Book Chapter

Opportunities for Quality Seed Production and Diffusion through Integration of the Informal Systems in Sub-Saharan Africa

Munyiri SW*

Chuka University, Kenya

***Corresponding Author:** Munyiri SW, Chuka University, P.O. Box 109-60400, Chuka, Kenya

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Abstract

In perpetuating the preferred crop species, seed is exchanged among family members, neighboring communities or between tribes and regions according to customs and practices in many African traditions. Overtime, this form of seed sharing and trade formed the basis of the informal seed system also referred to as the farmer-based system or the traditional system. The majority of farmers in sub-Saharan Africa (SSA) are resource-poor and operate under myriad of constraints including technological,

social, infrastructural and cultural limitations thus are mostly unable to access and source recommended quality crop seeds from the existing formal seed systems. Such seeds are pricey and their distribution channels are geographically limited in SSA. These challenges have partly resulted to the growth and persistence of the informal seed sector in the region. Crops established using poor quality seed lead to low yields and poor quality products. Most of the seeds exchanged in the informal sector do not meet the desired quality recommendations and these setbacks have been attributed to low crop production, disease and pest spread across farms and regions. While it is recognized that the informal sector is key in SSA, the challenge in enforcing quality has not been fully addressed to date. Further, due to overreliance on the formal sector for innovation dissemination, there is slow diffusion of new superior improved seeds. Seed is the most easily adopted innovation for improving agricultural productivity and ensuring food security. Essentially, all other agronomic efforts only enhance the inherent capability of a good seed, thus for greater yields, its quality must be unquestionable. The relative importance of the formal and informal seed suppliers is determined in part by biological and technical factors associated with seed production, multiplication, processing and distribution. The development of the formal seed system alone cannot solve the severe lack of quality planting materials in developing countries especially in SSA where perpetual food insufficiency is the norm. Enhancing the informal seed supply systems in the region could partly be achieved through gradual technical supported integration of the two seed systems and exploiting their synergy benefit at community levels. This review is premised on published work and has attempted to examine existing opportunities for enhancing quality seed production and distribution through integration of the two major systems.

Keywords

Diffusion, Formal, Informal, Integration, Seeds, Traditional

Introduction

Since crop domestication, seed has been saved and passed on from one season's harvest to the next crop's planting. and Sperling [1] singled out seed as the most appropriate medium linked to promoting productivity, nutrition and resilience in farming communities. Seed plays a critical role in increasing agricultural productivity because it determines the upper limit of crop yields and the productivity of all other agricultural inputs to the farming system [2,3]. A well-functioning seed system has been defined as one that uses the appropriate combination of formal, informal, market and non-market channels to efficiently meet farmers' demand for quality seeds [4]. Such a mixed system would be fundamentally appropriate for Africa where farming ranges from poorly capitalized subsistence to complicated large scale commercial farms. Good quality seed remains an integral part of any meaningful agricultural development [5]. In the global context of food security, seed gives the highest monetary returns of any agricultural investment and is the basic input in agriculture [6] thus a worthy deal for any farmer. Most countries in SSA are agricultural-based economies and seed being the medium carrier of new innovation benefits justifies attention by all agricultural stakeholders in both the public and private sectors.

Unfortunately, the recommended quality seed for many crops is fairly costly and out of reach for many resource-poor farmers in SSA region. This predicament has led to many farmers opting to source crucial crop seeds from the informal (traditional) sector which includes farm-saved among other uncertified unregulated sources at community level. Unregulated seed exchange for crop establishment can have unintended consequences, including the propagation of crop diseases, and other economic pests; however, it still remains a major mode of dissemination of innovations [7]. Efforts should, therefore, be made to ameliorate farmers' situations in sourcing quality seeds at cost-friendly prices from easily accessible sources. For instance, in Kenya, the African Seed Access Index (TASAI) is one of the entities that seeks to encourage public policy makers and development agencies of the need to create and maintain enabling

environments that enhances the development of competitive seed systems serving smallholder farmers who are mostly poorly resourced [8]. A competitive seed sector should ensure timely availability of high quality seeds of improved and appropriate varieties at affordable prices to all farmers. Both the public and private sectors (formal seed system) cannot fulfill the entire seed needs of farmers, especially for smallholders located in remote areas in developing countries in SSA who have little purchasing power [9,10]. The informal seed sector can, therefore, bridge the gap and contribute to supply of quality seeds should it be accorded the necessary technical and financial support. In their report, McGuire and Sperling [1] noted that there was need to address the imbalance in seed channels so as to focus attention to the main seed systems that smallholder farmers mostly use including several informal channels in developing countries. In SSA, it is evident that the informal (traditional) system deserves such attention towards improved agricultural productivity.

