up three interviews for the next day by calling five people on our contact list.

The following day we went for our first interview for that day where we met two brothers that we interviewed separately, interview 2 and 3 which took about 30 minutes each to conduct. Interview 4 was only with one farmer and took about 1.5 hour and interview 5 was with two farmers that we interviewed together and took approximately 1 hour to complete. All the farmers interviewed were men and at each interview other people were present. We have only accounted for the main farmers when stating the amount present at the interviews but women, children, friends and neighbors were also present from time to time. The interviews were semi structured and in depth interviews were the respondent was encouraged to elaborate their answers or add whatever they thought could be of interest. All interviews were conducted at the home of the farmer. Each interview was recorded except interview number 2 since he did not agree to being recorded.

All of the interview sessions started with a short introduction of us, our research and aim of the study, told by our interpreter to the farmers. For each interview the questions were asked in English to the interpreter that then translated it and asked it to the respondents in Marathi. She then received the answers in Marathi and translated them to English. We took notes of important things like numbers and names. At the interviews we had planned to observe their work at the farm and take pictures of the cotton fields. However, it was not season for cotton when we were visiting the farms so this was regrettably not possible. We did however take some photos of for example tools, seeds and the land.

Each evening on our four-day trip was spent transcribing the interviews. After completing this our interpreter was asked to proofread it to make sure we had understood everything correct.

<b>Interview</b>	<b>Respondents</b>	<b>Position</b>	<b>Time</b>	<b>Date</b>	<b>Documentation</b>	<b>Type of interview</b>
<b>Interview 1</b>	14	Farmers	10.00-13.00	2016/04/05	Notes and tape	Semi-structured group interview
<b>Interview 2</b>	1	Farmer	09.00-10.00	2016/04/06	Notes	Semi-structured interview
<b>Interview 3</b>	1	Farmer	10.00-11.00	2016/04/06	Notes and tape	Semi-structured interview
<b>Interview 4</b>	1	Farmer	12.00-13.30	2016/04/06	Notes and tape	Semi-structured interview
<b>Interview 5</b>	2	Farmer	14.00-15.00	2016/04/06	Notes and tape	Semi-structured interview

Table 1. Summary of the data collection.

## 5.4 Ethical issues

The following guidelines prepared by the National Advisory Board on Research Ethics named “Good scientific practice and procedures for handling misconduct and fraud in science” has to be met by all researches. The three ethical principles of research are; respecting the autonomy of research subjects, avoiding harm and privacy and data protection (National Advisory Board on Research Ethics Helsinki 2009).

In all of the interviews the respondents have been informed of the purpose of the study. They were also informed of their right to cancel the interview whenever without any consequence. This is how we respect the autonomy of the research subjects. The respondents were then asked if they would like to participate and whether or not they allow us to record the interview to ensure consent and avoid invasion of privacy and harm to participant (Bryman & Bell 2011). The respondents were not asked about any personal information as it would not add anything to the study. Due to this it should be impossible to trace the respondents and confidentiality obligations is met as well as data protection.

We were touching on what may be very sensitive subjects, such as suicide and indebtedness. It was therefore important that we clearly informed the respondents of their right to be anonymous in the study. We were also minimizing the discomfort of the respondents by asking the sensitive questions last. It turned out that none of the interviewed farmers knew of any family, relatives or close friends who had committed suicide. During our interviews it became clear that 14 farmers knew someone in the village that had committed suicide, one knew someone in another village and another one knew of one in his brother’s village. All the farmers talked freely about the topics indebtedness and suicides and therefore we did not feel it was too sensitive for the asked respondents. We also asked about health-related issues, which in science research normally need ethical approval. Our study is not going to be published in a scientific context and is not a master thesis and therefore it is not legally considered as scientific (Johansson 2016). Hence, no ethical approval is needed. We informed the respondents about SIDA's purpose and that it was a bachelor thesis and that the information would not be used for any other purpose. Unfortunately, we were not able to provide the farmers with the results of the research or offer them to read through their own answers due to the language barrier.

## 5.5 Data analysis

The gathered data from the multiple case study interviews has been transcribed to handle the vast amount of information collected; this is sometimes referred to as “analyzing within-case data”. This is to get to know the cases individually before analyzing them together (Eisenhardt1989). An “Open coding” was then used, which is the first step in the data coding process. This is a way to summarize all gathered information from the interviews and to be able to find similarities and differences (Ellram 1996). This summarization was then used to analyze the information through the framework.

## 5.6 Method reflection

A general criticism for qualitative research is that it is low in external validity (Bryman & Bell 2011). In this thesis we have increased the external validity by interviewing several farmers to be able to find patterns (Ellram 1996). Another critique of qualitative research methods is that the researcher's personal views and relationship to the people being studied has an influence on the results (Bryman & Bell 2011). As it is hard to reduce bias and subjectivity, we have instead chosen to be open with our thoughts and our reasoning, an approach that is advocated by Sayer (1992) and helps to improve trustworthiness (Eriksson 2015). Furthermore, it is argued that qualitative research is hard to replicate and lacks transparency (Bryman & Bell 2011). However, it could be argued that replication is always impossible in research where the context is important, and impossible to freeze in time (Sayer 1992). Even though transparency is reduced with the narrative of the research, it should be noted that research is not always strong in all quality criteria (Lincoln and Guba 1985). We argue that by being aware of the weakness, the research rigor is improved.

## 5.7 Method discussion

The plan was to use a snowball sampling method for the interviews but since a list of contacts was received, a regular convenience sample was used instead. A convenience sample is a sample that is easily accessible to the researcher (Bryman & Bell 2011). It is critiqued for not being representative for the population (Bryman & Bell 2011). We argue however, that this was the best available option for this research and recommendation was also made from contacts that you should not visit the farmers unannounced.

During our data collection some unexpected situations unraveled. Even though we organized interviews with one person there were always more people upon arrival. For the first interview, 14 farmers showed up to be interviewed, we improvised and turned it into a group interview. The number of farmers was positive in the sense that we got to take part of more farmers' opinions but negative in the sense that they might have been influencing each other to answer the same way.

Another issue we struggled with during the interviews was finding a quiet and private area to conduct the interviews, which is recommended (Bryman & Bell 2011). In this multiple case study, the respondents were met at their homes. This may have made the respondents feel comfortable but in our case it also imposed issues in form of family members intervening and noise in the background. There were not only the main farmers present at the interviews but also sometimes their families, friends and neighbors. People did intervene and possibly influenced the answers of the main farmers. The fact that the farmers were found through a contact and prepared for our visit probably lead to us being better received as well as the farmers being more open. Most of the farmers seemed comfortable answering the questions that were categorized as sensitive. For example, the sensitive question "Do you know of anyone that has killed themselves?".

