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Product Proliferation in India's Cotton Seed Market: Are There Too Many Varieties?

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Product Proliferation in India's Cotton Seed Market: Are There Too Many Varieties?*

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Abstract

With about \$250 million in sales, India's cotton seed market is one of the largest cotton seed markets in the world. While products of public sector breeding traditionally dominated this sector, the bulk of value is now accounted by private seed firms. A persistent criticism of the Indian cotton seed market is that there are far too many cotton varieties as the private sector recycles older and inferior varieties under new names. This paper examines the phenomenon of variety proliferation in the cotton seed market of Maharashtra, India. Empirical evidence is presented from a survey of seed dealers in 2005. The evidence shows that while variety proliferation is indeed observed, the cause of it is private bred hybrids that are highly localized and which are rarely market leaders. Only a few varieties are dominant geographically and they command price premiums suggesting brand power. Firm and brand reputations matter and substitute for regulation by restricting fly-by-night operators.

KEYWORDS: cotton seed, cotton hybrids, seed markets, India, Asia

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1. Introduction

Seed markets in developing countries have received little research attention perhaps because farmer-saved seed is the primary seed source for most crops. In recent years, however, the private sector has become an important supplier of varietal technology in agriculture. In developing countries, this has led to debates about what should be the appropriate regulatory structure (Tripp and Gisselquist, 1996; Tripp and Louwaars, 1997). A fairly widespread view in India is that unless seed markets are regulated well, inferior products will dominate the market. Although testing is not mandatory under current law, new proposals have envisaged mandatory testing and registration as mechanisms to ensure quality seed.

These issues are particularly important for India's cotton seed market. With about \$250 million in sales, the Indian market is one of the largest cotton seed markets in the world. While products of public sector breeding traditionally dominated this sector, the bulk of value is now accounted by private seed firms. Although seed markets are not in general recipients of media attention, the Indian cotton seed market has attracted much comment in the popular press. The public profile of the cotton seed market has much to do with the introduction of transgenic cotton hybrids ('Bt cotton') and the press reports of tragic suicides by farmers in the cotton growing districts of the states of Andhra Pradesh and Maharashtra.

A persistent criticism of the Indian cotton seed market is that there are far too many cotton varieties.¹ The journalist P. Sainath² (2005a) characterises the situation as follows: "The number of brands, names and claims is bewildering. Since both real and fake stuff are on offer, chaos rules." In a similar vein, Murthy (2004) remarks "In the seed market there are as many genuine as fake companies, confusing the farmer. Poor quality seed makers rely on high-decibel advertising and higher margins to traders and disappear from the scene when they realise that their game is up." Neither Sainath or Murthy define what they mean by fake seeds and fake companies but presumably what they have in mind are companies that sell seeds on the basis of false claims and advertising.

In another article, Sainath (2005a) quotes Vijay Javindia, a farmer activist, to say "Private seed companies, have been given a free hand in the name of research cotton. There are no regulations, no scrutiny. Agricultural universities put out no more than 3-4 varieties in 10 years. Then how do these companies bring twenty varieties to the market in ten years? Because that's where they are

¹ Another criticism is that the market is monopolistic and dominated by large multinational firms. See Murugkar, Ramaswami and Shelar (2007) for evidence on this issue.

² Sainath is the recipient of the 2007 Ramon Magsaysay Award for Journalism, Literature and Creative Communication Arts.

doing their testing. On the lives of the farmers. Using them as guinea pigs in experiments that could destroy millions." Revathi and Murthy (2005) also lay the blame at the door of regulation. "The unregulated informal market has provided a haven for fly-by-night operators selling spurious seed." They go on to say "The private seed markets have posed quite a challenge for the farmers to accustom with a hoard of companies that flooded the markets with aggressive advertising campaigns and other promotional instruments".

According to these popular accounts, private companies market far too many varieties in the cotton seed market and as many of them are low quality, farmers end up as losers. But why do cotton growers choose low quality unproven seeds? The argument seems to be that growers find it difficult to compare and evaluate all of these varieties. Moreover, if companies bring to the market, numerous and inferior variants of the few good ones, then growers could be swayed by false claims to make sub-optimal choices.