Support for the informal sector could be channeled using several efforts including participatory seed production activities supported by breeders within national agricultural research systems (NARs) frameworks and other technical networks. Such arrangements would be easily workable and successful in self-pollinating, open-pollinating and vegetatively-propagated crop varieties because farmers can safely save seeds for several seasons without any significant trade-off in anticipated yield benefits. Some extra benefits that could be accrued in such public sector seed production arrangement include the identification of most pressing seed sourcing constraints and the most ideal and preferred solution from the farmers' perspective. It remains imperative for national governments and policymakers as part of a social duty to invest in breeding research and cultivar development of traditional open-pollinated cultivars and in the minor and so-called ''forgotten'' crop species [11]. In such endeavors, it is essential to have goodwill from the public sector through funding and strengthening breeding activities.

Tripp [12] reported that whenever a new variety solved a particular production constraint that was well known to farmers,

its likelihood for adoption was enhanced since the farmers were aware and easily recognized such a variety's advantage. Almekinders *et al.* [13] similarly reported that seeds normally moved more rapidly through the traditional exchange systems. FAO-assisted seed programs in Africa have demonstrated that a community seed program fulfill an important role by creating a link between traditional farmer seed management and commercial seed production [9]. Seed being the most cost effective carrier of superior innovations presents a great opportunity for improving agricultural productivity through availing quality seeds within the informal (traditional) sector systems that provide the bulk of most crop seeds planted in Africa [14]. This is especially because the agricultural sector in SSA is still evolving at a different pace in each country and is yet to reach the point where commercial seed production and marketing are the norm for all seeds as elaborated in Maredia and Howard [4], and the use of improved seeds is still low.

A well-functioning seed system is one that will be able to use the appropriate combination of formal, informal, market and non-market channels to efficiently meet farmers' demand for quality seeds, thus the need to integrate the two systems. It is important to build linkages between formal and informal sectors at each functional level e.g., research and development, seed production in facilitating integration [3,14]. To achieve such a milestone, the public/private sector, development agents and other stakeholders need to support small-scale seed enterprises formation, then capacity-build farmers on quality seed production, small seed enterprises management, proper planning to satisfy the available market and effective seed distribution [4,6,10]. The objective of this review is to build a case for the integration of the informal and formal seed systems in support of quality seed production and diffusion in SSA.

Current Seed Access State of Affairs

It has been documented that the number of farmers in (SSA) who purchase high yielding superior seed varieties from formal institutions including private seed companies and parastatal organizations range from 5-10 % only, and this small percentage

primarily constitute the high in-come farmers [6]. Almekinders and Louwaars [15] and FAO [16] additionally reported that over 90% of the crops in developing countries were mostly planted with farmers' varieties and farm-saved seed. Most recent data from across six countries in Africa covering over 40 crop species indicated that farmers accessed 90.2 % of their seed from informal systems with 50.9 % of that coming from local markets [1,4]. Over 55% of these informal seeds are sourced by small scale farmers and transacted through cash payments, an indication of the enormous commercial and economic worth of this sector in the region. Unfortunately, this highly important traditional seed sector has not been receiving the much needed support from the public and private sectors and other agricultural development institutions. The low crop productivity in SSA region is indicative of the fact that the currently supported commercial formal seed enterprises have not provided options attractive for poorest farmers as to significantly improve their crop production. McGuire and Sperling [17] recommended that resilient seed systems need to be framed around promoting more integrated systems by linking formal and informal seed sectors which give more stability and better production gains.

Informal Sector Seeds

Though locally produced at community level, informal sector seeds are said to undergo some basic form of farmer selection, cleaning, conditioning, and preservation before being shared in open markets, between relatives or used in the same farms [6]. This begs the question; how can the formal seed sectors (both private and public sector) get involved in these seed production processes towards improving and ensuring that the informal sector produces seed that meets the quality specifications? This is a pertinent question especially because it is challenging to convince majority of SSA small scale farmers to pay a premium price for quality seed even from the informal sector enterprises while they can easily replant their own seed from previous harvests for most subsistence crops [10]. Such observations should drive the need for public and private agricultural sector stakeholders to formulate viable means of promoting quality in the informal seed sector enterprises. Almekinders and Louwaar

[14] reported that linking the formal and informal (farmers') seed systems and improving the latter may in many cases be a more effective strategy to improve national and local seed supply than aiming only at improving the infrastructure and investment climate for the formal (private and public) seed sectors.

