

Seed systems in millets

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Seed system is one of the most vital components of agricultural system that involves activities associated with seed production, multiplication, processing and marketing to ultimate use of seed by farmers. The right mix of formal and informal supply channels, market and non-market activities, and a well-functioning seed system is used to stimulate and effectively meet the changing demand of farmers for high-quality seeds. The process of seeding is a complex one, involving many factors that need to be considered in an integrated manner to ensure successful implementation of this process. Seed system is an integral part that has been identified to enhance the quality of seeds, to provide a source for the production of a wide range of crops, and to increase the yield. This article briefly discusses the various seed systems in millets.

Keywords: Millets, Seed, Seed systems

UNDERSTANDING seed systems is essential for maintaining crop biodiversity on farms in areas where it has societal relevance for future crop improvement and the resilience of the farming system as well as personal benefit to farmers. In general, seed system is mainly of two types, formal seed system and informal seed system. Considering inability of these two systems to meet seed needs to diverse groups and farming systems, recently, integrated seed system has emerged in the literature as a complementary system to make the seed system more holistic and pluralistic. Formal seed systems are easier to characterize as they are deliberately constructed, involving a chain of activities leading to clear products, i.e. certified seed of verified varieties. The chain usually starts with plant breeding and selection, resulting in different varieties, hybrid parents including hybrids and materials leading to formal cultivar release and maintenance. In practice, these systems may be constrained by their capacity to meet the diverse needs of farmers in developing countries. The guiding principles in the formal system are maintenance of varietal identity and genetic purity coupled with production of seed that possesses optimal physical, physiological and sanitary qualities.

The central premise of the formal system is that there is a clear distinction between seed and grain. This distinction is less clear in informal seed systems.

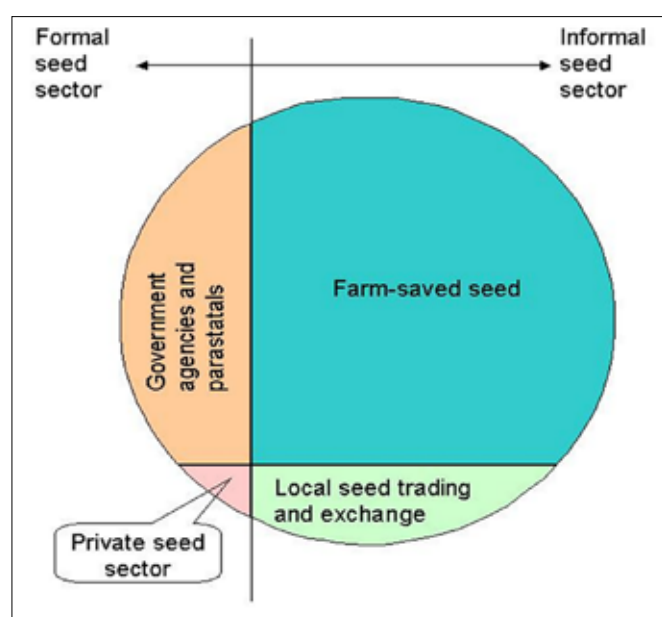
Informal systems are also referred to as local, traditional or farmer seed systems. In an informal seed system, farmers themselves produce, disseminate and access seed directly from their own harvest, through exchange and barter among friends, neighbours and relatives, and through local grain markets. Encompassing a wide range of variations, local systems are characterized by their flexibility. The varieties disseminated may be landraces or mixed races and may be heterogeneous. In addition, the seed is of variable quality in terms of purity and physical, and physiological parameters. While some farmers treat seed specially, there is not always a distinction between seed and grain.

Seed sources for informal and formal seed systems

Seed systems in dryland ecosystems are basically influenced by their pace of seed replacement, seed-to grain price ratios, distance to seed sources and the quantity of seed traded by formal and informal means. Both systems have their own limitations in which farmers procure seed by different sources depending on the situation and location.

Usually formal channels for seed transactions encompass traders in the district market yards, seed exchanges through private dealers and distributors, and seeds marketed by private companies, which are branded, the transactions are monetized, and those

engaged in the business are usually full-time traders. In contrast, in informal system, traders operating in weekly village markets, are part-time traders and seeds traded here are not branded, since they originate from farmers from surrounding villages or communities. To some extent, the seeds are identified by their village name or, in some cases, for e.g. by the farmer's name (if the farmer is reputed in the locality for the quality of seeds). The seed exchanges are monetized but the prices are not based on the existing market prices, nor are they fixed, they vary according to the demand and quality (physical purity) of the seeds. Seed dealers/distributors in the formal seed supply chain are a vital link between the formal seed producing firms and farming communities.