One unexpected finding was that the main issue was not at all, according to the farmers, what had been portrayed as it in the documentaries watched before starting the project. The documentaries claimed that Bt-cotton was the main issue whilst the farmers interviewed all agreed that water was the main issue.

While conducting the interviews it became clear that our question “What is your family’s general health like?” did not evoke the kind of answers sought after. The purpose was to find out if their health had been impaired by using chemicals in their cultivation but in an attempt to not be directive the question was asked in a general manner. Most of the farmers answered that their family’s health was good, but many for example also said that they get blisters on their back when spraying pesticides but related to other question. When reflecting over this it becomes clear that this question should have been asked more specifically to get the answers that were wanted. There were also other instances where the farmers were contradicting their own answers. Furthermore, it was sometimes unclear if the farmers were using the right term for things. For the question “Do you use any protections when spraying the fields?” some answered that they were using a mask, in some cases it became clear that this “mask” was in fact a handkerchief.

There is a risk when you conduct an interview that the respondents talk very convincingly about topics without enough knowledge to support what they are saying (Alvesson 2011). In this study we noticed for example that there was some confusion amongst the farmers regarding Bt-cotton seeds. There are many different kinds of Bt-cotton seeds and therefore one farmer claimed that he was using normal seeds but the other farmers claimed that it was Bt-cotton seeds. Confusions like this have been taken into consideration in our analysis. To increase reliability, it is advised to let the respondents go through their answers after the interviews are finished to verify that it has been noted correctly (Bryman & Bell 2011). However, because there was no easy way of reaching the farmers, we were not able to do this. Instead we asked our interpreter to go through the answers.

Having an interpreter during the interviews was necessary but imposed several issues. According to Xian (2008) interpreters are influenced by their own knowledge, background and experience while translating. This can lead to the results of an interview varying depending on the interpreter. To ensure that all interviews were translated in the most similar way possible the same interpreter was used for all the interviews. Since the farmers spoke Marathi having an interpreter was very important. However, some things may have gotten lost in translation. For example, sometimes the respondents would give very long answers whilst the interpreter would only translate a summary of what was said. The same goes for the other way around, there is no way to be sure that what we said was properly conveyed to the respondents.

## **6. Theoretical framework**

### **6.1 The economic situation of cotton farmers in India**

Since the cost of growing cotton has increased more than the yield and the cotton prices have fallen compared to other crops, cotton cultivation has become less profitable. An increase is also seen of indebted farmers (ICAC 2015). Self-employed farmers and their contributing family members are often inclined to overwork. It is also common that these families do not receive a fair compensation for their work due to variations in yield and cotton prices (ICAC 2015).

The cotton farmers in India are in such a challenging economic situation that some choose to take their life. This should mean that an improved economic situation for the farmers would lead to a decrease in suicides. The basis for any company that wants to increase their profit is either to increase incomes or cut costs (Merritt 2015).

## 6.2 Farmer organizations

As a small farmer you often face disadvantages in the marketplace and to overcome these limitations farmer organizations or associations are created (Huang, Vyas & Liang 2015; ICAC 2015). The organizations for small-scale farmers mostly have a business focus, are farmer owned and engage in collective marketing activities. The most important objective for the farmer is marketing activities that can help them become more self-reliant and receive a better price for their produce. Increased profitability, improved market reach, increased support and improved quality are other benefits that could arise from organizing farmers in developing countries. For example, small farmers normally have no choice but to accept the price offered at the market but if many farmers collect their cotton they are able to achieve the scale needed to reach other markets and get a higher price (ICAC 2015).

Fayet & Vermeulen (2014) conducted a study looking at the effects different sustainability initiatives can have on small cotton farmers in India. Fayet & Vermeulen (2014) claim that a well-functioning way of reducing poverty is by including small producers in value chains as well as linking them to markets. Smallholders are competing with bigger companies that have better access to for example financing, information regarding the market and technology (Fayet & Vermeulen 2014). Adding to their struggle is that they often live far away and where there is poor infrastructure leading to higher expenses. Fayet & Vermeulen (2014) present several ways of improving small farmers' economy. One way is to minimize the number of intermediaries in the cotton supply chain and thereby make sure the cotton farmer gets a larger share of the profit. Others are to create farmer organizations, supply market information, training and financial services (Fayet & Vermeulen 2014).

Fayet & Vermeulen (2014) concludes that all of the small cotton farmers in their study improved their situation when joining one of the sustainability organizations. The exact effects vary from case to case but farmers have improved their profits, reduced costs, increased yield as well as reduced the use of chemical pesticides and fertilizers. Interesting is that the reduction of chemicals reduced the costs as well as kept the yield at the same or a higher level. Fayet and Vermeulen (2014) also mentions that Indian farmers can only adopt these sustainability methods when provided with certain services.

In a similar study Tang, Wang & Zhao (2015) researches how farmers are affected by receiving market information from the government or receiving farming advice. Their study shows that market information improved the farmers profit in all their cases whilst farming advice only became profitable if the upfront investment (for example for new technology) was low.

Another view on how important information is for farmers' profit is that of the effect of peers. From a study made with small farmers in India they found that 60% of their income could be explained by who their peers were (Songsermsawas, Baylis, Chhatre & Michelson 2016).

## 6.3 Reducing risk

Cotton is a crop where the economy of poor farmers is mostly dependent on the climate, marketing and supply chain conditions. These are conditions that are difficult to influence but one thing that could strengthen the farmers' situation is if they could adopt healthy production and management practices to reduce the level of risk. For example, reduce the dependency on cotton and the negative impact of price fluctuations (ICAC 2015).

Crop rotation is a well known method which benefits both the economics and agronomics: "Benefits of crop rotation include the control of weeds, insects and diseases, improving the organic matter of soils, aiding the supply of nitrogen in the soil, increasing crop yields, and minimizing crop income and price risk" (Salassi, Deliberto & Guidry 2013).

