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# Informal Seed Traders: The Backbone of Seed Business and African Smallholder Seed Supply

Louise Sperling <sup>1,\*</sup>, Patrick Gallagher <sup>2</sup> , Shawn McGuire <sup>3</sup> , Julie March <sup>4</sup> and Noel Templer <sup>5</sup> 

<sup>1</sup> Seed System, Sherman, CT 06784, USA

<sup>2</sup> Independent Researcher, Dalton, GA 30720, USA; pgallagher1@gmail.com

<sup>3</sup> Food and Agriculture Organization of the UN, 00153 Rome, Italy; shawn.mcguire@fao.org

<sup>4</sup> United States Agency for International Development (USAID), Washington, DC 20523, USA; jmarch@usaid.gov

<sup>5</sup> Alliance of Bioversity International and CIAT, Nairobi, Kenya; N.Templer@cgiar.org

\* Correspondence: sperling@seedssystem.org; Tel.: +1-860-350-3555

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**Abstract:** To work well and be sustainable, seed systems have to offer a range of crops and varieties of good quality seed and these products have to reach farmers, no matter how remote or poor they may be. Formal seed sector interventions alone are not delivering the crop portfolio or achieving the social and geographic breadth needed, and the paper argues for focus on informal seed channels and particularly on traders who move ‘potential seed’ (informal or local seed) even to high stress areas. This paper provides the first in-depth analysis on potential seed trader types and actions, drawing on data collected on 287 traders working in 10 African countries. The research delves into four themes: the types and hierarchies of traders; the technical ways traders manage seed using 11 core practices; the price differential of +50% of potential (local) seed over grain, and the pivotal roles which traders play in remote and crisis contexts. Traders are the backbone of smallholder seed security and need to be engaged, not ignored, in development and relief efforts. An action framework for leveraging seed trader skills is presented, with the paper addressing possible legal and donor constraints for engaging such market actors more fully.

**Keywords:** potential/local seed; traders; local markets; Africa; smallholders; informal seed sector; last mile delivery; high stress contexts; sustainable seed systems

## 1. Introduction

Seed systems, if working well, can deliver multiple and diverse benefits to smallholder African farmers: enhanced food security and income, better nutrition, and greater resilience to climate stress. To function well, seed systems have to offer a wide range of crops and varieties, with seed of acceptable quality, and these products have to reach farmers, no matter how remote, stressed, or poor they may be. From a development perspective, there is a growing concern that formal seed sector interventions are not delivering the crop portfolio or achieving the social and geographic breadth needed (after decades of funding) [1,2]. From the emergency/humanitarian perspective, there is increasing alarm that seed aid, and especially ‘direct seed distribution’ (DSD), is being given repeatedly and in a widening set of countries. Such ‘free seed’ is undermining longer-term commercial interests and not working toward sustainable seed system operations [3].

Smallholder farmers in Africa source their seed from varied channels. Statistics from one of the largest seed system datasets in the world show that <3% of the seed smallholders sow, across crops, is sourced from private companies and their agro-dealer networks (the formal sector); and an even

smaller amount, 0.5%, from community-based seed production groups (CBSG—an integrated seed sector example). In contrast, over 90% of seed is accessed via informal systems, including: farmers' own stocks, social networks and informal markets, with the latter, local markets, serving as the core of farmer seed supply, some 51% of total smallholder seed [4].

This article draws closer attention to the informal/local markets used by smallholders to access seed. Informal market and local terminology refer to the same entities but emphasize different aspects. Both terms are used within this paper. 'Informal' terminology makes the contrast with the formal sector (including the formal research system and seed sector) and formal private sector companies. 'Local' emphasizes that many of these markets are located within smallholder farmer communities. That said, as the paper documents, potential seed might be brought via traders from regions even 100s of km distant, so not all seed within informal markets is necessarily local. To be clear, much that is sold in informal markets is used for grain, that is, for consumption or animal feed or brewing. However, there is a subset of material that is both sought by farmers and actively managed by sellers for use as planting material. This material is sometimes termed 'potential seed.' The term 'potential seed' has been labeled elsewhere 'implicit seed' [5]. The terms refer to the same type of seed. It is incorrect to assert that all potential seed is a subset of grain. There is farmer seed expressly selected and managed as seed on-farm and that is also sold in local markets.

To date, studies on informal markets used for potential seed have been limited in number and have focused mainly on the client side. As a group, these studies have shown that: (a) local markets are used by farmers of all wealth classes and for a range of reasons, from garnering the bulk of supply to searching for key varieties; (b) local markets are key outlets for certain clusters of crops, such as the legumes (e.g., common bean, cowpea, groundnut, Bambara nut; (c) these markets prove especially important for poorer farmers (who may re-stock off-farm every season); (d) local markets are increasingly used during stress periods when harvests fail; and lastly: (e) local markets, among all possible off-farm seed sources, provide the largest range of crops that farmers sow to address issues of malnutrition (e.g., legumes) and climate variability (e.g., sorghums and millets). Select vegetative crops such as cassava stems and sweet potato cuttings are not routinely found in local markets due to loss of viability in transport. These planting materials tend to be sourced through social networks or via sale at individual farms [6–9].

Local market use for seed has proven relatively invisible in the seed system literature mainly as the formal research and seed sectors have been reluctant to recognize planting materials from this channel as seed at all [10–13]. In particular, traders, as agents of seed provision and management, have been even more neglected as a subject for academic, practical action and investment inquiry. We posit at least three reasons for this gap:

1. Potential seed traders (aka seed/grain traders) are not immediately recognizable or locatable. They are not known by a storefront or signage, but are known by their customers. They do not have specific potential seed shops and their business by nature is seasonal. Most of the year, such traders sell mainly grain. Their potential seed business accelerates in the months prior and during sowing periods.
2. There has been a need to develop refined methods to trace the potential seed trade, as distinct from grain and from formally sanctioned certified or quality declared seed (QDS). In field investigations, traders easily used terminology directly referring to local seed business—or grain then sorted as seed—while researchers were often reluctant to recognize any local material as seed. (For some of the seed-linked terminology used in varied field investigations see: <https://seedssystem.org/assessments-and-e-learning-course/tips-for-planning-implementation/>).
3. Legal regulations challenge the very existence of potential seed in many countries in Africa, the geographic scope of this article. Seed is only 'seed' if it is formally produced by a registered set of growers and sold in clearly stipulated outlets [14,15]. Traders selling potential seed could fear legal prosecution or monetary fines if they advertise their wares specifically as 'seed' and sell them in venues where farmers seek seed, such as in open markets and rural corner shops.

