



Survey on Seed Sources and Quality Seed Availability in Telangana Districts

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Authors' contributions

This work was carried out in collaboration among all authors. Authors KP and RGSR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript.

Authors KK and TP managed literature searches, technical support and analyses of the study.

All authors read and approved the final manuscript.

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ABSTRACT

Our study was conducted to understand the significance of existing seed systems and extent of seed availability of major crops viz., paddy, maize (cereals); red gram (pulses); and cotton (commercial crops) in 4 major agrarian districts (Mahbubnagar, Karimnagar, Warangal and Nalgonda) of Telangana state. There is a striking influence of seed source on the productivity & profitability of farmers, and hence, our study was aimed at understanding the nature and extent of seed quality parameters like genetic identity, genetic purity and seed health contributing to gross output of the crop. Our survey conducted during 2 Kharif & 2 Rabi seasons during 2017 to 2019 brought out interesting facts that formal sector contributes 96 to 100% of seed replacement rate (SRR) for commercial crops, 70 to 90% for cereals, 75 to 100% for pulses and negligible in case of oilseeds. The reasons for highest contribution of formal sector are due to prevalent seed subsidy schemes and also, availability of good quality seeds. The informal supply of seed majorly involves farmer to farmer exchange and farm saved seeds which is a major source of seeds to resource poor farmers.

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1. INTRODUCTION

Next to China, India has the highest population of almost 130 crores and likely to reach 1.7 billion by 2050. In order to meet the growing demands, food production need to be increased manifolds which would be possible by bridging the existing yield gaps through improved technologies and by integrating crop improvement, crop production, crop protection, natural resource management practices with making available good quality seeds of improved genotypes [1]. Hence, the second Green Revolution would demand much faster growth of seed sector for meeting the demand of hybrid seeds and new high yielding varieties. Seed is the most important input in agriculture and the quality of seed is one of the determinants of output given other complementary inputs are proportionately provided with. Improved/hybrid seed is an integral part of new technology which is scale neutral. The process of modernizing the Indian agriculture involves the intensive use of non-conventional inputs such as quality seeds, chemical fertilizer, pesticide, weedicide, irrigation, farm machinery and network of research and extension infrastructure. In spite of intensive usage of inputs, agriculture has witnessed stagnant/falling productivity levels in most of the crops and the cost of production has been increasing. As a result, the return to private investment on agriculture is falling. In this scenario, use of quality seed in enhancing the productivity is crucial. Use of genetically good quality seed can alone increase crop productivity by 15 to 20 per cent [2].

Understanding seed systems is crucial for managing seed on farm in locations where it is of both private value to farmers and social significance for future crop improvement and the resilience of the farming system. A well-functioning seed system uses the appropriate combination of formal and informal supply channels, market and non-market transactions to stimulate and meet efficiently the evolving demand of farmers for quality seeds [3]. The seed supply system consists of two main sectors, namely informal and formal seed supply system. Share of seed supply from formal seed chain (30%) in comparison to informal sources (70%) [4,5].

1.1 Informal Seed System

It focuses on farmer management of local varieties which have been selected over time and produced under local circumstances. The system is sometimes described as traditional, operating at local level through exchange mechanism and involving limited quantities per transaction. In addition, the varieties have special attributes e.g., Tastes and nutrition that give varieties added nutrition within the community. Informal seed supply systems broadly include: (i) Farm-saved seed and farmer-to-farmer exchange (ii) Farmers' cooperatives (iii) Community groups (iv) Seed growers' associations (v) Non-governmental organizations.

1.2 Formal Seed System

The formal seed system includes those institutions involved in developing, multiplying, and distributing improved varieties as certified seed (CS) or truthfully labeled seeds (TFL), and can be publicly and privately-funded and organized in different ways. Formal seed supply systems consist of seed production by (i) National government agencies (ii) State government agencies (iii) Government-assisted and other cooperatives (iv) Multinational corporations (MNCs) or transnational corporations (TNCs) (v) Domestic private sector companies a) with their own research and development (R&D) b) without their own R&D (vi) Joint venture companies a) between MNC and domestic private company b) between two domestic companies, etc.