This paper examines the phenomenon of variety proliferation in the cotton seed market of Maharashtra state of India. With about three million hectares under cotton, Maharashtra is the largest cotton growing state in India. Private seed companies dominate the seed market in this state. About eighty percent of area is under private seed varieties. Using data from a dealer survey in 2005, we quantify the extent of proliferation and ask whether the evidence supports the notion that the number of varieties is excessive and whether there is a role for tighter regulation. The next section reviews the literature that allows us to frame the questions for this study.

2. Diversity of Product Varieties and Optimality of Varietal Choice

If farmers can observe seed characteristics and quality, then economic theory predicts that they would choose those seed varieties that maximize their profits. These desired choices can create a demand for differentiated seed varieties. For instance, if growers differ in their ability to pay upfront for inputs (and also differ in their access to credit) then some growers might opt for cheaper seeds even though they fully know that they are of lower quality. This leads to vertical differentiation of seed varieties.

Horizontal differentiation can also happen. If farmers vary with respect to their endowments (e.g., soil type, moisture availability, household labor) or with respect to the prices of complementary inputs (e.g., labor, pesticides), then the varietal characteristics that are optimal would also vary. As a result, seed companies may develop varieties that have different characteristics. Some important seed characteristics are (a) performance with respect to moisture conditions (rainfed/irrigated) and soil types, (b) crop duration (early, medium, long), (c) resistance to pests, (d) fibre length, (e) fibre strength and (f) boll size.

From the point of view of social benefits, variety proliferation either because of vertical or horizontal differentiation should not be a cause for concern.

Another possibility is that oligopolistic incumbents deter entry of new firms by variety proliferation. Theoretically, an incumbent monopolist could locate multiple brands so that no market niches could support profitable entry. The U.S. ready-to-eat (RTE) breakfast cereals industry was charged with such a complaint by the U.S. Federal Trade Commission in 1972. At the time of the complaint, the industry was dominated by four incumbents with market share in excess of 84%. By contrast, the top five firms accounted for just 60% of market share in the Indian cotton seed market in 2004/05 (Murugkar, Ramaswami and Shelar, 2007).

This literature assumes that farmers are able to observe seed characteristics and quality and make choices accordingly. The seed market critiques, on the other hand, stress the possibility that farmers end up with low quality seeds because of poor choices, induced in part, by aggressive salesmanship in a market with numerous varieties and absent standards. This is reasonably plausible as seed quality cannot be judged at the time of purchase. Seeds are examples of “experience” goods (in contrast to “search” goods) where the buyer learns about the quality of product only after purchase of the seed (Nelson, 1970).

However, it is not the case that low quality is a necessary outcome of markets with experience goods. Economic theory predicts that with such goods, firms will invest in advertising, warranties and other means to communicate product quality to buyers (Church and Ware, 2006). The marketing literature contains ample empirical evidence to support this proposition. In this line of reasoning, if seeds are experience goods and if growers care about quality, then in fact, we should see a limited number of reputed brands that command price premiums because of their association with quality. So are the critiques correct in asserting variety proliferation? And if they are, how can it be reconciled to the predictions of economic theory.

One possibility is that seeds are not experience goods but rather credence goods, i.e., goods whose quality cannot be ascertained even after use (Darby and Karni, 1973). Varietal performance depends on seed quality and a number of other factors including crop management, input application and weather. It is probable that growers cannot separate out the impact of these factors especially if their experience with the variety is limited to a season or two. Firm reputations as a method to signal quality is a lot less effective for credence goods. In this case, firms may not have an incentive to invest in the provision of quality seeds.

This is what is suggested by an anthropological study of the adoption of new cotton varieties in Warangal district of Andhra Pradesh (Stone, 2007). It attributes the proliferation of cotton varieties to fads in purchase decisions. The

author states “They (farmers) face a frenzied turnover in the seed market (which they encourage with their penchant for new products), deceptiveness in seed brands, unpredictable ecological events such as pest and disease outbreaks, secular changes in insect ecology, and a noisy and unreliable information environment.....This attraction to new seeds exacerbates the turnover of seeds in the market, as seed firms sometimes take seeds that have fallen out of favor, rename them, and launch marketing initiatives for the new product.”

