

Working paper



International
Growth Centre

Exploring Dynamics of Cotton Seed Provision in Sindh



Muhammad Ahsan Rana
Hassan Khawar
Ali Tahawer Gilani
Hassan Saleem Rana

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Informing Policy and Business Decisions

Muhammad Ahsan Rana
Hasaan Khawar
Ali Tahawer Gilani
Hassan Saleem Rana

International Growth Centre, Pakistan

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List of Acronyms

Bt	Bacillus Thuringiensis
FSC&RD	Federal Seed Certification and Registration Department
GDP	Gross Domestic Product
IR	Insect Resistant
KPK	Khyber Pakhtunkhaw
NIBGE	Nuclear Institute of Biotechnology and Genetic Engineering
PBR	Plant Breeders' Rights
R&D	Research and Development
RY Khan	Rahim Yar Khan
UC	Union Council

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1. Introduction

Cotton production is critical to Pakistan's economy. In 2011, it was grown by more than 1.3 million farmers on about 6.6 million acres, mainly in the provinces of Punjab and Sindh (Ministry of Finance 2011). Total annual cotton production in Pakistan has hovered around 12-13 million bales during the last 5 years. At this level of production, it contributed 6.9% to the value added in agriculture and 1.4% to Gross Domestic Product (GDP) (ibid). Its main consumer is the Pakistani Textile Industry, for which cotton lint is a key input in production of yarn, cloth, garments, apparel and other textile products.

Despite substantial improvement during the last few decades in productivity per unit of land, the average yield in Pakistan (7.3 maunds of lint per acre) is lower than the world average (8.3 maunds per acre) (ibid). This is due to a number of factors, such as pests and diseases, water shortages, high temperatures, etc. The effect of these constraints is confounded by the absence of an effective seed provision system. Currently, cotton seed is provided to the farmer by a mix of public and private sectors in a poorly regulated and documented environment. Consequently, it is common for the farmer to have to deal with poor quality and impure seed that does not germinate well and provides poor returns to his investment and labour.

A robust and dynamic cotton seed industry has not yet developed in Pakistan due to several reasons. Perhaps the most important is the archaic regulatory framework, which encourages breeders and seed companies to operate outside the regulatory framework. The Seed Act of 1976, which provides the legal framework under which seed is produced and distributed, envisages a rather limited role for the private sector. Further, development of new varieties does not create any legally enforceable right for a breeder. (See Forrester 2009 and Rana 2010 for a discussion on the relatively slow growth of private seed industry in Pakistan).

Efforts to improve the seed provision system are further hampered by a rather limited knowledge about the sources of seed provision, their respective shares in the market and the dynamics in each case. The available body of literature and data collected by public and private sector organizations are inadequate. In the absence of rigorous research and reliable data that such research could have produced, public policy has to place exclusive reliance on anecdotal evidence in important matters, such as developing an effective legal and institutional framework to regulate the seed sector and taking measures to support the development of a robust cotton seed industry. Similarly, private sector activities are hampered by the

lack of reliable data and analyses, which could feed into sound business decisions.¹ The situation warrants rigorous research to explore the nature and dimensions of the cotton seed provision system in Pakistan.

This study is an effort to fill this gap. It aims to generate data and analysis for use by public and private sectors. The study focuses exclusively on Sindh province, which contributes about 20% in cotton cultivation every year (Pakistan Bureau of Statistics 2011: Table 14).² The province was selected for this study because its seed industry is less developed as compared with the industry in Punjab. Larger firms, which are gradually emerging as reliable seed providers in Pakistan are based in Punjab; and so are the public sector research stations.³ Findings reported herein are based on field work carried during October – November 2012 in five districts of Sindh.

The report is divided into six sections. Recent literature on seed provision in Pakistan is reviewed in Section 2, whereas the methodology of data collection for this study is described in Section 3. This section also contains a profile of survey respondents. Section 4 presents findings from the field work and identifies key trends in a number of areas of interest to seed providers. Relative share of various seed providers is estimated. How seed is produced and distributed varies somewhat for different seed sources. These differences are documented in some detail. Basic information on management structure and infrastructure of seed companies is presented in Section 5. Section 6 concludes this report.

2. Literature Review

Seed provisioning is an under-researched area in Pakistan. The few studies and reports that exist can be grouped together in four categories. The first category comprises official documents and reports by departments concerned with various aspects of seed provision, viz. the Federal Seed Certification and Registration Department (FSC&RD); provincial Agriculture Departments; and Seed Corporations of Punjab and Sindh. Examples of this set of documents are Hussain and Hussain

¹ The commercial importance of reliable and up-to-date data on seed provision can be gauged from the fact that these data on the seed market are regularly collected by private firms in India (e.g. Francis and Kanoi) and made commercially available to seed companies.

² Of the total area under cotton production in 2011, about 79% was in Punjab, 20% was in Sindh and about 1% was in Balochistan and Khyber Pakhtunkhwa (KPK).

³ Examples are: Ayub Agriculture Research Institute, Faisalabad; Agriculture University, Faisalabad; Nuclear Institute of Agriculture and Biology, Faisalabad; the Cotton Research Institute, Multan. Sindh has two research outfits – Sindh Agriculture University, Jamshoro and the Cotton Research Station, Sakrand; but both are smaller in size and scope of activities than their counterparts in Punjab.

(2007), FSC&RD (2005), Hussain (2005) and Hussain and Bhutta (2002). These reports are almost entirely based on official data on seed certification, which has become largely irrelevant due to large scale cultivation of uncertified seed of various crops in the informal sector. While they do acknowledge the existence of large informal market in which farmers save their own seed and buy in brown bags, no effort is made to systematically examine either of these practices and to estimate how widespread these practice are.

In the second category would fall academic documents based on secondary data. Examples are: Rana (2010), Forrester (2009) and Ali and Ali (2004). Rana (2010) broadly examined the structure of the cotton seed industry in Pakistan and (based on FSC&RD data) estimated its size at about 65,000 metric ton in 2008. He further estimated that only about 40-45% of this fell in the formal sector. He divides the market into two very broad categories, namely, the formal sector and the informal sector. It would have been interesting if he had produced his own estimates of the cotton seed industry, rather than relying on data from the FSC&RD, and had narrowed down his categories to identify the numerous seed providers in the formal and the informal sectors. Forrester (2009) identified the lack of a professional seed industry as a major problem for cotton production in Pakistan. He notes that the absence of a robust industry has inhibited research and development (R&D) that is required to develop a pipeline of new varieties and to provide quality seed to farmers. Forrester's diagnosis is clear and this research will help address this problem by producing the background knowledge that is required for a professional, dynamic and vibrant seed industry to emerge in Pakistan. Ali and Ali (2004) is a generic note on the seed industry based on secondary data and analysis. It describes the broad structure of seed industry in Pakistan and estimates the size of the informal sector in cotton seed at 45%.

The third category comprises reports and studies that present primary data on cotton seed in Pakistan. Examples are Ali and Abdullah (2010), Abdullah (2010) and Ali et al. (2007). All these studies examine the spread of Bt cotton – generic name for insect-resistant genetically modified cotton seed – in Pakistan in recent years. They provide useful hints into the very large size of the informal sector and how new seeds reach farmers' fields. However, these studies leave unanswered important questions about sources of seed and extension advice, farmers' buying practices and company strategies to enlarge their market share.

The fourth category comprises studies conducted in other countries, notably India, where the cotton seed industry has undergone a remarkable transition from the informal to the formal sector in the past three decades and which is fast emerging as the world's largest cotton producer. A notable examples is Murugkar et al. (2007), which studied the competitiveness of the cotton seed market in India

during two time-periods: 1970-1993 and 1993-2003. The role of the private sector grew significantly especially during the later period. This increased competitiveness and expedited the development not only of high-quality cotton seed but also (and more importantly) of an efficient supply chain in India. Murugkar et al. examine the structure of the Indian cotton seed industry in the second period. They present relevant data from various market surveys (e.g. from the Francis and Kanoi) and government reports to estimate the respective market shares of the main seed providers, viz. local seed companies, multinationals and the Indian public sector.

3. Methodology

Field work for this study was carried out in five cotton producing districts of rural Sindh. The first step was to develop data collection instruments. A draft questionnaire and an interview guide were prepared to collect information from respondents. These instruments were pilot tested in two villages of tehsil Debalpur, district Okara, which is an important cotton growing area in Central Punjab. A focus group discussion was also carried out to nuance the understanding of seed provisioning at the farmer level. The pilot helped identify key variables for the study, viz. education and age of respondents, area under cotton cultivation, nature of land title, awareness of seed companies, source of extension advice, number and names of varieties cultivated, seed application rate, buying preferences and disposal of produce. Through discussion, seven major seed sources were identified: 1) farmer-saved seed; 2) farmer-to-farmer non-commercial exchange; 3) purchase from another farmer; 4) ginning factory; 5) agriculture input dealer/distributor; 6) plant breeder (typically from a public sector research institute); and 7) seed company.⁴ To supplement the questionnaire, a matrix was also developed to capture information (separately for different varieties cultivated by farmers) on key variables, such as seed source, price, application rate, packaging, etc. The revised questionnaire and the matrix were again pre-tested in a village of district Vehari on five cotton growers. Another questionnaire was developed to collect data from agriculture input dealers/distributors, which emerged from the pilot as important actors in seed provision. The final questionnaires were translated in Urdu (Appendix A).

An interview guide (Appendix B) was also prepared for use in interviews with government officials, representatives of seed companies and farmers. Government officials and company representatives were asked questions on their management structure, field infrastructure and services offered. Farmers were asked questions

⁴ Sindh Seed Corporation also produces and markets cotton seed, but its market share is negligible (estimated by Rana (2010) at 0.31% of the market in 2008). Hence, it was not included in the list.

on their seed procurement choices and practices. This enabled in-depth exploration of the aspects already covered in the questionnaire.

The next step was selection of respondents. This was accomplished in a five-step process. First, all districts in Sindh were ranked on the basis of area under cotton cultivation during the last three years (Appendix C). – Shaheed Benazirabad, Noshero Feroz, Sanghar, Khairpur and Ghotki came out as the top five districts in the order given. As per sowing data of the Sindh Agriculture Department, together these districts accounted for 67 % of cotton cultivation in the province in 2012 (Sindh Agriculture Department 2012). Top cotton cultivating – rather than producing – districts were selected for field work because the latter would represent better farming practices and productivity, and hence introduce a bias in the sample. Second, one taluka⁵ was randomly selected from each of these districts. The selected taluka might not be representative of the district, but random selection reduced the chances of selection bias. Third, two Union Councils (UCs) were randomly selected from each of the selected taluka. For each taluka, names of all constituent UCs were written on pieces of paper and ballots were drawn. This yielded 10 UCs spread over five top cotton cultivating district in Sindh. The fourth step was selection of villages (dehs).⁶ Up to four villages were selected from each UC. Several UCs had 3-4 villages, which meant all villages therein were selected. For the larger UCs, ballots were drawn to select four villages. List of sample villages is attached as Appendix D. The last step was the selection of farmer-respondents. Random sampling was not possible for this step, as a comprehensive list of farmers in a village did not exist. Therefore, farmer-respondents were purposively selected in each village to adequately cover various farm sizes. In all, data were collected from 506 farmers spread over 38 villages in the top five cotton cultivating districts of Sindh.

The second questionnaire was administered to 25 dealers – five in each field work district. Since agriculture input dealers are neither registered with the FSC&RD nor with the provincial Agriculture Department, a comprehensive list does not exist that can serve as the sampling frame. Respondents had to be, therefore, chosen on the basis of convenience.

In addition to these questionnaires, data were collected through semi-structured interviews from 28 farmers – selected through local contacts (district revenue officials, district agriculture officials and farmers known to survey team) – were interviewed in field-work districts. These interviews were used as an opportunity

⁵ Sub-district or tehsil.

⁶ Village or deh is the basic administrative unit in Pakistan. Separate records and maps are kept for each village/deh. Normally a village in Sindh would comprise several small settlements dispersed over agricultural farms of various hues.

to collect qualitative data on various aspects of seed provision, such as farmers' seed procurement preferences and practices, source of extension, knowledge of seed varieties, etc.

At the start of field work, major seed companies operating in selected districts were identified and approached for data collection. In all, representatives of nine seed companies were interviewed. Data were collected on a range of topics of interest, such as the history of operations, management structures, distribution networks, extension provision, seed price, packaging, etc. District officials of the Sindh Agriculture Department, officials of Sindh Seed Corporation, representatives of FSC&RD and breeders at Cotton Research Station, Sakrand were also interviewed. They presented official perspective on seed production and distribution.

506 completed questionnaires comprised a rich data set, which was analyzed using SPSS. This enabled generation of frequency tables/graphs as well as cross tabulation of various variables. Data were segregated for districts and different farm sizes to look for patterns, if any. Summary statistics on farmer-respondents are presented below. Findings are presented in the next section. Data tables are given in a Data Appendix at the end.