Both formal and informal seed systems have innate strengths and weaknesses. Formal sector in India has made initial investments and standardized various seed systems while informal sectors took off from there after 1988. However, both have significant role in the present situations. Both the sectors are mutually exclusive as farmers depend upon them for various seeds suiting various climatic and regional needs. Nowadays, informal seed system is well organized and supported good research as well as market surveillance while formal sectors are strong in patches taking care of local needs.

2. METHODOLOGY

To understand and assess the contribution of various seed systems pertaining to seed supply of various crops viz., paddy, maize (cereals); red gram (pulses); and cotton (commercial crops) in major agrarian districts of Telangana state, we have conducted a detailed survey in districts viz., Mahbubnagar (MBNR), Karimnagar (KMNR), Nalgonda (NLG) and Warangal (WGL).

The data was collected from farmers falling under different categories: (marginal (0-1 ha.), small (1-2 ha.), semi-medium (2-4 ha.), medium (4-10 ha.) and large (more the 10 ha.). A total number of 60 farmers in each selected district were contacted personally and pertinent data was collected and collated. Collectively, data was collected from 240 farmers of 4 to 5 villages of 4 aforesaid districts.

Data and information were collected through primary survey using a standard questionnaire from each selected farmer. Seed samples of every seed class of crops from every surveyed farmer was tested for basic seed quality parameters like germination, physical purity and moisture content as per ISTA, 2015 and seed health was tested by visual examination of dry seed and by taking observations on seedlings with primary infection (%) under abnormal seedling category in the seed germination test.

3. RESULTS AND DISCUSSION

Seed is most important and critical input for sustainable agriculture and, it has been proved that an estimated direct contribution of quality seed alone to the total production is about 15 – 20% depending upon the crop which can otherwise raised up to 45% with conservative agricultural practices [2]. Indian seed industry has seen tremendous growth and promise during the last 30 years both in terms of crop improvement and availability of quality seeds to farmers [5,6]. However, studies show that there are lacunae in achieving the desired levels of Seed Replacement Rates (SRR), which could be because of lack of coordination and transparency in the seed recruitments and movement of seeds. Incidentally, there is no data on the area under particular crop and cultivar (High Yielding Varieties or hybrids), and their seed sources. Hence, estimates of SRR in a particular crop and cultivar in a location are still unknown. Keeping these concerns in mind, we attempted to collect pertinent data directly from

farmers in 4 districts of Telangana state. The observations and results are not startling but gave a deep insight about the role of various seed sectors in those districts.

The agricultural scenario of Telangana state has been revolutionized after successful irrigation projects and mission Kakatiya as the water availability had been improved by manifolds. Thus, area and productivity under both field crops like paddy & maize and commercial crops like cotton & vegetables have increased. Thus, the seed replacement rate (SRR) and need for quality seeds of such crops also increased significantly [7]. Evidently, resource rich farmers depend upon formal seed sectors like private seed companies while resource poor farmers depend upon formal sources like subsidy seeds distributed through department of agriculture (DoA) and incidentally, informal seed sources like farm saved seeds.

The results lucidly depicted that farmers depend more (100%) upon formal systems for commercial crops like cotton and maize while 70 to 100% paddy seed comes from formal system and 60 to 75 % high volume low value seeds like redgram as shown in Tables 1 & 2. It is deduced from the personal discussions with farmers that quality of seed supplied by formal sectors is very high in terms of germination percent as well as health (Table 3). In crops like cotton and in the regimes of Bt Cotton, every seed is valuable and so, farmers expect to have healthy seedlings / crop stand from all the used for sowing purposes. The investment on land preparation, fertilizer management and drip irrigation installations, pest management would be at stake if even few of the seeds turn out to be unhealthy and less performing. Farmers have been usually using 450 g of Bt Cotton seeds for sowing in one acre of land to get economical crop stand and subsequent yields. Incidentally, almost 100% of Bt Cotton seed is produced and marketed by private seed companies which are both MNCs and national seed companies. Since there is no subsidy component in Bt cotton or hybrid cotton seed supply, there is no role of DoA or State Agricultural Universities (SAU).

In case of maize, farmers have been sowing hybrids which are either short duration hybrids for dryland and rainfed areas as well as full season hybrids for irrigated regions. Though the entire quantity moving in the market are researched and produced by private seed companies, a considerable proportion (14 to

55%) is being marketed through DoA subsidy sales. Evidentially, there is no role of other formal or informal sources like SAU, Cooperatives, farm saved seeds etc.