Seed Supply Challenge

The distinction between seed and grain is important in agriculture. A seed is strictly an embryo meant for planting for reproduction purposes. When the seed is scientifically produced under seed certification, it is distinctly superior in terms of seed quality (the improved variety, varietal purity, freedom from admixtures of weeds and other crop seeds, seed health, high germination and vigor, seed treatment and safe moisture content etc). The source of seed for multiplication remains an important aspect of maintaining seed purity for enhancing yield of any crops [18]. Much of the seed exchanged within the informal sector at community level could be classified as grain and not seed per se since the aspects of quality is never considered during the crop's growth to harvesting and distribution. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20% depending upon the crop variety and it can be raised up to 45% with efficient management of other inputs [5].

Agricultural productivity in SSA is continuously on the decline and this has had a direct effect on food security, ultimately impacting on the health, nutrition and welfare of many rural families and especially women and children residing in the rural areas [6]. Farmers all over the world depend on access to good quality seed, which is fundamental to their crop production systems, yet developing countries still face difficulties in accessing quality seed of the varieties that they desire. Certified seed production for subsistence crop species which forms a major livelihood source for most SSA smallholder farmers are neglected and this continues to have a negative impact on food security [19]. The importance of good quality seed is fundamental to crop production systems and cannot be overemphasized [16]. The source of a crop seed is the most

important aspect of maintaining seed purity and must be highly guarded in terms of necessary production controls [18]. While research is important for cultivar development [11], it is equally important to put in place sustainable quality seed provision systems for subsistence farmers in Africa who form the bulk of the agricultural population.

For quality crop seed provision, only very few select non-governmental organizations (NGOs) and donors have put emphasis on the need to support locally-driven initiatives and particularly those regarded as informal, farmer-based, local or traditional seed sector operations [20,21]. In contrast, major organizations in SSA are more focused in investing resources in private sector seed business development towards the promotion of private commercial seed and formal sector input companies [6]. This is because private seed companies are usually in the business of manipulating genes through conventional breeding or biotechnological approaches solely for the purpose of improving plant cultivar performance for a profit [11]. While this approach is highly logical for several crops and specifically more beneficial for cross pollinated hybrid species such as maize, it leaves out the majority of the subsistence crop species such as grain legumes, root crops, and vegetatively propagated crop species, yet these subsistence crops form the backbone for food security in most SSA countries.

There has been expansion of breeding programs and dissemination of improved seeds through fairly well funded public sector programs in SSA since the post-colonial era period, but the informal sector has successfully 'resisted death' and remained active and resilient, supplying the largest bulk of seeds to many farmers in the world [3,14]. While this sector continues to supply these much needed seeds, it continues to face several challenges including low technical advice on quality seed production, harvesting and storage practices. This predicament limits the sector's impact on crop production benefits as envisaged since the basic seed multiplication procedures are not followed which often leads to loss of any initial genetic purity and quality along the production process. For example, maize hybrid seeds, re-sowing the harvested seeds halves the heterosis

factor (hybrid advantage) in each future replanting generation. The implication is that maize farmers have to keep sourcing every season's planting seeds from the formal sector for sustained hybrid production benefits. This makes hybrid seed production very lucrative for private seed companies. However, more public sector breeders are needed to select and produce non-hybrid cultivars of other minor and subsistence crop species. There is, therefore, need for a comprehensive seed system that adequately meets all the farmers' demand for quality seeds in SSA region. Maintenance of vigorous public sector breeding programs in areas where private companies are not interested in providing the low profit crop cultivars is highly desirable [11]. Such endeavors can be achieved through participatory plant breeding (PPB) initiatives. Through PPB, breeders and farmers share their knowledge and skills in order to develop varieties or breeding strategies together. The PPB system allows farmers to grow crops in their own fields and make local selection in close collaboration with the breeder [22]. The approach represents a paradigm shift from a research approach focused solely on the development of "high-yielding varieties", irrespective of the social context in which these varieties are to be used, towards the development of varieties, seed and their dissemination within a multi-stakeholder framework [23]. This approach differs with that of the formal private sector which is solely in the seed business for profit gains.