As can be seen in Figure 3.1, our respondents are well-spread over various farm sizes. 63% farmers in the sample are subsistence farmers (i.e. cultivating less than 12.5 acres), 20% cultivate between 12.5 and 25 acres, and only 17% cultivate more than 25 acres. However, 83% cultivate cotton on 12.5 acres or less (Figure 3.2).

Figure 3.1: Approximate Farm Size

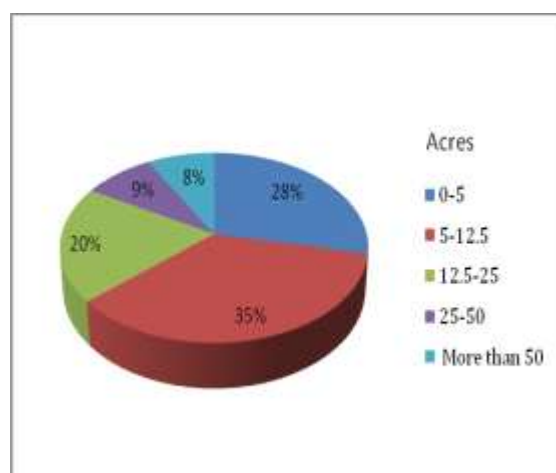
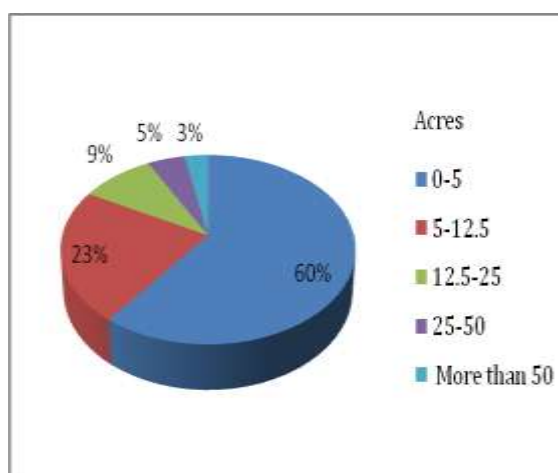


Figure 3.2: Area under Cotton Cultivation



They also cultivate a range of crops other than cotton, either in rotation with cotton (such as wheat) or independently (e.g. banana, dates, mangoes) (Figure 3.3). As for

land tenure, 61% are land owners and 35% cultivate land as haris to landlords (Figure 3.4).⁷

Figure 3.3: Other Crops

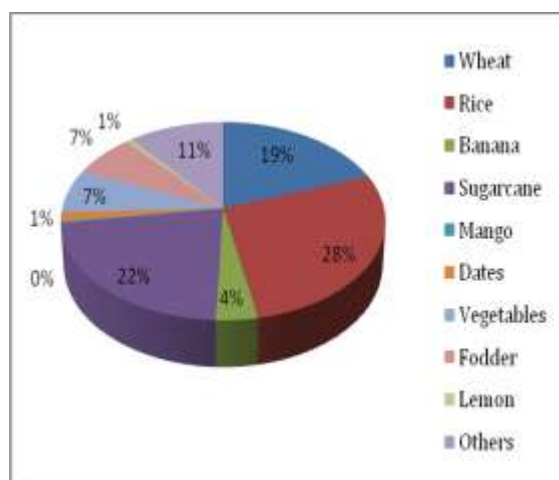
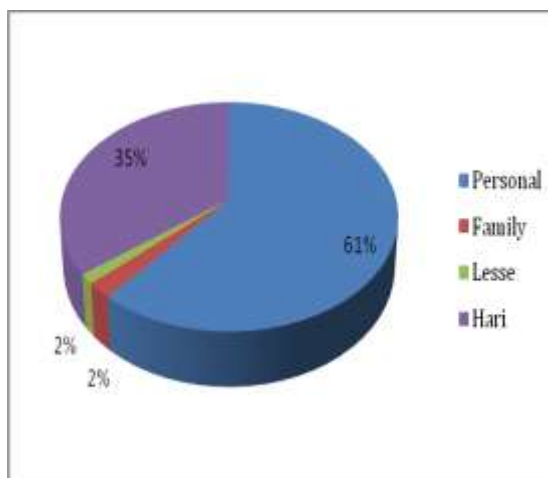


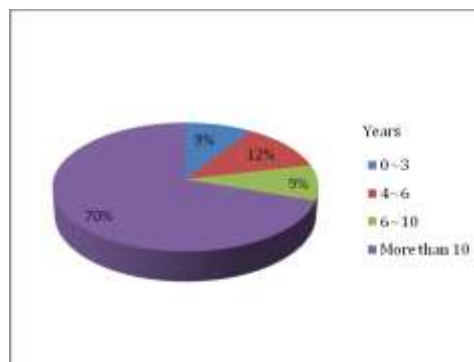
Figure 3.4: Ownership Status



70% are long-standing cotton farmers (more than 10-year experience) and only 9% are cultivating cotton for three years or

less (Figure 3.5).

Figure 3.5: Years of Cotton



As for age and education of farmers, expectedly we have a youthful and semi-literate set of respondents. 69% are between the ages of 21 and 40 (Figure 3.6), and 72% did not complete high school (Grade X) (Figure 3.7).

Figure 3.6: Age (years)

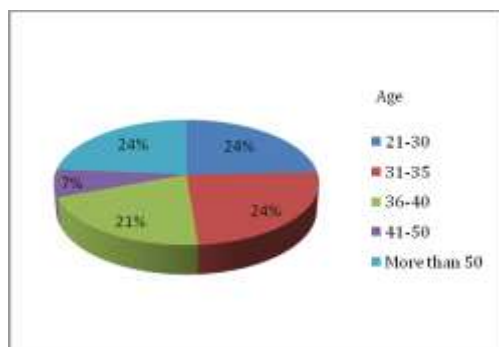
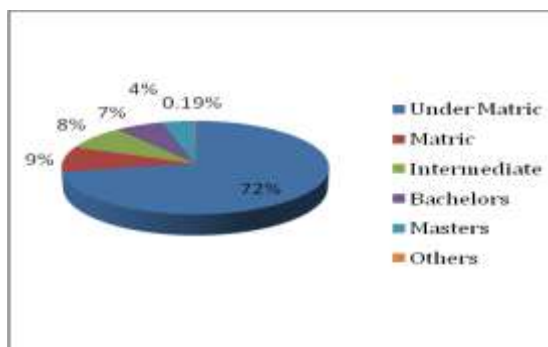


Figure 3.7: Education Level



⁷ Haris are sharecroppers who are assigned a small piece of land – typically less than 12.5 acres – by the landlord. In this feudal arrangement, their dependence on the landlord is multi-faceted. They are the most numerous of farmers in Sindh. In our sample, however, we made a conscious effort to also include larger farmers, who are almost invariably land owners, rather than lessees or haris.

4. Findings

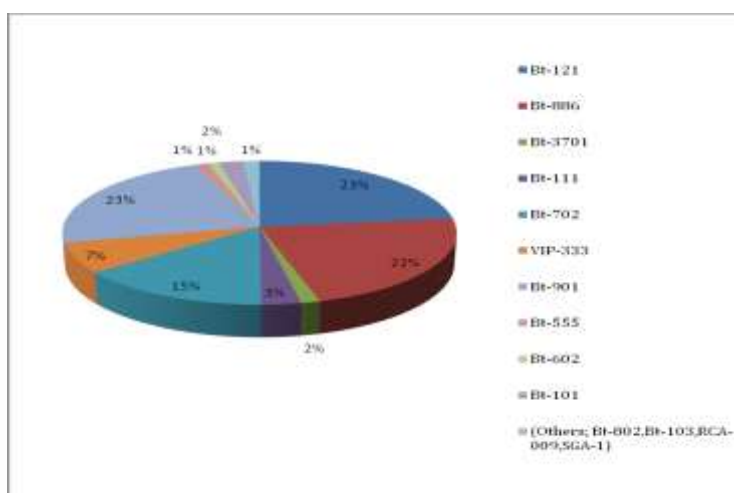
Before we present detailed data on key variables, two observations need to be made. First, all farmers included in this survey cultivated wheat in rotation with cotton. The ubiquitous practice of cotton-wheat rotation is noteworthy because Punjab farmers have recently moved away from this age-old crop rotation system. In recent years, farmers in Punjab have tended to plant cotton as early as February/March and continue it until as late as November/December, which leaves little time for cultivation of another crop in the same field. This practice has its advantages and disadvantages. Farmers go for early sowing and late harvest mainly to avoid crop damage by the Cotton Leaf Curl Virus, whose attack is the most damaging when the plant is under stress in extremely hot months of May-July. Early-sown plants mature by the time virus attacks and are, therefore, more likely to survive the attack. On the other side, cultivation of single crop also means the pest and disease cycle is not broken, as the pests and pathogen continue to survive in host plant year long. Cotton in Sindh has been less susceptible to virus attack, which removes the imperative to sow early, hence the continuation of cotton-wheat rotation.⁸

Second, only four farmers in the sample cultivated non-Bt varieties of cotton. They, too, cultivated these varieties *in addition to* Bt varieties. Ali et al. had estimated in their 2007 study that Bt varieties were cultivated on 80% of cotton area in Sindh. The penetration of genetically modified Bt varieties seems to have deepened since then and it will be fair to conclude that cultivation of non-Bt cotton varieties is now limited to a negligible scale.

Varieties and their spread

Farmers were asked to name the top three cotton varieties of their choice and also the varieties they cultivated in 2012. Figure 4.1 presents their cultivation preferences. Bt 121, Bt-886, Bt 702 and Bt-901 seem to be the most cultivated varieties that have among them about 83% of cotton area under cultivation.

Figure 4.1: Varieties and their Spread



⁸ See Forrester 2009 for a discussion on this.

A Bt cotton variety is developed by insertion of a Deoxyribonucleic Acid (DNA) fragment isolated from a common soil bacterium (*Bacillus thuringiensis*) into the variety through genetic engineering techniques. This DNA fragment is responsible for coding a protein in the bacterium that is toxic to bollworms. When it is inserted into the target cotton variety, it continues its function, i.e. the modified variety also starts producing the toxin. Once the new DNA fragment is stably inserted into the host variety, it is biologically reproduced by the variety along with other DNA that it contains. It can also be transferred to other varieties through normal breeding.

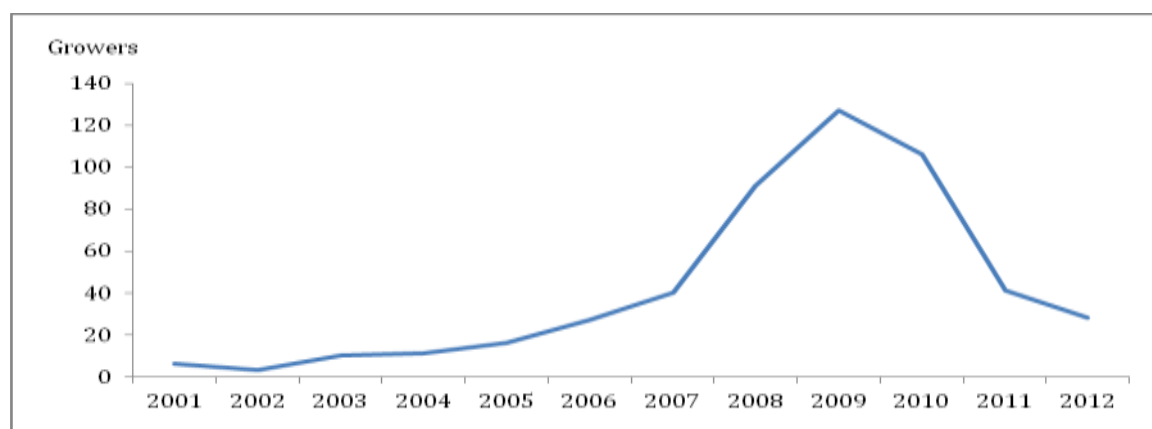
The process of insertion is called a Transformation Event, several of which have been successfully carried out by various private and public sector entities (including two Pakistani research institutes). Commercially, the most successful Event has been MON531, which was carried out by the multinational Monsanto. In the early 2000s, several Pakistani breeders crossed exotic (smuggled) cotton varieties containing MON531 with Pakistani varieties and obtained Bt cotton varieties that were suitable for large-scale cultivation in Pakistan. Since MON531 was not patented in Pakistan, it was fair game for breeders in the public and the private sectors (see Rana 2008 for a detailed discussion on this). All popular varieties currently under cultivation in Pakistan contain MON531 and were developed by Pakistani breeders through usual plant breeding.

India followed a different route. Monsanto partnered with a leading Indian company (Mahyco) and commercialized Bt cotton hybrids in 2002 in the formal sector. These were also developed by crossing Indian varieties with exotic material containing MON531. Quite a few enterprising Pakistani farmers have tried smuggled Indian hybrids on their farms, but these have not been successful commercially.

