“Future of bamboo textiles in Pakistan”

By

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Indus Valley School of Art and Architecture
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“Future of bamboo textiles in Pakistan”

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This Thesis submitted in partial fulfilment of the requirements for the degree of BACHELOR OF TEXTILE DESIGN, from Indus Valley School of Art and Architecture.

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## Contents Page

Acknowledgments
Abstract
Contents

**Introduction**  1-5

**Literature Review**  6-14

**Research Methodology**  15-19

**Findings and Analysis**  20-31

**Conclusion**  32-33

**Processes involved in Bamboo yarn manufacturing**

(Photographs)  34-36

**Glossary**  37-38

**Bibliography**  39-42
# Appendices

## Personal Interviews

<table>
<thead>
<tr>
<th>Interview</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 1</td>
<td>43-48</td>
</tr>
<tr>
<td>Interview 2</td>
<td>49-53</td>
</tr>
<tr>
<td>Interview 3</td>
<td>54-58</td>
</tr>
<tr>
<td>Interview 4</td>
<td>59</td>
</tr>
</tbody>
</table>

## Email interviews and Follow-ups

<table>
<thead>
<tr>
<th>Interview</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 5</td>
<td>60-63</td>
</tr>
<tr>
<td>Interview 6</td>
<td>64</td>
</tr>
<tr>
<td>Interview 7</td>
<td>65-69</td>
</tr>
<tr>
<td>Interview 8</td>
<td>70-71</td>
</tr>
</tbody>
</table>

## Telephone Interviews

<table>
<thead>
<tr>
<th>Interview</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 9</td>
<td>72-74</td>
</tr>
<tr>
<td>Interview 10</td>
<td>75</td>
</tr>
<tr>
<td>Interview 11</td>
<td>76-77</td>
</tr>
<tr>
<td>Interview 12</td>
<td>78</td>
</tr>
<tr>
<td>Interview 13</td>
<td>79</td>
</tr>
</tbody>
</table>
Acknowledgments:

I am grateful to Allah for having given me the opportunity to study in an institution like Indus Valley School of Art and Architecture who gave me the opportunity to do this research paper, helping me learn about bamboo textiles and I hope those who read it learn and appreciate it too.

Furthermore I would like to thank my teacher Mrs. Shehnaz Ismail for being there to guide and to our counselors Gemma Sharpe and Arshad Farooqui but foremost Ms. Uzma Bawany who guided us and stood by us at every stage and painstakingly read through our chapters and for chalking out a very useful timetable for us.

Secondly, I would like to thank my parents who went with me to Hyderabad and took me to meet people making it a picnic for me and for being their in dua’s and support of all type and to my younger brother for just being there every time I broke down. I am also grateful for all those who took out time for my interviews.
Abstract

This Dissertation focuses on the Developments and Experimentations being done with regards to Bamboo Textiles in Pakistan. Bamboo textiles have been in the international market for quite sometime and have developed a lot of preference due to it being organic and to the unique properties of bamboo in comparison to cotton. I have explored what so far has been done here in Pakistan. Our industry has been manufacturing bamboo products for export purposes. Here in Pakistan we have both the manufacturing of bamboo yarn and the production of finished goods especially home textiles. Hence, I have explored that and seen whether there is potential for growth in our country as a consumer and what the hindering problems are.

The research strategy that I undertook was qualitative analysis n which I took interviews from the concerned people, read articles online and went through books. But since there was no information regarding the manufacturing and production of bamboo textiles in Pakistan, most of my research was based on primary research.

Development in bamboo textiles is increasing thoroughly in the international market as they have a huge consumer demand for organic materials and have awareness regarding bamboo and its properties. Although Pakistan is still new at it I see potential of growth her and hence have taken this topic for my research.
Introduction:

Before selecting a topic I went through quite a number of them starting from medical textiles to leather goods and all but round about then I had overheard a conversation about bamboo bed sheets and their emergence in both the local and international market. This topic interested me and I wanted to dig in further and learn about the eco-friendly fibers being used in our country. I knew they were being used in clothing internationally but locally I had heard of it for the first time. The reason I felt research was important on this topic was because as new emerging students into the market we should understand both the importance of using organic fibers and increase our knowledge about the different experimentation and developments that are happening in our local textile industries. When we enter the textile market our only knowledge is about design and aesthetics hence I feel it is important for us to open our minds and see what new work is happening in the textile industries.

When I started off with my research I was considering bamboo as an eco-friendly fiber only to discover that since the extraction of bamboo fiber is highly expensive, many industries also use semi-synthetic fiber called bamboo rayon\(^1\). There are two types of Bamboo fibers. One is known as original Bamboo fiber which is made from pure bamboo streaks and the other is made from bamboo pulp which is passed through micro filaments.

and is known as bamboo rayon\(^2\). Bamboo made from rayon is four times cheaper than the original bamboo fiber\(^3\). Reading through many articles it turns out that Bamboo rayon is a silky, soft, lustrous, anti-bacterial fiber.\(^4\) After digging further into the topic I discovered through various articles and a few initial interviews with Mr.Uzair Ahmed from Gulahmed Textiles\(^5\) and Mr.Akram from The Marketing Company in Lahore that bamboo rayon is preferred over original bamboo fiber because it has a softer and silkier feel.\(^6\) Bamboo rayon fiber and original bamboo fiber have both created a market for themselves internationally and are in demand. Also looking at our export market our textile earnings will fall by $1 billion in 2011 because of the reduced prices of cotton all over.\(^7\)

In the process of reading articles I learnt of the many controversies over bamboo being an eco-friendly fiber.\(^8\) There were environmental concerns internationally which led them to start using organic fibers and provide for the consumers but in our local market the environmental concern is hardly there hence using environmentally friendly fibers will have no effect on our market unless we educate them about it. The use of pesticides is hazardous on both the environment and humans wearing the apparel.

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\(^2\) Akram Rehmani, Farhaan. Online Interview. 24-September-2011
\(^3\) Akram Rehmani, Farhaan. Online Interview. 24-September-2011
\(^5\) Ahmed Uzair. Telephone Interview. 3-Aug-2012
In my research I have looked at the experimentation that have been done so far in Pakistan with bamboo fibers, the various kinds of blends being made and the respective products that get made. I will also be looking at the process that is involved using bamboo fibers and if the weaving procedures are any different than that for cotton and other fibers and if yes then why so. I will also focus on the dyeing and the further procedures for example the change in the absorption of water or any other dyes by using different blends, what effect each blend has on the various dyes etc and how economical is the blend. I will be looking at the Research and Development departments and people concerned of a few companies to learn about their findings and give my analysis based on the findings. I will also look at the products that sell well in the international and local market being made in Pakistan, the responses of the markets. If any comparisons are made they will be made against cotton because its Pakistan’s main textile raw material.

So far the articles that I have reviewed by our agricultural department said that our sympodial bamboo area was 20,000 hectares in 2005 and 136,000 tones of wood is cut for use in commercial purposes. This shows that since bamboo is grown in Pakistan as well if we develop our textile industry further we may be able to use this for the extraction of bamboo. In the international market various blends are created to give different feels and uses but nothing as such has been written for the Pakistani market. The

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few international articles focus mainly on denim that is mostly being exported from Pakistan.

Since most of my answers will not be answered only with secondary research I will be taking interviews as well for my primary research. This will be able to give me more authentic answers to my question and will help me arrive at a stronger conclusion and have a better analysis.

I have focused on Karachi and Hyderabad mostly because of a number of reasons. Firstly, as it is very few Textile Mills are working with bamboo fibers and they can be found between Hyderabad and Karachi. Secondly, because of personal reasons travelling to Faisalabad and Lahore was not feasible. Online interviews from companies in other cities were conducted. One major problem that I faced was the ease with which Mills will gave information on Bamboo textiles. It is a new field in their departments and many want to keep it a secret because of their personal interests.

The basic chapters that this Dissertation will hold are:

- Introduction
- Literature Review-
- Research Methodology
- Findings and Analysis
- Conclusion-
With this research our knowledge about this topic will increase especially since it will be focused towards the local market. Giving us (students and teachers) an insight into the market and it will open our minds.
Literature Review:

The research question of this dissertation is, “Future of Bamboo Textiles in Pakistan.” The Sub-topics that have been focused on are the various blends and why each blend is suitable for a certain type of product, it covers the difficulties that are faced in using bamboo fiber while weaving and through other procedures and why, the different procedures it goes through and what are the results for each blend for example how the ratio of dyes used changes in different blends and compared to cotton and how economical and worthwhile it is to blend.

The data that has been collected to study from and take references are not directly linked to the question. This is because of the unavailability of any scholarly article or book on this topic more so focused towards Pakistan. Few of it that has been collected is for America and India or are chemical formulas about cellulosic plant structures. Hence most of my research will be primary.

“In 2001, Beijing University discovered how to produce fabric from bamboo. Since then, the technique of manufacturing top quality fabric has been in development, bringing new innovations in fiber mixing and other processes.”