If fads drive purchase decisions and result in rapid turnover of the “favored” seed, then the seed market is so constructed that seed branding is itself of negligible value. As brand power is built on perceptions of quality, the absence of branding would indeed mean that there is no market incentive to supply quality seeds. In this case, testing and regulation could conceivably reduce the clutter and increase the efficiency of grower choice.

The literature therefore suggests the following check-list of questions relevant to the role of regulation. Is there variety proliferation? Do the product varieties reflect farmer heterogeneity? Are there varieties that command price premiums? If the answers to these questions are yes, no and no, respectively then it would seem that the cotton seed market is essentially a market for a credence good and therefore mandatory quality standards could be important in correcting information failures.

3. Background and Data

The Indian cotton seed market consists of both self-pollinated varieties and hybrid varieties. India was the first country in the world to commercialise cotton hybrids and this was done by public sector research institutions. The release of improved self-pollinated cotton varieties is an entirely public sector activity. Private investment is absent here because the private sector cannot protect its intellectual property in selling self-pollinated variety seed. Private investment in plant breeding is directed towards developing hybrid seed. Although private-bred (or proprietary) hybrids were developed after the success of public-bred hybrids, they now dominate the cotton seed market. In 2004/05, proprietary hybrids accounted for 5 million hectares, public hybrids for nearly 1 million hectares and self-pollinated varieties for another 2.6 million hectares (Murugkar, Ramaswami and Shelar, 2007). In Maharashtra, these trends occur in an even stronger form. Eighty percent of area is sown with proprietary hybrid seed, while the rest is evenly split between public-bred hybrids and self-pollinated varieties. As variety proliferation is associated with proprietary hybrids, it is a relevant issue for Maharashtra.

Our data consists of a survey of seed dealers in Maharashtra. The questionnaire consisted of two parts. In the first part, we recorded the price of

every cotton seed product (i.e., public variety, public bred hybrids, and proprietary hybrids) that the dealer sold in 2004 and 2005 crop season. We use the term products as a generic term to include self-pollinated varieties, public bred hybrids and proprietary hybrids. Note that the same public-bred hybrid when sold by two different companies counts as two different products. With respect to proprietary hybrids, we differentiate between the hybrids of the same firm. Thus, Ankur 651 and Ankur 2534, both hybrids from Ankur Seeds count as two different products. Bt hybrids were excluded from this study.³

In the second part, the dealer was asked to pick the top three seed varieties by volume of sales at his outlet for each of the years. The survey was done for the three major cotton growing regions within Maharashtra: Khandesh, Marathwada and Vidharbha. Within Khandesh, all three districts (Dhule, Nandurbar and Jalgaon) were covered. In Vidharbha, 5 out of the 6 districts were randomly picked (Yeotmal, Amravati, Akola, Washim and Wardha). In Marathwada too, 5 districts (out of 7) were chosen but the survey could only be carried out in 4 districts (Nanded, Latur, Parbhani and Beed). The sample size for each district was fixed according to the size of the district and an initial enumeration of the seed shops in the district headquarters. The sample was chosen randomly with the restriction that at any location, not more than 4 shops would be sampled. After accounting for the non-response cases, the total sample size consists of 204 seed dealers across these 3 regions.

4. Variety Proliferation

In the 2004 and 2005 cotton planting season, our survey records at least one sale of 199 cotton seed products across the 204 locations in Maharashtra. In 2004, 24 products did not register any sale while in 2005, the corresponding figure was 13. Of the 199 products, 154 are proprietary hybrids, 31 are public bred hybrids and 14 are public varieties. Among the public bred hybrids, there are several versions of the same hybrid that are counted in our survey as different products because they are sold under the brand names of different firms. Thus, for instance, a public hybrid NHH44 is sold by as many as 20 different firms. Hence the overall product proliferation that is observed is entirely due to the large number of proprietary hybrids from the private seed companies. This supports the observations cited in the introduction that there are a large number of private cotton seed varieties on offer.