Technically, Pakistan is not far behind India in developing Bt cotton varieties. Pakistani breeders have successfully introgressed Bt into Pakistani varieties, as Indian breeders have done for Indian cotton hybrids. Commercially, however, the two have followed different trajectories. Pakistani Bt varieties were produced and sold in the informal sector until 2010, which meant poor quality control and low levels of investment. Even after 2010, lukewarm government support and a weak regulatory framework have translated into farmer being forced to use sub-standard seed for most part. India, on the other hand, controlled the spread of illegal Bt seeds early on, commercialized Bt hybrids in the formal sector and increased its cotton production significantly. Indian cotton seed industry is far more developed than the seed industry in Pakistan. India has since successfully commercialized second-generation Bt, whereas Pakistani farmers are still cultivating the first-generation Bt varieties.

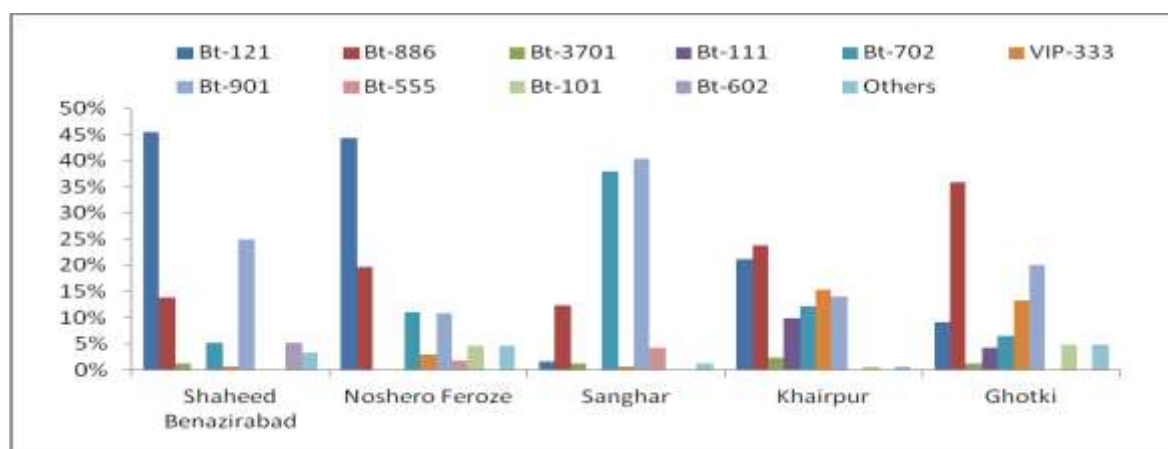
Bt varieties seem to have reached farmers' fields in 2003-04 and their spread peaked in 2009, where after the number of farmers using these varieties for the first time declined sharply (Figure 4.2). Data do not indicate any noticeable difference in variety preference across various farm sizes.

Figure 4.2: First-time Use of Bt Varieties



Varietal spread is not even across districts. Bt 121 seems to be more popular in Noshero Feroz and Shaheed Benazirabad; Bt 886 is more widely cultivated in Ghotki; and Bt 702 and Bt 901 in Sanghar (Figure 4.3).

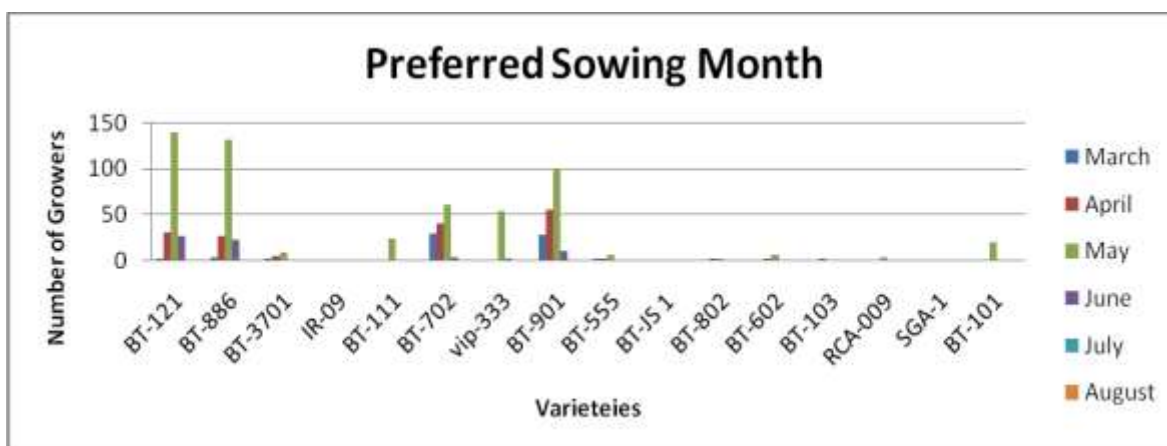
Figure 4.3: Spread of Cotton Seed Varieties ~ District Wise



This can be due to suitability of various varieties to the agricultural context in a district, or due to varied marketing effort by seed companies. We suspect that it is more the former than the latter. For example, one would expect Bt 121 – reportedly less heat-tolerant than its competitors – to be less popular with farmers in Ghotki,

which is hotter by a couple of degrees on average than districts towards lower Sindh. This is precisely what we find in the dataset.

Most sowing seems to take place in April and May, although there is substantial sowing in March as well (Figure 4.4).



This is in line with our earlier observation about the ubiquitous prevalence of cotton-wheat rotation. Farmer interviews revealed that March sowing was in fields left fallow after cotton harvest.

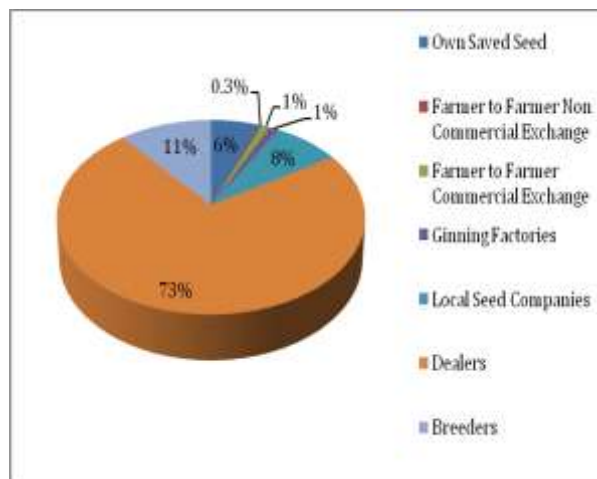
Not all varieties shown in Figure 4.1 are approved by the Sindh Government for cultivation in the province. Since these are genetically modified varieties, they also require biosafety approval from the National Biosafety Commission before release in the environment. Sindh Agriculture Departmental officials reported that only four of these had the required approvals. This indicates the large-scale spread of genetically modified varieties of cotton outside the regulatory purview.

This also indicates crossing of a mental barrier *vis a vis* genetically modified seeds. Although, farmers in Sindh were among the first ones to start experimenting with new Bt varieties as early as 2001-02, for about 10 years these varieties were marketed in the informal sector, as commercial use of Bt varieties was prohibited (under the National Biosafety Rules and the Seed Act of 1976) without formal biosafety approval from the competent forum, which was not forthcoming. All these years, Bt varieties were sold in brown bags, i.e. without company label. Quality control was a problem in such an unbranded market. Formal approval by the Sindh Government of four Bt varieties in 2010-11, represented *inter alia* destigmatization of production and sale of at least the first-generation genetically modified insect-resistant cotton seeds in Pakistan. The lid having been lifted, seed companies were quick to start marketing under their company labels not only the approved varieties, but also the other ones.

Seed sources and their market share

Of the seven seed sources, agriculture input dealer/distributor emerges as the seed provider to the largest number of farmers in the sample (Figure 4.5). Around 73 % farmers purchase cotton seed from their nearby dealer. The second in line is the breeder, who supplies seed to approximately 11 % growers. Around 8 % farmers purchase seed from local seed companies and about 6% save their own seed from the previous crop. Share of ginning factories and other farmers in seed provision is 1.1 % and 1 % respectively. The least preferred source is farmer to farmer non-commercial exchange, which is only 0.27 % in this survey. A brief discussion on each of these follows.

Figure 4.5: Seed Sources



- **Agriculture input dealer/distributor:** Dealers can be exclusive, but mostly they are non-exclusive, which means they market products of multiple seed providers. In addition to seed, they market other agricultural inputs, such as fertilizers and pesticides. They provide a variety of services to their client-farmers, with whom they often have a long-standing and multi-dimensional relationship. The list of commodities and services they provide includes agricultural inputs, credit, extension advice and purchase of agricultural produce. Their business is located in convenient and central locations. They play an important role in seed provision in the province.

The seed they sell comes from the following sources: 1) seed companies; 2) breeders; and 3) progressive farmers. Data collected from dealers in fieldwork districts show that on average their sales can be broken down as follows: 85% company seed; 5% breeder seed; and 10% farmer seed.

.All major seed companies have their own outlets as well (discussed shortly), but they increase their outreach through the existing dealer network. A dealer is the interface between a seed company and its clients in remote locations. He will be happy to keep company products, payment of which is made to the company upon sale of the product. However, if the company enjoys good reputation and its products have an established market in the area, dealers pay at the time of delivery. Seed companies give dealers hefty margins and incentives to boost their product sale. They also provide basic advice/training

on the use of their seed, so that the same may be passed on to the farmer at the time of sale. Dealers anticipate demand of various seeds from their daily interaction with farmers and pass on this demand to seed companies who provide the stock accordingly. They do not have advertising networks and rely on seed companies for the same. Dealers and seed companies appear to live in a symbiotic relationship.

Breeders are the second source of seed for dealers. Often a breeder from a public sector research outfit or a private company may want to test the market potential of his seeds before these are marketed large-scale.⁹ The local seed sale-point is an appropriate place to introduce his seed in the market. He will supply required quantity to the local dealer, which is sold in brown bags. If the new seeds do not perform well, the breeder will drop out of the market at least to the extent of seeds supplied the previous year. But if they do perform well, he will multiply more of them in the subsequent year and market at a larger scale. He is a seed company in the making.

The third seed source for the dealer is the local progressive farmer. He will select the best lot from his farms, have it ginned¹⁰ at the local factory (taking special care that it is not contaminated in the process through mixing with other farmers' seed) and market these as seed directly as well as through the network of local dealers. If the farmer is well known in the area for obtaining consistently high yields, other farmers will readily try his seed out to see if they, too, could get a high yield. Dealers' recommendation is also important in these buying decisions. Such seed is also sold in brown bags.

- **Breeders:** 11% farmers purchase cotton seed directly from breeders (Figure 4.5). These are progressive farmers who want to try new stuff or want to be sure of the genetic purity of the seed they cultivate. Interaction between such farmers and breeders (mainly from public sector) starts early. The latter having developed a new variety needs to test the same at multiple locations before commercial decisions can be made. Progressive farmers come handy at this stage, which are happy to let the breeder test his new varieties on small scale at their farm. If the variety performs well, the breeder may decide to market it through a seed company or through the local dealer network (as discussed above). While this is done, progressive farmers of the area start approaching the breeder for seed, which he is happy to provide at a premium. Often new

⁹ Please note that this is different from field testing, which the breeder carries out to test the performance of his variety before he takes it to the market.

¹⁰ Ginning is the process of separating lint from the seed. Lint is sold to the textile sector and seed is either crushed for its oil or sold in the seed market. Since ginning takes place in bulk in factories, special care has to be taken that unwanted seeds do not get into the lot.

promising varieties are sold at prices higher than market. Even after the variety has been formally launched in the seed market in subsequent years, several progressive farmers want to be sure that the seed they use has not been contaminated during the process of multiplication and distribution. This is ensured through direct purchase from the breeder, who is more likely to successfully maintain genetic purity of his variety than, for example, a seed-grower who multiplies it on his farms for a seed company.

- **Seed Companies:** 8% farmers purchase seed directly from a company outlet. The number of farmers using seed produced by a seed company and sold under its own label is much larger (estimated shortly), as farmers also purchase company-seed from local dealers. Interviews with farmers revealed that mostly quality-conscious farmers purchase seed directly from company outlets, which are more likely to be centrally located in major cities than dispersed in rural areas.

Exact number of seed companies currently operating in Sindh is not known (total number of seed companies registered with FSC&RD was 634 in 2008 (Rana 2010)). However, FSC&RD officials estimate that around one hundred seed companies of various sizes operate in Sindh. Not all of them sell cotton seed. Several have their registered offices and multiplication farms in Punjab. None of the four multinational companies currently doing seed business in Pakistan are selling cotton seed. Hence, the entire company segment comprises local seed companies. They deal in all marketable varieties and types of seeds and are involved in processing, multiplication, storage, marketing and distribution activities. Over the years, these companies have developed seed production infrastructure, such as warehouses, seed plants and multiplication farms.