This article aims first to expand knowledge of local seed markets by focusing on the supply side, i.e., those actors who make potential seed available, especially around sowing periods. Given that local market seed is crucial to smallholder seed security and that traders are the main drivers in managing this business, this paper aims to shed light on this set of actors and actions. The paper draws together dispersed but widespread evidence on the different types of traders working in the potential seed business, the scale of commerce, the sourcing and the management seed processes. A second aim is to explore strategies to engage and leverage these potential seed traders. Traders are one core of overall farmer seed supply and perhaps, the backbone for the socially vulnerable, geographically remote farmers, and for those residing in conflict and fragile state areas.

## 2. Materials and Methods

### 2.1. Scope and Context

Quantitative and qualitative data on potential seed traders were collected in the course of conducting Seed System Security Assessments (SSSAs). This assessment methodology has been described elsewhere [16,17]. SSSAs are used in emergency, chronic stress and developmental contexts to evaluate the functioning of all the seed systems farmers might use. These include: the ‘formal channels’—from the government, commercial seed companies, sometimes relief providers; ‘informal channels’—from farmers’ own harvests, social networks, or local markets; and ‘integrated seed channels’ that may cross-cut the two, for example, seed from CBSGs. Somewhat unique to seed assessment methods, the SSSA includes both formal and informal market analysis, assessing clients’ wants and needs (the demand side) as well as traders’ insights on the supply side (especially around issues of availability, access and price, and quality).

This paper draws from over 10 years of research where particular SSSAs had a strong market and trader component. It synthesizes data from 12 field reviews: 10 full SSSAs plus 2 sites involving SSSA leadership training courses where the trader focus was central (in Zimbabwe, 2017 and Tanzania, 2018). The SSSAs were conducted between 2009 and 2018 in 10 countries in Africa. Some SSSAs took place countrywide (South Sudan), while others were region-specific. Information on the individual assessment sites appears in each SSSA report, with all reports posted in the public domain (<https://seedsystem.org/field-assessments-action-plans/>, citations of reports used here are also in Supplementary Materials).

Table 1 summarizes the broad characteristics of the SSSA trader sites. In terms of stresses, three SSSAs took place immediately during or after shocks to farming systems. The Zimbabwe SSSA was carried out mid-2009, shortly after a period of hyperinflation which rendered the local currency worthless. The South Sudan assessment unfolded just prior to the 2011 Referendum as the country transitioned to an independent state, and the DRC-Kasai Assessment was undertaken during times of sporadic conflict. While the effects of these acute stresses were closely documented, in all cases, chronic stress factors largely shaped the seed security scenarios, e.g., erratic access to agriculture development work, little value addition or agro-processing activity, and poor infrastructure. For instance, at the time of the assessment in South Sudan, only ca. 50 km of macadam were paved countrywide, severely affecting general transport and market development.

It is notable that the profile of SSSA sites broadly evokes the type of areas in which substantial seed sector investments and seed aid interventions are routinely proposed to bolster smallholder agriculture, via emergency assistance, safety net programs, rural development or business initiatives. In all of the assessment sites, traders had a significant and ongoing presence, even in times of active conflict when other seed agencies and service providers were seen to withdraw.

**Table 1.** SSSA (Seed System Security Assessment) sites in which seed/grain trader analysis has been a prominent component.

SSSA Country (Africa Only)	Year	Sites Selected in Regions of:	N Traders	Stress Context	
				Immediate (Acute)	Longer-Term (Chronic)
Malawi	2011	Zomba Balaka Chikwawa	37	Drought	Low purchasing power
Kenya	2011	Makueni Tharaka-Nithi Kilifi	52	Drought	Decline of maize yields Low purchasing power
DR Congo	2012	Katanga +	56	Ongoing conflict	Low innovation Weak infrastructure Weak state
South Sudan	2010	Countrywide (excluding Unity)	70	Post-conflict	Weak state and infrastructure
Zimbabwe	2009	Murewha Tshlotsho Bikita Beitbridge	6	Political instability Currency collapse	Declining purchasing power
Zambia	2013	Chipata Ludzi	6	Drought	Lack of crop diversification
Madagascar	2013	Vavatenia Ambovombe	11	Drought	Low innovation Weak infrastructure
Ethiopia	2016	Tigray, Amhara SNNPR Oromiya	9	Drought	Weak infrastructure
DR Congo	2017	Kasai-Oriental	14	Some conflict at border	Low innovation Weak infrastructure Weak state
Burundi	2017	Muyinga Province	11	–	Developmental work in area plagued by food insecurity
Zimbabwe	2017	Murewha Mudzi	7	Currency challenge (local currency lacking value)	Not unusually stressed, although Mudzi is a low rainfall zone
Tanzania	2018	Mbeya	8	–	Not unusually stressed
<b>TOTAL</b>			<b>287</b>		

+ now named Tanganyika.

## 2.2. Sample Size and Specific ID of Potential Seed Traders

The potential seed trader sample encompassed 287 traders across the 10 countries. Fieldwork showed that those who trade in potential seed always also sell grain and, conversely, many primarily grain traders also sell potential seed. In one very large trader sample focused on yellow beans in Tanzania ( $n = 278$ ), 55% of grain traders recognized that their customers were also buying seed—especially prior to and during peak sowing time [18]. Hence, the term ‘potential seed trader’ refers to traders who, in practice, sell both seed and grain and recognize that their customers buy both, either at the same time or staggered seasonally. All traders in the SSSA multi-country sample were confirmed as selling both potential seed and grain. Hereon, the term ‘trader’ will be used for those who sell both commodities.

Traders interviewed during the SSSAs worked at very different scales: Some owned big storage depots and trucks, others owned permanent shops and boutiques and sometimes rented transport; and a good number of the retail vendors had fluctuating venues, selling in daily or weekly open

markets. In terms of identifying potential seed traders, the larger ones proved to be well-known in their regions, e.g., those covering northern Ethiopia, or the zone of Kasai Oriental who managed depots of select major staples that moved within and across agro-ecological zones, and even across borders (Kasai SSSA; Ethiopia SSSA). For the intermediate and smaller traders, SSSA interviewers made impromptu visits to shops and stalls that had crops on offer, likely used for potential seed, such as diverse legumes and local maize. The key is that teams were introduced by prominent local leaders, extension agents or Non-Governmental Organization (NGO) collaborators. In some cases, such as in Harare, Zimbabwe, teams required formal government clearance to even enter markets. At all sites, expectations were clarified prior to the interview, that teams would not be buying seed, so a conflict of interest was avoided. Understandably, traders are always keen to make a sale, especially when prospective institutional buyers visit.