³ In some regions of Maharashtra, there were reports of sales of unapproved (by biosafety regulators) Bt seed. To avoid being seen as representatives of official agencies, we decided to exclude questions relating to Bt hybrid seed. The resulting bias cannot be large because during the year of the survey, there were only a handful of approved Bt varieties that were available.

The next question is whether the product diversity reflects farmer heterogeneity. Maharashtra is a large state and regional differences in soils, water availability and climate are well known. If variety proliferation is because of market segmentation, then we should expect to see the spatial spread of proprietary hybrids to be limited. If, on the other hand, most of the proprietary hybrids have a wide spatial spread, then diversity in farmer endowments is not the reason for product proliferation.

To see this, let s_{ict} be the sales of product i from shop c in year t . Define the indicator variable $g_{ict} = 1$ if $s_{ict} > 0$ and $g_{ict} = 0$ if otherwise. We can then define $p_{it} = (\sum_{i=1}^{204} g_{ict} / 204)100$ where 204 are the number of seed dealers in our sample. Thus, p_{it} is the percentage of shops at which at least one unit of product i was sold in year t and is a measure of spatial spread. The distribution of this measure over the 199 products is displayed in Table 1 for 2004 and 2005 cotton planting season.

In both years, 50% of products registered a sale at, at most 1% , of (i.e., 2 shops). 75% of products registered a sale at only 4 to 4.5 % of shops (8 to 9 shops in the sample). It is thus clear that a count of proprietary hybrids sold in the state exaggerates the variety proliferation as an overwhelming number of products are extremely limited in geographical spread.

Table 1: Distribution of the measure of spatial spread

Percentiles of Seed Varieties	$p_{i,2004}$	$p_{i,2005}$
1%	0.00	0.00
5%	0.00	0.00
10%	0.00	0.49
25%	0.49	0.49
50%	0.98	0.98
75%	3.92	4.41
90%	30.39	24.02
95%	50.49	52.45
99%	86.27	87.25
# Seed Varieties	199	199
Mean	7.57	7.83
standard deviation	16.93	17.22

Note: p_{it} is the percentage of shops at which at least one unit of product i was sold in year t .

However, not all products are so local in their sales. Tables 2 and 3 display the top 5% of products (amounting to 10 brands) when ranked by spatial spread in 2004 and 2005 crop season respectively. These tables show that there are some products that enjoy wide geographical presence. If product proliferation were solely due to agro-climatic features, then we would not have expected such a finding.

Table 2: The Top 5% of Seed Varieties Ranked by Spatial Spread in 2004

Variety Name	Company	Varietal Type	# of shops where sale occurred
Banni	Nuziveedu	Proprietary Hybrid	191
Maruthi 9632	Krishidhan	Proprietary Hybrid	176
Ankur 651	Ankur	Proprietary Hybrid	147
Nanded 44	Mahabeej	Public-bred Hybrid	147
Paras-Krishna	Emergent (Monsanto) Genetics	Proprietary Hybrid	141
Ajeet 11	Ajeet	Proprietary Hybrid	137
Paras-Brahma	Emergent (Monsanto) Genetics	Proprietary Hybrid	134
Tulsi 4	Tulsi Seeds	Proprietary Hybrid	117
Ankur 2534	Ankur	Proprietary Hybrid	116
H 8	Narmada	Public-bred Hybrid	103

Note: The total number of seed varieties sold in 2004 was 175.