All companies engaged in this survey have a lean sale and distribution network. Their Sales Officers get orders directly from farmers and dealers. These Officers supply these order from the company stock in its warehouses. Large companies also maintain one or two sale-points in district headquarters, but they mostly market through the existing network of dealers (discussed earlier). All companies sell fuzzy seeds,¹¹ due to its 95 % usage in the market. They market their seed stock in labeled bags of 10, 20 and 40 kg each.

¹¹ Even after ginning, there remains residual lint on the seed. Fuzzy seeds can be washed in acid to remove the residual lint. The de-linted seed germinates better. Apparently, this is not a common place practice in Sindh and farmers are happy to use fuzzy seed. They compensate by using higher quantities of seed to obtain the desired plant population per acre.

Companies get basic seed from other companies and from public sector breeding institutes. These include the following: the Nuclear Institute of Biotechnology and Genetic Engineering (NIBGE), Faisalabad; Nuclear Institute of Biotechnology and Genetic Engineering, Faisalabad; Cotton research Institute, Multan; Cotton Research Station, Multan; and Cotton Research Station, Sakrand. The same is multiplied on company farms or on farmers' fields especially engaged for this purpose. Several progressive farmers have long-term lease contracts with seed companies for seed production, which is supposed to be duly inspected and certified by FSC&RD. In practice, however, our fieldwork shows the inspections and certifications regime has gone lax over the years and is now more cosmetic than real.

Seed companies are selling under their company label not only seed of their own varieties, but also seed of varieties developed by public sector institutes and other seed companies. Thus Bt 121 – one of the most cultivated varieties in Sindh – was developed by Neelum Seeds of Multan and is registered in its name with FSC&RD, yet it is being marketed as Bt 121 by several seed companies through their sales network. Same goes for Bt 3701, which is registered with FSC&RD as NIBGE's variety but is being freely marketed by seed companies. Both Bt 886 and Bt 901 were reportedly developed by Cotton Research Institute, Faisalabad; neither is registered with FSC&RD and both are being sold by several companies.¹² Does this constitute an infringement of intellectual property rights of Neelum Seeds and NIBGE? We do not think so. Formal approval of a variety by competent forums – the Sindh Seed Council and the National Seed Council – and its subsequent registration with FSC&RD acknowledges a variety to a breeder and allows its sale in the formal market, but it does not create any legally enforceable right for the breeder (see The Seed Act of 1976). Plant Breeders' Rights have not been yet legislated in Pakistan and in their absence a legitimate developer of a variety does not have the right to exclude a seed business from multiplying and commercially distributing his variety. His variety is fair game for all.

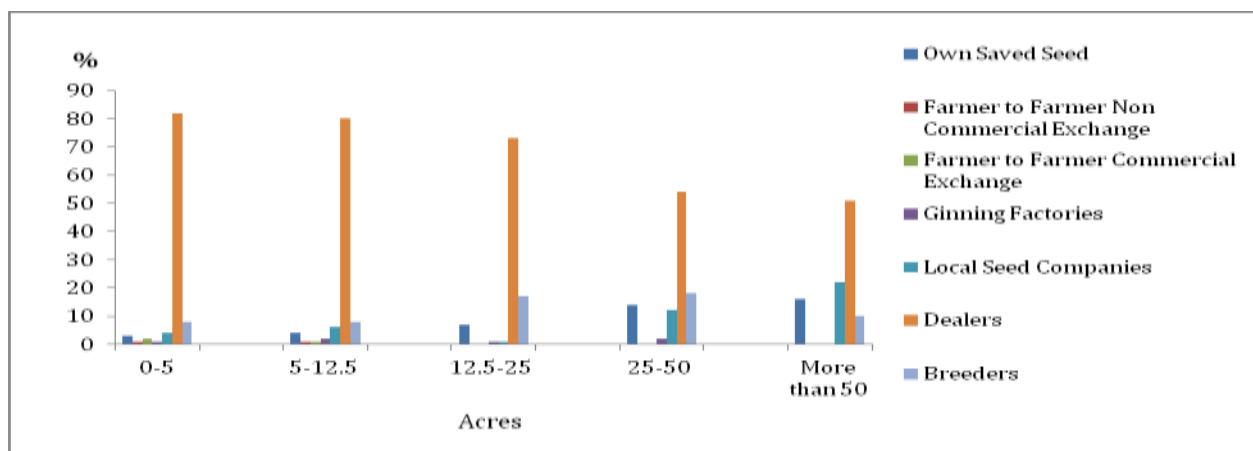
- **Farmer-saved Seed:** Only 6% farmers save their own seed from the previous year's crop. Farmers prefer to buy from the market every year due to a growing realization that seed loses its quality due to inexpert handling in processing and storage. Further, saving seed is a dead investment for five-six months, i.e. until the next sowing season. They would rather sell now and buy later when the need arises.

¹² Bt 702 was reportedly developed by Ali Akbar Seeds and is not approved for commercial cultivation.

Typically, a farmer will select healthy-looking fruits from the first or the second pick and store these in a cotton bag. The fruits are preserved for a few months until the sowing season arrives, when these are taken to the local ginning facility. Before ginning, the farmer will closely examine the machine for cleanliness to avoid mixing with low quality seeds. After the ginning, the farmers will collect the fuzzy seed and consume the lint in the household (mostly in quilt and pillow making).

Data segregated by farm size show that seed saving increases for larger farm sizes (Figure 4.6).

Figure 4.6: Seed Sources ~ Farm Wise



It is negligible in the 0-5 acre category but steadily grows to about 18% for the 50 acres and above category. This observation goes against the common view that small subsistence farmers save seed, rather than buy from the market. 63% of our sample comprises such farmers and we have found them going to the local dealer (and also to the breeder) to purchase seed. Farmers in the > 25 acre category – more educated and more likely to be owner-proprietors (85%) than in smaller categories – feel confident about their own crop and are happy to rely on their own skills for selecting the best pick and saving it properly until the next sowing season.¹³ Often, these farmers are also registered with seed companies as seed-growers. Some of them may grow into a seed business in due course.

- **Others:** Ginning factories and other farmers (purchase as well as exchange) constitute a very small proportion of the overall seed procurement. Hence, their dynamics were not explored.

¹³ This category also buys seed more often from breeders than farmers in other categories.

The above discussion brings out an interesting trade-off between quality and convenience. The farmer preferring the former over the latter goes to great lengths – sometimes literally – to procure good-quality seed of high genetic purity. He is the one who procures seed directly from the breeder and/or from the seed company. On the other hand is the farmer who prefers the convenience of buying from the local dealer, fully cognizant of the compromise on seed quality. His convenience is a product of geographical proximity as well as of the ability to procure seed on credit.

Dealer, however, is not a seed source *per se*. He is just a convenient location and a middle man in the supply chain. His share in seed provision (73%), therefore, needs to be reassigned to genuine seed sources, as these come out of this study. Since our data show that about 85% seed sold by dealers is sourced from seed companies and 5% and 10% respectively from breeders and progressive farmers, the actual purchase practices of our sample farmers come out as follows: seed companies – 69%; breeders – 15%; other farmers – 8%; farmer-saved seed – 6%; and others (ginning factories; non-commercial exchange) – 2%.

Figure 4.7: Purchase Preference

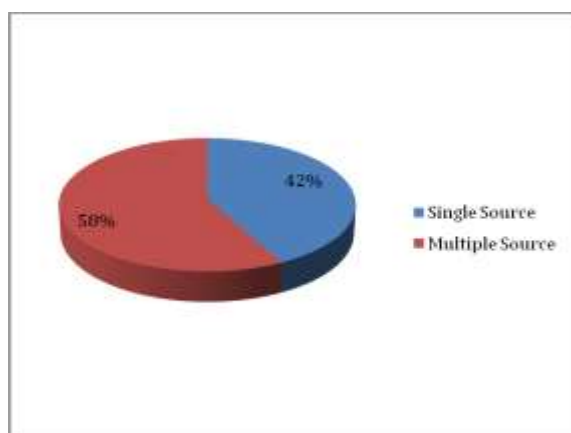
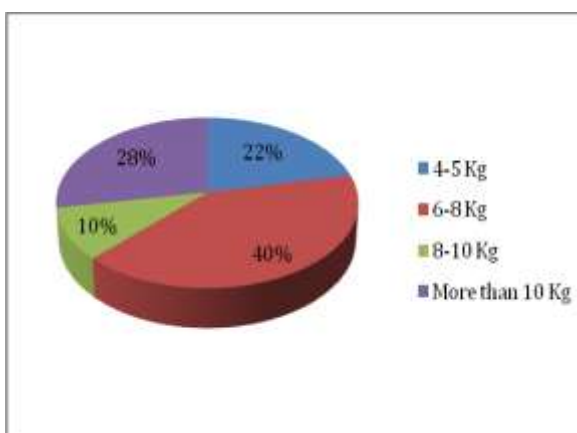


Figure 4.8: Seed Application Rate



Of course these are not exclusive categories and many farmers purchase seed from multiple sources. Figure 4.7 shows that 58% farmers purchase seed from multiple sources. Further, it should be clarified that these are not estimates of seed quantities/volumes provided by various seed providers. These are simply estimates of the proportion of farmers that approach them for cotton seed. Hence, when we say that 69% farmers in our sample purchased company seed, this does not necessarily mean that seed companies provide 69% of the seed market. Hypothetically speaking it is possible for a seed source or a combination of multiple sources to provide large quantities of seed to a small number of large growers and hence occupy a place in the seed market more prominent than our data suggest.

Seed application rate, packaging and price

Data presented in Figure 4.8 show that 40% farmers use 6 – 8 kg seed per acre. About 38% farmers use more than 8 kg seed. This seed application rate is high as compared with Punjab where farmers reported during the pilot testing using 5-6 kg per acre. As discussed earlier, farmers in Sindh mostly use fuzzy seed (95%), which has to be used in larger quantities due to relatively lower germination. Poor seed quality also reduces *inter alia* germination, which is compensated by using larger quantities per acre to achieve the desired plant population in the field. Seed application is higher for farmer-saved seed due to loss of quality in storage. Seed application rate is also a function of the variety used. Since different varieties are more popular than others in various field work districts, seed application rates also vary from district to district (Figure 4.9). Data segregated for farm size do not show any trend.

Figure 4.9: Seed Application Rate ~ District Wise

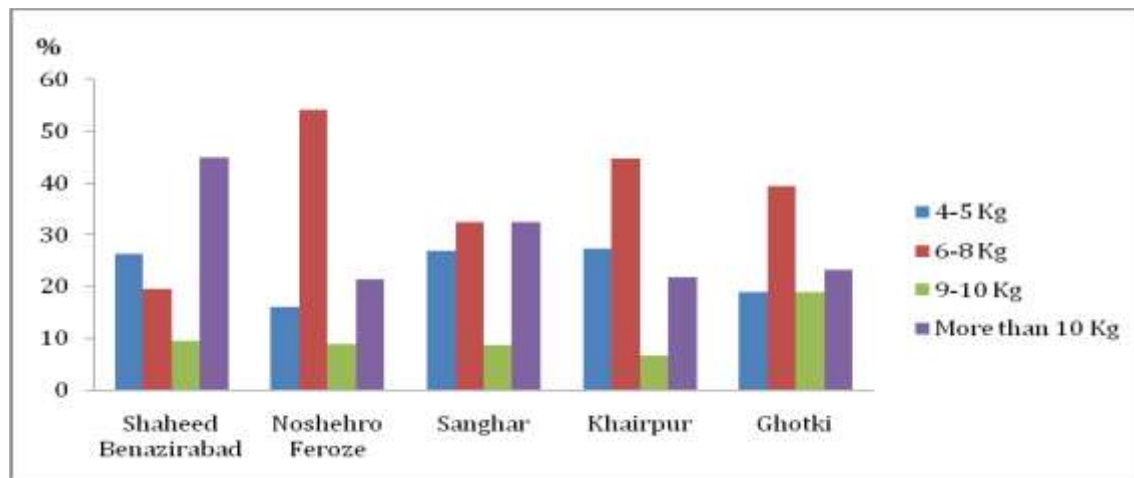


Figure 4.10: Bag Size

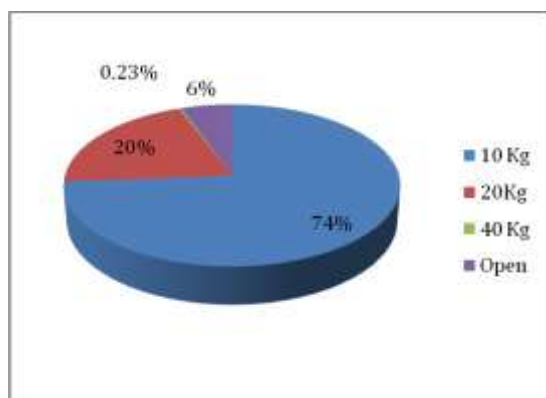
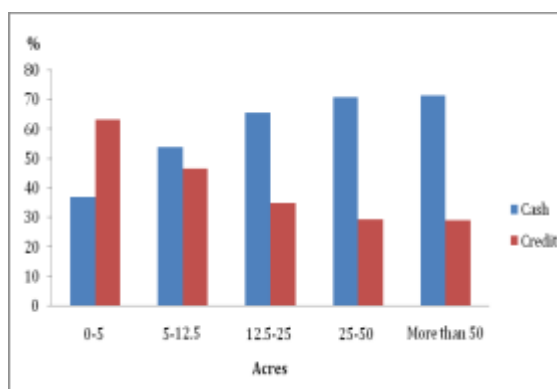


Figure 4.11: Mode of Payment ~ Farm Wise



74% farmers purchase seed in bags of 10 kg each (Figure 4.10). 5 kg bags – commonplace in Punjab – were not to be seen in Sindh. About 20% purchase 20 kg bags as well. 55% buy seed on cash payment. As one would expect, proportion of farmers buying on credit steadily declines from a peak of about 62% in the 0 – 5 acre category to slightly less than 30% in the 50 acres and above category (Figure 4.11).