11 “Bamboo Fabric- a new concept”. http://www.bambooclothing.co.uk/faqs/html 15 November 2011,
One of the articles that was published in Fort Collins Colorado on April 8th, 2008 states that a graduate student from Colorado State University and an assistant professor Subhash Appidi discovered how to make bamboo fabrics UV resistant and have stronger anti-bacterial properties. He believed that bamboo fabrics were eco-friendly but because of being organic bacteria affected the fibers hence destroying the properties.

"All cellulose fibers allow more moisture to leak in and provide more food for bacteria to eat," he said. "That's why bacteria grow more on natural fibers rather than synthetic fibers."¹²

Their answer to the problem was by using dye laced with UV absorbing chemicals when colouring the fabric and using a chemical called Tinosan to improve the antibacterial properties of the fabric.

One of my concerns was the authenticity of the writer especially after constantly having read in various articles that bamboo fabrics are naturally UV resistant and anti-bacterial. It is something I want to learn further. Furthermore how economical and environmentally friendly is it to lace dyes with UV absorbing chemicals.

In another article called “Bamboo fiber- A brief analysis” the writer talked about the various properties of bamboo and the scientific reasoning behind it. Bamboo fiber can be softer than silk when spun into yarn.¹³ It absorbs moisture 3-4 times faster than cotton fabrics. “The cross-section of the bamboo fiber is filled with various micro-gaps and micro-holes leading to much better moisture absorption and ventilation. It is also very

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warm in cold weather, because of the same micro structure as the warm air gets trapped next to the skin."\(^{14}\)

It is antibacterial, anti-fungal and anti-static. “Bamboo has a unique anti-bacteria and bacteriostasis bio-agent named "bamboo Kun" which bonds tightly with bamboo cellulose molecules during the normal process of bamboo fiber growth. This feature gets retained in bamboo fabrics too”\(^{15}\) After many tests that were conducted the results show 70% death rate after bacteria was exposed on to the fabric.

Bamboo fiber manufacturers had put the fiber through rigorous bleaching techniques but some companies leave the original bamboo fiber unbleached. The fiber is thinner compared to hair and has round, smooth surface which makes it abrasion proof.

There are a number of products which use bamboo fiber. Because of being anti bacterial, anti-fungal and moisture and UV absorbent nature it is used in bed sheets, under garments and in summer clothes. “The fiber is blended with 4% Lycra for making sportswear.”\(^{16}\) Since it can absorb UV light it is suitable for wall papers and curtains. For upholstery different blends are used. It is also suitable for medical supplies.

The drawbacks of bamboo according to the article are that although the growing process is great for the environment and its pesticide free the extraction process involves chemicals. While the previous article talks about introducing UV dyes this states about it already being present in sufficient quantity.


On the other hand it also talks about how bamboo has an upper hand over organic cotton. Its yield is ten times more and the amount of water used is far less than organic cotton. Bamboo can grow without irrigation on hill slopes and places where no other crop grows well.

I find this article to be very preachy and too pro-bamboo but it gives a clear picture of the properties with supporting scientific facts leading us to investigate further which is why the article can be considered worthy. According to this article UV absorbing is a natural ability but the previous article argues that claim and provides a solution. This requires further searching into as it is a part of the experimentation in bamboo fabrics.

Ed Mass in his article “Bamboo Textiles: Green, Luxurious and Practical” writes that Bamboo sheets and towels do not require fabric softeners thereby reducing the overall cost of the product. There is also the advantage of reduction in energy and water consumption along with labour saving. There is also a reduction in the waste water from detergents. Making it environmentally quite friendly. I agree with his article that blending bamboo with non organic cotton makes no sense. It affects the environment as it destructs the air, water and soil. 17

The authenticity of the author may not be argued with because he writes for Natural Life Magazine which promotes green products and the point he made, made a lot of sense. But by using bamboo rayon with non-organic cotton is a more economical option in places where the consumer is not environmental conscious. By blending many properties of a product can be enhanced such as moisture absorption, lustre and softness.

On an online products blog page (BAM) Bamboo clothing in Europe says that bamboo fabric gets dyed in rolls before cutting and sewing. Moso bamboo is used for fabrics. The various blends mentioned are with 30% cotton. This certain company uses Syrian or Turkish cotton for its blends which is high in quality and has a longer staple length this improves the softness and makes it better in handling. 4% Lycra is added for the stretchiness and functionality. They have the state of the art dye house which makes a huge difference to the end products. Just like cotton they end up producing varieties of fabrics made with bamboo.18

This article gives the researcher a push into exploring the many bamboo fabric varieties as it shows that such blends are being explored internationally. The blog sounds biased and it seems like they are comparing properties of bamboo fabrics as a marketing gimmick rather than discussing both the pros and cons of bamboo fabrics and bringing the real picture forth but nonetheless the site offers you a variety of bamboo products under one roof and it gives an insight into the various possibilities of using bamboo in apparel. But it can help in exploring what is happening in Pakistan with bamboo textiles.

In another article called “Bamboo fabric- a new concept”19 says the selling point of bamboo is its unique qualities. Its incredible softness and natural lustre are one if it exceptional qualities because of which it has a resemblance to cashmere. On the other hand its durable and breathable nature is useful but not exceptional. It is suitable for

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18 “Frequently asked questions.”  http://www.bambooclothing.co.uk/  15 November 2011

people with skin allergies because of the lack of harsh chemicals which may irritate the skin and it achieved a score of 50 on the UPF scale (Ultraviolet Protection Scale), which amounts to a 98% reduction in UV activity reaching your skin. It is environmentally very friendly because it reduces greenhouse gases.

Again this article belongs to a clothing website which seems to be promoting bamboo. But the point of interest is to explore whether bamboo is really UV protective and to such an extent as 98%. The first article in this review published in Fort Collins Colorado says that dyes laced with UV absorbing chemicals may be used to enhance the property hence the point of concern is how much can it absorb UV rays without any artificial additions.

“Technology and fabric go hand in hand. As fabrics such as denim continue to dominate apparel trends and sales, textile manufacturers specializing in producing the blue jean fabric also continue to push the envelope by incorporating different weaves, colors and washes. Finishes such as coating, popular with vintage denim, as well as different weaves such as cross hatch construction or left-hand twills, add interest to the denim textile surface.”

Similarly, denim Factory’s has been experimenting with bamboo. Us Denim Mill: USA had launched Re-Gene which is basically reusing and recycling yarns into the denim fabric. They provide their customers with a variety of eco friendly denims and they also...

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20 Valladeres, Mercedes. “About Denim weaving mills.” April-6-2011
21 Valladeres, Mercedes. “About Denim weaving mills.” April-6-2011
use bamboo blends for their denim 65% cotton and 35% bamboo. This gives it the strength and durability along with the abrasive quality required in denim.

In a yarn blog, “Bamboo Fabric Vs Nanotechnology Bamboo Charcoal Fabric” dated 23rd April 2010. It discusses a new technology in the extraction of Bamboo Fibre. This is a new development in the field called Nanotechnology Bamboo charcoal Fabric. This technique basically involves the use of 4-5 yr old Taiwanese grown bamboo that has been dried and then burnt at 800 degrees centigrade. The reduced charcoal is retrieved, grounded and converted into nano particles which are then made into fibres through a closed loop system which is eco friendly. The properties are similar to bamboo fabrics with a few differences only.

In this article I felt that besides it being more eco-friendly than normal bamboo fabric because of the closed loop system they share almost the same properties.

In the article, “Economic Value of Bamboo Fabrics,” says that one of the most expensive cotton items are the high thread count bed sheets which are very expensive unlike the bamboo bedding which is a little inexpensive and softer than the high thread count cotton sheets yet they have a similar sheen and drape to silk. On the other hand they are more anti bacterial and anti fungal which a plus point for the bed sheets is.

22 http://www.usdenim.mills.com/sustainable/ 26 November 2011

In an article written about the R and D projects done in the last ten year between 1999-2009 “Development of functional fabric to provide bacterial & ultraviolet protection to the skin (Sponsored by Ministry of Textiles, Govt. of India)”, It states that, “Bamboo fiber and its blended fabrics are characterized by its good hygroscopicity, excellent permeability, soft feel, easiness to straighten and dye and splendid color effect of pigmentation.”

It also goes on to point out that since this fiber possesses better properties than cotton it needs to be brought into the limelight by awareness.

This article is written for the ministry of India to improve its industry so it has been written for a textile industry making it useful in my research.

Another article which is helpful in this research is based on cotton but it is important because it points out the much experimentation the blends undergo which will be helpful in analyzing the data that is collected from primary interviews. The article is called “Cotton Blending: How the EFS System Can Help in Producing Optimum Yarn Quality.” It points out the various ratios, flexibility and fiber friction. It also points to the many difficulties faced while creating the blends and gives various equations of how to work out the blends.

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Although the article holds a number of technical aspects it will help in both comparing and learning more about bamboo blends. It also gives a non-technical person an insight into various terms which can then be taken forward in interviews.