### 2.3. Instruments

Standardized instruments were used across sites (see samples at <https://seedssystem.org/assessments-and-e-learning-course/seed-system-security-assessment/market-analysis-tools/>). While many of the results draw from standardized quantitative data, an equally important source were the in-depth qualitative exchanges that described practices and identified key anecdotal cases.

## 3. Results

The findings are clustered around four principal themes. The first gives an overview of the different types of traders and hierarchies. The precise technical ways traders search for and manage potential seed are documented for the second theme. Price differences between grain and potential seed serve as the third focus. Lastly, the special roles of these traders are explored, especially in stress periods.

### 3.1. Traders: Type and Hierarchy

One trader is not like another and in trying to chart how potential seed markets function, it is important to understand key differences. Traders who have large, reliable trucks and storage facilities define their supply territory differently from local sellers who may produce their own seed and travel to market by bicycle or donkey [17]. The seller categories across SSSAs are generally clustered into: direct farmer sellers, collectors, brokers, and larger-scale regional traders at nearly every site. Sometimes, in between levels, there are specialized urban traders and also medium-sized traders (between the brokers and largest scale). Much depends on the site and whether the crop is traded over wide geographic distances.

#### 3.1.1. Levels

Starting at the bottom (or at the grassroots), farmers-sellers may sell their harvest directly at local markets or to collectors (in rural areas, or towns), or to higher-level brokers. Collectors generally work within a community or local area (e.g., areas with a similar agro-ecological zone) and frequently are tasked by brokers or larger middlemen to seek out specific crops, varieties and quality types, especially if there is an advance special order. Some farmers perform the collector role themselves and bring produce of several farms for sale to urban or rural traders. Brokers may be engaged by a larger trader to buy from farmers directly, or from smaller traders. These brokers vary in expertise, e.g., from off-duty taxi drivers transporting between field and shop, to more specialized agents who supply shops from other regions. While urban traders have more capital assets and more extensive supply networks than rural trader shops, both types of traders, urban and rural, might buy directly from farmers, and this can be important for some traders to guarantee provenance. Finally, trans-regional traders move seed/grain longer distances, and often have the larger storage capacity and ability to engage in price arbitrage.

It is hard to generalize about volumes of potential seed traded. Research on the yellow bean chain in Tanzania showed that trader volumes may vary from selling several baskets of potential seed

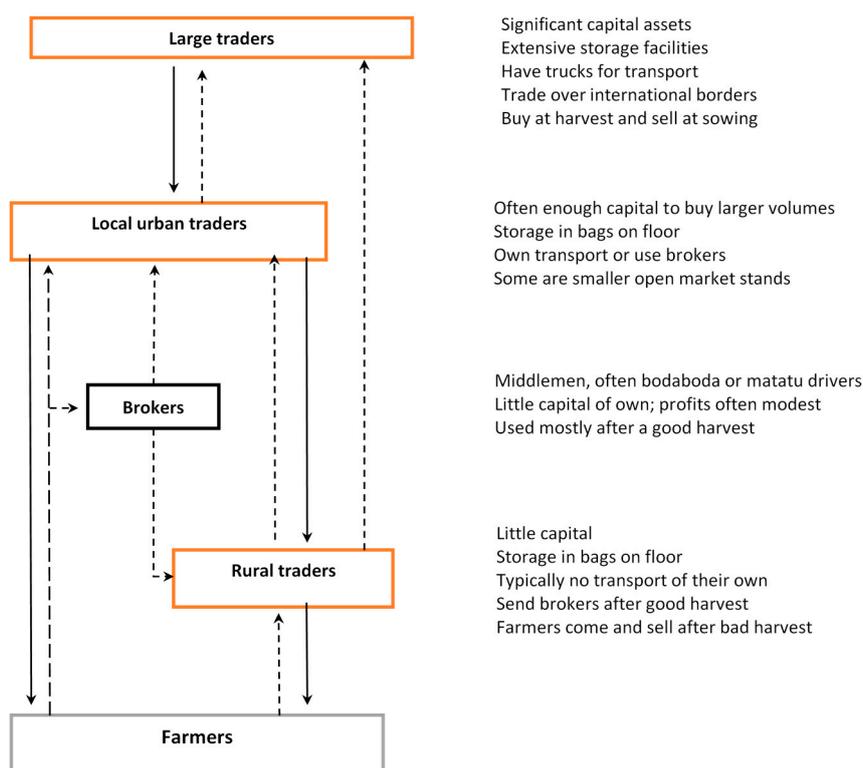
to an impressive 1500 mt per year, even for a single variety [18]. Again, for the Tanzanian yellow bean trade, the relative divide between seed and grain business varied only slightly by trader scale. Both self-identified large grain traders and potential seed (and grain) retailers stated that seed sales encompassed 31–39% of their total business during sowing periods and 13–20% during non-sowing periods [19]. While the potential seed business is markedly seasonal, it is also partly year-round. Farmers may buy seed any time in the year when they come upon a special variety.

### 3.1.2. Diagramming Specific Potential Seed Flows

Two diagrams sketching the different levels of potential seed traders give an idea of the flows of the trade. The cases are drawn from eastern Kenya in 2011 and northeast Zimbabwe (near Harare) in 2016; a third case, for eastern Ethiopia, has been charted previously [5]. Each case emphasizes slightly different factors and adds aspects to our understanding of the potential seed trade.

#### a. Eastern Kenya potential seed trader diagram 2011

The Eastern Kenya analysis (2011) mapped the directional flows among different traders at harvest and sowing periods (Figure 1). Following harvest, farmers sell production to rural traders based in small communities, to local urban traders in larger market towns, and to brokers. These brokers supply both rural and local urban traders, who in turn may sell to large traders whose operations span different regions.



**Figure 1.** Flows between different levels of actors in grain/potential seed trade, Kenya (SSSA 2011; grain at harvest, dashed lines; potential seed at sowing time, solid lines).