Since the credit facility is available only with dealers (breeders and seed companies provide seed on cash payment), larger farmers who tend to buy from other sources more often pay in cash more often. 38% farmers in the 0 – 5 acre category and more than half in the 5 – 12.5 acre category pay in cash. This is significant, as it shows that not all subsistence farmers buy their seed on credit. On the other hand, even larger farmers seem to avail credit facility, when available.

Average seed price is Rs. 180 per kg. It varies slightly for different seed sources. Seed supplied by breeders fetches a higher average price of Rs. 194; whereas companies sell their seed at Rs. 174 per kg. Average price charged by dealers is Rs. 185 per kg. By charging only Rs. 11 per kg extra, dealer provides a useful service to seed companies as well as to farmers. No wonder seed companies prefer to use them, rather than establish their own distribution infrastructure. Further, seed cost per acre (Rs. 1,440 for an average seed application rate of 8 kg per acre) though substantial, is a small proportion (3%) of the price an (average national) yield of 7.3 maunds of lint per acre will fetch in the market (Rs. 42,700 per acre).¹⁴ Average price varies with farm size (Figure 4.12).

¹⁴ <http://www.alibaba.com/countrysearch/PK/cotton-lint.html>; @ \$ 1.6 per kg; \$ 1 = Rs. 97.55 (on 13th December 2012);

Farmers in the 25 – 50 acre category buy from the breeder more often, which is relatively expensive. Interestingly, farmers in > 50 acre category buy seed at the lowest price. This is a reflection of their purchase directly from companies (though more than half in this category also buy from the local dealer). Seed price falls below Rs. 150 acres in the 100 – 500 acres category. The large volume of their purchase appears to attract discounts.

Figure 4.12: Average Price Per Kg ~ Farm Wise

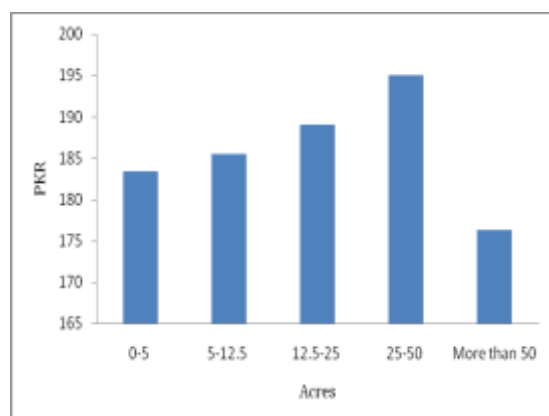
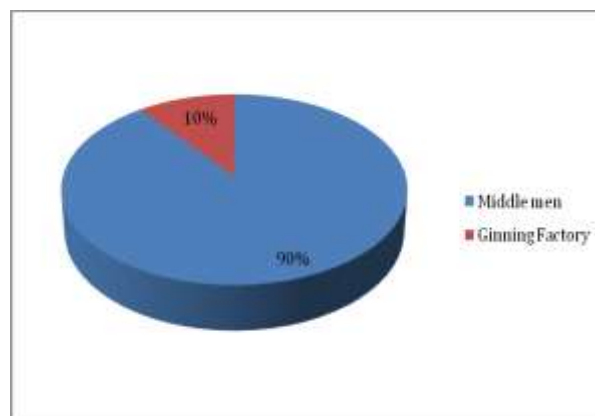


Figure 4.13: Disposal of Phutti



An overwhelming number of farmers (90%) sell their farm yield (phutti – un-ginned cotton) to middle men. Only 10% take the trouble of taking it to the ginning factory (Figure 4.13). This pattern seems to vary with education: educated farmers are more likely to sell to a ginning factory than their less-educated fraternity (Figure 4.14). It also varies with farm size. Expectedly, larger farmers are more likely to sell their produce to ginners than their smaller neighbours (Figure 4.15).

Figure 4.14: Disposal of Phutti ~Education Wise

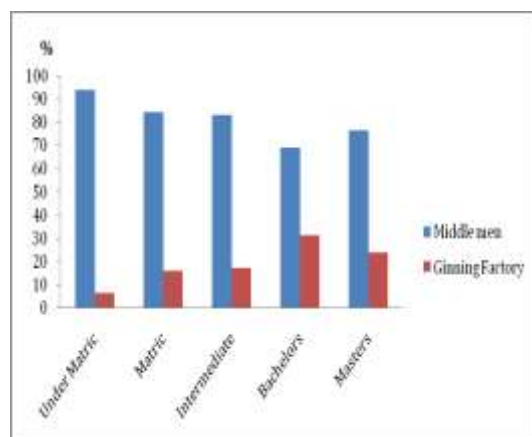
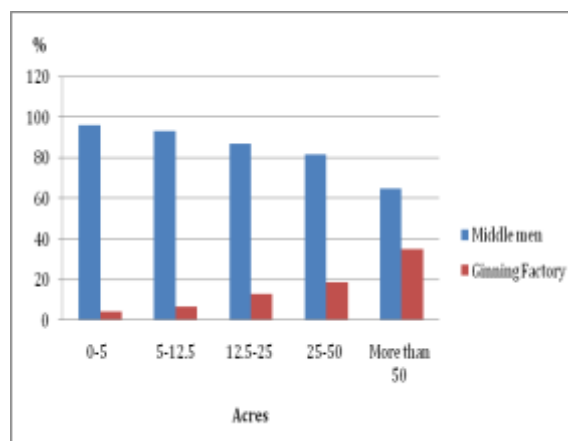


Figure 4.15: Disposal of Phutti ~ Farm Size Wise



We can use above data to estimate the approximate size of the cotton seed market in Sindh. As per Appendix C, cotton was cultivated on approximately 1.39 million acres in 2012. Assuming an average seed use of 8 kg per acre and average seed price of Rs. 174 per kg, seed market in Sindh stood at approximately Rs. 1,934 million in 2012.

Extension advice

46% farmers said they did not need any extension advice (Figure 4.16). 19% received advice on cotton cultivation from other farmers and the Extension Wing of the Sindh Agriculture Department, whereas 16% received advice only from the Extension Wing. About 18% received technical advice on farming practices and use of inputs from a combination of other farmers, pesticide companies and seed companies. Only 1% reported other farmers as the only source of advice. Of course, farmers share their experiences with other farmers all the time and *ipso facto* are probably the largest single source of advice on cultivation. But very few farmers will receive such advice exclusively.

91% farmers reported to have never attended a workshop organized by the Sindh Agriculture Department (Figure 4.17). Only 5% had attended a workshop during the previous year. This shows the very low coverage of dissemination activities. Segregated data show that larger farmers are more likely to have attended a government workshop than their smaller neighbours (Figure 4.18).

Figure 4.16: Extension Advice

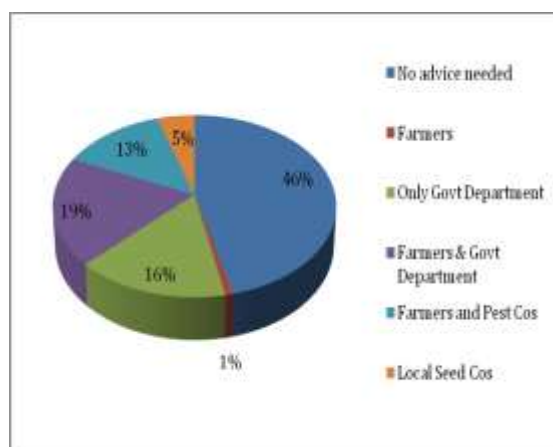


Figure 4.17: Participation in Workshops Arranged by Agriculture Department

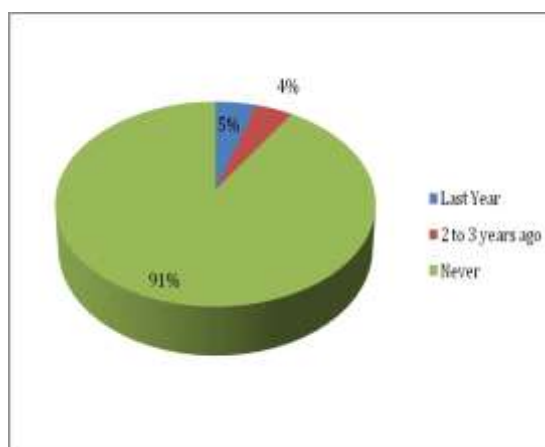


Figure 4.18: Farmers' Participation in Agriculture Department's Workshops ~ Farm Wise

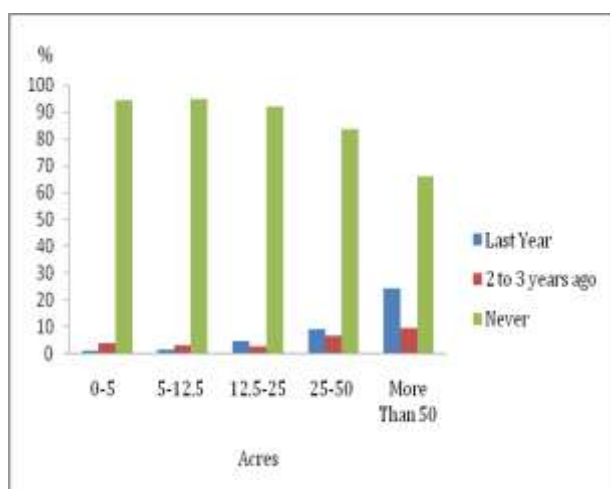
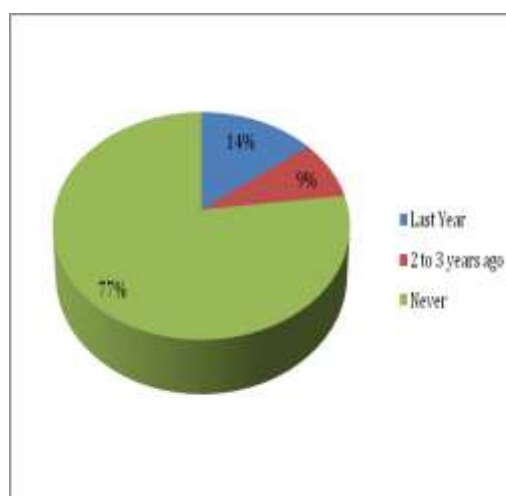
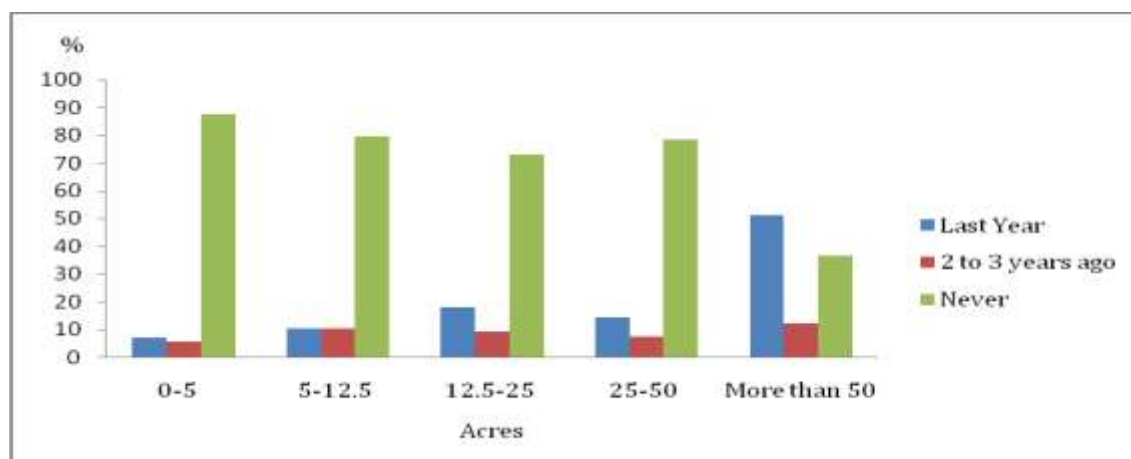


Figure 4.19: Farmers' Participation in Seed Company Workshops



Participation rate in workshops hosted by seed companies is slightly better, in which 23% farmers had participated in the last three years (Figure 4.19). Larger farmers once again appeared to participate in these workshops more often (Figure 4.20).