Since Bamboo Textiles is a recent introduction into Pakistan there are not many articles and researches done on it for this part of the world. Articles are mostly found for the international market where it is very common. Some articles are very biased since they are mostly marketing the bamboo products with its properties while others are extremely against bamboo as they believe it is not an environmentally healthy addition. There is no article or book that talks about the developments in both the international and local markets in Pakistan about bamboo textiles such as the blends, the type and quantities of dyes used and the techniques involved in making the fiber more strong or even about the finishing processes. Many local companies have kept their experimentation a secret as they want to be the first one to introduce a new product with Bamboo. Mostly the products that are being made in Pakistan for the international market are home textiles.

Although number of texts are based internationally and are about cotton they will be a guide for this research taking it forward and looking into the local market and the experimentation and developments being done on bamboo fabrics. The properties with the scientific terms will help in analyzing the results obtained. Also they will be good supportive elements.
The manufacturing and use of bamboo textiles is quite common in the international textile market and it seems to be the most sought after organic / eco-friendly sector. United Kingdom seems to be in the forefront with the marketing and the use of textiles made from bamboo fiber. This is because if they being aware of environmentally friendly fibers and its unique properties. Manufacturing of bamboo textiles is very limited in Pakistan and the local usage is absolutely nil at the moment. I have undertaken this topic as my research to increase my understanding of so far what has been done in Pakistan regarding bamboo in the field of textile and whether it has the potential to be grown in Pakistan or not, hence the topic, “Future of bamboo textiles in Pakistan.”

Manufacturing of bamboo is at a very initial level in Pakistan. Mostly the products are being manufactured for export purposes and on orders for the international market. Qualitative method of research had been undertaken for my topic.. Personal interviews, telephonic interviews and interviews via email had been done along with articles and research paper reviews of others. Shank (2002) describes qualitative analysis to be “a form of systematic empirical inquiry into meaning.” Systematic meaning “planned, ordered and public” by empirical he means that this type of inquiry is grounded into a world of experience and by inquiry into meaning he means that researchers try to make sense of whatever data that has been collected. 26 The reason qualitative analysis was

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chosen as a medium of research because the answers I was looking for were based more on what has happened so far in this field in Pakistan and since Bamboo Textiles is at such an initial level in Pakistan, using a qualitative approach was a better option than a quantitative method. Once the qualitative side has been covered and if the industry decides to expand further in bamboo textiles then a quantitative approach can be undertaken. I made questionnaires as can be seen in the appendices. Generally the questionnaires were the same for everyone but a few were tailored as per requirement and follow-up questions. My secondary research involved visiting the Textile Institute of Pakistan’s library, Pakistan Textile Journal, newspaper clippings and articles online.

Before selecting my topic I researched online on manufacturers and exporters on a website called Ali Baba. Com. There after I spoke to them on the telephone and got their feedbacks and the exporters told me about their links in Karachi, Lahore and Faisalabad to whom I later spoke. Some were helpful while others were not as helpful. Uzair Ahmed at Gulahmad who was in charge of the research in the field of bamboo textiles confirmed that they had manufactured bed sheets made of bamboo fiber. Mr. Farhaan Akram at the Textile Marketing Company –Divisional head marketing in Lahore shed some light on their experimentation and answered my initial questionnaire via email. Such initial telephonic and email interviews helped in clearing out my question.

I had chosen Karachi and Hyderabad as my region of study because firstly, Karachi is an industrial hub and near to the sea making imports and exports through the city easy. People working here were aware of produce entering and leaving the city for other cities
in the country. Secondly, my area of research included developments in the raw material and the manufacturing of the produce which was happening between the two cities and was more conveniently accessible. Thirdly, I had travelling limitations to Faisalabad and Lahore hence my focus was within these two cities and I was able to extract information from them.

My main interviews were from three different departments in the textile industry but were thoroughly aware of all three departments; yarn manufacturing, printing and weaving and the research department. Besides this many short interviews were conducted with Shehzad Qureshi, a merchandiser; Mr. Mansoor Alvi; Mr. Ahmed Abdul Rehman at Artistic Milliners, Mr. Faisal at Yunus Textile Mills and Mr. Abu Amir at Clariant. From the main interviews the first interview was conducted in Hyderabad with Mr. Shahid Iqbal at Indus Dyeing Mill. He was the General Manager there and he answered not only my questions but gave a detailed tour of bamboo yarn manufacturing and samples of the yarns and towels made of bamboo. The other interview was conducted with Mr. Waheed Zafar, Manager Product Development at Yunus Textile Mill where I saw both printed and woven bamboo fabrics and learnt more about the processes and developments being done in Pakistan and the third interview was conducted with Mrs. Farzana Arsalan who was researching on bamboo textiles herself and conducting experiments on fabric and knitwear produced with bamboo for her thesis in the Masters program in Textile Engineering ant Mehran University, Jamshoro. With her I and Indus Dyeing Mill did multiple mini interviews over emails. (MMI)²⁷

²⁷ Multiple-Mini interviews. http://en.wikipedia.org/wiki/Multiple_mini_interview. 19-Feb-12
Since three of my major departments of research were covered I did speak to Mr. Abu Amir at Clarient over the telephone to ask them about any dyes that were specifically being made for bamboo fiber. I also spoke to Mr. Faisal Mirza at Yunus Textiles who is head of marketing there and he gave me a brief interview about bamboo textiles over the telephone. Similarly, I had a discussion with Mr. Abdul Rehman at Artistic Milliners about using bamboo in denim and he did confirm the use of it but was unable to give exact information because of an underdeveloped Research and Development department.

Before every interview was conducted I told them about how I’m a student at Indus Valley School of Art and Architecture researching about Bamboo Textiles and that whatever information they shared would solely be for academic purposes and if they agreed they would answer.

The limitations I faced during my research were firstly, because of the unavailability and time limitation of the respective people they were very hard to catch for interviews. Secondly, manufacturing of bamboo textiles is so fresh in the market that people are not eager to impart their knowledge unless one had connections hence I had to keep assuring them that it was only for academic purposes. Thirdly, the people were not available for follow-up questions although they promised. Fourthly, the articles on Sage journals - The Textile Research Journal had to be purchased and the promise through school was very long and slow hence I was unable to use some information from there abstract. Other than that books on bamboo textiles or bamboo fiber were few and those
that did exist had a lot of talk about their chemical compositions and structures which deviated from my research.

For my questions my literature reviews was very helpful. After going over what was happening in the international market and by identifying the gaps in the literature I was able to extract many questions from the articles I had studied and I structured them accordingly. Mostly they were not open-ended questions but since I was interviewing them over the phone or personally I recorded their conversation which was later transcribed. The questions were generally the same for all but some were tailored according to the concerned departments. Since, they were face to face interviews I would let the interviewee talk and share as much information as they could and later I would ask them questions which were in sequel to their conversation, adding questions to my questionnaire.

My evaluation strategy involved relating the findings of my interview and stating what has been done so far and what potential of growth still existed or not. I compared it briefly with my secondary research; this is called textual analysis or content analysis.28 Together with my findings I gave my analysis of the data collected.

Findings and Analysis

In 2001 in Beijing University it was discovered how to produce fabrics with Bamboo.

Bamboo Textiles today are at a very initial level in Pakistan and many mills hide the fact that they have anything to do with it yet because they themselves are developing and want to be the first to be out there with a new product.

Bamboo is a cellulosic fiber. Cellulosic fibers are those that come from plants or plant like materials. Cotton is also a cellulosic fiber hence in nature both fibers are similar with their respective properties.

Referring back to the literature review, the properties of bamboo that have been discussed so far have said that it is anti-bacterial, anti-fungal and anti-static. It also is claimed to have UV protection. It also states that it is “softer than silk when spun into yarn, absorbs moisture 3-4 times more than cotton.” The fiber is said to be thinner when compared to hair hence making it abrasion proof. The original fiber is yellow in colour and has a soft feel and luster to it.

These properties were further discussed with Mrs. Farzana Arsalan a student of Textile Engineering at Mehran University, Jamshoro in a personal interview, who herself is doing her Masters and writing a thesis on Bamboo Textiles. She explored the properties of bamboo and its potential applications in the textile industry. The interviews highlighted the importance of developing bamboo textiles in Pakistan to meet the growing demand for eco-friendly and sustainable materials.