Table 3: The Top 5% of Seed Varieties Ranked by Spatial Spread in 2005

Variety Name	Company	Varietal Type	# of shops where sale occurred
Banni	Nuziveedu	Proprietary Hybrid	195
Maruthi 9632	Krishidhan	Proprietary Hybrid	178
Ankur 651	Ankur	Proprietary Hybrid	156
Paras-Krishna	Emergent (Monsanto) Genetics	Proprietary Hybrid	149
Paras-Brahma	Emergent (Monsanto) Genetics	Proprietary Hybrid	141
Ajeet 11	Ajeet	Proprietary Hybrid	140
Tulsi 4	Tulsi Seeds	Proprietary Hybrid	127
Nanded 44	Mahabeej	Public-bred Hybrid	126
Ankur 2534	Ankur	Proprietary Hybrid	117
H 8	Narmada	Public-bred Hybrid	107

Note: The total number of seed varieties sold in 2004 was 186.

Overall, then, we see that it is the localized presence of a large number of proprietary hybrids that leads to variety proliferation at the aggregate level. However, there is a small minority of products that enjoy wide geographical presence. In terms of the check-list of questions thrown up by the discussion in section 2, we can conclude that (a) varietal proliferation is not as severe as suggested by the comments cited in the introduction and that (b) some varieties have wide spatial spread transcending the limitations of adaptation to local agro-climatic factors. This leads to the next question: do the firms that own product varieties with wide spatial spread have market power?

5. Spatial Spread and Market Power

In the survey, prices are reported per packet of seed. The weight of a packet of seed varies between proprietary hybrids, public hybrids and varieties and sometimes within the category itself (especially in the case of variety). From the price and weight data, we derive the unit price of a gram of seed. Define a dummy that takes the value one for products that are in the top 5 percentile of all products by the measure of spatial spread. We call this Top5. Similarly, we can define the Next5 dummy for all the products that are in percentiles 90 to 95. Both of these variables are computed for the crop year 2004 as well as the crop year 2005. Market power is tested by regressing the log of unit price on these spatial spread dummies. Table 4 reports regressions for 2004 and 2005. These regressions are done for only proprietary hybrids and to remove the presence of those hybrids that are very infrequently sold, we consider only hybrids that were sold in at least 8 locations. The regressions indicate a 9 to 11% price premium for products in the top 5 percentile measured by spatial spread but a statistically insignificant price premium for the products in the next 5 percentile. Thus, spatial spread and market power are closely associated.

To investigate this further, we used the seed dealer's response in ranking the top three products sold through his outlet. For each seed dealer, we create a market leader dummy, which assigns the three top ranked products the value one, and the value zero to the other products sold by the dealer. These dummies are called leader04 and leader05 for the crop years 2004 and 2005 respectively. As there are 204 shops, the number of observations for which the leader dummy is one should be three times that much, i.e., 612. However, because some of the dealers did not respond to this question (as they could not recollect the largest selling seeds), the number of observations for which this dummy is one is 554 in 2004 and 574 in 2005.

To analyse the correlation of spatial spread with market leadership, we ran a probit regression of the leader dummy on the log of the measure of spatial spread. The results showed significant correlation and the elasticity of the

probability of being a market leader with respect to spatial spread was 0.53 in 2004 and 0.44 in 2005. This finding means spatial spread is closely associated with market power as well as market leadership.

Table 4: Regression of unit price on spatial spread measures

	(1)	(2)
Explanatory Variables	Dependent Variable: Log of unit price in 2004	Dependent Variable: Log of unit price in 2005
Top5 in 2004	0.09*** (0.02)	
Next5 in 2004	0.03 (0.02)	
Top5 in 2005		0.1*** (0.02)
Next5 in 2005		0.03 (0.02)
Constant	-0.2*** (0.02)	-0.2*** (0.02)
Observations	2193	2327
R-squared	0.023	0.032

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Top5 is a dummy for products that are in the top 5 percentile of all products by the measure of spatial spread (defined in text). Next5 is a dummy for all products in percentiles 90 to 95.