Formal Sector limitation

Aiming for a formal seed sector that supply 100% of the seed for planting is only realistic for a small number of crops and in very few countries [14]. In the formal sector, the most traded seeds are those of cross-pollinated crops such as maize or vegetable F_1 hybrids because old seeds of such crop species cannot be replanted due to loss in hybrid vigor advantage (Allard, 1960; [18]). Because farmers can replant old seeds of self-pollinating crops and vegetatively propagated materials without significant trade off in yield; most poorly-resourced farmers in SSA hardly buy new seed of such crops as certified stock from the formal sectors. To remain in business, therefore, seed companies usually focus on seed of high-value crops such as hybrid cereals and

vegetables and only to a very small extent do they produce self-pollinating or vegetatively propagated seed materials [9]. In most cases, national agricultural systems (NARs) are the only supplier of quality seeds of these low profit seed that are usually shunned by the formal sectors. Unfortunately, most NARs are under limited funding from their governments owing to budget constraints. It therefore, implies that the supply of quality seed of such crops cannot be fully satisfied by NARs and ultimately the seed supply gap has continued to be bridged through the traditional local seed exchange systems (informal sector). Unfortunately, farmers in SSA and other developing countries can only access quality seed of the varieties that they desire through a viable seed supply system able to supply all types of seed stock [16]. The informal system cannot, therefore, be wished away and needs to be supported as it bridges the seed supply gap not met by the formal sector. It is clear that the formal and informal seed systems focus on different crop species and varieties and serve different stakeholders, both should be supported to grow technically in such a way as to complement each other for improving agricultural productivity in SSA [6].

In some rare cases, the informal sector is involved in such marginal profit-earning crop seeds production and especially legumes. In such cases the private companies use contracted growers whom they pay a premium price for seed lots produced that meet the required quality standards based upon the regular market grain price [9,16]. Such seed production contractual arrangements are done under the regulatory quality control schemes where the regulating agencies monitor the seed crops in the field through to processing, storage and distribution. Due to the certification costs involved, the formal sector still considers these contractual arrangements unattractive, profit consuming and thus unfavorable. Many private seed companies shy away from such ventures that are considered to be of low profit margins inevitably leaving the supply gap to be filled by the informal supply systems.

Why Promote the Informal Seed Sector?

Agriculture is the most critical source of livelihood and a key pathway out of poverty in many countries in SSA and undoubtedly, the majority of novel innovations are best economically passed on to the farmer end-user through seed. By using good quality seeds of adapted varieties and hybrids, potential benefits can be of great value. The availability of such quality seeds to farmers can help increase productivity; reduce risks from pests, drought and disease pressure, and increase incomes [6]. Seed production, distribution and sale is a business like any other the notable difference being that seed business deals with live stock (dormant embryo). Seed production and distribution must thus be done in a regulated process so as to ensure maintenance of high genetic purity and quality at all times for maximum intended benefits to the farmer. Unfortunately, neither the public sector nor the private sector has an effective seed production and delivery strategy able to provide seed of improved cultivars, particularly to small-scale farmers living in less favorable remote isolated regions of Africa [24]. Thus, most subsistence crop production in SSA is based on the less regulated informal seed systems. Therefore, it is paramount for African governments (public sector) and other stake holders to give attention and the necessary support to the informal system towards its improvement. Such inputs should firstly focus on technological aid in producing good quality seeds, estimating quantity and market needs, financial support and infrastructure improvement among other regional or crop species-based needs since challenges vary between regions and crop varieties too. Almekinders and Louwaars [14] emphasized that the importance of farmers' seed systems merits that closer attention be paid to farmers' seed production and seed exchange at the policy level and in technical assistance projects.

In ideal situations, producers need to have capacity to start and sustain breeding programs, multiply, store, preserve, and distribute seeds [16]. In countries where seed production regulating systems are well developed and entrenched in law, registered seed companies work with the regulating agencies throughout the entire seed production chain including marketing