29 Bamboo Fabric- a new concept”. [http://www.bambooclothing.co.uk/faqs/html](http://www.bambooclothing.co.uk/faqs/html) 15 November 2011,

30 Bamboo Fabric- a new concept”. [http://www.bambooclothing.co.uk/faqs/html](http://www.bambooclothing.co.uk/faqs/html) 15 November 2011,
in her lab by doing experiments on knitted bamboo wear. She claimed that it’s true that the fiber has anti-microbial and anti-bacterial properties. She kept a piece of moist bamboo fabric and a piece of moist cotton fabric in a cupboard blocking out any light or air from entering the experiment hence keeping the conditions same for both. A few weeks down the line when they both were extracted from the cupboard cotton had much more fungus in comparison to bamboo.\(^\text{31}\) She agreed with the statement in the article called “Bamboo fabric – a brief analysis” in the literature review that this is because of the “Unique anti-bacteria and bacteriostasis bio-agent named "bamboo Kun" which bonds tightly with bamboo cellulose molecules during the normal process of bamboo fiber growth. This feature gets retained in bamboo fabrics too.”\(^\text{32}\)

Secondly, Mrs. Farzana Arsalan felt that the strength of the Bamboo Fiber became quite weak because of the application of caustic substances during the process of fiber extraction\(^\text{33}\) and hence is a weaker fiber in comparison to cotton while on the other hand both Waheed Zafar,\(^\text{34}\) Assistant Manager of Product Development at Yunus Textiles Mill and Mr. Shahid Iqbal, General Manager at Indus Dyeing Mills Hyderabad thought otherwise. Mr Iqbal said that, “The strength of Bamboo yarn gets stronger when the yarn is made. It becomes stronger than even cotton\(^\text{35}\).” Mr. Waheed also believes that, “Bamboo is a stronger fiber than cotton. Its tensile strength depends on the cross-section for example a thinner count yarn will have less tensile strength in comparison to a higher

\(^\text{31}\) Arsalan Farzana. Personal Interview. 14 Jan 2012

\(^\text{33}\) Arsalan Farzana. Personal Interview. 14 Jan 2012
\(^\text{34}\) Zafar, Waheed. Personal Interview. 22nd December 2011
\(^\text{35}\) Iqbal, Shahid. Personal Interview. 14th January 2012
count one.” Mr. Ahmed Abdul Rehman at Artistic Milliners, Karachi and Mr. Farhaan Akram at The Marketing Company in Lahore said that since the fiber has a smooth surface it has poor abrasive quality hence they had to use blends while making denim apparel like jeans and jackets. The article “Bamboo Fiber – a brief analysis” supports this statement. Since denim has rougher usage and has to last long the percentage of cotton is kept more than bamboo since it gives it more abrasive quality. Bamboo gives it the luster and shine. Hence, cotton and bamboo are blended together usually in a ratio of 65% cotton and 35% bamboo as quoted on the US Denim Mill website.

This fiber naturally has a certain degree of Ultraviolet (UV) protective ability but Subhash Appidi from Colorado State University believes that dyes laced with UV absorbing chemicals are required to enhance the UV protective characteristic of bamboo. Ms. Arsalan on the other hand was in the process of experimenting in her lab to check how much exactly is it UV protective and whether it requires special dyes to enhance that character. From her follow-up interviews she replied back that the Ultra Violet protection ability of a grey bamboo fabric is not much and she has had to apply different finishing technique using UV protected chemicals or functional finishing.

36 Zafar, Waheed. Personal Interview. 22\textsuperscript{nd} December 2011
37 Rehman, Ahmed Abdul. Telephone interview. 15\textsuperscript{th} November 2011
38 Akram, Farhaan. Online interview. 23. September. 2011
39 \url{http://www.usdenimmills.com/sustainable/} 26 November 2011
41 Arsalan, Farzana. Online Interview. 30-March-2012
This property is very useful in curtains and clothing especially in humid and hot countries. On the other hand when spoken to Mr. Abu Amir at Clariant\textsuperscript{42} to inquire whether any developments such as UV laden special dyes were being made with regards to bamboo textiles he said that he was clueless about even bamboo textiles being done in Pakistan and hence no special dye was being made for property enhancements.

It is also known to have better absorption capabilities than cotton. As stated previously in the chapter it is said to be 3-4 times more absorbent than cotton. Therefore its dyeability i.e the ability to absorb dye and gain a certain shade of colour is said to be much better than cotton. Dr. Subrata Das, who has done his Phd and M.Tech from the Textile Technology Department if I.I.T Delhi said that, “Bamboo fabrics need less dyes than cotton, modal or viscose. It seems that the absorption of dyes is remarkably better. Bamboo absorbs the dyestuffs faster and shows the colors better.”\textsuperscript{43} Mrs. Arsalan\textsuperscript{44} and Mr. Shahid Iqbal\textsuperscript{45} both agreed with this fact while Mr.Zafar believed that because of the impurities in the bamboo fiber absorption reduces and hence more dye is required making it more expensive than cotton by approximately by 25\%.\textsuperscript{46} Mrs. Arsalan thinks that bamboo is used extensively in knitting and bamboo’s absorbent nature enhances a knitted fabrics absorbing property.\textsuperscript{47}

\textsuperscript{42} Amir, Abu. Telephone interview. 22. February.2012
\textsuperscript{43} \url{http://www.fibre2fashion.com/industry-article/textile-industry-articles/properties-of-bamboo-fibre/properties-of-bamboo-fibre1.asp}. 14/ March 2012
\textsuperscript{44} Arsalan Farzana. Personal Interview. 14 jan 2012
\textsuperscript{45} Iqbal Shahid. Personal Interview. 14 jan 2012
\textsuperscript{46} Zafar, Waheed. Personal Interview. 22\textsuperscript{nd} December 2011
\textsuperscript{47} Arsalan Farzana. Personal Interview. 14 jan 2012
Bamboo fiber because of it’s expensive extraction process and international market rates remains to be an expensive raw material but if one is educated about it and appreciates the properties a demand may be created in the country and its future may be bright in Pakistan. The main problem one notices in many people is the lack of vision, to foresee about creating a healthier environment with natural materials. As Mr.Iqbal, Mrs. Arsalan and Dr. Subrata Das put it its better dye absorption capabilities can reduce the cost of dye used hence reducing the product cost. If marketing techniques about it are improved and its anti bacterial and UV protective abilities, which can also be achieved with the choice of construction\(^{48}\) are brought into light the middle class and the elite may be interested in purchasing it. It is the marketing gimmicks in the international market that have pulled consumers to purchase articles made of bamboo. If similar techniques are applied here a demand may arise in the Pakistani market in the future.

Moving on to the technical aspect, bamboo yarns are being spun at Indus Dyeing Mills in Hyderabad. They are one of the few mills spinning bamboo. Bamboo is spun in the exact same way as any other yarn. The fiber is imported and comes in bales from usually China. Since bamboo fabric production for Pakistan’s use is almost nil the spinnings are done for international companies. Turkey sends bales to Pakistan because spinning quality here is much better and is cheaper compared to in other countries.\(^{49}\) Once the fibers have been cleaned they are combed through in a combing machine and straightened out. This way the shorter fibers are removed out. There after, the fibers are drawn out and combed through again to remove any existing shorter fiber or impurities.

\(^{48}\) Iqbal, Shahid. Email interview (MMI) 2 March 2012
\(^{49}\) Iqbal, Shahid. Personal Interview. 14th January 2012
The fibers are then twisted and spun into yarn. The machines have advanced so much that everything from the point of lifting smaller cones to preparing bigger cones everything is done in a matter of seconds and automatically. The fiber, when felt, in comparison to cotton was so much softer, lustrous and more yellowish in colour. Indus Dyeing also made many blends of bamboo for example 60% cotton 40 % bamboo and vice versa, 50& cotton and 50 % bamboo, 70% cotton and 30% bamboo and vice versa. When asked whether polyester and bamboo were also blended Mr. Iqbal replied that not until it was a requirement. Their yarn counts were dependant on the demand. According to Mr. Iqbal bamboo produces very less fluff in comparison to cotton. Hence, the fabric lasts longer. The bamboo towels their company had manufactured were extremely soft, lustrous and fluff free. According to him one could save up on fabric softeners as well because even after a wash they remained soft. The yarns were pre dyed in vibrant colors before being woven into towels. Mr. Iqbal explained the zero twist concepts that they had developed to bring maximum softness in their towels. The cotton thread was twisted to its optimum level and then released. On being released it wound itself up on a Polyvinyl acetate fiber (PVA) and remained quite loose. After the towel was woven with the zero twist fiber the fabric was dipped in a chemical that dissolved PVA leaving a towel of the softest nature because it had zero twist. This was before they started working with bamboo fibers and realized it was much hassle free and economical since less hard work had to be put in achieving better fabric.

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50 Iqbal Shahid. Personal Interview. 14 Jan 2012
51 Iqbal Shahid. Personal Interview. 14 Jan 2012
They found it to be more economical in comparison this was in case of where maximum softness was the concern and not the type of raw material. Where cotton was the demand they used the zero-twist technique.\textsuperscript{52}

After yarn making Mr. Waheed Zafar describes the process of making bamboo fabrics which undergo the same techniques of cloth making as any other fabric starting from de-sizing. De-sizing is done on cellulosic fibers and it means to remove any chemicals from the fabric. Chemicals are applied on to the fibers to give them strength during weaving. After that it goes through scouring to remove impurities such as oil. Then it under go’s bleaching to remove the yellowness. Thereafter it is dipped through a mercerization process with a caustic medium to increase dye penetration. This also improves the feel of the fabric making it more lustrous and smooth. According to him the negative affect is that the fiber loses some strength at every stage. Now the fabric is prepared for either printing or dyeing.\textsuperscript{53}

Three types of dyes are applicable on it. Reactive dyes, Pigments and Vat dyes. “Reactive dyes are usually used for cellulosic fibers,” said Mr. Zafar at Yunus Textile Mills.\textsuperscript{54} He goes on to explain that they are cheaper compared to the other two options and the dye binds with the molecules in the cellulosic structure guaranteeing colour fastness. After a certain point when reactive surfaces in the fiber finish the excess dye will be washed off. Pigments only do surface coating and are preferred for printing purposes. It does not wash off if fixed properly with chemicals while Vat dyes are extremely expensive and is usually considered to be the last resort said Mr.Zafar. They are used if one requires

\textsuperscript{52} Iqbal Shahid. Personal Interview. 14 Jan 2012
\textsuperscript{53} Zafar, Waheed. Personal Interview. 22\textsuperscript{nd} December 2011
\textsuperscript{54} Zafar, Waheed. Personal Interview. 22\textsuperscript{nd} December 2011
extraordinary properties for example light fastness i.e. the ability of the dye to fade away when exposed to light, washing fastness i.e. loss of colour because of washing and rubbing fastness i.e. colour loss because of being rubbed against another fabric. When Bamboo and Polyester blends are used disperse dyeing is done because polyester being a synthetic fiber has no molecule to react with or stick to as in pigments because the surface is very smooth, In disperse dyeing the dye seeps in when the pores open and close when it cools down. This way the colour gets absorbed in. He showed a few samples where pigment dyeing had been done i.e. the base colour had been applied with a screen and the fabric had not soaked up the colour properly. Hence reactive is a better option.