## 6.4 Water

Cotton production has impacts on water depletion and water quality (Glantz, 1998; Hall, Dixon, Gulliver & Gibbon 2001; Pereira, Cordery & Iacovides, 2002; UNEP, 2002; Loh & Wackernagel, 2004). The subject of water depletion is only relevant for irrigated cotton (ICAC 2015). Most of the irrigated cotton is grown in warm and dry regions where freshwater already is scarce (Soth, Grasser & Salerno 1999), commonly using furrow irrigation systems, sprinkler and drip irrigation (Postel, 1992). Irrigation can be a sustainable method if the water used is replenished within a reasonable amount of time, otherwise water sources will be depleted. However, 85-90% irrigated cotton is grown using surface irrigation methods which leads to water being lost by evaporation, run off from the fields or going deeper than the root systems of the cotton plants. Using mobile or drip irrigation will decrease the risk of these issues and many studies also show that drip irrigation gives a better yield than surface irrigation. However, these methods are more energy intensive and can lead to salinity or sodicity issues in the soil (ICAC 2015).

The relationship between water and crop yield is linear to a certain point, this means that water is a very important requirement for acquiring good yields (ICAC 2015). It is also important for the length of the cotton lint (Cordão Sobrinho et. al. 2015). In cotton cultivation across the world, rain fed or irrigated, it is normally water supply that limits the productivity of the cotton. How much water is needed is dependent on many factors but vary between 600-1200 mm. This means that to produce 1 kg of cotton 3000-7000 liters of water is used. Cotton is a heat and drought resistant crop which makes it suitable for regions with low rain falls. However, even though it can handle dry conditions it severely affects the crop yield (ICAC 2015). Hence, irrigation strategies can be used to reduce this yield risk (Barham, Robinson, Richardson & Rister 2011). Half of the land under cotton in the world is irrigated and produces 73% of the cotton (Soth, Grasser & Salerno 1999; ICAC 2015).

One method commonly used in China to increase the yield of cotton as well as retain more moisture is to cover the field with polyethylene film (Dong, Li, Tang & Zhang 2009). This can be done after or before sowing the seeds. Dong et. al. (2009) conclude in their study that using the film previous to sowing has a more positive effect on the yield. This was mainly due to a rise in soil temperature and reduction of moisture being lost. The method was more expensive than covering the field after sowing, however the increase in yield was sufficient to cover the extra cost (Dong et. al. 2009).

## **6.5 Pest & pesticide management**

Pests are an issue within cotton cultivation and the most common way to prevent it is by using pesticides. The use of pesticides can harm the environment, human health and the yield. The effect is largely decided by which variety of pesticides are used, quantities and the way you apply it (ICAC 2015). The use of broad spectrum pesticides has a negative effect on biodiversity by killing not only the pests it is supposed to but also other species (Rao, Bellin & Brusseau 1993; ICAC 2015). Estimations show that less than 0.1 % reach the targeted pests, the rest ends up in the environment (Pimentel & Levitan 1986). The loss of biodiversity is proven to decrease the yield of the crop (ICAC 2015).

Using pesticides at the wrong time, overdosing it or using broad spectrum pesticides can lead to the pests becoming resistant. Applying pesticides often and with a low kill off rate increases the odds. When pest become resistant more chemicals are needed to control them, it becomes a vicious circle. GM (Genetically modified) cotton is another way to deal with pests. The research regarding GM cotton is divided; some claim that it is a sustainable method for controlling pests and others claim the opposite, that it is not (ICAC 2015).

Pesticides that are classified as highly hazardous stand for a large proportion of pesticides used in cotton fields. Most countries with advanced regulatory systems are no longer permitting these (ICAC 2015) whilst in developing countries the regulations are less restrictive (Ghimire & Woodward 2013). Many are trying to phase them out but they are often cheaper to buy and easy to find (ICAC 2015). In developing countries, it is common to use backpack sprayers to apply pesticides on the fields often without use of proper protection (Ghimire & Woodward 2013). Therefore, occupational poisoning is common in developing countries (ICAC 2015). Several studies show that you can reduce the costs of cultivation by completely excluding the use of pesticide and this without change in yield (Joshi 2006), (Fayet & Vermeulen 2014).

## **6.6 Soil management**

Cotton can be grown by itself, in combination with other crops or as a rotational crop. Monoculture cotton production increases for example the risk of soil erosion (ICAC 2015), soil structure decline and soil fertility loss (Hulugalle, Weaver, Finlay, Hare & Entwistle 2007). To maintain soil fertility and be able to continue cotton production different methods are used around the world. Common methods include the use of fertilizers and crop rotation (ICAC 2015).

Soil is a vital part in agriculture; it is the place where water, mineral nutrients and oxygen are fed to the crop. Soil health is important for the ecosystem and biodiversity but it is often only considered when it comes to greater productivity. The continuous use of chemicals affects soil microorganism activities and may disturb the soils biological processes that are necessary for soil fertility and crop productivity. Depletion of soil nutrients and deterioration of soil structure is common in countries where cotton is grown on a large scale with use of inorganic methods and where soil rebuilding systems does not exist. Another issue is that it is common to find residues of pesticide in soil where cotton has grown and this can affect the soil negatively and thereby the crop health (ICAC 2015).

## **6.7 Organic farming**

Eyhorn, Ramakrishnan & Mäder (2007) compares 58 organic cotton farmers and 112 conventional cotton farmers in India to see the economic differences. All the organic cotton farmers are members of an organic cotton initiative called Maikaal bioRew India Limited which includes over 1500 small and medium sized cotton farmers. They grow cotton in rotation with food crops, usually in periods of 2-3 years. The organization provides the farmers with advice and training and buys all the cotton from them at 20% above market price. This is possible since they then sell the cotton internationally at a higher price which covers not only the premium price but for example certifications as well. Examples of nutrients added to the soil is compost from the farm and pest management include using robust cotton varieties and herbal pesticides for example (Eyhorn, Ramakrishnan & Mäder 2007).

For the first 2-3 years of growing organic the yield declined by 10-50%. This decline may not be fully covered by the reduction of costs and the higher price received for the produce. Eyhorn, Ramakrishnan & Mäder (2007) believe this decline to be due to that the soil take time to recover and adjust to the new kind of method and that it is a learning period for the farmers. Some farmers also reported that they had to put in more work hours initially to for example construct a compost. However, the study shows that after the 2-3 initial years the farmers can get the same yield as with conventional cotton. Since they receive a higher price for their organic cotton they increase their incomes as well as cut their costs by for example no use of chemical pesticides. In total the gross margin for the organic farmers in the study was 30-40% higher than for the conventional farmers. This way organic farming can reduce poverty and indebtedness. Obviously organic farming would also have positive effects on the environment. Something that has to be considered however is that small farmers with little resources may not be able to handle the initial 2-3 years of reduced incomes. Therefore, it is of utmost importance to support the farmers through this transition period (Eyhorn, Ramakrishnan & Mäder 2007).