Figure 4.20: Farmers' Participation in Seed Company Workshops ~ Farm Wise



Only 8% had been visited by a government extension worker (i.e. Field Assistant or Agriculture Officer of the Sindh Agriculture Department) in the last year (Figure 4.21). Another 7% had been visited once or more during the last two – three years. 85% had never been visited. Seed company representatives visited farmers far more often. 34% farmers had been visited at least once during the last year and another 21% had been visited in the preceding two years (Figure 4.22).

Figure 4.21: Visit of Extension Workers

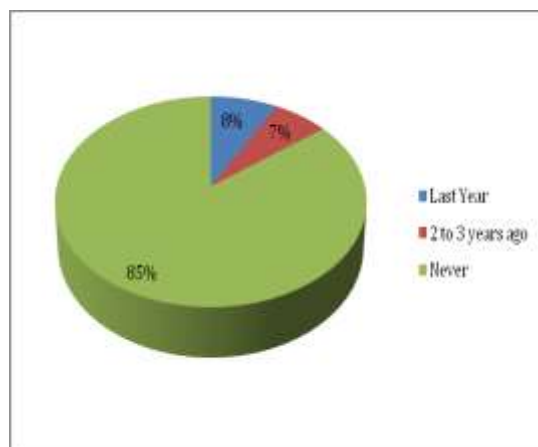
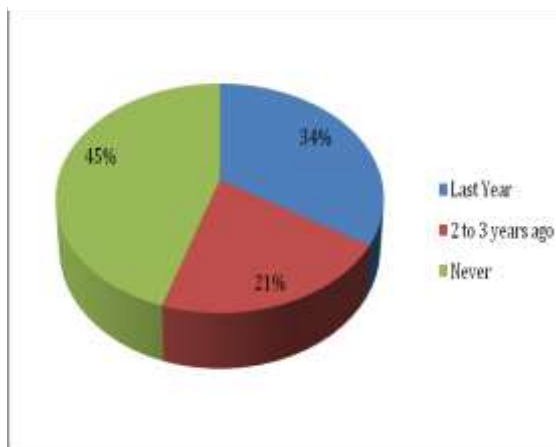


Figure 4.22: Visit of Seed Company Representatives



Seed company representatives mostly visit farmer fields at the time of wheat harvest to get orders for cotton seed. The preference for larger farmers is shared by public and private sectors (Figure 4.23 and Figure 4.24).

Figure 4.23: Visit of Extension Workers ~ Farm Wise

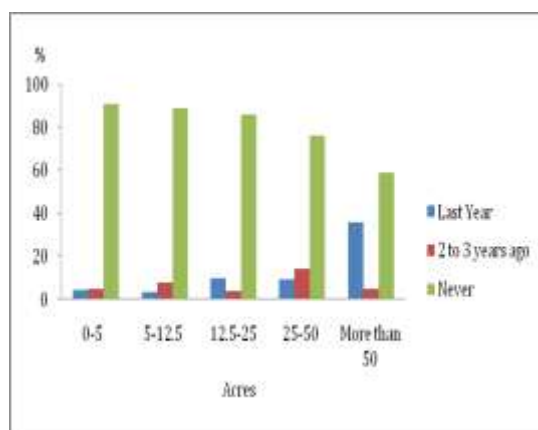
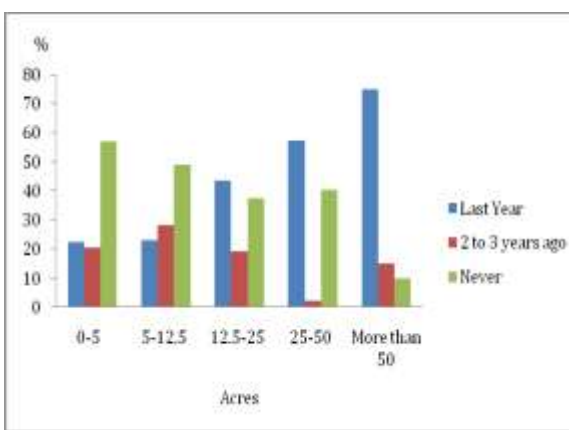


Figure 4.24: Visit of Seed Company Representatives ~ Farm Wise



5. Seed companies

There are three types of seed companies in Sindh. The first type is based outside Sindh (mainly Punjab), does not have its own sales network in the province and sells its seed exclusively through dealers. Example of this type is Neelum Seeds, which is based in Multan and markets its popular variety, Bt 121, through the network of local dealers. The second type is based in Punjab, but also has some sales network in Sindh. Jallandhar Seeds – one of the oldest companies working in

Sindh – is an example. The third type is based in Sindh and sells exclusively in Sindh directly and through dealers. Example of this type is Paradise Seed Corporation. We will examine the working of the second and the third type in this section.

Basic detail on seed companies actively marketing their products in field work districts is presented in Appendix E. It should be clarified that there may be other companies selling their seed in these districts; but these were the names farmers remembered or that came up in discussion with Agriculture officials. Of the nine companies that we collected data from, five are based in district Rahim Yar (RY) Khan of Punjab and four are based in Sindh. Of the Punjab-based companies, except for Jallandhar Seed, all were established in 1990s. All Sindh-based companies were established during the last 8-9 years and except for one company, operate locally. Two are family businesses, one is a partnership and the rest are sole proprietorships. All of these have warehouses, but only the Punjab-based older companies have their own seed testing facilities. One company in Sindh has its own ginning factory. All of them maintain their own farms for seed production. Except for one company (established only last year), all companies also have other products in the market – mainly seed of other crops, but also pesticide and fertilizer. Depending upon the size and spread of their operations, they maintain small teams of sales and technical people to carry out their business. The number of breeders employed by these companies is small – most companies have only one breeder working on cotton seed. No company reported use of microbiological testing of their seed for genetic purity or for optimal gene expression in genetically modified seeds.

Data were also collected from seed companies on the price they charged for various varieties (see Table 5.1). Two things are noteworthy. First, the same variety is sold with different price tags by different companies. For example, the seed of Bt 121 is available for Rs. 90 per kg as well as for Rs. 250 per kg on the other end of the spectrum. Same goes for Bt 886. The germplasm being the same in either case, companies seem to compete on seed quality. Second, FSC&RD registered varieties are not necessarily the ones more popular with seed companies (and with farmers as noted earlier). For example, Bt 703 is an approved variety and yet it is being marketed by only one company, that too with a low price tag of Rs. 90 per kg. Its sister variety, Bt 702 was reportedly not approved by the Sindh Seed Council due to its poor fiber characteristics and yet it is marketed by two companies in the list below. The market seems to work independently of official approvals.

Table 5.1 Seed Price (Rs. per kg) ~ Company Wise

Name	Jalandhar Seed Co.	Thakkar Seed Co.	Al-Karam Seed Co.	Manthar Seed Co.	Shahbaz Seed Co.	Paradise Seed Co.	Rabanni Seed Co.	Summer Seed Co.	Tawakkal Seed Co.
Bt-121	145	90	115	98	90	250	100	95	100
Bt-886	175	100	130	100		250	90	95	
IR-901	140	90	135	110	100		100	90	100
IR-3701		95	110		100			100	100
Bt-SGA 1	145								
Bt-702	135							95	
Bt-602					85	85			
Bt-Z33	138								
Bt-802	140								
Vip333			120			500			
Bt-555		90							
Bt-456						150			
Bt-703								90	

6. Conclusions

Previous sections present several important findings. First, the size of the cotton seed market in Sindh is substantial (approximately Rs. 1.93 billion). More important is the observation that most of it is in the formal sector, i.e. provided by registered seed companies (69%) under their own company labels. Of course, companies do not provide all this seed directly – dealers do most of the distribution for them; but Pakistani seed companies share between them around Rs. 1.3 billion in annual sales in Sindh.

Second, seed companies are openly marketing genetically modified varieties of all hues, even the ones that are not formally approved for commercial cultivation in the province. As noted in Section 4, this is a recent development and represents on the one hand large-scale acceptance of genetically modified seeds and on the other a total collapse of the National Biosafety and the variety approval systems. The latter are unable to take cognizance of the spread of unapproved varieties: the matter is doubly serious since these are genetically modified organisms whose release into environment must be preceded by following of specific protocols.

Third, the conceptualization of the formal and the informal is challenged. We can define the formal seed sector in ways more than one. It can be understood as sale of certified seed of approved varieties by registered seed companies through their licensed dealers. It can also be understood as commercial distribution of varieties

under company labels. These represent two different paradigms. The former requires several permissions ('certified'; 'approved'; 'registered'; and 'licensed') before a seed can legitimately reach the farmer. The latter relies almost exclusively on 'truth in labeling', i.e. a seed that meets pre-set quality standards can be marketed as long as the company is 'declaring' what it is marketing and is ready to associate its name with the product. The buyer, rather than the official, makes the decision what stays in the market and what leaves. Our discussion in earlier sections shows that the former represents the *de jure* and the latter the *de facto*. If the formal sector is defined as the former, most of the seed sector in Sindh is informal. If, however, it is defined as the latter – as we have tended to do – around 69% of the seed sector will fall in its ambit.

Fourth, seed saving is far less common than thought. Most literature – in the absence of recent data – has tended to assume that farmers, especially the small and subsistence type, save their seed from one crop to the other. But our data show that only 6% farmers save cotton seed and the ones doing so are not necessarily subsistence farmers. In fact, larger farmers are more likely to save seed.

Fifth, purchase of seed on credit is also less common than commonly thought. It is still substantial (45%), but the observation that 55% (small and large) farmers buy seed on cash means that we cannot simplistically understand their purchase and (phutti) sale practices in terms of their credit-dependence on local seed dealers. They might still be buying other inputs on credit – we haven't explored this issue, but seed is now largely part of their cash economy.

Sixth, companies seem to have started to compete on seed quality, rather than on different varieties. We saw multiple seed companies selling seed for the same variety (e.g. Bt 121, Bt 886, IR 901) under their company labels with different price tags. The fact that at least some farmers buy the same variety at a higher price shows that they care for seed quality. This is not to suggest that they will not pay higher (or lower) for a different variety, but their ability to choose from amongst different providers for the same variety's seed is a recent development.

Seventh, the cost of seed – though substantial for a subsistence farmer – is small (3%) when compared with what the farmer's produce currently fetches in the market. This also partly explains the capacity and the willingness of farmers to go to the market each year to buy seed, rather than save from previous year's produce.

Eighth, farmers – at least a proportion thereof – seem willing to pay higher for quality seed. 18% farmers took the trouble of procuring seed directly from either the breeder or the seed company. The same seed was likely also available with the local dealer. But they appreciated that the breeder or the seed company were more likely to maintain genetic purity of their variety than other seed companies or

dealers selling seed of their variety. They not only paid a higher price for the seed (about 11%) but they also travelled some distance to get the seed.¹⁵

Ninth, the dealer emerges as a key player in the seed provision system. For a small premium (Rs. 11 per kg on average), he provides useful services to seed companies as well as to farmers. To the latter, he presents not only with a menu of choices for seed but also with credit facility and extension advice. He is also a convenient source of spread of new (unapproved) varieties, which farmers are happy to try on small scale.

Tenth, the existing system of extension provision emerges as inadequate. Here we only provide more evidence of what has been documented before in the literature (e.g. Ahmad et al. 2000; Davidson and Ahmad 2002; Davidson and Ahmad 2003).

These findings can inform business decisions by private seed companies. They should feel encouraged to note that the seed market is quite substantial and for most part is provided by them. Farmer seed saving is much less prevalent than often stated. Quality consciousness of the farmer and his willingness to pay a higher price for genetically pure, high-performing seed, calls for increased business investment in quality control. It will also encourage enhanced participation of local companies in the seed business as well as attract multinational companies (which were active in cotton seed business until late 1990s) to re-enter the Sindh seed market.