Mr. Zafar further goes on to explain how different weave structures can enhance the properties of bamboo. Satin weave is known to be the most flattering of the weave structures since it is looser in comparison to plain and twill weaves giving more flexibility in the fabric also making it feel softer. Since the weave structure is three up one down there are more threads to reflect light off enhancing the lustrous feel of the fabric.  

Knitted wear has much loser constructions and requires less machinery and less tough conditions than a woven fabric.

When Mr. Iqbal was asked whether there were any difficulties weaving bamboo he said that there came about difficulties in weaving 100% bamboo but it was not because of its tensile strength and when asked whether there was any difference in weaving a viscose, rayon or bamboo he explained how because of bamboo’s strength a lot of friction developed because of which the machinery life reduced.  

55 Zafar, Waheed. Personal Interview. 22nd December 2011
56 Iqbal Shahid. Personal Interview. 14 Jan 2012
One see’s so much potential of growth and development in this. Even though we may be producing for the international market but our mills have explored and experimented with bamboo fiber in a number of ways now. Of course sky is the limit but it is not like that there is no knowledge about it. We are practicing it and we are continuing to explore even if at a very small level. For example Indus Dyeing Mill realized that it is more economical for them to use bamboo fiber instead of zero twists concept to achieve a similar feel in their towels. Similarly, Mr.Zafar realized that satin was the most flattering weave structure of them all for their range of products for example bed linen, bed sheets, bed covers, top-up beds. So do you feel there’s a future for it in Pakistan? I feel there is. It is a matter of introducing it with a big bang.

When asked about blending of different raw materials together Mr. Faisal Mirza, Marketing Manager at Yunus Textile Mills said that the maximum amount of blending were done with cotton and bamboo because both of them are similar to each other in nature and bamboo enhances and adds some extra value to the cotton fabric. 57 This also helps in maintaining the cost while maintaining quality. Upon asking the question on which blend absorbs the most dye and is the most economical Mrs.Arsalan she said that 100 % bamboo was the most absorbent 58 and the most economical in terms of dyeing but because of its weak nature as compared to a blend and it’s price which is almost 1.5 times that of cotton as per Mr.Iqbal, it was not the best option 59. The most viable is 60% bamboo with 40 % cotton because the more the quantity of cotton the more difficult it

57 Mirza Faisal. Personal Interview. 22 Dec 2011
58 Arsalan, Farzana. Personal Interview. 14th January 2012
59 Iqbal, Shahid. Personal Interview. 14th January 2012
would be to absorb dye. With polyester blends the disperse dyes are more expensive hence it is not the foremost option.

When Mrs. Arsalan was asked whether there was something that needed to be changed about bamboo fibers or required further development she mentioned very strongly about its shrinkage problem. During her experiments she realized that knitted bamboo fabric did not shrink equally. From some places it shrunk more and others less although the difference was minute there was unequal shrinkage which can affect the product. This would improve quality control of the material. While on the other hand Mr. Iqbal does not feel the need for any improvement in the spinning sector with regards to bamboo he feels satisfied with the developments there. He also said that if both the raw materials were available at the same price he would definitely opt for making bamboo yarns any day.

He feels strongly about its properties and its ability to flourish in the local market as well. Gul Ahmad in the past had introduced bamboo sheets in their store but since nobody opted to buy it because of the price range they removed it explained Mr. Uzair Ahmed part of a research team working on bamboo fabrics. It was an experimental exercise to see the reaction of the consumers.

Demographically, bamboo takes up less land space to grow than cotton. It shoots in height and requires less looking after. It requires lesser nutrients, water and preferably no chemicals during its growth period while on the other hand cotton requires greater amount of pesticides and looking after. Whilst talking to Shehzad Qureshi, he also believes that if bamboo does come into the market it may have a potential. It is expensive

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60 Arsalan, Farzana. Personal Interview. 14 Jan 2012
61 Iqbal Shahid. Personal Interview. 14 Jan 2012
at the moment but if it is developed in Pakistan it can be an added income. When asked if he believes cotton will ever get exhausted he disagrees. But on the other hand I feel it is important to explore options other than cotton. This would help our economy, if not in becoming an equal replacement but at least a helping hand in the economy with regards to cotton. It would add to our GDP (Gross Domestic Profit) and give relief to cotton. It would also be an additional product that our growing industry could master. We also have the fertile land and conditions for it’s growth as seen in the Punjab region.

Again I very strongly feel that since experimentations are going on even if at a very small level this is the only way to tackle the problems and develop the fiber further for example the shrinkage issue and also Mrs. Arsalan feels there isn’t sufficient UV protection in it but if a cheaper solution can be developed it can work. There needs to be an increase in publicity of bamboo products. The industry should hire creative teams to build advertisements that represent the high quality of bamboo textiles. To this Mr. Shehzad Qureshi, a merchandiser thoroughly agrees with whom I had an informal talk. Being in the textile business for quite some, he feels that the advertisements and marketing strategies need to be very strong when introducing a new range of products especially when a product like bamboo is introduced in clothing, the maximum population does not know anything about it hence to educate people into appreciating and purchasing bamboo products it is important to market it smartly. Also the Industry really needs to develop their Research and Development (R & D) departments even in these trying times. If they are not going to continue experimenting and tackling every hurdle that comes we as an
industry would not be able to progress and be stuck in our safety net of cotton producers only. I feel there is a future for Bamboo textiles in Pakistan only and only if we push ourselves a little further.
Conclusion

Pakistan is a cotton producing country not a bamboo growing nation hence I feel that bamboo cannot be an alternative fiber to cotton. Our main GDP (Gross Domestic Profit) comes to us through cotton and that is a medium that people generally want as it is a cheaper form of textiles in comparison to bamboo or any other material.

One of the main good I feel that bamboo can do to our country is helping us increase our GDP, add some relief to our burdening economy, also as Mr Ahmed Abdul Rehman put it that by growing too much crop of the same kind makes the lands disease prone hence by introducing a crop rotation on that land we can improve the quality of fertility for cotton\textsuperscript{66} but not replace it completely since our consumers and buyers currently rely on us and have loyalty with us because of our cotton products. We do have the grounds to grow bamboo and start experimenting with options of producing the yarns and making products but I feel it has not yet happened because of our nation’s lack of vision. Like it said in one of the articles reviewed in this dissertation, “Bamboo sheets and towels do not require fabric softeners thereby reducing the overall cost of the product. There is also the advantage of reduction in energy and water consumption along with labour saving. There is also a reduction in the waste water from detergents”\textsuperscript{67}. We can save on so much energy and its environmentally friendly also Bamboo can grow without irrigation on hill slopes and places where no other crop grows well. This saves labour and sounds cost effective.

\textsuperscript{66} Ahmed Rehman. Telephone interview. 15\textsuperscript{th} Nov 2011.
as well. ⁶⁸ Unless someone takes a stand and decides to start this business off, even if as a side business, it would never be accomplished.

Our industry has so much potential of growth but our lack of foresight has hindered its success. We have the machinery, the finances and the workers but even then. If we are able to set up a bamboo industry here it will benefit our country very much. It does not even require a special set up just the same industry, same machinery and same processes to make a new product which is both eco-friendly and would be an economic benefit. It will increase our product ranges and buyers but one main thing that is lacking at the moment and Mr. Shehzad Qureshi, in an informal interview⁶⁹ agreed that is the lack of awareness which needs to be improved with better advertisements and marketing which really is lacking. When Gul Ahmed did introduce their product at their store it was expensive but no consumer could appreciate the product since they had no knowledge about it and it had not been advertised enough. Also the backing of the Government is very important but with a convincing proposition why can’t one start off? Even if as a side business.

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15 November 2011 (Dissertation pg 8)  
⁶⁹ Qureshi, Shehzad. Informal Interview. 3rd April 2012
Processes Involved in Bamboo yarn manufacturing:

Fig 1: Bales of Bamboo

Fig 2: Bamboo being lifted through air jets.