## **7. Empirics**

### **7.1 Cotton farmer interviews**

In the below section, the cotton farmer interviews are presented. We conducted five interviews, where a total of 19 farmers were heard (some were group interviews). All of them cultivate less than 5 acres of land which puts them in the category of small or marginal farmers. Below is a table that summarizes some of the data collected from the interviews. Most of the data will also be presented in text after the table. However, we will not refer back to the table, only repeat what has already been stated there.

<b>Interview</b>	<b>1 14 farmers</b>	<b>2 1 farmer</b>	<b>3 1 farmer</b>	<b>4 1 farmers</b>	<b>5 2 farmers</b>
<b>Question</b>					
<b>What kind of seeds do you use?</b>	Bt seeds	Conventional seeds	Bt seeds	Bt seeds	Bt seeds
<b>How long have you been growing cotton for?</b>	Average 25 years	30 years	30 years	7-8 years	Their entire life
<b>How much do you yield? Quintals (100kg)/ acre</b>	Low rain= 2-4 Good rain= 10 Average= 6-7	10-15	15-18	Low rain= 2 Good rain=10-12 Average= 6-7	Low rain=4 Good rain=6
<b>How much do you get paid per Kg of cotton?</b>	Average 40 rupees	40 rupees	50 rupees	40 rupees	First harvest 48 rupees  After that 38 rupees
<b>How much do you invest in you cotton cultivation?</b>	Average 8000-10 000 rupees/ acre	Not available	8500 rupees/ acre	20 000- 25 000 rupees/ acre	40 000 rupees/ acre
<b>How do you water your crop?</b>	Mostly uses a surrey, a type of flood system	Drip irrigation  Has a well with water	Drip irrigation  Has a well with water	Uses a surrey, a type of flood system  Has a well but no water in it	Rain fed
<b>How many do you provide for?</b>	Not available	5-6 people	17-18 people	3 people	7 people
<b>Do you have loans?</b>	Yes	No	No	Yes	Yes
<b>Do you feel you can provide for your family?</b>	Good rain= yes Poor rain= no	Yes	Good rain= yes Poor rain= no	Good rain= yes Poor rain= no	No

<b>Do you have any other incomes than cotton cultivation?</b>	Grows onions	Sells milk and a small amount of food crops	Sells milk	Works extra For example carpeting or road work	Has a labor job
<b>Income/acre</b> (Price*yield (kg)/ acre) Based on averages	24 000 rupees/acre	50 000 rupees/acre	82 500 rupees/acre	28 000 rupees/acre	21 500 rupees/acre
<b>Profit/ acre</b> (Income/acre-cost/acre) Based on averages	15 000 rupees/acre	Not available	74 000 rupees/acre	5500 rupees/acre	-18 500 rupees/acre

Table 2.

## 7.2 Cotton cultivation

In this section collected information about cotton cultivation is presented. Information regarding specific facts from the farmer interviews can be found in the above table.

The total cycle of the cotton plant is eight months and during this time the farmers work 9-12 hours each day. All the farmers say they plant the seeds when the soil is wet enough, around the 7th of June which has a favorable star constellation for rain according to the farmers. It then takes 3-4 days before the plant starts to grow and after three to five months you can start to pick cotton. The cotton can be picked 3-6 times over the next three months before the plant needs to be taken out.

For the first three months when you have monsoon rains, you do not have to water but after that, in winter (October, November) the plant needs more water than nature supplies. However, if the monsoon is not that good you sometimes have to start watering in September. How much they can water depend on water access as well as electricity since some of them use a generator to get water. They then apply the water to the plant by either drip irrigation or a kind of irrigation they call “surrey” which is a pipe that floods the rows.

All of the farmers use chemical pesticides. Several brands are named, one of them is KARATE, which is mentioned several times. Both chemical and natural fertilizers are used. The natural fertilizers come from their own farms, in form of cow dung but are not enough for the entire cultivation. The farmers have black, light brown or reddish soil, many have a mix.

When harvesting cotton, the farmers yield between 2-18 quintals/acre and the costs related to cultivation is between 8 000-40 000 rupees/acre. The payments to the farmers is dependent on exports, if a lot of cotton is exported then the government are able to pay more for it. A better payment is generally also received when the yields are poor. However, they have not received a good price for their cotton the last two years, even though this has been the case This is because of the cotton being low in quality due to insects. The farmers stated in the interviews that the payments varied from 38-50 rupees/kg.

### 7.3 Cultivation costs

Interviewee three says he pays 1000-1200 rupees for 450 grams of Bt-cotton seeds while the normal seeds cost only 850-930/rupees for the same amount. He claims that 600 grams covers about one acre. On the other hand, interviewee 4 says that he only needs 240 gram of seeds for one acre. He pays 8000-10000 rupees for fertilizers for one acre and 2000 rupees for pesticides each time he sprays, which is four times in a season. The total cost for this farmer is 20000-25000 rupees per acre as stated in the table above and includes labor costs as well.

Interviewee five's total cost of 40000 rupees to grow cotton included seeds, labor cost, plowing cost and cultivating cost. He pays 558 rupees for 450 grams of seeds, 1000 rupees/acre for plowing, 600 rupees/acre for cultivation and around 30000 rupees in total for labor workers in four months. Pesticides are used six times, with a cost of 2000 rupees each time. The amount of seeds needed for one acre is said to be 1500 grams by this farmer. The farmers in interview one claims that they need 800 grams seed for one acre and their cost is 934 rupees for 450 grams of Bt- cotton seeds. The cost for the old seeds was 257-321 rupees for 450 grams. They also say that everyone wants the seeds at the same time which leads to the shops charging around 600-1200 on top of the seeds normal price.

### 7.4 Pesticides & risk management

Sometime their crops get attacked by Lalya, which they call “The cancer of cotton”, it comes when the cotton is almost ready to be picked and the farmers have nothing against it. If one farm gets Lalya all the farms around will as well. This is what Bt cotton is supposed to be resistant towards but they still get it sometimes. Interviewee 4 mentions a pest that is a caterpillar that eats the seeds inside the cotton bud which lowers the quality of the cotton.