Further, these findings have important policy implications. First, there is *prima facie* a case for abolishing or redefining the role of two public sector organizations – the FSC&RD and the Sindh Seed Corporation. FSC&RD provides two services: 1) it registers varieties approved by the Sindh Seed Council; and 2) it certifies seed production. Both have been rendered redundant by the turn of events in the field. We have seen unapproved and unregistered varieties being sold and cultivated indiscriminately. Neither the vendor nor the buyers seem to care or notice that some of the seeds they are selling/buying are ‘illegal.’ This is because registration of a variety with FSC&RD: 1) does not create any right for the breeder/vendor (discussed in Section 4); and 2) does not assure the farmer that the new variety is better or more suited than the ones he is previously cultivating. In other words, FSC&RD registration is of material consequence neither to the breeder nor to the farmer. Why then insist that it be carried out at all? As for seed certification – the second role FSC&RD performs – this too has become largely irrelevant as much for the lax implementation regime as for farmer’s reliance on his judgment, rather than

¹⁵ A seed company representative reported that often his farmer-clients would travel hundred kilometers or so on public transport to get 4-5 bags of his seed only because they wanted to be sure that they got what they were seeking.

a tag issued by an official displayed on the seed bag. Companies reported that they get these certification tags from FSC&RD to comply with a legal requirement, rather than for any value that these might add to their business.

Sindh Seed Corporation produces cotton seed on 392 acres and distributes the same through its nine sale points and also through dealers. Its main product in 2012, Bt 3701 – a variety developed by NIBGE, Faisalabad – was purchased by only 1% farmers in the sample. Since Bt 3701 was also marketed by seed companies, it is fair to conclude that the share of Sindh Seed Corporation is negligible in the cotton seed market. Further, the Corporation is providing a commodity that is being provided (more successfully) by several providers in the private sector. Why should it try to compete with these private providers in a sector where it neither has a competitive advantage nor an established market share? We believe there is a convincing case for closing down at least the cotton seed business of the Corporation.

There is also a case for reimagining the regulatory framework. Whose interests – other than the petty bureaucrat's – are being served by keeping on the statute book regulations that have long lost any market relevance and are now honoured more in the breach than in the observance? When the farmer has multiple providers to choose from in a functioning and competitive market, why not let him use his judgment to select the best seed that *he* thinks suits his site-specific agro-climatic conditions. Truth-in-labeling is not a call for a withdrawal of the state from seed regulation: far from it, this is a call for strengthening regulation by bringing it in sync with ground happenings. The state should redefine its role: 1) from a provider *and* regulator to a regulator *only*; and 2) from an entity that 'certifies,' 'approves,' registers,' and 'licenses' to an entity that defines benchmarks, enables accreditation services and ensures that benchmarks are complied with.

The argument for legislation of PBRs is less clear. Currently, multiple seed companies use the same germplasm and compete on seed quality (and price, marketing, etc.). They are able to do so because the breeder whose variety is being used does not have any exclusive rights to the use of such variety, despite the same having been registered with FSC&RD. This reduces the incentive for the breeder, but enables seed company competition in areas other than germplasm. If, however, PBRs are legislated and enforced, they will empower the breeder to exclude others from commercial usage of his variety. Another seed company will have to obtain license from the breeder before his PBR-protected variety can be sold. This will increase breeder's incentive and will attract investment to development of new varieties. At the same time, however, this will increase cost of seed and will force companies to compete primarily on germplasm. How this will affect the seed market in Sindh in the short and the long term is an open question.

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Appendix A

Questionnaire

سوالات

خصوصیات آبادی

نام: _____ جنس: _____ مرد () عورت ()

رابطہ نمبر: _____ گاؤں: _____

تعلیم () میٹرک سے کم () میٹرک () انٹر میڈیٹ () گریجویٹ ()

مستور () پاؤں اور ()

عمر (سال): _____ 21-30 () 31-35 () 36-40 ()

41-50 () 51 یا اس سے زیادہ

1- آپ کے زیر کاشت رقبہ کتنا ہے؟ (ایکڑ)

0-5 () 5-12.5 () 12.5-25 () 25-50 ()

50-100 () 100-500 () 500 سے زائد

2- آپ نے اس سال کتنی کپاس کاشت کی ہے؟ (ایکڑ)

0-5 () 5-12.5 () 12.5-25 () 25-50 ()

50-100 () 100-500 () 500 سے زائد

3- کپاس کے علاوہ آپ نے اور کون سی فصلیں کاشت کی ہیں؟

4- آپ کے ذریعہ رقبہ کی ملکیتی حیثیت کیا ہے؟

ذاتی () خاندانی () کرایہ پر () ہاری ()

5- اگر شراکت میں ہے تو ہر ایک کا حصہ بیان کریں؟

ملکیتی حیثیت	فیصد
ذاتی	
خاندانی	
کرایہ دار	
ہاری	

طریقہ کاشت:

6- آپ کتنے سال سے کپاس کاشت کر رہے ہیں؟

7۔ آپ کپاس کے بعد کوئی فصل لگاتے ہیں؟ نام بتائیے؟

8۔ کیا آپ کپاس کی فصل میں کوئی اور فصل بھی لگاتے ہیں؟ نام بتائیے؟

9۔ بیج خریدتے وقت کوئی نین کہیں کے نام آپ کے ذہن میں آتے ہیں؟

10۔ اس سال کی نین بہترین BT کپاس کی درائی کے نام بتائیے؟

11۔ کیا آپ دوہلی اور مکھا دوہلی سے خریدتے ہیں جہاں سے بیج خریدتے ہیں؟

() ہاں () نہیں

12۔ کپاس لگانے کے متعلق زرعی مشورے آپ کو کہاں سے ملتے ہیں؟

13۔ آپ آخری بار کپاس کاشت سے متعلق ورکشاپ میں کب گئے تھے؟

ورکشاپ	پچھلے سال	دو سے تین سال پہلے	کبھی نہیں
زرعی محکمہ			
کسی کہنی کی طرف سے			

14۔ آپ کی کپاس کی فصل پر آخری مرتبہ لاسندہ کب آیا تھا؟

	پچھلے سال	دو سے تین سال پہلے	کبھی نہیں
زرعی لاسندہ			
کہنی کا لاسندہ			

15۔ آپ کپاس کا کیا کرتے ہیں؟

آپ زمین کو پہلی بیجے	جنگ فیکٹری	سوپال جھری	گاؤں کی جھری
ہاں			
نہیں			
قیمد			

بیج کے ذرائع

وراثی کا نام	ذرائع	تقریباً رقبہ (ایکڑ)	پہلی دفعہ بیج کی پیمائی (سال)	قیمت (فی کلو)	نقد یا ادھار	بیج کے یک کا وزن (کلوگرام)	بیج کمپنی کے بیج میں ہے یا سادہ بیج میں	ایک ایکڑ میں کتنا کو بیج لگتا ہے	بیجے کا مہینہ	بیج استعمال کرنے کی وجہ

اپنا محفوظ کیا ہوا بیج۔ (الف) کسان کا محفوظ کردہ بیج (ب) ایک اور کسان کے ساتھ غیر تجارتی تبادلہ (ج) کسی دوسرے کسان سے خرید کردہ (د) جینٹل فیکٹری (ر) کمپنی کے فروخت کردہ پوائنٹ سے حاصل شدہ (ز) زرعی ان پٹ ڈیلر (س) بریڈر۔

سوالنامہ ایگری ان پٹ ڈیلرز

نام:

رابطہ نمبر: پتہ/ایڈریس:

1- کب قائم ہوا؟

2- رجسٹرڈ ☐ ہاں ☐ نہیں

اگر ہاں تو ادارے کا نام بتائیے جس کے ساتھ رجسٹریشن کی ہوئی ہے۔

3- آپ اور کونسی پروڈکٹس فروخت کرتے ہیں؟

الف _____

ب _____

ج _____

4- سال 2012 میں آپ نے فروخت کردہ بیج کن ذرائع سے حاصل کیا؟

الف: بیج بنانیوالی کمپنیز _____ فیصد

ب: پروگریسو آبادکار _____ فیصد

ج: جیننگ فیکٹریز _____ فیصد

د: بریڈرز _____ فیصد

ر: کوئی اور _____ فیصد

5- آپ کے کتنے سیل پوائنٹس ہیں؟

6- سال 2012 میں آپ کے فروخت شدہ بیج کی تقریباً شرح تناسب کیا تھی؟

کمپنی کا بیج _____ فیصد

کھلا بیج _____ فیصد

7- آپ آخری دفعہ کپاس سے متعلق ورکشاپ/سینار پر کب گئے تھے؟

بھی نہیں	دو سے تین سال پہلے	پچھلے سال	
			زرعی محکمہ
			کس کمپنی کی طرف سے

8- کیا آپ اپنے گاہکوں کو بیج استعمال کرنے کے مشورے دیتے ہیں؟

9- گاہک آپ کو بیج کی قیمت کیسے ادا کرتے ہیں؟

نقد _____ فیصد

ادھار _____ فیصد

(شکریہ)

Appendix B

Interview Guide National and Multinational Seed Companies					
Company _____					
Name of Company Representative: _____ Designation: _____					
1. History and Infrastructure:					
a. When did you enter the seed market?					
b. Do you also work in other provinces?					
c. What is your basic infrastructure for seed production?					
i. Approximate size of the research farm?					
ii. Approximate size of your seed multiplication farm?					
iii. Do you have a seed testing laboratory to test seed and fibre characteristics, such as GOT, fibre length, fineness, etc.?					
iv. Do you have a seed production plant?					
d. Do you have a partnership with another institution (research organization and/or seed company) for cooperation in variety development, seed production and marketing?					
2. Management Structure					
a. Under which legal instrument are you registered?					
b. Please describe the management structure of your organization					
i. Organogram					
ii. Major duties/functions of key positions					
iii. Total number of people employed					
iv. Frequency of audit (internal and external)					
3. Company Products					
a. Do you also sell other agricultural inputs? Fertilizers? Pesticides?					
b. Do you also market seed of crops other than cotton? Which crops?					
c. Please name five cotton varieties whose seed you marketed during any of the last three years.					
Variety Name	Developed by	Bt/Non-Bt	Recommended seed application rate (kg)	Recommended sowing date	Price per kg (Rs.)

- d. What is the size of the seed bag? 5 kg? 10 kg? 20 kg?

4. Marketing and extension

- a. What was your approximate share in the cotton seed market in Sindh this year?
- b. How do you assess demand of your seed products every year?
- c. What are key reasons for farmers to buy your seed? Competitive price? Resistance to pests and diseases? High yields? Aggressive marketing?
- d. Do you have your own sale points? How many?
- e. How many dealers do you have in various districts of the province for marketing cotton seed?
- f. How many extension and/or marketing people does your company employ?
- g. How does your company provide extension services to farmers?
- h. Do you hold training workshops for farmers and/or seed dealers? How frequent are these workshops?
- i. Do you also use mass media to educate farmers regarding use of your seeds? Which mass media?
- j. Are there any complaints from farmers? What are they? And how you deal with it?

5. General

- a. Who are your major competitors in cotton seed business?
- b. How can formal sector's share of the seed market be increased?
- c. How can the provincial and/or the federal government facilitate your seed business?
- d. How do you see the future of the cotton seed market in Sindh province in coming years?

Appendix C

Yearly sowing of cotton in various districts of Sindh

District	Area (acres) on which cotton was sown			
	2010	2011	2012	Average
Sanghar	294,523	317,951	301,217	304,563
Ghotki	207,480	233,415	186,732	209,209
Khairpur	197,971	196,612	187,720	194,101
Shaheed Benazirabad	118,560	152,646	133,380	134,862
Noshero Feroz	93,860	101,270	77,064	90,731
Mirpur Khas	91,000	95,836	80,646	89,161
Matiali	83,200	83,600	94,095	86,965
Sukkur	79,139	87,764	78,250	81,717
Umer Kot	44,707	63,301	63,212	57,073
Tando AllahYar	50,561	56,810	52,833	53,401
Badin	34,259	66,641	37,544	46,148
Jamshoro	42,237	38,433	40,014	40,228
Dadu	24,305	30,529	17,784	24,206
Hyderabad	15,956	17,908	14,697	16,187
Tando Muhammad Khan	8,645	13,585	12,227	11,486
Thatta	4,619	22,218	4,179	10,339
Larkano	8,299	3,026	4,323	5,216
Tharparkar	1,408	2,569	2,648	2,208
Karachi	299	1,462	1,512	1,091
Shikarpur	0	0	0	0
Jacobabad	0	0	0	0
Kashmor / Khandhkot	0	0	0	0
Qambar / Shahdadkot	0	0	0	0

Appendix D

Sample villages

District	Taluka	UC	Deh
Shaheed Benazirabad	Sakrand	Hamal Fakir	Yakhtiar Khan
			Nakur
			Morio Lakho
			Talli
		Bhora	Rain Boobak
			Mudd
			10 Bhoora
			Bhiraro
Noshero Feroz	Neshero Feroze	Dangraaja	Wasayo
			KorHasan
			Asman dagabar
			Noshrehro
		Arbaan	Arban
			Bhrund
			Kajhar
			Punjjo
Sanghar	Jam Nawaz Ali	Jam Nawaz Ali	Mai Kori
			86 morr
			Kodu was an
		Nauabad	Parano Nawabad
			Jam Nawaz Ali
			Juman Shah
			Haji Muhammad Sadiq Mangriyo
Khairpur	Sobhoderro	Rasoolabad	Shah Awais
			Rasoolabad
			Rah Pota
			Tunio
		Ranipur	Watni
			Larrk
			Meer Khan