Fig 3: Air transferring of Bamboo

Fig 3: Cleaning to remove any particles.
Fig 5: Combing and Straightening of fibers

Fig 6: Straightened Fiber

Fig 7: Drawing out

Fig 8: Further combing done by these brushes.
Fig 9: Making Blends

Fig 10: Spinning

Fig 11: Spinning

Fig 12: Spun Bamboo yarn
Glossary:

- **BCI Cotton**: The Better Cotton Initiative (BCI) is a voluntary program who’s vision is to enable millions of farmers around the world to grow cotton in a way that is healthier for the farming communities and the environment, and more economical.  

- **Tensile Strength**: (Physics / General Physics) a measure of the ability of a material to withstand a longitudinal stress, expressed as the greatest stress that the material can stand without breaking.

- **PVA**: Abbreviation for Poly Vinyl Acetate.

- **UV**: Abbreviation for Ultra Violet rays

- **R&D**: Abbreviation for Research and Development department

- **Semi-Synthetic Fiber**: Prepared by chemical synthesis from natural materials.

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• **Cellulosic Fiber**: They are fibers from plant based materials.  

• **GDP**: Abbreviation for Gross Domestic Profit

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73 Wikipedia. www.en.wikipedia.org/wiki/Cellulose_fiber  Date 17-Jun-12 Time 0410
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Appendices:

Interview 1

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Waheed Zafar

Manager Product Development

Yunus Textile Mills.

Q. What type of bamboo blends are you working with?

A. 100% Bamboo
   
   60% 40% (Cotton/ Bamboo)

Q. With different blends the purposes will change hence what are they used for?

A. For bed sheets and bed linens we prefer 60% cotton and 40% bamboo or 50% of each.

   100% bamboo becomes too expensive.
Q. Do you think Bamboo is strong?
A. Not exactly as a fiber. It’s weak with short staple lengths but when it is made into a yarn the fibers are intertwined to improve the strength.

Q. What can you say about the fiber?
A. Bamboo is a stronger fiber than cotton. Its tensile strength depends on the cross-section for example a thinner count yarn will have less tensile strength in comparison to a higher count one

Q. What is the point of blending with bamboo if any type of finish is possible?
A. The point of blending is that you improve on the properties. For example bamboo and cotton are close in nature because of their cellulosic nature hence it becomes more economical to gain strength in the fiber and its property’s by combining with bamboo and for acquiring more properties. It enhances properties. We not only blend it with cotton but also with nylon and polyester but very hardly since our demands are for cotton/bamboo mixes.

Polyester is usually added to give whiteness, strength and shine. Since it has a smoother surface it reflects light more than natural fibers hence it is blended to increase the luster if need be.

Q. What type of bamboo do you use?
A. It is not synthetic but natural.
Q. There is some information available online that bamboo keeps you cool during the summer and warm during the winter, is this true?
A. Not exactly to the extent the hype has been created but to a certain degree cotton too has that ability.

Q. How does the type of fiber you use affect your product and your price?
A. Although we use the rayon medium the properties of bamboo fiber are retained in it. The demand abroad is quite a lot and our labour is cheaper hence we get demands and they pay. Plus there is awareness and also because since no pesticides are used it’s considered an eco friendly fiber raising prices.

Q. Do you use Organic cotton?
A. In very limited quantity.

Q. What can you say about the absorbency of bamboo?
A. Its cellulosic structure does not have that many impurities. He has not seen the inside of bamboo under the microscope but from his knowledge he knows this and that cotton and bamboo have similar structures. Because of fewer impurities it has good absorption and penetration of dyes.

Q. What does original bamboo fiber feel like?
A. It is courser in nature he suggested it is used for bags and rougher products.

**Q In comparison to cotton how would you rate the absorbency of bamboo?**

A. It is good but I feel cotton has better penetration and hence better dyeing ability and promise of the right shade. Hence increasing the cost of dyeing.

**Q. From your statements it seems like you are happier with 100% cotton then why did the need arise to blend?**

A. Customer demand. New things are needed in the market and that is the need of the hour. Bamboo is a stronger fiber than cotton. Tensile strength depends on the cross-section e.g. thinner count yarn will have less tensile strength than cotton. This is how they blend and experiment.

**Q. What processes are included?**

A. After weaving there is desizing i.e. the chemicals that are applied before eaving to give further strength to the fiber are removed. This is done because the weaving process is so fast and hence to protect it from damage.

Secondly, scouring is done to remove the oil and impurities.

Then bleaching i.e. the yellowness has to be removed.

After that caustic mercerization takes place i.e. the fabric is dipped in an alkaline medium for penetration to increase. This way dyes get absorbed more and become smooth and soft. The negative effect is that the strength becomes weaker.

Then dyeing or printing takes place.
Q. What kind of dyes can be used?

A. There are three options:

Reactive dyes which work best on cellulosic fibers

Pigments are the second option

Vat is third and is more expensive. We usually don’t opt for it unless need be.

Dye sites are there on the cellulosic structure and it will only penetrate through that. Since the structure has limited dye sites the dye will absorb limitedly. After a certain optimum level it will not absorb anymore and the rest will be excess. Hence reactive dyes are usually used for cellulosic fibers

Pigment dyes are only for surface coating. They have binders in them which bind themselves to the dye sites

Vat Dyes have extraordinary properties and are expensive hence you use them only if need be examples light fastness, washing fastness and rubbing fastness.

Although because of the impurities in bamboo the dyeing power is reduced by 25%.

Q. Are all three used?

A. Generally reactive and pigments are used.

Q. What type of weaves are generally employed with bamboo?
A. Loser the structure more the hand feel. We do make plain weaves but preferably satin weaves with 3 up and 1 down to give maximum reflection increasing luster and and because of loser structure it increases the softness. Twill is harsher than plain. We also employ basket weaves. This acts as value addition.

**Q. What type of finishings is done?**

A. Calendar gives a shiny feel non calendar gives no shiny feel.

There is also soft finish, wrinkle free, oil-repellant and water repellant.
Interview 2

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time. All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Mr. Shahid Iqbal
General Manager
Indus Dyeing Mills
Hyderbabad

Q. How expensive is bamboo to cotton?
A. Much expensive than cotton. Cotton is Rs. 24/kg while bamboo is $ 3.60/kg. (On that day). The thinner the count the lengthier is the thread.

Q. What do you do here at Indus Dyeing Mills?
A. We import the fiber or are sent fibers from different countries and we make towels for them. At the mill here in Hyderabad we just spin the yarn but our other mill in Lahore weaves and does the packaging for exporting.

Q. What type of problems arise when weaving or knitting with 100% bamboo?
A. Problems do arise but they are not that the tensile strength is weak it is that we find the
tensile strength to be a lot which increases the friction whilst weaving and has an impact
on the machinery, which results in us changing machinery more frequently than when
compared to cotton.

Q. What do you think are the differences between cotton and bamboo?
A. Both cotton and bamboo in their fiber states are very soft but once they are woven you
can feel the difference in the softness.

Since I don’t have much expertise in the dyeing department I can’t say much about how
their dyeing differs but in my opinion there is not much of a difference.

Q. What can you say about the fiber?
A. The strength of Bamboo yarn gets stronger when the yarn is made. It becomes
stronger than even cotton

Q. Knowing that it is expensive why do people want to purchase it?
A. The reason people purchase it so frequently is because of its luster, softness, strength
and absorption.

Q. What if you got cotton and bamboo at the same price what would your company
opt for?
A. Definitely if pricing was not an issue we would have used bamboo and since we deal in towels we would make bamboo ones more conveniently for both Pakistan and abroad.

Q. What would you say about cotton?
A. Till today it is a very good fiber and he believes there is no fiber of that nature so far.

Q. Viscose is said to be the nearest synthetic to cotton, is that true?
A. Yes but it isn’t anywhere near cotton.

Q. Is their difference in spinning viscose/ bamboo and cotton?
A. Machinery life gets affected. Since bamboo fiber is stronger than cotton it requires more strength to withstand the pressure.

Q. What about the fluff produced while spinning?
A. The fluff produced by bamboo is much less than cotton hence even after many washing it gives out less fluff. The fabric will hence last you longer in comparison.

Q. Do you do blending here?
A. We do blend cotton and bamboo (70/30, 60/40, 40/60, 50/50) as per requirement but we usually don’t blend with polyester or nylon because of the requirements otherwise the only property it gives to us is the strength and the whiteness we can achieve by bleaching.

Q. In the spinning process do you feel that bamboo requires new developments?
A. He believes bamboo needs no development yet because it is being appreciated internationally for what it is and the properties it holds and that gives it advantage over cotton sometimes.

**Q. What new techniques have you tried out in spinning?**

A. Twists give harshness to fabric hence; we tried the zero-twist formula in cotton. The machine twisted the cotton fiber and when it released it got wound on another poly vinyl acetate fiber (PVA). This technique gave not only strength to the fiber but also the softness that was required. After weaving the towel was put in a basin at high temperatures (90 degrees C) which melted the PVA hence giving the required softness.

Later they found out that bamboo was softer and less of a hassle than this hence where softness was the concern and not the type of raw material they started achieving softness blending bamboo with cotton. 100% bamboo was not used because it was expensive and in cases where cotton was required zero twist was used.