The farmers in interview 1 say they are well aware of the risks of using pesticides but they feel they have no other choice but to use them. They rarely use protection, some do not have it, and others have started using it but used to just depend on their immunity. The farmers do not know what chemicals the pesticides contain and therefore do not know exactly what they should protect themselves against. But they know that they sometimes get blisters on their back for example from using it, but they just take it. They use for example KARATE which they say is very strong; you will immediately see the effect on the plant but you can also feel it in your eyes, when you breathe and just one drop will burn your skin. Interviewee 2 says he is unaware of the risks but he does use a handkerchief over his mouth when spraying the cotton. Interviewee 3 knows about the risks and always uses a handkerchief over his mouth and sprays the field using a compressor. Interviewee 4 knows of the risks and uses a mask and gloves and makes sure there are no animals or humans close by when he sprays the field. Interviewee 5 knows that if he does not use protection he can get sick, he uses a handkerchief and if he gets free or very cheap gloves, he will use them as well.

## 7.5 The situation over time

According to farmers in interview one the situation has gotten worse in the last 5-7 years, for the last 4-5 years there has not even been enough water to drink. Before they used to grow cotton in 4x3 feet and it used to yield really well, now they grow it in 4x1 feet and still do not get the same yield due to low rains. They also used to grow sugar canes but due to decreasing rainfalls they had to switch crop. One of the farmers stated: "If we had water everything would be different; we would not need the government to help us if we only had water! We are lacking water more and more." Interviewee two says that his situation has changed since he used to live in a hut, now he has a house. He also used to water by hand, but now he has drip irrigation. He uses different seeds depending on the amount of rain; if it is dry he grows normal seeds and if it rains a lot he uses Bt cotton seeds. Interviewee three claims that his lifestyle has improved after he started to grow Bt cotton. Interviewee four says "the situation would only change if I get a good price for the yield, I would like to have 70 rupees/kg." Interviewee five says there is no change at first but changes his mind and says that there is less water now. There is not even enough to drink, they have to get water from a water tank truck.

## 7.6 Other incomes

Most of the farmers feel they can provide for their families when there is enough rain so they get good yields. However, when there are poor yields they feel they cannot. The exception is interviewee 5 that feel he can never provide for his family and interviewee 2 that feels he can provide independently of rain level. Interviewee 1 states that when they get poor yields they have to take loans which they then have to pay off when they have good yields, they can never get ahead.

All the farmers interviewed have other sources of incomes as stated in table 2. However, the farmers in interview 1 claim that they have limited work opportunities. They say they could not become for example milkmen because there is not enough water to keep more cattle. If they would like to study they would still have to farm to pay for schooling. They could not open up a shop either because there are only 5000 people in the village and enough shops already. The only way would be to get employed by someone else. Hence, it is common that the next generation become farmers as well.

## 7.7 Loans

The farmers in interview 1 say they all have loans for farming, it is how they survive. They get loans from the banks which survey the land and give out loans accordingly at a rate of 6% interest per year. If you cannot pay the bank they double the interest. Others have loans from money lenders with interests of 5-7% per month, possibly equal to 60- 84% interest per year depending on how the interest is paid. If you cannot pay the money lenders you have to pay interest on the interest. For the bank they have to put the land as collateral but the money lenders have higher interest rates instead of collateral. They can only pay their loans when the

rains are good, otherwise not. Right now what they want is dependable electricity, loan waivers and water. Interviewee 4 has a house loan and a farm loan, both from the bank. The land is put up as collateral. The interest rate is 2% per month but you have to pay it after 11 months as a lump sum, or the interest gets doubled (for the farm loan). The house you can pay off monthly. They sometimes have to earn other incomes to pay the loans off. Interviewee 5 has a loan from friends of 40 000 rupees (he pays back 42500 after 11 months) and also he has taken loans to buy gold for 70000 rupees (2,5% interest per month). He did not have to put up collateral and he pays of his loans by taking new loans.

## **7.8 Government compensation**

The farmers mention several compensations. The most common seem to be that for the pest Lalya, this scheme is called “Jan Dhan Yojana”. The compensation is 3000 rupees/ hectare and the farmers say that if one farm gets Lalya then everyone in the area will. However, two farmers claim that you do not always get the compensation.

Some farmers also mention getting compensation of 1500 rupees/ acre for lack of water. Other contributions are compensation for crop failure, loan waivers and money to build a pond. The pond scheme is called “Magel Tyala Shet Tale” and means anyone who asks for it should get the money to build a pond in their farm. For the Aurangabad district they get about 2200-2300 ponds (about 15000 apply), there are 8 counties in the district, meaning each county gets about 150-200 ponds. This means each village will get about 1-2 ponds so in reality not even close to everyone gets one.

Regarding the loan waivers, the farmers say that they do not give them out this year since they are trying to invest in irrigations systems instead. This is to help the farmers in the long run instead of just give them a quick fix. However, for the past three years the government has been declaring interest waivers but the farmers’ claim this does not work, they still have to pay it. They can also pay for insurance but in the end the government decides if they get any money from that or not.

Furthermore, there is a scheme called “Sanjay Gandhi Niradhar Yojana” for anyone without an income in India that gives about 400-500 rupees per month. The government also gives out seeds but they give them out too late in the season so they are of no use. The farmers finish off by saying that “they are not asking for much, just what they need for farming; water, electricity and good roads”.

## **7.9 Bt cotton**

The farmers in interview 1 claim there are no normal seeds available. There are however different kinds of Bt cotton. They like the Bt cotton better because it yields more. The sellers charge a high price for it though, because they can. Also sometimes you get really good quality seeds for a few years and then when you buy the same ones again they are poor quality. Even if Bt seed are of good quality it does not help because it does not rain enough. For all the other crops the farmers are growing, except for cotton, the farmers are able to make their seeds by themselves but for cotton they do not have the necessary equipment. This has

nothing to do with Bt or normal seeds, they have never been able to do it. The farmer in interview 2 thinks Bt seeds are better but that it needs more rain than normal seeds. The farmers also mention that the old seeds were cheaper but that they were more prone to insects and diseases. Bt cotton is genetically modified to be more resistant so even if they spray pesticides later the seeds can still survive.