At sowing time, these flows reverse direction for potential seed. Farmers buy directly from rural traders, or may bypass them to buy from urban traders in market towns, when the quantities or quality they seek are not available locally. At planting time, rural traders' stocks may be limited. This was the case, for example, in shops in rural Bungale, Magarini District; a farmer travelled 50 km to Masindi city to buy potential seed, where supplies were good and there were traders known for good seed quality.

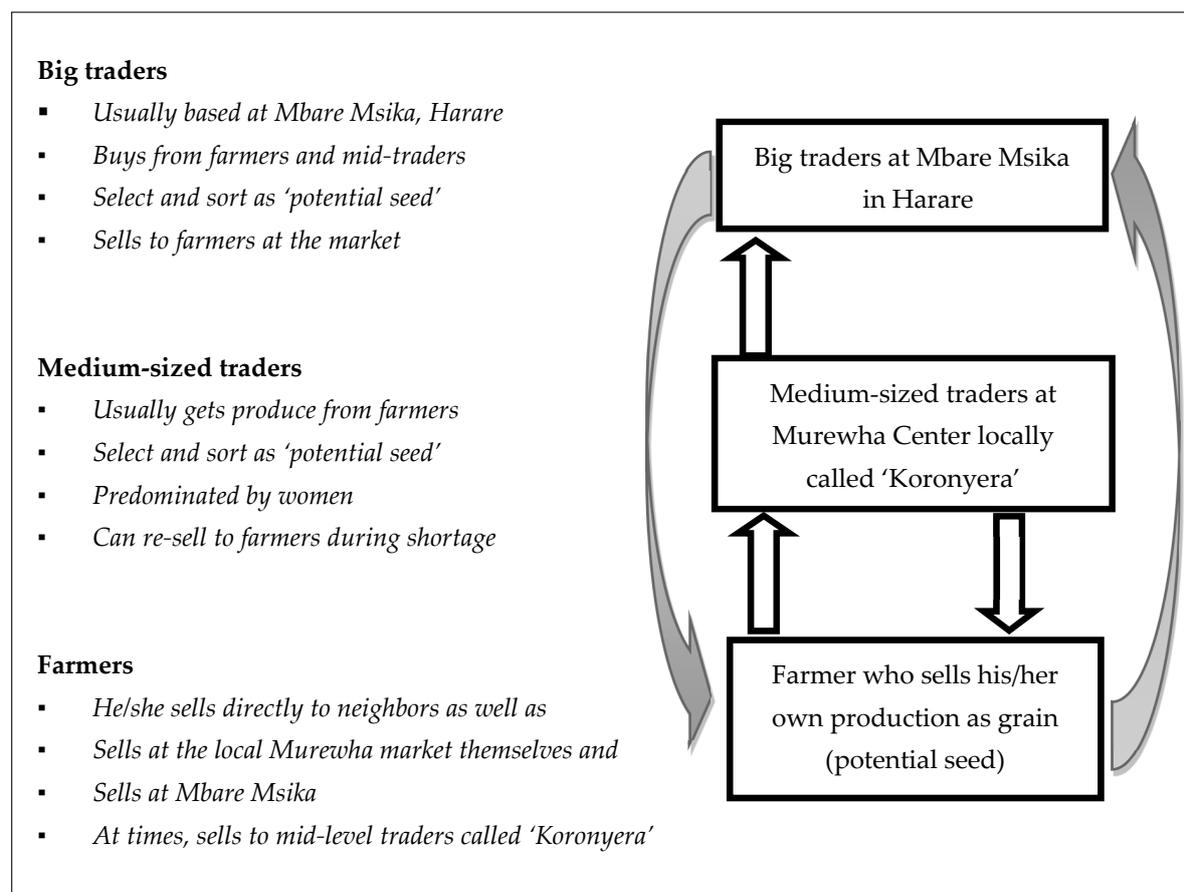
### b. Northeastern Zimbabwe—potential seed trader diagram

The northeastern Zimbabwe case in Murewha, 85 km from the capital Harare, highlights the roles of the brokers (middlemen) and large urban traders located in the capital city market of Mbare Msika. Farmers in Murewha may directly sell their own seed locally, especially for crops such as groundnuts, cowpeas, Bambara nuts, common bean, sunflower and sorghum.

Mid-level buyers (Koronyera) collect from other farmers and then transport to town centers. ‘Koronyera’ can either be local or from Harare: They may buy much of the product to resell outside of Murewha. These local intermediaries, mostly women, move to sites where they can sell it at a profit, such as the roadside of Murewha-Nyamapanda highway. Some intermediaries also sell to bigger traders at Mbare Msika in Harare. For instance, farmers sell a 20-L tin (bucket) of groundnuts at US \$2.00 for re-sale locally, and for US \$3.00 or as high as US \$4.00–5.00 for sale at Mbare. As the rainy season approaches, the intermediaries usually sort the products for sale as food and potential seed (e.g., common beans), including to supermarkets, usually packaged as food but frequently planted also (SSSA Zimbabwe 2009, 2017).

Big traders are often based in the Mbare Msika market in Harare. They sell to diverse clientele, including to urban food buyers, and rural farmers who buy for potential seed as well as for food. Buses going to and from almost all destinations in Zimbabwe are hosted at Mbare market and it proves to be a lively trading locale. Murewha farmers also source select agricultural inputs from vendors at this market (Box 1).

**Box 1.** Three levels of potential seed trading system, for Murewha district (Source: SSSA Zimbabwe 2009, 2017).



### 3.1.3. Discussion of Potential Seed Trader Hierarchies

Normally, the higher up the ladder of potential seed acquisition, the less focused traders may be on potential seed sourcing and management, unless they are responding to a special order. There are some important key exceptions to this ‘higher-up-the-less-the-potential seed business’ focus.

- (a) Traders serving high-stress areas, and those who deal in crops with narrow adaptation, are acutely aware of the market for potential seed, rather than for just grain. As examples: large traders serving Hararghe routinely source sorghum seed within a 25 km radius, in contrast to the 100 km+ radius for sourcing common bean seed [17], with these stocks kept separate during storage and sale. In northern Mali, a cluster of villages is well-known for producing an early maturing pearl millet variety, essential for the more arid areas of Douentza Circle. This trade again, conducted at a regional scale, is quite specialized towards adapted local seed—not grain (SSSA Mali 2006).
- (b) Larger traders serving urban and peri-urban markets recognize that important numbers of town dwellers maintain small, intensively-cultivated plots. Such is the case for a number of large traders in the Mbare Msika market, Harare, Zimbabwe, who cater to a surrounding population of 500,000 farmers or more (SSSA Zimbabwe 2017).