The area under paddy cultivation has been increasing in these districts of Telangana because of various developmental activities like major irrigation projects on river Godavari & Krishna, mission Kakatiya and also, power subsidy to farmers. Paddy is grown both in Kharif and Rabi seasons and the varieties adopted are different in terms of duration, grain quality and photoperiod requirements. Despite the availability of hybrids, the cultivation of hybrids is very meagre and almost all the area is under high yielding varieties. The erstwhile ANGRAU and present PJTSAU have been exceling in the rice research and have come out with very valuable HYVs. However, private sector has come with innovations and reduced the seed rate from usual 30 kg/ac to 8 kg/ac which resulted in huge savings in farmer's investments on seed cost. Our survey deduced characteristic and almost equivalent contribution of both public sector (SAU, DoA) and private companies towards the supply of quality paddy seeds to the farmer. It was also observed that resource farmers of Karimnagar district save seeds of traditional varieties to a larger extent.

Red gram is one of the rainfed crops of Telangana state and it is also one of the most remunerative crops for resource poor farmers. SAU and ICRISAT have contributed very high yielding and disease resistant red gram varieties of various crop duration and plant height which enable them to fit in mixed cropping, intensive cropping as well as sole cropping systems. Farmers usually (upto 40%) save good quality seed from previous cropping season and use the same in subsequent seasons. Interestingly, the role of private seed companies is high (20 to 70%) because farmers started believing that quality and productivity of seeds supplied by private firms is high while SAU & DoA have been

failing in supplying required quantities and field establishment is very low. However, most of the resource poor farmers look forward public sector organizations like SAU and National Seeds Corporation (NSC) / State Seed Development Corporations (SSDC) because these agencies produce and supply seeds of those varieties which are tested across the regions for both agro-climatic conditions, soils and market preferences etc.

Our study also elucidated the differential roles of seed systems in these 4 districts of Telangana like in Nalgonda district, which is rich in irrigation sources and fertile lands, major crops grown are paddy, cotton, red gram, sugarcane. Paddy is dominantly grown in this area, as there is availability of plenty of water under left canal of Nagarjunasagar project. The role of formal seed supply system (Private companies) is dominant in cotton and almost 100% of Cotton grown is Bt-Cotton. The role of formal seed supply system consisting the public sector institutions like Krishi Vignana Kendras (KVKs), state and national government agencies. However, the trend observed in Nalgonda district is that the share of formal seed supply systems is 100% in cotton, 90% in paddy while 10% of paddy area farmers are using their own seed material for raising next crop (Informal system).

Observations in Karimnagar district in which the major crops grown are paddy, cotton, maize, red gram, sesamum and vegetables are interesting and intriguing. Public sector institutions like DoA, SAU & Co-operative societies have been playing major role in supply of quality seed of Paddy. Whereas the role of Private companies is predominant in Cotton and entire Cotton area is under cultivation of Bt-Cotton hybrids. Framers usually use farm-saved seed for raising the next generation crop in case of redgram and sesamum. The share of formal seed supply system is 100% in paddy, cotton, maize and vegetables whereas the share of informal system is predominant in crops like redgram, greengram, sesamum.

Table 1. Contribution of seed supply systems in various crops in Telangana state

District	Paddy		Maize		Cotton		Red Gram	
	Formal	Informal	Formal	Informal	Formal	Informal	Formal	Informal
Mahbubnagar	100	0	100	0	100	0	75	25
Karimnagar	70	30	100	0	100	0	72	28
Nalgonda	97	3	100	0	100	0	75	25
Warangal	100	0	100	0	100	0	60	40

Table 2. Distribution of seeds by various seed sources

Seed source	Paddy				Red gram				Cotton				Maize			
	MBNR	KNR	NLG	WGL	MBNR	KNR	NLG	WGL	MBNR	KNR	NLG	WGL	MBNR	KNR	NLG	WGL
SAUs	0	0	0	25	0	0	5	40	0	0	0	0	0	0	0	0
State dept.	46	51	32	16	11	28	0	0	0	0	0	0	46	14	55	27
Gol	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Co-operatives	0	2	3	16	4	0	0	0	0	0	5	0	0	0	0	0
Private companies	54	17	60	43	60	44	70	20	100	100	95	100	54	86	45	73
Owned field	0	30	3	0	21	28	25	40	0	0	0	0	0	0	0	0
Peer farmers	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