## **7.10 Other issues**

The farmers in interview 1 say that they see a few other problems. Sometimes you can get rain in December when it is not supposed to rain which makes the cotton quality lower. It is also an issue that everyone needs workers to pick the cotton at the same time, therefore they have to pay a premium price (6 rupees/ kg). So cotton pickers currently make more than the farmers since they do not have any expenses. The reason all the cotton has to be picked around the same time is because if you leave it too long it can dry out, or get wet from rains or fly away in the wind. You have a span of about 15 days for each cotton batch.

Interviewee 2 says there is no major issue but it is hard to find people to pick the cotton. Interviewee 3 says that water is the main issue and that fertilizers are sometimes hard to find and Bt seeds are expensive. However, the seed price has decreased over the last two years. Interviewee 4 says it is hard to get the tools they need. They rent bulls for example and everyone wants it around the same time, it cost about 1000 rupees per day for two bulls. Another farmer mentions that the government charges you the same for electricity no matter how much you use, so even if you have power shortages you still have to pay for that time.

Interviewee 4 also says that it is hard for him to find a wife as his yields are so low due to poor soil and low rains and therefore his income is insufficient. He needs to build a toilet if he wants a wife and he jokes about how he might have to pay the dowry instead of the bride's family since he is so poor.

## **7.11 Organic cultivation**

The farmers in interview 1 do not know if it would be possible for them to grow organic, they have never grown any other way. But after some consideration they conclude that they could not since they cannot keep enough cows due to lack of water and food (to get natural fertilizer). Ten years ago they used to also make fertilizer by composting the old cotton bushes but because of lack of water they cannot do it anymore. They also add that they only use as much chemicals as they need. Interviewee 2 says he has never thought of growing organically, he always uses a mix.

## 7.12 Suicides

The farmers in interview 1 say they do not know anyone personally but they know of someone in their village that killed themselves last year. They feel the reason is that there is not much unity in the region. In western Maharashtra they have dams and channels so that they can grow sugarcanes and if the rate drops they will fight it immediately. But here we do not unite the same way to fight the prices. Loans, lack of money and water are other reasons. “Also weddings are a huge cost, they feel responsible to marry their daughter away and in India the parents of the daughter have to pay for the whole wedding as well as a dowry, so many take loans for this”.

Interviewee 2 and 3 does not know anyone who has killed themselves but think the reason is the farmers’ tough economic situation, for example if they cannot pay their loans. Interviewee 4 says there are many from villages nearby but he does not know anyone personally. He thinks the farmers should fight more, get another job if they do not yield enough, not just give up. The farmers killing themselves think that their families will get money but the government only removes the farm loans, and only bank loans. They also give a lump sum, he thinks of about 100 000-200 000, or at least under half a million. Interviewee 5 does not know anyone from this village but from his brother’s village. He thinks that farmer killed himself due to him having large loans, being poor and growing Bt cotton.

## 8. Analysis

The farmers in Vaijapur have a tough economic situation, with poor access to water as the main reason. Another reason to their economic situation could be that cotton has decreased in price compared to other crops since 90/91. The cost for growing cotton did also increase between 2007-2012 without enough increase in yield which has reduced the profits (ICAC 2015). Many of the farmers in Vaijapur felt they were not able to provide for their family by only growing cotton and therefore had other sources of income as well. Most of the farmers have to work all day and sometimes even during the nights in the cotton field and still they do not get a fair compensation. Due to variations in yield and cotton prices this is common for self-employed cotton farmers (ICAC 2015).

### 8.1 Factors in receiving a better price

Small cotton farmers are exposed to many risks (Huang, Vyas and Liang 2015; ICAC 2015) and often do not have the assets necessary to protect themselves against it, as bigger companies have (Huang, Vyas and Liang 2015). To overcome the disadvantages and improve their economy, organizations are mentioned as one strategy (Huang, Vyas & Liang 2015; ICAC 2015; Fayet & Vermeulen 2014). Unfortunately, we did not ask the farmers in Vaijapur if they were connected to a farmer organization but in the first interview with the 14 farmers, they said that they did not unite to fight together for example regarding prices as they do in Western Maharashtra. By this, it is likely that they do not have any specific organization that could be useful for marketing activities, which ICAC (2015) mention to be the most important

factor for small cotton farmers. If many farmers get together they can reach other markets and get better compensation for their cotton. The farmers in Aurangabad also pointed out the need for better roads. Poor infrastructure is also mentioned by Fayet & Vermeulen (2014) as one thing that could increase the costs for the farmers. Furthermore, it decreases the chances for organization (ICAC 2015). The quality of cotton is an important price decider but this is very dependent on both water and soil which will be discussed in the next paragraph.

## 8.2 Factors of yield

India's cotton farmers are facing many challenges today. First and foremost, water scarcity is a huge issue in the area that was visited, as one farmer said: "If we had water everything would be different, we would not need the government to help us, if we only had water!". The two farmers that used drip irrigation instead of surface irrigated methods were the ones that claimed they got the highest yield. Their situation was perceived as much better compared to the others as well. One of them provided for the most number of people and none of them had loans. Drip irrigation instead of surface irrigations is said to give a better yield and decrease the risks of water being lost by evaporation, run off from the fields or going deeper than the root systems of the cotton plants (ICAC 2015). But still, the farmers lack of water is not likely to be mainly due to watering crops as they water sparingly on their fields, this is otherwise a common cause (ICAC 2015). Instead a decrease in rainfall might be the leading cause. One farmer describes how he waters one row per day, if he has enough water.

According to ICAC (2015) water is an important factor around the world when evaluating the overall sustainability in cotton cultivation. In Vaijapur the farmers claimed that during their time farming the rainfall has decreased, the farmers used to grow sugar canes but say this is not an option today due to water scarcity. This statement is supported by India today's article on changes in the monsoon over the past 60 years, they conclude that the rainfall has decreased during this time (Chandra Sharma 2014). Water is a very important factor in deciding the yield (ICAC 2015) and the length of the cotton lint (Cordão Sobrinho et. al. 2015). In Aurangabad district they have had on average 737.51 mm of rainfall between 2002-2011 (Central Ground Water Board 2015). This is on the lower end of what the ICAC (2015) mentions as the water demand for a cotton plant, 600-1200 mm. This is likely the main reason for the farmers struggling with low yields in Vaijapur. Climate conditions is another factor that small cotton farmers are dependent upon and sadly nothing that can be affected (ICAC 2015).