This attention to potential seed even among higher-level traders makes sense. When there is a strong potential seed business, savvy traders aim to cater to it. Their connection with underserved segments—whether serving populations at the last mile or offering an array of locally adapted crops—also suggests that traders will not necessarily be in direct competition with formal outlets, which often focus on fewer crops and are strategically located near to transport and viable economic centers.

## 3.2. Traders Managing Potential Seed and Farmers Seeking Potential Seed

Both traders (sellers) and farmers (buyers) use a range of strategies to identify and manage potential seed in markets. For the seller, he/she aims to capture the increased seed volumes around sowing periods as well as the price differential between what can be used as seed and what may be simply grain (see Section 3.3 on prices below). For the buyer, he/she wants to increase the possibility that the product purchased will grow on the home farm and address family needs for consumption and sale.

### 3.2.1. Trader Potential Seed Management: Specific Actions

Fieldwork across SSSA sites has identified 11 main actions that are variously used by traders to manage potential seed (Table 2). Some are routine, such as seeking seed from specific regions known to provide adapted material; sorting out the bad grains (e.g., those that are broken or immature or discolored; sorting out the waste (e.g., pebbles, dust); and keeping freshly harvested stock apart. Of the 11 practices commonly identified, 6 are used by the majority of traders. Conversely, of the 11, the single practice of conducting germination tests is relatively rare, with most traders not even knowing of the option.

Traders may also visually advertise that they have put for sale material that has been managed specifically for sowing. In the markets of Arusha, Tanzania, common bean sellers have been known to maintain completely separate sale baskets for seed and for grain, and then steer the customer accordingly (SSSA Tanzania 2018). In parts of eastern and southern Madagascar, the maize on sale for seed is put on display with the kernels kept dried, still on the cob (versus the de-husked stocks’ kernels), as a local sign that it is sowing material, not grain, that is being sold (SSSA Madagascar 2013).

**Table 2.** Trader seed quality management practices—all crops: (% of traders using practice).

Site *	N Traders	Get Grain from Specific Regions (Adapted)	Seek Out Specific Varieties	Buy from Growers Known for Quality Seed	Keep Variety Pure	Keep Freshly Harvested Stocks Apart	Grade Stocks	Do Germination Tests	Use Special Storage Conditions	Sort Out 'Waste': Pebbles, Dirt	Sort Out 'Bad Grains': Broken, Discolored	Sell Seed and Grain Separately
Burundi 2017	11	36	36	27	64	91	45	0	64	45	45	55
DRC Kasai 2017	14	89	89	0	55	100	67	0	55	100	100	67
DRC Katanga 2012	56	98	93	61	79	65	42	13	45	86	64	57
Ethiopia 2016	9	33	56	22	89	78	67	33	0	89	89	56
Kenya 2011	52	87	81	63	77	71	27	12	54	37	42	54
Madagascar 2013	11	64	26	17	4	27	9	4	17	30	9	9
Malawi 2011	37	68	65	41	81	78	24	5	38	95	92	5
Tanzania 2018	8	100	88	50	100	88	88	0	50	100	88	63
Zambia 2013	6	100	83	67	83	83	83	17	67	100	100	0
Zimbabwe 2018	7	29	57	57	43	29	43	14	43	57	57	29
<b>Total</b>	211											
<i>Simple average</i> **		70	67	41	67	71	49	10	43	74	69	39
<i>Weighted average</i>		80	75	48	73	71	39	10	45	71	65	43

\* For Zimbabwe 2009 and South Sudan 2010 SSSAs, trader qualitative and quantitative data sets did not focus on potential seed management by traders. \*\* Simple average is the mean of the percentages from each country, ignoring the number of traders. The weighted average takes into account the number of traders.

### 3.2.2. Farmer Seed-Buying Signals

There are also specific actions and signals from farmers when they are looking to buy seed. Farmers buying sowing materials from the local market look for visually clean and healthy batches, often seek to buy from a seller they trust, and, as a later step, sort out the purchased stocks when again at home. In addition, in a direct exchange, customers standing in front of a market stall may say they are looking specifically for seed and ask key questions about the stocks on offer: e.g., where they were sourced and whether they will grow in a given local region. Even in South Sudan, where local markets were less developed than in all the other SSSA sites (partly due to security concerns and poor road networks), farmers' quest for seed was made clear both by buyers' direct questions to traders, and indirect practices, such as buyers biting grains to assess freshness and moisture content (Box 2).

**Box 2.** South Sudan: How a trader knows that a farmer is buying/wants seed (versus grain). Source: South Sudan SSSA 2010.

#### Customer:

- directly asks for seed;
- asks about the provenance of the varieties, whether they are locally adapted and whether they have been directly procured from farmers; sometimes asks for specific seed grower's name;
- asks about the performance, in terms of maturity and yield;
- sorts out, carefully, from the bins, the specific varieties he/she wants;
- demands a specific variety, by name, known for performance;
- asks for 'modern' seeds;
- requires seed from most recent harvest (or asks about exact harvest date);
- requires that the batches be 'pure' of a single variety;
- enquires about storage conditions;
- asks about germination; bites and smells the seed to look at freshness and moisture content;
- buys a small amount, in a 'sowing size' tin.

### 3.3. Price Differences Between Potential Seed and Grain

There are clear differences between the price of seed and that of grain at local markets. Generally, the price of potential seed goes up before or during sowing periods that extend some four to eight weeks prior to planting. That said, very desired, unique or scarce varieties may command high prices year-round. The quality of the potential seed itself influences the degree of margin, with the variety quality much more important than the seed quality per se. In terms of variety quality, prices spike for the most sought-after varieties for sowing, that is, for the plant genetic materials that are most adapted, productive, or that give the highest income return. In terms of seed quality per se, around planting time, traders may distinguish among batches of the same variety (batches that are 'well sorted and stored' from batches 'less well sorted and stored'). As an example of firm price rises, in western Kenya, where root rots suppress bean production, root rot resistant-bean varieties may command an increase of 25–50% over local seed [20], with well sorted batches adding another 5% premium—those cleaner materials which presumably demand less labor to prepare for sowing.