Table 3. Quality assay of seeds of various sources

District	Crop	Moisture content (%)	Physical purity				Seed health (dry seed examination) diseased seeds (%)	Germ (%)	Seedlings with primary infection (%)
			Pure seed (%)	Inert matter (%)	Weed seeds (no.)	Other crop seeds (no.)			
Mahabnagar	Cotton	10	100	0	0	0	0	98.33	3.43
	Paddy	11.13	93.5	6.5	0	0	0	88.75	2
	Red gram	8.56	92.89	4	0	0	0	96.33	1.78
	Maize	11.67	98.67	0	0	0	5	91.33	6.55
Karimnagar	Cotton	10.5	100	0	0	0	2	95	5.22
	Paddy	10.24	94.3	2.5	0	0	0	82.52	2
	Red gram	9	95.89	3	0	0	6	76.93	6.78
	Maize	11.67	85.67	0	0	0	0	86.24	5.33
Nalgonda	Cotton	10	100	0	0	0	4	94.84	2.4
	Paddy	11.13	93.5	6.5	0	0	0	88.75	2
	Red gram	8.56	87.89	6	0	0	6	82.42	4.78
	Maize	10.64	98.5	0	0	0	0	96.21	5.65
Warangal	Cotton	10	100	0	0	0	0	95.33	0
	Paddy	11.13	98.5	1.5	0	0	0	86.84	0
	Red gram	8.56	92.89	1	0	0	0	91.21	4.64
	Maize	11.02	98.5	0	0	0	2	95.56	6.24

Warangal district is one of the most progressive districts in Telangana pertaining to Agriculture and a diversity was observed in terms of crops grown like paddy, cotton, maize, groundnut, turmeric and vegetables like chillies, ridge gourd, beans, okra, tomato etc. The private seed industry is playing major role in crops like cotton, vegetables, maize while public institutions like Co-operative societies are playing major role in crops like paddy, pulses. The share of formal seed supply system is 100% in crops like cotton, vegetables, and paddy while the share of informal system is 100% in turmeric.

During our survey, the most striking revelation of farmers we got to know is their concern for seed health which is grossly neglected at all levels. Farmers want vigorous as well as healthy seedlings and crop stand. Hence, we studied all seed quality parameters like physical purity, germinability while our focus was more on seed health which was done both physical verifications as well as microscopic studies to know the microbial complexes on young seedlings under controlled conditions. Such studies help us to understand and appreciate the per seed value of a seed packet bought by farmers from a source. Besides, farmers can be advised with suitable seed treatments and soil management practices viz., adding microbial consortia for combating both soil and seed borne inocula etc. Observations of seed quality and health parameters taken in various crops revealed that seed moisture affects the seed health and Seedlings with primary infection (%) which infers that seeds should be dried to safest seed moisture content (SMC) before packaging. And also, the seedlots with high inert matter showed high primary infection and low germination. It's a perceivable quality control measure wherein seedlots are cleaned properly, dried to lowest possible SMC, packed in an impermeable packets for achieving maximum vigorous seedlings [8].

During our study, many farmers opined that they look forward major contributions from public sector institutions like SAUs and seed corporations because of proven cultivars, better seed quality and also affordable prices. It is clearly understood that both formal and informal seed systems have equivalent effective role in serving farmers. With five-year plans, it was planned to strengthen Indian seed systems through public sector while private sectors were encouraged with new seed policy 1988. However, all the seed systems are equally

regulated by Indian Seeds Acts 1966 and Indian Seed Order 1983 which had been amended and enriched in due course of time. Thus, India have achieved a poised and strong position in providing quality seeds to farmers which ensures their productivity and profitability.

4. CONCLUSION

The present Indian seed scenario clearly shows that private sector started playing significant role for last few years and their number has crossed thousands which includes MNC, National companies, small local seed suppliers to unregistered night fliers etc. Main focus of these companies had been high value low volume seeds while public sector companies including NSC, SSCs, DoA, SAUs etc has been marketing low value high volume seeds of cereals, pulses and oilseeds. Private sector companies have significant place mainly in the case of maize, sunflower, cotton, vegetables & flowers. Though, private companies started dominating paddy seed sales, but its enthusiasm about entering into seed production of high-volume low margin crops of wheat, paddy, other cereals, oilseeds and pulses is very low.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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