so as to ensure quality. In the formal sector, this ensures that seed quality controls are enforced and farmers access seeds that are as close as possible to the original stock released by the breeder. Because these quality control requirements are a costly technological undertaking, registered seed companies cushion themselves by passing over the high cost of quality seed production to the consumer through setting premium prices on their products. It therefore, means that while hybrid seed will always yield better than traditional seed of the same species, it will always be 'costly', and out of reach for most resource-poor SSA farmers. In a report by CABI [25] entitled 'Good Seed Initiative', the major issues found to be limiting large scale uptake of hybrid/improved varieties by poor and small-scale farmers included; limited distribution systems targeting small-scale farmers in remote and marginal areas, farmers poor farming practices which do not allow the full benefits to be expressed, farmers' inability and unwillingness to pay for seed every planting season, as well as other inputs needed to take advantage of improved varieties. In Africa and more so in SSA region, outside of hybrid maize and vegetable seeds, it remains difficult to make any successful business case for pure private sector investment in other seed types [10]. This underpins the dire need for support and development of the informal seed sector to effectively cater for other seed crop needs. McGuire and Sperling [1] advised that more actions from agricultural stakeholders are necessary for promoting greater formal and informal seed systems integration and effectiveness. Both the public and the private sectors need to appreciate the informal sector's importance and not see it as a competitor but as a necessary tool for agricultural productivity support until such a time as when SSA farmers will attain a good enough economic empowerment as to source most of their seeds from the well regulated formal sector [1]. The best bet for support and development of the informal seed sector would be by starting integration of the two systems.

Seed Systems Integration, Variety Diffusion

The diffusion of many modern crop varieties has been reported to be very slow, while some new seed varieties may go

unadopted at all. Much of the blame has been apportioned to inappropriate breeding programs, uninspired extension workforce, high seed costs, poor distribution channels and unappreciative farmers [12]. More importantly, the dependence of seed diffusion on only the formal sector while the informal sector in rural Africa is more vibrant has contributed to the slow process. The sluggish diffusion of new improved varieties remains an indication that both the formal and informal seed systems are facing challenges in executing their purposes. FAO [26] and Mgonja [6] acknowledged that the challenges facing "the seed systems" are in almost all nodes of the seed value chain and these are experienced by both the commercial farmers who rely mostly on formal systems albeit on a small scale, and by small scale farmer who are more reliant on the informal system. The formal sector faces challenges in reaching far flung remote areas while the informal sector experience financial and technical support challenges among others needs such as lengthy variety registration procedures [9]. A seed system and small holder farmers report by McGuire and Sperling [1] hypothesized that new varieties would not move/diffuse quickly or, would only do so at a very low scale until more impact oriented seed systems received combined research and development attention. Promotion and up scaling of the current informal sector thus qualifies for such a system and could contribute to bridging the dissemination gap of new improved varieties.

A widely recognized problem in many SSA countries is the lengthy time period between the initial identification of new varieties and their eventual release and commercialization. This long period which ultimately delays adoption, means that farmers fail to enjoy the breeder's intended benefits in good time. This lag time could be reduced through the involvement of farmers and community-based seed production systems right from the inception of the breeding program through participatory plant breeding to seed production initiatives after the variety is released. Mgonja *et al.* [21], reported that part of the greatest challenges in the diffusion of improved seed across many African countries includes the fact that a new variety must undergoes several years (at least three) of testing before its official release and commercialization. Further, even though a

variety can be released in one country in the same region, a similar process has to be followed in other neighboring countries, despite comparable growing conditions that traverse national boundaries. An unfortunate predicament in the lengthy variety registration procedural delays is that a new released variety may even be 'overtaken by events' when a novel biotic challenge is experienced. Worthy examples include the fairly new maize lethal necrotic (MLN) disease and the fall army worm (FAW) carnages which have both appeared in the SSA as major constraints in the last five years. The aftermath of the appearance of these biotic challenges has meant that recently released and commercialized superior maize varieties which succumbed to the pests are no longer tenable to farmers. This predicament has ultimately sent breeders back to the drawing board in their programs which is a costly venture.

In Africa, new improved variety diffusion or seed distribution is further compounded by the fact that seed regulations are usually adapted from international standards that are often not compatible with the reality of the farmer's cultural seed exchange procedures [1,6]. These rules restrict the free exchange of seed in local market set ups, through relatives, neighbors or friends which have always been the norm. While this is understandably to limit the passage of the many seed-transmitted pests and diseases and maintain quality, it has curtailed innovation dissemination and the growth of the informal seed sector yet it is the same sector that supports subsistence agriculture and contributes most substantially to food security in developing countries. The mandatory certification of seeds discriminates against seeds produced by farmers, who may be subject to civil or criminal sanctions in case of violation of such laws [27]. Farmers need to be better integrated in every aspect of the seed system; as active participants in research, seed release, and diffusion processes since they are vital links in seed production and distribution. This could be achieved either through well coordinated farmer-to-farmer seed exchange networks, as independent seed entrepreneurs producing seed for the local market, and as contract seed producers and informed agent's/seed traders linked with other private and public seed companies [1,4].