			Rais Ali Abad Wasan
Ghotki	Ghotki	Qadir Pur	Sundrani
			Soryani
			Meera Pur
		Ghotki II	Warh
			Jamal Chachar
			Odhar Wali
			Arazi

Appendix E

Seed companies operating in Sindh

Company Name, Place and Year of Establishment	Type of Company	Human Resource and Physical Infrastructure	Products other than Cotton Seed	Cotton Seed Sold	Concentration Area
Jalandhar Seed Corporation RY Khan 1952	Partnership (Two Partners)	Sales staff: 28 (23 district and 5 divisional) Agronomists: 5 Other staff: 50 Farm Size: 1000 Acres Seed testing plant: 1 Warehouse: 1	Wheat, Rice, Mustard, and Cornflower seed	Bt-886 Bt-901 Bt-JS-01 Bt-702 Bt-802 Bt-121 Bt-Z33 VIP333	Punjab and Sindh Approximate cotton seed sale in 2011-12 was 400,000 kg
Thakkar Seed Corporation RY Khan 1992	Sole proprietorship	Sales staff: 8 (2 Managers and 6 Sales officer) Procurement Manager: 1 Assistant Manager: 1 Farm size: 1500 Acres Warehouse: 1 Seed testing Plant: 1	Wheat seed	Bt-886 Bt-901 Bt-212 Bt-555 IR-3701	Sindh and Punjab
Al-Karam Seed Corporation RY Khan 1997	Partnership (family owned business)	Agronomist: 2 Sales staff: 16 Other Staff: 15 Farm Size: 1000 Acres Warehouse: 1 Seed testing plant: 1	Wheat, Rice and Maize seed	Bt-886 Bt-121 IR-901 IR-3701	Punjab, Sindh and Baluchistan Approximate cotton seed sale in 2011-12 was

					200,000 kb
Manthar Seed Corporation Sadiqabad 1998	-	Production Manager: 1 Marketing Manager: 2 Procurement Officer:1 Accounts Officer:1 Farm Size: 400 Acres Warehouse: 1	Wheat seed	Bt-886 Bt-121 IR-901	Cotton districts of Sindh and Punjab (has a distribution network of 80 dealers)
Shahbaz Seed Corporation Sadiqabad 1995	Sole proprietorship	Sales Officer: 8 Procurement Officer: 4 Store Keepers: 4 Farm Size: 350 Acres Seed testing laboratory: 1 Warehouse: 1	Wheat seed	Bt 121 Bt-602 IR-3701 IR-901	Cotton districts of Punjab and Sindh
Paradise Seed Corporation Kandiario, District Noshero Feroz 2006	Sole Proprietorship	Agronomist: 2 Sales Staff: 2 Other Staff: 35 Farm Size: 100 Acres Warehouse: yes	Wheat seed	VIP333 Bt-886 Bt-121 Bt-456	District Noshero Feroz
Rabanni Seed Corporation Shaheed Benazirabad 2008	Partnership (family owned business)	Farm size: 30 Acres Ginning factory: 1 Warehouse: 1	Wheat and Rice seed Pesticides and Fertilizers	Bt-121 Bt-886 IR-901	District Shaheed Benazirabad
Summer Seed Corporation	Sole Proprietorship	Sales Officer: 4 Agronomist:1	Wheat and Mustard seed	IR-901 IR-702	Sindh and Punjab

Shaheed Benazirabad 2003		Production officer: 1 Store Keeper: 1 Farm Size:1200 Acres Warehouse: 1		IR-703 IR-7301 Bt-121 Bt-886	
Tawakal Seed Corporation Shaheed Benazirabad 2011	Sole Proprietorship	Farm Size: 250 acres Sale point: 1	-	Bt-121 IR-3701 IR 901	District Shaheed Benazirabad

Appendix F

Data in tables

Figure 3.1: Approximate Farm Size (Acres)

0-5	5-12.5	12.5-25	25-50	More than 50
28%	35%	20%	9%	8%

Figure 3.2: Area (Acres) Under Cotton Cultivation

0-5	5-12.5	12.5-25	25-50	More than 50
60%	23%	9%	5%	3%

Figure 3.3: Other Crops

Wheat	Rice	Banana	Sugarcane	Mango	Dates	Vegetables	Fodder	Lemon	Others
19%	27.7%	4%	21.8%	0.3%	1%	7%	7%	1.1%	11%

Figure 3.4: Ownership Status

Personal	Family	Lessee	<i>Hari</i>
61%	2%	2%	35%

Figure 3.5: Years of Cotton Cultivation

0~3	4~6	6~10	More than 10
9%	12%	9%	70%

Figure 3.6: Age (years)

21-30	31-35	36-40	41-50	More than 50
24%	24%	21%	7%	24%

Figure 3.7: Education Level

Under Matric	Matric	Intermediate	Bachelors	Masters	Others
71.81%	9%	8%	7%	4%	0.19%

Figure 4.1: Varieties and their Spread

Bt-121	Bt-886	Bt-3701	Bt-111	Bt-702	VIP-333	Bt-901	Bt-555	Bt-602	Bt-101	(Others; Bt-802, Bt-103, RCA-009, SGA-1)
23%	22%	2%	3%	15%	7%	23%	1%	1%	2%	1%

Figure 4.2: First Time use of Bt Varieties

	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
Number Growers	28	41	106	127	91	40	27	16	11	10	3	6
%age of Growers	5.5 %	8.1%	20.9%	25.1 %	18 %	7.9 %	5.3 %	3.2 %	2.2 %	2.0 %	0.6 %	1.2%

Figure 4.3: Spread of Cotton Seed Varieties ~ District Wise

	<i>Shaheed Benazirabad</i>	<i>Noshero Feroze</i>	<i>Sanghar</i>	<i>Khairpur</i>	<i>Ghotki</i>
Bt-121	44.1%	49.3%	0.7%	23.0%	9.2%
Bt-886	13.8%	21.6%	12.3%	23.8%	38.5%
Bt-3701	1.3%	0.0%	1.2%	2.3%	1.1%
Bt-111	0.0%	0.0%	0.0%	9.9%	4.6%
Bt-702	5.3%	11.4%	38.0%	12.2%	6.9%
VIP-333	0.7%	3.0%	0.6%	15.7%	13.2%
Bt-901	25.0%	12.6%	40.5%	14.5%	22.4%
Bt-555	0.0%	1.8%	4.3%	0.0%	0.0%
Bt-101	0.0%	4.8%	0.0%	0.6%	5.2%
Bt-602	5.3%	0.0%	0.0%	0.0%	0.0%
(Others; Bt-802, Bt-103, Bt-RCA-009, SGA-1)	3.3%	4.8%	1.2%	0.6%	5.2%

Figure 4.4: Preferred Sowing Months

	March	April	May	June
BT-121	2	31	140	27
BT-886	4	29	138	23
BT-3701	2	5	9	
BT-111		1	24	
BT-702	30	41	61	4
VIP-333		1	54	2
BT-901	29	55	110	10
BT-555	5	2	6	
BT-802	0	2	3	
BT-602	1	3	6	1

BT-101	1		20	
BT-103	1	2	1	
RCA-009			4	
SGA-1				1
Total	75	172	576	68

Figure 4.5: Seed Sources

Own Saved Seed	Farmer to Farmer Non Commercial Exchange	Farmer to Farmer Commercial Exchange	Ginning Factories	Local Seed Companies	Dealers	Breeders
6 %	0.9%	0.27%	1.1%	8%	72.73%	11.0%

Figure 4.6: Seed Sources ~ Farm Wise

	Own Saved Seed	Farmer to Farmer Non Commercial Exchange	Farmer to Farmer Commercial Exchange	Ginning Factories	Local Seed Companies	Dealers	Breeders
0-5	3%	1%	2%	1%	4%	82%	8%
5-12.5	4%	1%	1%	2%	6%	80%	8%
12.5-25	7%	0%	1%	1%	1%	73%	17%
25-50	14%	0%	0%	2%	12%	54%	18%
More than 50	16%	0%	0%	0%	22%	51%	10%

Figure 4.7: Purchase Preference

Single Source	Multiple Source
41.72%	57.28%

Figure 4.8: Seed Application Rate

4-5 Kg	6-8 Kg	8-10 Kg	More than 10 Kg
22%	40%	10%	28%

Figure 4.9: Seed Application Rate ~ District Wise

	4-5 Kg	6-8 Kg	9-10 Kg	More than 10 Kg
<i>Shaheed Benazirabad</i>	26.3%	19.5%	9.3%	44.9%
<i>Noshehro Feroze</i>	15.9%	54.0%	8.8%	21.2%

<i>Sanghar</i>	26.9%	32.3%	8.6%	32.3%
<i>Khairpur</i>	27.2%	44.6%	6.5%	21.7%
<i>Ghotki</i>	18.8%	39.3%	18.8%	23.1%

Figure 4.10: Bag Size

10 Kg	20Kg	40 Kg	Open
73.75%	20.42%	0.23%	5.53%

Figure 4.11: Mode of Payment ~ Farm Wise (Acres)

	Cash	Credit
<i>0-5</i>	37 %	63%
<i>5-12.5</i>	54 %	46%
<i>12.5-25</i>	65 %	35%
<i>25-50</i>	71 %	29%
<i>More than 50</i>	71 %	29%

Figure 4.12: Average Price per Kg ~ Farm Wise (Acres)

0-5	5-12.5	12.5-25	25-50	50 and above
183.4	185.5	189	195	176.3

Figure 4.13: Disposal of Phutti

Middle Man	Ginning Factory	Mobile Ginnery	Village Ginnery
90 %	10%	0 %	0 %

Figure 4.14: Disposal of Phutti ~ Education Wise

	Middle men	Ginning Factory	Mobile Ginnery	Village Ginnery
Under Matric	93.7%	6.3%	0 %	0%
Matric	84.1%	15.9%	0 %	0%
Intermediate	82.9%	17.1%	0 %	0%
Bachelors	68.8%	31.3%	0 %	0%
Masters	76.2%	23.8%	0 %	0%

Figure 4.15: Disposal of Phutti ~ Farm Size Wise (Arces)

	Middle men	Ginning Factory	Mobile Ginnery	Village Ginnery
0-5	96 %	4 %	0 %	0%
5-12.5	93 %	7 %	0 %	0%
12.5-25	87 %	13 %	0 %	0%
25-50	81 %	19 %	0 %	0%
More than 50	65 %	35 %	0 %	0%

Figure 4.16: Extension Advice

No advice needed	Farmers	Only Govt Department	Farmers & Govt Department	Farmers and Pest Cos	Local Seed Cos
46 %	1 %	16 %	19 %	13 %	5 %

Figure 4.17: Participation in Workshops Arranged by Agriculture Department

Last Year	2 to 3 years ago	Never
5 %	4 %	91 %

Figure 4.18: Farmers' Participation in Agriculture Department's Workshops ~ Farm Wise (Acres)

	Last Year	2 to 3 years ago	Never
0-5	1.4%	4.2%	94.4%
5-12.5	1.7%	3.4%	94.9%
12.5-25	5.0%	3.0%	92.0%
25-50	9.3%	7.0%	83.7%
50 and above	24.4%	9.8%	65.9%

Figure 4.19: Farmers' Participation in Seed Company's Workshops

Last Year	2 to 3 years ago	Never
14 %	9 %	77 %

Figure 4.20: Farmers' Participation in Seed Company Workshops ~ Farm Wise (Acres)

	Last Year	2 to 3 years ago	Never
0-5	7.0%	5.6%	87.4%

5-12.5	10.2%	10.2%	79.7%
12.5-25	18.0%	9.0%	73.0%
25-50	14.3%	7.1%	78.6%
50 and above	51.2%	12.2%	36.6%

Figure 4.21: Visit of Extension Workers

Last Year	2 to 3 years ago	Never
8 %	7 %	85 %

Figure 4.22: Visit of Seed Company Representatives

Last Year	2 to 3 years ago	Never
34%	21 %	45 %

Figure 4.23: Visit of Extension Worker ~ Farm Wise (Acres)

	Last Year	2 to 3 years ago	Never
0-5	4.2%	4.9%	90.9%
5-12.5	3.4%	8.0%	88.5%
12.5-25	10.0%	4.0%	86.0%
25-50	9.5%	14.3%	76.2%
50 and above	35.9%	5.1%	59.0%

Figure 4.24: Visit of Seed Company Representatives ~ Farm Wise (Acres)

	Last Year	2 to 3 years ago	Never
0-5	22.5%	20.4%	57.0%
5-12.5	23.0%	28.1%	48.9%
12.5-25	43.4%	19.2%	37.4%
25-50	57.1%	2.4%	40.5%
50 and above	75.0%	15.0%	10.0%

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