Data from across South Sudan on multiple crops gives a broad brush of the systematic price differences between grain and seed by comparing prices of the same crops during non-sowing and sowing periods (Table 3). Except for vegetable seed, which is imported and sold in standard, sealed, small packets, seed and planting material increases in price by some 50% at sowing periods, with a considerable range from 10–61.5 % (SSSA South Sudan 2010). It was difficult to sort out the factors accounting for the price margins as traders interviewed operated at very different scales; for example, some were selling their own production, others were collecting from many local farmers, and still others were acting as cross-border agents seeking seed from Uganda and hauling it back.

**Table 3.** South Sudan—Price change from non-sowing to sowing periods, 2010.

Crop	No. of Traders	% Price Change
Beans	10	65.5%
Cassava	1	10.0%
Cowpea	3	25.1%
Groundnut	13	53.9%
Maize	14	45.7%
Millet	2	35.0%
Sesame	9	61.5%
Sorghum	28	40.9%
Vegetables	1	0.0%
Wheat	1	7.1%
<b>Total</b>	<b>82</b>	
<b>Avg of all transactions</b>		<b>47.0%</b>

(Source: SSSA South Sudan 2011).

A case in central Ethiopia (Oromia), from a single trader, gives more insight into the crop- and site-specific subtleties for grain and seed price factors, including comparing seed of more and less desired varieties. The crops of wheat and teff prices serve as examples (Box 3 and Table 4). Note the margins for seed vs. grain, +17 and +27% for teff and wheat, respectively.

**Box 3.** Higher prices for seed in local Ethiopian markets: A signal of traders' and farmers' attention to quality.

AL is a medium-sized trader in the town of Dera, the main market town for Sire and Dodota Woredas in Arsi Zone. From his store facing the market, he has been buying and selling wheat, maize, teff, and beans for many years, sourcing his purchases from the surrounding region but also further afield (Bale, Adaama, Wollega) in difficult times. During planting time, AL also sells potential seed. For this 3-month period, he reckons seed sales make up 20% of overall sales in a good season, and an even higher proportion in a dry year, when more farmers turn to local markets to meet seed needs. AL takes this task very seriously: "We have a family relationship to farmers," he says, while he attends to a cash loan to a farmer, confirming such close ties. "We've been in this business a long time, and we need to look after our reputation." So, AL identifies good producers during the growing season and arranges to buy their harvest. This is further selected and sold specifically for seed, at a higher price than grain. How much higher, we ask? "Depends on which variety," he replied, naming specific wheat and teff varieties and patiently explaining how different varieties may have different market prices but all the stock selected and sold as seed is more expensive than that sold for grain, as the table below shows.

**Table 4.** Grain and seed prices for wheat and teff, Dera, 2016.

CROP	Grain Price (Food)	Seed Price (Less Desired Varieties)	Seed Price (Most Desired Varieties)	Margin
Wheat	7.5 ETB/kg	8 to 8.5 ETB/kg	9.5 ETB/kg	+27%
Teff	18 ETB/kg	20 ETB/kg (red and white mixed)	21 ETB/kg (white)	+17%

Source: SSSA Ethiopia 2016; 1USD = ~22 ETB in 2016.

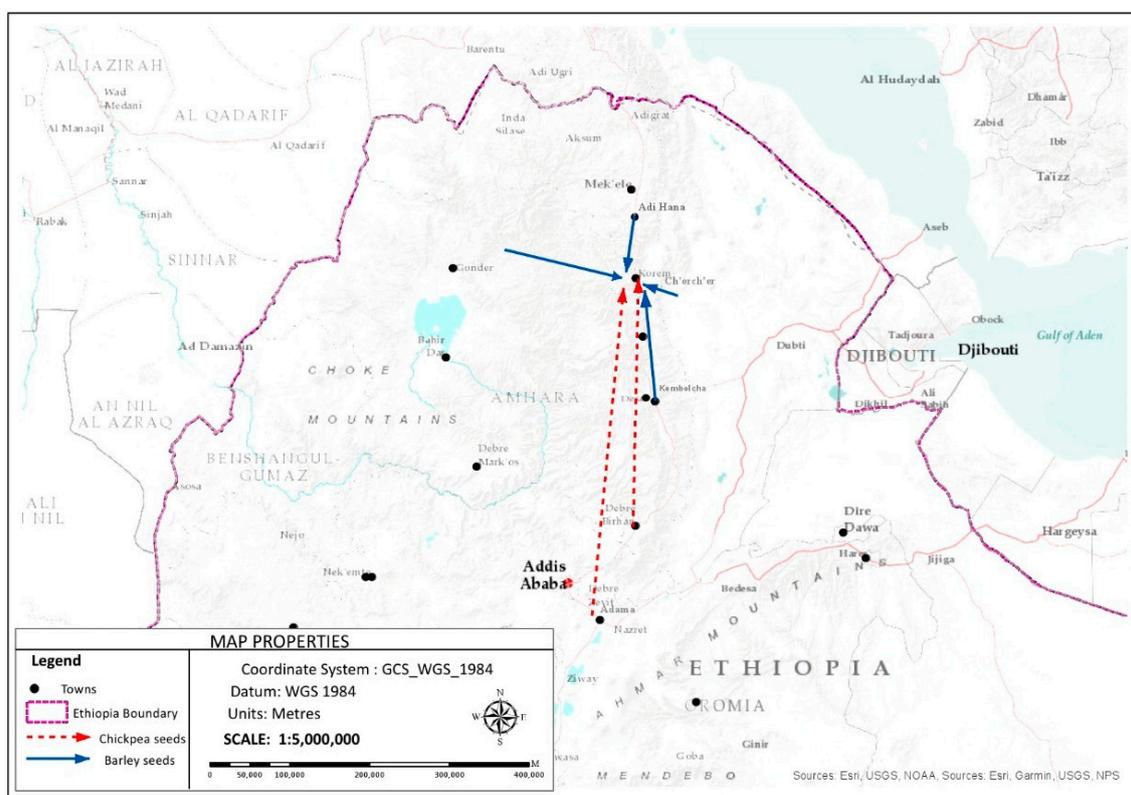
Analysis of price differentials certainly merit significantly more attention, especially if potential seed becomes more of a development and humanitarian commodity in its own right (see Section 4).