Possible Interventions

It is worth noting that the strengths and weaknesses of the two seed systems vary and this may depend on regions. The informal sector however, remains the heart for seed acquisition in Africa yet seed production, diffusion and distribution has primarily focused on strengthening the formal sector [1]. Efforts to exploit the strength of each or identifying any synergies between the two could be utilized to improve provision of good quality seeds to small scale farmers in SSA. While the formal sector has previously been taken as the most ideal seed production and distribution channel, in the recent past many countries have encouraged privatization or commercialization of the public sector seed activities. Moreover, international organizations have faced budget constraints, leading to reduced investment in public-sector breeding and seed production and dissemination enterprises [16]. On the other hand, farmers' traditional systems (informal) are variable in performance; with their effectiveness differing between crops, varieties and farmers. Invariably none of these systems used alone is perfect for developing countries especially in SSA region. Previous reports by Almekinders *et al.* [13] indicated that strengthening the informal seed system by integrating their positive practices with the commercial (formal) systems would increase farmers' use of quality seeds. This would also enable farmers to maintain genetic diversity of their preference and choices *in situ*. Emphasis has been put on the need to conserve biodiversity *in situ*, establish and technically support participatory community seed banks in Africa through participatory efforts in growing and supplying seed because it can enable farmers to be self-reliant by timely provision of seeds when needed (Mgonja [6].

In all these scenarios, the informal and formal sectors have great potential to complement each other. Farmer groups and associations, community-based organizations, and NGOs are able to effectively support seed related activities that ultimately create complementarities between the informal and commercial sector. FAO and ICRISAT [10] outlined that such activities may include grouping farmers so as to lower desired seed costs (economies of scale) and raise extension impact, identification

and early bulking of promising varieties within farming communities, training and quality control on seed production and disease recognition, linking producers to markets for specific varieties and advocating for beneficial regulations within regions.

It has been proved that the preference of one variety by farmer in one region similarly applies in other regions too and that new varieties already diffuse across borders among neighboring farmers despite national regulations [6]. In testing farmers' preferred varieties across regions, the unwanted danger of transporting/transmitting dangerous pests and diseases in the neighboring countries could be eliminated by easing the cross border trade regulations and focusing more on seed testing at farmers' level. For success of such seed trade and exchange, farmers could to be educated on the importance of sharing only stock that have been confirmed as free from dangerous pests and diseases. Because the informal system mainly builds on the local agro-biodiversity, its improvement through borrowing recommended seed technology practices and improvements from the formal sector and using informal channels for seed production and dissemination would be greatly favorable in SSA [10]. These systems could be used to produce certified seeds through the use of formalized and standardized quality control regulations using small scale seed enterprises, and integrating them into seed markets [28]. The linkages of formal systems with farmers' systems strengthen the informal seed system and also enable the formal system to establish collaborative relationship with the farmers' system. In such an integrated system, seed companies would be able to involve smallholders in contract seed production more easily and building trust overtime which is beneficial in seed business [4].

Non-governmental organizations could play an important and intermediary role of linking the formal seed sector and with the farmers. Even though they are not permanent, farmers have firm trust in their activities. Therefore, the role of NGOs should be limited to short term assistance such as season-based financial support in seed production, organizational support and marketing

bearing in mind that they are usually temporary depending on factors beyond a farmer's control.

A successful seed system in SSA, therefore, remains that which will adequately integrate the formal and informal systems and where each of these partners has a role to play in seed production, crop improvement, diffusion and conservation. McGuire and Sperling [1] advised that the best actions from agricultural stakeholders were those that could spearhead processes that would promote formal and informal seed system integration and effectiveness. Such approaches must take opportunity to leverage the relative strengths of both systems.

Conclusion

The importance of both seed systems in the growth and sustenance of agriculture, achievement of food security, and reduction of poverty through the provision of quality seeds cannot be overemphasized in SSA. This calls for concerted efforts between agricultural stake holders in leveraging, up scaling and streamlining the informal (traditional) system into an enterprise that can produce quality seeds that meets the necessary regulatory requirements. Given the attention it deserves, the informal seed system can form a convenient, economical and affordable source of quality seeds and distribution tool in SSA countries. It can also be used as an innovation diffusion and biodiversity conservation tool since local farmers are best placed to conserve own materials in places of best adaptability. For successful integration of the sectors, it is important for SSA countries to revise seed regulations since most are only favorable for the formal sector and discourage farmer-based seed production and distribution.

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