A healthy soil is important for the crop as it is where it is feeding from (ICAC 2015). In Vaijapur some of the farmers claimed that their soil was of poor quality. It is unclear whether or not this is a new or old issue for the farmers. However, the risk of soil fertility loss (Hulugalle, Weaver, Finlay, Hare & Entwistle) and soil erosion (ICAC 2015), to name a few, increases when cotton is grown as a monoculture. This is the method used by all the interviewed farmers, and sometimes for generations, and it is therefore not unlikely that the soil has decreasing levels of nutrition as well as issues with erosion. Monoculture is also a large cause of biodiversity loss (ICAC 2015). A common way of dealing with soil fertility issues is to use fertilizers (ICAC 2015), this is also reflected in this empirical research since the farmers use this regularly. Soil health can also be negatively affected by pesticides (ICAC 2015) which could be the case in Vaijapur as well. A black soil is said to be the best for cotton cultivation (Central Ground Water Board 2015). The farmers in Aurangabad have a mix of

different soils; black, light brown and reddish ones. Soil is important for the yield and therefore this could explain some of the variations in yield for the different farmers.

Another strategy mentioned by Fayet & Vermeulen (2014) to improve small cotton farmer's economy is to join a sustainability organization, which according to their study improves the profit, reduces cost, increases yield as well as reduces the use of chemical pesticides and fertilizers. Eyhorn, Ramakrishnan & Mäder (2007) concludes in their study about farmers switching to organic cotton, that it took 2-3 years of decreased profits before the organic cultivation would become more profitable than conventional cotton. An economic burden small farmers may not be able to handle. Another article showed that market information from government is more profitable for the farmers than farming advice (Tang, Wang & Zhao 2015). In our study some farmers thought it was impossible for them to grow organic since they do not have enough water and food for the cattle to get natural fertilizers and another farmer have never thought about growing organic. This might indicate that the small farmers need more information about the market and technology to be competitive (Fayet & Vermeulen 2014).

The farmers in this study used very different methods when cultivating cotton. The amount of seeds used on an acre varied greatly as well as the cost put in per acre, which varied from 8000-40000 rupees. No clear relationship between input of money and output of money can be seen. The yield and quality varies as well. We can see two possible reasons for this; it could be due to differences in soil, seeds and chemicals put in to their cultivation or it could depend on the farmers having different knowledge levels. Previous studies show that who your peers are can affect your yield (Songsermsawas, Baylis, Chhatre & Michelson 2016). If you know someone who is really good at growing cotton they are likely to share their skills with you and hence you may increase your yield. Someone who has peers that are not as skilled may not get access to this information.

The cotton farmers in Aurangabad did not have anything bad to say about Bt cotton but some said that Bt cotton could generate more yield when the monsoon is good and lower yield in dry conditions compared to conventional cotton. Most of the farmers claim that the conventional seeds are no longer available. However, one farmer claimed he used the conventional seeds. Bt cotton is also said to cost more than the conventional seeds which makes it an important factor of costs as well.

### **8.3 Factors of costs**

An increase of indebtedness has been seen amongst cotton farmers (ICAC 2015) and in Vaijapur all of the interviewed farmers, except two, had loans. Most of them had loans from banks where they had to put the land up as a collateral. Some of them had loans from moneylenders as well with a huge interest making it even harder to pay back.

Pest and pesticide control represents a major cost for the cotton farmers in Vaijapur. GM (genetically modified) cotton is debated and some claim that it could be a sustainable way to fight pests while others claim the opposite (ICAC 2015). Most of the farmers in Vaijapur use Bt cotton seeds that are developed to repel Lalya which is a kind of bollworm. However, Lalya still attacks the farms and they have nothing against it and when one farm gets it all the other farms get infected as well.

Karate is a broad spectrum pesticide (Syngenta 2016) which the farmers mentioned many times in the interviews. A broad spectrum pesticide is named as one of the common reasons for causing the pests to become resistant (ICAC 2015). These types of pesticides also affect the biodiversity by killing of not only the targeted pest but also other species (ICAC 2015; Rao, Bellin & Brusseau 1993), less than 0.1 % reach the targeted pests (Pimentel & Levitan 1986). In its extension this means that some natural enemies to pests are killed off as well, leading to decreased crop yield (ICAC 2015). The soil and water quality are other areas that could be affected in a negative way when pesticide application is high (Arias-Estévez et.al. 2008), to control the pests more chemicals are often needed and it becomes a vicious circle. This could make the situation worse for the farmers as well by creating even larger expenses.

Laborers for cotton picking is another huge cost for the farmers. The cotton needs to be picked within a certain time frame that is too tight for the farmers to handle the work load by themselves. The cotton gets destroyed if you wait too long. Since all the farmers need employees at the same time there is a scarcity of workers and they can therefore charge more for their services.

## 8.4 Other factors

It is not only common to take loans for farming, many farmers also take loans to be able to pay for their daughter's wedding and the expected dowry. Dowries are illegal but still exist, above all in rural parts of India (Roy 2015). Some also take gold loans, a loan taken to be able to buy gold jewelry.

The government in India work to improve the farmers' situation by for example offering compensation when they are attacked by Lalya or provide money for ponds. However, it is still not enough to make the situation sustainable for the farmers in Vaijapur. One farmer says: "if we had water everything would be different; we would not need the government to help us if we only had water."

## 9. Conclusion

**Water** is perhaps the most important factor in deciding the yield for cotton farmers in Vaijapur. The relationship between yield and water supply is linear to a certain point. Which **kind of seeds** are used can also affect the yield a lot, for example the farmers claim Bt seeds provide a better yield for rainier years whilst a lower yield for dry years (compared to conventional seeds). The **climate** is also important for the yield as well as **growing techniques**. The farmers use different techniques and research indicates that this information is often passed on from **peers**.

To be able to receive a good price for your produce it seems being part of an **organization** is important since this leads to better **supply chain management**. One factor that decreases the chance of organizations is living in an area with poor **infrastructure** (roads). The **market price** of cotton is important as well as being able to produce cotton with a high **quality**.

The main costs for cotton cultivation in this area are **interest** (loans), **seeds**, **pesticide**, **fertilizers** and **cotton pickers**. Furthermore, some farmers have to rent bulls for ploughing. Other important factors are **Government compensations** that are available. The culture of India also brings certain costs for families with daughters, such as **dowries** and the cost of **weddings**.