The relationship between market leadership and market power is directly investigated in Table 5. The table reports three regressions. In the first regression, the log of unit price in 2004 is regressed on the product type dummy (whether proprietary hybrid, public hybrid, or whether self-pollinated variety), the market leader dummy for 2004 (leader04) and the product terms of these two types of dummies. As expected, unit prices for proprietary hybrids are the highest – more than twice of public bred hybrids and many times that of public varieties. Further, the regression shows that on average, the price premium for market leaders is of the order of 4%. In the second regression, the dependent variable is the log of unit price in 2005 and the market leader dummy for 2005 (leader05). In the third regression, the dependent variable continues to be the log of unit price in 2005 but the market leadership variable is now leader04. As can be seen, the second and third regressions are very similar to the first one and the price premium for market leaders varies between 4 to 5%.

Table 5: Regression of unit price on market leader variables

	(1)	(2)	(3)
Explanatory Variables	Dependent Variable: Log of unit price in 2004	Dependent Variable: Log of unit price in 2005	Dependent Variable: Log of unit price in 2005
Whether public hybrid	-0.8*** (0.02)	-0.8*** (0.01)	-0.8*** (0)
Whether variety	-2.9*** (0.03)	-2.9*** (0.03)	-2.9*** (0)
Leader04	0.04*** (0.01)		0.05*** (0.01)
Leader05		0.04*** (0.01)	
Whether public hybrid X leader04	0.4*** (0.07)		0.3*** (0.08)
Whether variety X leader04	2.4*** (0.03)		2.4*** (0.03)
Whether public hybrid X leader05		0.3*** (0.07)	
Whether variety X leader05		2.4*** (0.03)	
Constant	-0.2*** (0.006)	-0.2*** (0.006)	-0.2*** (0.006)
Observations	3017	3134	3134
R-squared	0.899	0.887	0.888

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note: Leader04 is a dummy that takes the value 1 if the seed variety is ranked by a seed dealer to be in the top 3 products (by sales) in 2004. Leader05 is a similar dummy for 2005.

The price premiums for market leaders are only half of what we observed for varieties that have wide spatial spread. Why is that? To answer this question, Table 6 tabulates the number of market leaders for each ventile of the measure of spatial spread (p_{it}). Thus, for instance, in 2004, the seed varieties in the 20th ventile (i.e., the top 5% of varieties when ranked by the measure of geographical presence) were ranked as market leaders 399 times. Broadly speaking, varieties in a higher ventiles are ranked more often as market leaders, which is what produces the significant relationship between market leadership and geographical presence in Table 5. However, the relationship is not monotonic as there are

market leaders even in lower ventiles (including ventiles one and three). These are striking instances of seed varieties that are only locally known and yet locally popular. What these results establish is that although wide geographical presence is closely associated with market leadership, market power is associated more with the former than the latter.

Table 6: The distribution of market leaders conditional on spatial spread

Ventile of spatial spread	# of locations/shops at which varieties in this ventile are ranked market leaders in 2004	# of locations/shops at which varieties in this ventile are ranked market leaders in 2005
1	8	11
2	0	0
3	24	31
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	5	8
10	0	0
11	15	16
12	0	0
13	4	3
14	4	8
15	4	8
16	9	11
17	16	15
18	39	32
19	27	27
20	399	404
Total	554	574

Note: This tabulation is based on responses from 204 seed dealers that rate which three seed varieties had the largest sales in 2004 and 2005. The total number of ratings should have been 612 (204 x 3) but owing to non-response (because of limited recall), the total number of ratings is 554 in 2004 and 574 in 2005.

6. Local Brands and Dealer Power

As remarked earlier, economic theory predicts that firms will invest in advertising to build brands that signal quality and earn price premiums. Consistent with this prediction, we have found, that varieties with wide geographical presence enjoy price premiums presumably due to brand loyalty. However, the previous section also established that there are many proprietary hybrids with an extremely localised presence. Indeed, few of them even command market leadership in their areas.