### 3.4. Traders and Stress Periods

Finally, as a finding, it is notable that traders' role for seed becomes key, and at scale, during high stress periods. Traders are the ones serving rural, remote and fragile zones as part of their normal work routines [21]. During high stress periods, such as severe drought or active conflict, trader roles become even more visible, especially when meeting procurement demands from local, national or

international humanitarian assistance. Traders may hold more nuanced contextual knowledge and social capital than a fixed commercial outlet, allowing them to operate in stressed environments with greater success.

A well-documented case comes from northern Ethiopia during 2016 in Meher, a season marked by a prolonged, severe drought. A group of four trusted traders were contracted by the Government of Ethiopia (GoE) based in Tigray, Korem-Ofla, to help gather emergency aid supplies of chickpea and barley because seed of adapted varieties was not available in sufficient quantity from the formal seed sector service. The traders sourced some 200 mt (2000 quintals) of the two crops combined, seeking supplies locally and from other targeted regions of comparable adaptation. The seed was verified to be of good quality from harvest to delivery. One of the traders who was a farmer himself, checked the seed in the field in the bags, and verified that the stocks included the right varieties for the given locations. The seed garnered was also subsequently inspected by the government purchaser. For the chickpea, the main sources were Debre Birhan and Adama, 760 km away from Korem. For the barley, stocks were sourced from Maychew, Adishuhu, Weijrat, Kombolcha, and Alamata, some 250 km distant (Figure 2, SSSA Ethiopia 2016).



**Figure 2.** Trader acquisition of chickpea and barley seed during Meher 2016 emergency response.

While aid organizations often must perform logistical feats to move commodities in time for planting, medium to large traders can have a firm grasp of what it takes to move in-demand items (access to fuel, safety and security on the route including official and impromptu roadblocks and fees, navigation of government systems and requirements, etc.).

Though this case of directly leveraging traders may seem exceptional, in practice, it may be more routine than commonly acknowledged. De facto, traders in crisis often provide seed not just to farmers (as during Seed Voucher and Fair programs) but also to institutions (such as governments and NGOs). To wit, the emergency supplies for many major crops frequently proved to be ‘re-conditioned grain’. This ‘grain’, if of good quality, should consist of potential seed screened by traders (and if poor, may be suitable only for food and feed—which is why local seed experts might be best involved).

Such acquisition of potential seed during crisis periods is legal in many countries (e.g., Afghanistan, Ethiopia, Zambia, Rwanda, Kenya, Tunisia) as laws stipulate special clauses linked to emergency periods. If such seed is acceptable in times of crisis, it might also be considered of value in non-crisis periods—especially in chronic stress contexts where formal sector seed for many crops is often in scarce supply.

#### 4. Discussion

Extensive quantitative data show that smallholder farmers make liberal use of local markets for seed in normal times and in stress periods. In fact, during emergencies, local markets prove more important for farmers' getting seed than emergency seed aid itself [22]. Further, on a continuous basis, poorer farmers rely more on local markets for sowing materials than do the wealthier; although all kinds of farmers (over 60% for legumes) access some seed from markets for a range of reasons [23]. The key is that local markets continue to operate in stress areas where commercial companies have closed shop (i.e., conflict zones) or where they have never set foot at all (remote areas with little infrastructure).

This paper has started to explore how local markets function for seed. Up to now, such analysis has largely been uncharted, apart from [8], a notable exception, and by seemingly opposite groups:

- (a) For formal sector proponents, market seed is not recognized as seed at all, but rather labeled 'grain' or 'grain markets'; and
- (b) Informal sector enthusiasts often hold dear to the tenet that smallholders always save their seed or share liberally through social networks—so market use for seed is invisible or deemed minimal [24,25]. In some regions, even farmers themselves may hide use of local markets for seed, feeling shamed for seeking seed off-farm or stigmatized as less-good managers (SSSA Mali 2006).

This paper has started to shed light on the functioning of local markets by focusing on one set of key actors: The traders who gather, move, sell and sometimes produce potential seed. In the spirit of further exploring possible trader roles linked to seed security, this paper proposes an initial framework to examine entry points of support to ensure informal markets can deliver the seed farmers want and need—via the contact point of traders.

##### 4.1. Framework for Supporting Seed Security-Linked Traders

To brainstorm about support to informal markets and specifically, trader support, we frame possible actions using the seed security framework as a base of thinking [26].

Seed security has three basic parameters: seed has to be available, farmers need to be able to access it, and the seed quality must be sufficient to promote healthy seed system functioning [26]. *Seed availability* is defined narrowly as whether sufficient quantity of seed of target crops is present within reasonable proximity to communities, and in time for critical sowing periods. *Seed access* largely depends upon the assets of the farmer or household in question: whether they have the cash (financial capital) or social networks (social capital) to purchase or barter for seed. Seed quality includes two broad aspects: seed quality per se, and variety quality. *Seed quality* consists of physical, physiological and sanitary attributes (such as the germination rate, and the absence or presence of disease, stones, sand, broken seed or weeds). *Variety quality* consists of genetic attributes, such as plant type, duration of growth cycle, seed color and shape, palatability, and so on [3]. In the table below, we have added a seed security feature on *information*. This encompasses two-way information systems: to clients and feedback from clients. All seed security features—availability, access and quality—have an integrated information component.

Importantly, these seed security parameters are often described using farmers' as the focal point (the demand side). Is seed available to farmers locally? Is it accessible and the quality of what farmers want and need? This paper shifts the analyses to the supply side—and specifically, to informal markets and traders' possible roles. For informal markets, the actors might include farmer-sellers, collectors,

brokers and traders working at difference scales. Table 5 presents our initial brainstorming attempts on seed security-linked possible interventions.