## 10. Discussion

This thesis shows that water is an important factor in deciding the yield and thereby important for the economy of cotton farmers. Water in the researched area Vaijapur is very scarce. The Indian government tries to assist the farmers by for example giving out irrigation systems or money to build ponds. However, one can question how effective this is when there is not enough rain or other water sources around that can supply water for these tools. Is it at all sustainable to grow cotton in this region and in that case how can water be supplied in a way that does not deplete the resources. There is an interesting article that researches the method of covering plants with plastic to increase the yield through heat and moisture retention (Dong, Li, Tang & Zhang 2009). Perhaps this could be useful in a dry area like Vaijapur. However, it would also be interesting to see if other crops could be more suitable for this region as well as more profitable for the farmers. Hemp has some promising qualities for this purpose; it requires half the amount of water as cotton and yields twice as much on the same amount of land (Palmer 2011). Furthermore, hemp is resistant to most pests and grows tight together to shut out weeds (Yonavjak 2013). However, there are some legal challenges for the plant as there is no legal distinction between hemp and marijuana in India (Ayyar 2014).

Furthermore, it is interesting that the farmers in this research claim that Bt seeds provides a better yield than conventional seeds when it has a good water supply but that the reverse is true when there is a poor water supply. Perhaps Bt seeds are not very well suited for dry areas. On the other hand, the interviewed farmers were positive towards Bt seeds in spite of reduction in yield during dry periods and the higher price. The yield of Bt seeds in comparison with conventional seeds is also a common research area and the results vary greatly (Subramanian & Qaim 2010; Morse, Bennett & Ismael 2005; Forster et. al. 2013). Through this study a conclusion could not be drawn whether Bt or conventional seeds are better. However, the farmers informed us that it does not give a full coverage for the pest it is supposed to protect from. Another interesting finding is that the farmers in this study have always rebought the seeds for cotton since they do not have the proper equipment to prepare the them. Previous research sometimes mentions rebuying of the Bt seeds as an extra cost, this would eliminate that argument for the farmers in this research. The Bt seeds also basically have monopoly on the Indian market which can give Monsanto a lot of power over for example prices.

One farmer mentioned in an interview that the nearby village was much more tight knit and would immediately fight for example a decrease in cotton prizes as well as help each other out to a bigger extent. This indicates that the nearby village is organized in some way, but it may not be a proper organization. Instead it might be some mutual agreement to help each other out. The farmer also said that this was not the case in their village. This indicates that the farmers in this thesis are not part of an organization. The reason for this is unknown. However, the farmers did mention that they wanted the road infrastructure to be improved in

the area. Poor roads have been mentioned as a factor decreasing the odds of organizations amongst farmers in previous research (ICAC 2015). High transportation cost due to the houses usually being spread out and insufficient funds to finance a union has also been found hindering for these kinds of organizations (ICAC 2015). Perhaps improvements of the infrastructure would improve the economic situation of these farmers since organized farmers can get a better price for their produce.

Broad spectrum pesticides are dangerous because they cause resistance in pests as well as loss of biodiversity (ICAC 2015). Eventually the soil gets damaged and can not provide the cotton plant with enough nutrition, hence the farmers need to add fertilizers. This becomes a cost for the farmers. The point here is that everything is connected, you cannot neglect the environmental effects of cultivation without it eventually affecting the economy. There are other ways of dealing with pests that are more environmentally friendly, for example the use of natural enemies, which for example is used in Israel (Made In Israel - with Gordon Robertson 2014). This could be an environmentally beneficial and effective way to deal with the pest Lalya which the farmers struggle with, as well as other pests. Another study shows that you can stop using chemical pesticide and grow organic instead with no change in yield (after the initial 2-3 years) and a reduction of costs (Eyhorn, Ramakrishnan & Mäder 2007). One can then question why this is not more common. Other studies also show that you can completely exclude the use of pesticide without change in yield (Joshi 2006; Fayet & Vermeulen 2014).

One problem which is very local to India is that of the tradition of dowry and the bride's family paying for the wedding. This is a huge burden for families with daughters and thereby an important factor for their economy. It is illegal with dowry in India but still common in the rural parts of the country according to previous research. During the interviews in this thesis it became very clear that these traditions were norms and not at all seen as a crime. One farmer joked about it and another saw it as a contributing factor to the high suicide rates in India. Making sure that this law is enforced should improve the economic situation of families with daughters as well as improve the position of women in society.

This thesis has contributed to business economics by specifying the important factors to take into consideration when trying to improve profitability within small cotton companies in India.

## **11. Further research**

In this thesis the conclusion was drawn that water is a very important factor in deciding the yield of cotton, which is also supported by previous research. It also became very clear that water is a scarcity in the researched area, Vaijapur. Therefore, we suggest further research to be conducted on how more water could be supplied to this area without depleting the sources. As well as research how the water available is best utilized in the fields to maximize the cotton yield.

We also suggest further efforts to be put in to researching what hinders cotton farmers today to switch to organic cultivation. As well as further research the economic implications this would lead to.

Furthermore, research could be made within the area of replacements of cotton. One suggestion is to look at hemp which has a lot of promising qualities. Perhaps this could benefit not only the economy of farmers but the environment as well.

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# Appendices

## Interview-guide farmers

How much land do you have?

What kind of cotton seeds do you use? Do you use Bt cotton?

When did you switch to Bt cotton?

How long time does it take from you putting the seed in the ground to the cotton being ready to get picked?

How much time is put into the cultivation each day?

How much cotton do you yield? (per year, hectare or other)

How much money do you get per sack of cotton? (sack, look how much it contains?) What are the costs related to cultivating cotton? (Pesticides, herbicides, seeds, employees, Other? For how long time does it last? How much land does it cover?)

What kinds of pesticide and herbicide do you use?

Do you know how to read?

Do you know any risks with the use of pesticides and herbicides?

Do you use any protection when spraying your fields?

Do you recognize any (other) issues growing cotton? -How does weather affect your crop?

What is your family's general health like?

Can you provide for yourself and your family by growing cotton?

Does your family have any other incomes?

Do your children go to school?

Do you have any loans?

How did you get a loan? (from where?)

What is the interest rate?

Did you have to put up a collateral?

Can you pay your loans on time?

How long have you been growing cotton for?

Do you feel the situation has changed during this time?

How do you feel about Bt cotton?

Would you prefer to grow the "old" seeds or the Bt cotton seeds?

Are you able to buy the "old" seeds anywhere?

Have you ever grown anything else than cotton? If yes, then why did you switch to cotton?

What kind of soil do you have?

Could you imagine switching crop?

Do you think is it possible? If no, why not?

Do you know of anyone who has killed themselves? Why do you think they did it?



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