Therefore, the reputations of select varieties and companies have not been enough to drive out seed varieties with localised presence. Why do growers purchase seeds that are not widely reputed? We are unable to offer a conclusive answer to this question; on the basis of interviews of dealers and seed companies, we conjecture, however, that locally prevalent seed varieties exist because of dealer power. Seed dealers often sell other inputs – most notably pesticides – on credit. Because of credit ties, growers are locked into a relationship with a particular dealer. This gives dealers the power to influence seed choices. Going by the trade practice as reported to us, dealers rarely dictate that a grower should buy unbranded seeds to meet their entire requirement. The more common practice is to modify, at the margin, a farmer's preference for a particular branded seed. The grower is encouraged to try out an unbranded seed for some portion of his requirements. The incentive for the dealer come from the reported 'fact' that the margins on unbranded seeds are greater than on branded seeds by a multiple of two to three. According to our interviews with seed companies and dealers, the companies with brand acceptance offer dealers margins not higher than 15% of the seed price. On the other hand, companies with little or no brand acceptance would need to offer substantially higher dealer margins (our interviews cite numbers ranging between 35 to nearly 50%).

Relative to the differences in dealer margins, we see market leaders enjoying only modest price premiums. However, the branded seeds receive a higher share of the selling price because they can get away with lower dealer margins. Companies without a brand presence cannot push sales without offering dealers higher margins. Dealers derive their power from their ability to influence seed purchases of their clientele. If they did not have this power (if, for instance, growers had other credit sources) then companies with no market power would have to compete by selling at substantially lower prices – in effect transferring the major part of dealer margins to the farmer.

7. Conclusions

From a survey of seed dealers across 3 regions in Maharashtra, we found that as many as 199 cotton varieties (whether public hybrids, proprietary hybrids or public varieties) were sold in the years 2004/05 and 2005/06. How can a farmer evaluate even a substantial subset of them and select a seed that suits his conditions best? The case for testing and regulation springs from such observations.

However, a closer look tells us that the proliferation in varieties is because of the large number of proprietary hybrids that have an extremely localised presence. Reputation works to winnow the great number of product offerings to less than a dozen varieties. The market leaders, are in most cases, the ten varieties that have a broad geographical presence and command price premiums. There is, therefore, far greater order in the cotton seed market than what is supposed. The seed market is best characterized by a theoretical model of monopolistic competition (with differentiated products) that faces a competitive fringe.

Despite seed being an 'experience' good, the existence of the competitive fringe owes itself to dealer power that in turn derives from their credit relationships with growers. Dealers are able to use their leverage in order to be able to push unbranded seeds at prices only marginally lower than the varieties that are market leaders. Firms that invest in brand presence obtain their returns through low dealer margins rather than price premiums, which are quite small. Although the proliferation of seed varieties is thought to lower seed quality, we do find a few cases where a purely local variety is in fact the market leader. Why such varieties do not become better known is not clear. Perhaps they are so well adapted to their regions that they are not suited to conditions outside it. Or it could be that these locally popular varieties are copies of known brands and therefore cannot be widely disseminated without attracting adverse attention. A third possibility is that these varieties are not reputed because they are either new to the market or because they belong to the companies that lack resources to advertise them.

India's seed sector is governed by the Seed Act of 1966. Under this act, varieties are 'notified' after performance testing. For private varieties, 'notification' is not mandatory and most seed companies do not opt for this process or do so well after their varieties are in the market. A new set of draft laws, referred to as the New Seeds Bill, 2004 has been put forward as a replacement for the existing laws. Among other things, this bill proposes mandatory registration of all varieties on the basis of agronomic tests. The bill has drawn criticism from farmer groups and non-governmental organizations on the grounds that mandatory registration favors large firms that can afford its costs.

In particular, the fear is that the proposed law would jeopardise traditional systems of farmer seed saving and exchange (Kuruganthi, 2005).

It is not clear how tighter regulation in the form of mandatory registration would improve seed quality in the Indian cotton seed market. As has been seen, firm and brand reputations matter and substitute for regulation by restricting fly-by-night operators. On the other hand, costly regulation can shut out small seed companies that under present laws are able to, at least, compete locally. Small firms are disadvantaged by their inability to market their seeds widely. Indeed, we find a few instances of highly localised but popular varieties. Their diffusion to other regions would increase social gains. A registration system that is voluntary, inexpensive and credible could endow even smaller firms with the 'reputation' to compete beyond their local markets.

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