**Q. Bamboo in Turkey and twists.**

A. Bamboo is a luxury item very common in Turkey and are used for towels. Bamboo’s fiber length is more than in cotton. Their aim is to reduce the number of twists to give it maximum softness. Twists give harshness. The minimum the twist the softer the fabric. If the fiber is strong and has length the twist given can be less. This also reduces the over all cost on fabric softeners and maintenance.
**Q Bamboo and knitting**

A. In knitting less strength fibers are required because the cone spins on a spindle while in weaving, pre-strength is required because the warp thread are always pulled apart.
Interview 3

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Mrs. Farzana Arsalan

Masters in Technical Textiles

Mehran University, Jamshoro

Q. I know that you are researching on bamboo as a textile medium here, what have you learnt so far?

A. Bamboo Fabrics are close in nature to cotton. They do not require too much pre-treatments and their absorbency is really good. It is being used in knitted fabrics quite a lot.

Q. Do you think that bamboo is an eco-friendly fiber?

A. It is still a controversy whether it is an eco friendly fiber or not because heavy amounts of caustic substances are applied in the process. Carbon nano-tubes are being used outside to make it as green as possible but again there is a controversy.

Q. Anyone here that is working with bamboo?
A. Spun yarn was ordered Nishat or Gul Ahmed, not sure which one but even then that did not survive much in the market here.

Q. What kind of difficulties do you think bamboo fiber goes through and what have you learnt by in-house experimentation in your lab?

A. The strength of the fiber is really less because of which pre-treatment to improve the strength is important only. It loses strength when chemicals are applied on it. Since a lot of caustic was used in processing (Na2So4) Sodium Sulphate that causes the strength loss.

Q. What problems do you find bamboo give?

A. There is a problem with its shrinkage. It shrinks irregularly. (She showed a piece of knitted bamboo fabric which had shrunk 4-5% more than cotton but in an irregular manner)

The strength of the fiber can be improved only at fiber level meaning before importing by the owners working on it.

Shrinkage is also because of its cellulosic nature.

Q. What processes does it go through?

A. Since in weaving a lot of stress is applied on the threads it has to undergo a process of sizing so that it can bear the stress of the fast machines.

The fabric needs to be processed, removed of starch. This ensures better absorbency. She gave an example of how starched fabrics fight water as in has difficulty absorbing till removed.
Q. What process does it go through in knitting and weaving?

A. Yarn without sizing can be used whilst in weaving yarn needs to be sized as to ensure that it can withstand pressure.

Since no sizing hence no de-sizing and in weaving since there is sizing there is de-sizing process.

In weaving scouring and then bleaching is done.

In knitting we use 100% bamboo as well since the strength is not an issue. As 100% bamboo is weaker in comparison to 100% cotton. This is also because of the ability to twist. If the fiber is strong many more twists can be given to increase the strength.

Q. What about blends?

A. For my thesis I have worked with 100% bamboo mostly but when I used a blended bamboo yarn the amount of shrinkage was less. (60/40 ratio i.e. 60 cotton 40 bamboo)

Q. What can you say about the dyeing process?

A. We have tried with only reactive dyes. The absorption is so good that the concentration of colour required will be much higher and the dye required will be less hence reducing the cost. (her assumption)

Q. What have experimented with in the lab?
A. Air Permeability of knitted fabrics was much more than of woven and this was because of loose construction. But the grey fabric had ten on the air gauge but after one wash it had reduced to sixteen/seventeen showing that after the wash the fibers came close.

She also tested whether it was actually anti bacterial or not so she took a piece of damp cotton fabric and a damp bamboo fabric and put it in the most cool, airless and sunlight less area of a cupboard and let it stand for a few days. Cotton got molded much before bamboo proving that its anti bacterial properties are there. Even at the last stage there was not a lot of bacteria. It was minimal.

UV I am still working on.

Q. Do you think the processes for cotton and bamboo are the same or it requires setting up of a different type of machinery and undergo processes?

A. Same as cotton

Q. Then why has the Pakistani Industry not set up their own even when we have the possibility to grow it (Punjab is already growing some)?

A. the Government is the issue and the lack of knowledge and initiative to do something different. Nobody wants to experiment with their own investments hence only small scale can be done.

Q. What would you like to add?
A. If there was some way to control the shrinkage that would make the fabric more viable and economical and the fact that cheaper alternatives to improve UV absorption.
Interview 4

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Shehzad Qureshi

Merchandiser

Q. Have you heard of bamboo textiles being done in Pakistan?
A. Yes at a very small level. Mostly for exporting purposes

Q. Did you know Gul ahmad had experimented with it and had tried selling it at their home store?
A. Yes, but they had not advertised it enough for the customer to understand the importance or properties of bamboo before selling. Lack of marketing.
Interview 5

Email Interview, Follow-up.

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Indus Dyeing Mills
Lahore Branch

Q1. What Properties (chemical) are the reasons for bamboo fiber being anti-fungal and anti-static? If all could separately answered. (I learnt about the reasons for bamboo being anti-bacterial but the reasons can't be the same for the other two)

A. Bamboo has a unique anti bacteria and bacteriostasis bio-agent name “Bamboo Kun” which bonds tightly with bamboo cellulose molecules. This feature gets retained in bamboo fabric too. Result show over 70% death rate after bacteria was incubated on bamboo fiber fabric.

Q2. Besides the lack of awareness, why are bamboo textiles hardly being found in Pakistan?
A. Bamboo fabric is still in his developing age, and it needs awareness as well as Government has to take steps in giving knowledge to farmers. It is easy to grow in Any kind of environment, required less pesticides as compared to cotton.

Q3. Why is it that Bamboo fiber cannot be extracted in Pakistan? Since synthetic fibers are also made using spinnerets, why can’t bamboo fiber is made using the same equipment?

A. There are two ways of extraction of bamboo which can be done in Pakistan.

i.e.1) Mechanical Method. In it enzymes are used, it is costly & time consuming process

But Eco friendly.2) Chemical Method: It is basically hydrolysis alkalization.

In it crushed bamboo cooked with NaOH (caustic soda).Then treated with carbon Disulphide but this process is not Eco friendly.

Q4. How UV protective is bamboo fiber? (Percentage or a certain value on a scale of 1-10 will be helpful for analysis) If you did an experiment on it to find out please do elaborate on it. Or anything from your research it will be quoted accordingly.

A. Bamboo fabric also has natural UV protection ability. Test results shows is sun care research laboratory in Winston Salem, for N.C for UV Protection testing that UPF label rate is 15. The fabric scored 18.3 on the UPF-scale with 94% UVA block and 93% UVB block.
Q5. It is possible to create UV laced dyes in Pakistan? How economical do you think it will be? Do you feel bamboo needs to be dyes with such special chemicals?

A. Result shows that thick and dense fabric made of vegetable fiber usually showed UV-Protection level even if undyed. The use of tannis based mordent increased Even without dyeing. The UV protection level can be achieved with good fabric Construction. Dyeing did not increase protection level much. Since bamboo fabric has natural ability of UV protection ability so don’t need to use such kind of dyes.

Q6. Which blend absorbs the most dye and is the most economical? Why do you think so? Pleas if you could elaborate on the answers with reasons. It will be very helpful in the research.

A. 100% bamboo
60% Bamboo and 40% cotton
40% cotton and 60% bamboo
60% bamboo and 40% polyester
60% bamboo and 40% nylon.

Q.7 Why does one raw material absorb more than the other and why is one blend more expensive than the other blend?

A. Blend of 60% bamboo + 40% cotton is more absorbent, and economically is 60% Bamboo & 40 % Polyester.
Q8 Why bamboo fiber imported and bamboo yarn is exported? Is it because of cheaper labor? Any other reasons? Why don’t we make finished products like the international market?

A.: Bamboo fiber from china is cheaper & yarn is expensive in china other countries also Pakistani yarn quality is best compared to other countries and also cheaper due to many reasons. Finished product is in working stage.

Q9 Why can’t we set up a system for bamboo fiber extraction?

A. Don’t Know

Q10 How difficult is it to extract bamboo fiber in Pakistan?

A. Don’t Know.
Interview 6

Follow up email reply about Ultra-Violet absorption:

Farzana Arsalan
Mehran University Jamshoro

Hi,

its true grey bamboo does not have sufficient UV protect ability. I need it to improve by applying different finishing technique using UV protected chemicals or functional finishes.
Email interview

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Sincerely,

Eimaan Fawad

Farhaan Akram

The Marketing Company

Lahore

For my dissertation I would like to research on a number of things regarding Bamboo Fiber before I reach a conclusion or a final research question. My interest developed in this certain area because of three reasons. Firstly, to educate our students about Eco-friendly fibers so that the use of products made by such fibers can become a part of our mainstream fashion (ethical fashion, organic fashion and slow fashion). One sees that such fibers are made use of extensively abroad so I would to enlighten students in textile fields to use fabrics made of such material, basically awareness. Secondly, to promote going green. Thirdly, to bring about a change in the fashion market.