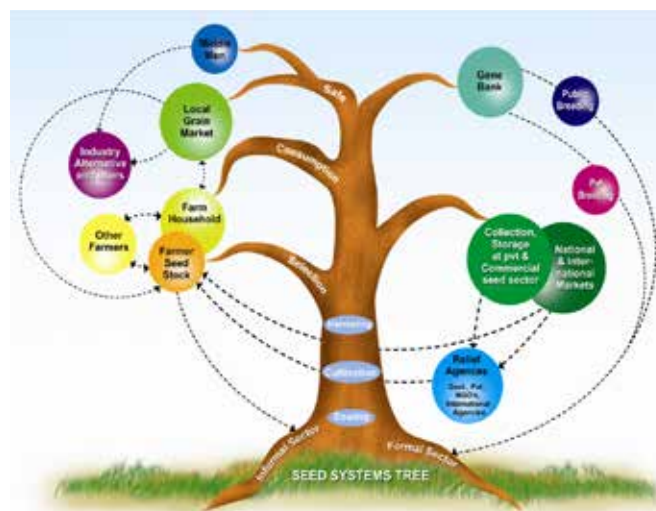
Traditional seed supply scenario of millets in dry land ecosystems

Integrated seed systems

The analysis of strengths and weaknesses of local seed systems leads to the conclusion that local seed systems and the formal system are complementary, hence integrated seed systems come into play. An integrated seed system (ISS) can be defined as a system to produce near quality seeds of a specific variety by adopting some specific parameters of formal systems to improve production of quality seeds informally. In this system, the approach towards seed production of improved varieties is through farmers associations/SHGs/FPOs where the formal methods of seed production process, government procedures for seed production and certification process are not adopted completely.

Sorghum seed system

Sorghum seed system is very unique in the country with contrasting situations and systems. Hybrids are the cultivar choice in *kharif* (rainy season) sorghum, and hybrid adoption by farmers is up to 95% in states like Maharashtra though there are wide variations in adoption across the states in India. The public and private sector seed companies develop hybrids and rule the market. The seed requirement is predominantly met



Farmers seed sources from formal and informal systems and seed flow from formal to informal channels.

by the vibrant formal seed system by private sector seed companies and public sector seed agencies like National Seeds Corporation (NSC) and state seed development corporations in different states and Mahabeej in Maharashtra. In the case of post-rainy season sorghum cultivated on black soils under residual moisture condition, open-pollinated varieties are the cultivar choice because of stringent quality considerations, lack of appropriate hybrids, inadequate hybrid seed production, and supply chain.

High-yielding and improved cultivar seed availability is not a constraint in *kharif* sorghum, but the major issue in post-rainy season sorghum in India is that majority varieties are age old and still ruling the major area under cultivation. Most notable local varieties popular among the farmers include M 35-1 (Maldandi) and Dagadi grown by 80–90% of farmers in India. M 35-1, a landrace selection from Maldandi, cultivated traditionally by the farmers in these areas for several decades, was selected in 1938, nearly 75 years ago, and is still dominating the post-rainy season tracts (Maharashtra, Karnataka and Andhra Pradesh) in India.

Pearl millet seed system

Pearl millet seed system in India is dominated by formal seed system. More than 90% seed share is by private seed companies which mainly includes hybrids. Role of public sector is minimum. The low-income farmers, located mostly in water-scarce areas such as western Rajasthan, largely rain-dependent grow open pollinated varieties (OPVs) in the rainy season. Certain sections also have strong taste preference for OPV seed use. About 80% farmers purchase and re-use OPV seeds, as hybrids are unsuitable in water-scarce regions. Nevertheless, 20% farmers still use hybrids decision drivers.

Small millet seed system

Small millet seed system is mainly dominated by informal sector (>90%) (Table 1). In India, among millet crops, the seed replacement rate (SRR) is highest in

pearl millet (60%) followed by sorghum (30%) and small millets (25–30%).

Table 1. Share of seed systems in millets

Crop	Area (Mha)	Seed systems	Seed share
Sorghum			
Kharif - grain	2.6	Formal	95%
Rabi - grain	4.8	Informal	85%
Forage	3.0	Formal	90%
Pearl millet			
Grain	7.6	Formal	70%
Forage	0.9	Formal	70%
Ragi (finger millet)	1.2	Informal	>90%
Other millets	0.7	Informal	>95%

Mha; Million hectares.

Approaches for sustainable seed system

Important issues providing way forward for sustainable seed value chain to meet the demand of improved variety seed of post-rainy sorghum in India are:

Seed mission: This involves developing and implementing rain-fed agriculture seed mission with a built-in mechanism of supporting the cost of seed production for five years by the government by adopting public-private partnership with effective coordination

and convergence mechanisms.

Seed production: Promoting contract seed production program by advance indenting of the seed of specific improved cultivars to both public and private sector seed companies including KVKs and community-based organizations with technical support and capacity building program for production of quality seed is essential to make seed production effective.

SUMMARY

In order to improve production of millets and nurture a sustainable seed production system, strengthening and improving the overall efficiency of the millet seed systems is essential, including both formal and informal channels. The system should increase seed availability to farmers at lesser cost, preserve crop diversity and promote locally-adapted varieties. An enabling policy environment will help in production and dissemination of improved variety seed of rain-fed crops. Provision of funds and support for seed multiplication and dissemination activities for at least five years will make it self-sustaining. Strengthening extension services for creating awareness and demonstration of rain-fed agricultural technologies is required.

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