The factors I would like to research on are the following:

Q. The process of making yarn from bamboo crop.
It is from a cellulosic family. Bamboo Fiber is made through a process called “Hydrolysis Alkalization” and the raw material is bamboo pulp.

Q. The difficulties faced in weaving with bamboo.

Bamboo fiber is a low strength product thus it is woven at slower RPM than cotton or any other yarn.

Q. Developments of different types of bamboo fibers e.g bamboo rayon

Yes these are two sides of bamboo, one is a cheaper version that is called and internationally labeled as Bamboo made from Rayon. In some markets this produced is prohibited as it imitates the bamboo fiber yarn. Other is Original Bamboo that is made with pure bamboo streaks. This is about 4 times the price of other and is a certified product with all properties of bamboo enclosed. Generally in Pakistani industry about 85% of people are producing with the cheaper version.

Q Although it grows without pesticides and insecticides the process of making the fiber requires chemicals. How can it be avoided so that it may remain eco friendly?

Is a natural cellulose fiber, It can be 100% biodegraded in soil by microorganism and sunshine. The decomposition process doesn't cause any pollution environment. "Bamboo fiber comes from nature, and completely returns to nature in the end. Bamboo fiber is praised as "the natural, green, and eco-friendly new-type textile material of 21st century".

Q. Why is it not being introduced into the local market?
We have a few products of bamboo with brands in the local market but unfortunately the consumer here is more inclined towards appearance and hand feel rather that the fibers technical properties like being 100% biodegradable and antibacterial. It is only working out in a few products as bed wear, towels, ladies undergarments, bath robes and socks also it captures a very small niche.

Q. If it can be woven into yardage can it go into mainstream fashion in Pakistan?

With the new brands evolving these days; there is a potential but the price should be in a viable range.

Q. Will bamboo fabrics ever be the next lawn?

To my understanding, Not at all, the wearers of lawns least bother about what bamboo has in it.

Q. can Bamboo replace cotton?

No, something that cannot be produced at a mass level cannot be replace its counterpart. Bamboo has a very small production scale. It is product not crop. Also our community has been cottonized for past 5000 years. There are my other uses of cotton which cannot be replaced with Bamboo. So the chances are quite thin.

Q. Will eco friendly fibers ever take up our closet?
Again it depends upon the knowledge and commitment of community toward a green world. And if people start thinking this way then there are other cheaper version available and waiting in line like organic cotton, bci cotton etc.

**Q. How are the waste products of bamboo disposed off?**

It can be 100% biodegraded in soil by microorganism and sunshine.

**Q. How are they being dyed?**

Same process as cotton dyeing. No special process needed.

**Q. Since bamboo properties include it being anti-bacterial and allergens free, can carpets ever be woven with them? Is upholstery an option (basically other possibilities other than home textiles and apparel)**

Bamboo is weak for long term use. We have made denim out of pure bamboo but it has resulted in a less abrasive fabric. Using the same in carpet and upholstery is not a good idea. It may work out if blended with polyester or other man made fibers.

**Q. What is the scope of the construction of a bamboo industry in Pakistan.**

In next 10 year. No. Pakistan is cotton producing country and has less resources of bamboo fiber production.

**Q. The apparels that get made for the overseas market are they being made her in Pakistan or in-house in their respective country's?**
A lot of apparels and home textile items are being made in Pakistan as well.
Follow-up interview

Faisal Mirza
Yunus Textile Mill

Q. What products are u making?
A. Most of the development have been for Sheets and tuppa beds (top up beds) covers comforters, sheets etc

Q. What types of different blends do u try out?
A. Common blend with bamboo is cotton in home linen.

Q. Why did we need to bring that about?
A. There’s no issue of durability. Natural fiber comes form natural source anti bacterial, crease resistance more than normal cotton. U need to maintain the price hence u blended. The reason u need to blend them is because of looking at the availability, the price needs to be maintained. Blended to take the properties. Productivity is very less. Narrow width per work is being done like t shirts and all. Producing on larger widths it becomes difficult for productivity it hence it is preferred for blending.
There’s 100 % bamboo and then different blends. The most common in 60 40 and similarly there can be many various blends depending on the cost availability and requirement. With different blends the purposes change as well.

For bed sheets and bed linens we prefer 60 40 or 50 50.

100% bamboo tencel is softer bamboo in between before finishing.

Q. Why is bamboo being used?

A. Point of using

Bamboo is more moisture absorbing

More luster

Non organic cotton n bamboo.
Interview 9

Telephonic Interview.

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

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Sincerely,

Eimaan Fawad

Mr. Ahmed Abdul Rehman
Artistic Milliners
Karachi

Q. What have you learnt so far about bamboo fibers being used in your company?
A. They are being bought from Faisalabad. Original bamboo fiber is being used in Denim to give the course feel. Bamboo is mostly mixed with cotton because bamboo has shine they need to tone down with cotton because of their product which is denim.

Q. Why is Bamboo fiber used?
A. Eco-friendly (very imp factor for exporting purposes)
Better absorption than cotton
Dries up more quickly
Cotton prices have gone up on the last 4-5mths
In an eco-friendly fiber consumption of water is 50% reduced during manufacturing.
Q. Why is bamboo fiber used instead of any other eco-friendly fiber?
A. Organic cotton was being used but it got expensive as well and then BCI cotton came in the market which Levi and H&M started using. Its extraction is easier than corn, hemp etc fibers.

Q. Why can’t bamboo rayon be used in Denim?
A. Rayon has a silky feel and no one wants to wear silky denim. Natural Organic bamboo is always used. It’s feel is what is important to give denim an abrasive feel.

Q. Why did the requirement for eco-friendly fibers develop?
A. Mothers in Europe were very much concerned by the use of pesticides on the crop which gave their kids rashes. The washing method while manufacturing and the further use of chemicals were a source of concern.

Q. Processes involved? (Denim Making)
A. Weaving at high speed
This leads to bailing
This I burnt in a process called synging.
Mercerizing happens to give a soft feel to the fabric with sodium hydroxide.
Stantering happens i.e. controlling of weft for fixing
Coating
Wringing
Q. Why do we need to explore bamboo?

A. Bamboo is grown in Pakistan hence we do have the possibility to set up our plant.

Too much normal cotton growth has destroyed lands and been the causes of many diseases so we need to move to eco friendly fibers.
Interview 10

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

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Sincerely,

Eimaan Fawad

Mr. Abu Amir

Clariant

Karachi

Q. Do you know about dyes being made specifically for UV enhancement ability’s?

A. No

Q. Do you know about dyes being made specifically for bamboo?

A. Really? Is bamboo being done in Pakistan? Where do let us know. The dyes should not be any different than those for cotton because they are both cellulosic structures.
Interview 11

Telephonic Interview.

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Sincerely,

Eimaan Fawad

Faisal Mirza

Yunus Textile Mill

Karachi

Q. What are the developments and what have you done so far?
A. Developments are being done and they experimented as well-some of their orders did run.

Q. Tell me more about your bamboo importing and exporting?
A. Since the bamboo they use is mostly bamboo rayon. The excise duty on fabrics is too much. This reduces the imports a bit. The retailer in Pakistan does not care about the properties. He gets more duty. Towels on the other hand have been the best bet so far. The demand for bamboo towels is a lot.

Q. What about blends?
A. Experimentation is being done using the finest quality yarn. They are blended with other fibers to lower the cost. Bamboo and polyester, bamboo and cotton. Bamboo fiber gives luster and shine which cotton does not. The softness etc. It handles better. Bamboo fiber (rayon) can undergo all the reactive dye processes and a;;.

People prefer bamboo fabrics to others because of the soft shiny feel. The appearance is better than cottons.

Q. Why is bamboo being used? Because cotton is going down or to increase variety?

A. Bamboo is kept as a high end product. Value added. In some cases it is used 100% and in some it is blended.

Q. Where is it used mostly?

A. In Jacquard fabrics we use poly and bamboo mixes more than cotton and bamboo.

Q. Do we have demand here

A. Yes we do?
Interview 12

Telephonic Interview:

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Sincerely,

Eimaan Fawad

Uzair Ahmad

Gulahmad Textile Mill

Q. Have you worked with bamboo?

A. Yes we put up some sample at our home store but they did not sell because people did not know what it was.

Q. Do you use rayon or original bamboo fiber?

A. Original is coarser than rayon. Rayon is soft and silky which gives a better result.

Q. Do you export your bamboo products?

A. Yes the orders we get we do it and send it back.
Interview 13

Telephonic Interview.

I am a student of Indus Valley School of Art and Architecture working on my Dissertation. Your guidance will be much appreciated and thank you for your time.

All the information you share will only be used for my research.

Sincerely,

Eimaan Fawad

Mansur Alvi
Senior Merchandiser
Kams International

Q. Why do you think Bamboo is not being explored much here?

A. Because of recession a lot of R&D has become stagnant. The last was done two years back (conversation in relation to Al Karam from what he knows on the inside). But when there was no global recession customers were willing to purchase the products (explore it more) but now mixing bamboo with cotton means increasing the price by 14-17% which is a lot for the consumer but 2 yrs back when the economy was better so was the demand.