**Table 5.** Informal market-based trader-linked seed security interventions.

Seed Security Parameter	Market-Based Interventions—Supporting Trader Roles on the Supply Side
	<i>Focus: Informal Sector</i>
Availability	Transport vouchers/cash to traders to move supplies to remote areas, with supplies screened (this cross-cuts availability and access); support also for storage rental. Capital advances to traders/loans—to seek out supplies in anticipation of stress. Support traders' commissioning and multiplication of popular, highly adapted varieties. Advocacy for diversified quality restrictions—allowing for more supplies at different price points.
Access	Transport vouchers to traders to move supplies to remote areas, with screened seed (this cross-cuts availability and access); support also for storage rental. Traders to sell small packs (of certified seed)—to move new varieties.
Quality-Seed Health	Work with traders to improve seed storage facilities and practices—even with local varieties. Work with traders to diminish storage loss of seed—take over risk from farmers. (high-risk crops, such as cowpeas)—via use of hermetic or other seed storage technology.
Quality-Variety Quality	Work with traders to distinguish among varieties—and to keep stocks separate. Provide capacity building of traders along the path on seed quality identification and even seed selection.
Information Two-way information systems	Link traders to sources of information on new/modern varieties (as traders may serve as modified extension agents where there is a gap). Provide traders with information systems to help farmers learn about stress-tolerant varieties/crops. General information systems geared to trader potential seed business: e.g., where supplies might be available, market trends, demand and price information.

Modified from [27].

As suggested in Table 5, traders have important roles to play in ensuring all aspects of seed security are reinforced, especially in remote and fragile areas. A good number of these roles are already partially implemented. In terms of availability, traders are already involved in procurement and in seeking out supplies to help with stress, as the Ethiopian case of gathering barley and chickpea seed concretely shows. For enhanced access, traders have selectively been engaged to sell seed (certified) in small packs where formal companies have narrow reach—although this practice has been limited depending on national seed laws. Moreover, for quality, traders have engaged in efforts to improve seed quality by storing better, especially through use of hermetic bags [28], and even in separating out varieties and maintaining clean and inspected warehouses in response to a relief intervention. As an example, CARE in the early 2000s required traders participating in a seed voucher scheme in Ethiopia to construct separate seed storage, which many continued to use afterwards as they saw the benefits of growing the seed side of their business [29]. The issue in terms of the traders' recurring actions is to make these roles more visible and legitimate, to give traders better support to carry out key activities and to scale them up more routinely.

In other cases, particularly in terms of information sharing and leveraging traders for information dissemination, engaging traders in these key roles will take novel efforts. Grain traders have long been invited to engage with national crop-specific or cross-crop platforms [30]. Potential seed traders, however, have been largely absent as it is formal seed sector representatives who are invited to the stakeholder table. The two groups (grain and seed) may see themselves at odds, rather than as serving complementary client groups and geographic regions. It may take a major change in mindset to stop seeing informal seed traders as the 'enemy' or 'oppressive middleman' and rather reinforce their positive roles as service providers for underserved crops, clients, and contexts. See Box 4 for possible trader roles.

**Box 4.** Multiple possible roles for potential seed traders.

In no particular order:

- Introduce new varieties
- Maintain and enhance quality of seed
- Diminish storage loss of seed—take over risk from farmer
- Serve as service provider in a storage function
- Maintain local varieties and serve as source of local varieties
- Serve as information function on good seed and new varieties
- Serve as seed security function (provide seed stocks, in normal and stress periods)
- Move seed to remote areas . . . (They may act fast, good social connections, social certification, knowledge of adaptation zones, planting times, potential seed demand, end market demand)

Each of these might be mapped more fully as a strategy for action.

#### 4.2. Legal and Donor Insight into Embracing Trader Roles

In moving forward, one might ask: What do the seed laws say about trader roles in the seed arena? Is there insight into donor policies in reference to traders, again in the seed security arena?

Legal insight. Seed policies and seed laws are mainly concerned with regulating the formal seed sector, though there have been concerns raised around how such legislation may affect how farmers' seed systems function [31]. If seed legislation prohibits the sale of crop varieties that were not registered in the national or regional varietal list, or of seed that was not certified or quality assured, informal traders may be unable to operate legally [32]. Reviews of seed policy impacts on informal seed systems tend to focus on biodiversity—what can be circulated, rather than who can take part in the circulation [33]; but these reviews help clarify how legislative frameworks may affect informal traders, and where there may be scope to work with them more closely.

An analysis of seed legislation in 94 countries and 2 regional economic organizations [14] found 28 percent of countries required—for commercial seed sales for any crop—that varieties be formally registered, and the seed certified. In such cases, seed legislation appears to offer no recognition for seed traders working outside the formal system. However, other countries defined exemptions to the application of laws. For example, seed laws in some countries apply only to a list of priority crops, with all other crops outside the scope of regulation. Some countries exempt particular transactions from regulation, such as sales among farmers themselves (for example, Zimbabwe). Such exemptions may allow space to work with informal traders. However, in many instances, the scope of regulation is not clearly defined in relation to informal seed systems, leaving it open to interpretation [14]. For example, ISSD Africa [15] found varying opinions in Malawi on whether potential seed sales in open markets were regulated or not. A follow-up FAO study [34] examined actual enforcement of seed laws in 18 countries and found that enforcement action against unregistered varieties or uncertified seed was uncommon, even in countries where legal frameworks seemed 'restrictive'. Enforcement action was generally focused on horticultural or cash crops (e.g., cotton, vegetables) where the impact on value chains of poor quality seed is more evident.

While there appears to be little evidence of enforcement actions taken against informal seed traders, their ambiguous legal status may make it more difficult for development agencies to work with these traders at scale (for example, to provide training or access to financial services). Some countries have relaxed regulations around variety registration or seed quality assurance for specific types of germplasm, to facilitate the commercial trade of diverse genetic materials (for example, the European Commission Directive 2008/62/EC, applied to landraces). There may be value in creating similar legal space to diversify the range of commercial actors, affording traders greater recognition, and supporting a path to professionalization, distinct from that taken by agro-dealers in the formal sector.

Donor insight. Traders who profit by buying from smallholder farmers when prices are low and selling when prices are high have often, in the donor sphere, been characterized as 'middlemen', a term which has informally signified a business person who profits off a stressed small farmer.

Donor-supported approaches of forming producer groups, farmer cooperatives, and bulking of produce and seed have been attempts to shift the profit from middlemen to farmers. In many chronically (and even acutely) stressed locations though, conflict or poor infrastructure has the potential to challenge traditional market actors. Smaller, more localized traders may have greater capacity to navigate stressed situations, relying on localized networks and social capital to continue to move goods. Traders can be a key to reaching farmers where they actually purchase seed, even in stress times.

Understanding where farmers access seed has revealed a gap in service provision. Donors and implementers are often not focusing on where farmers actually shop (for certain crops), but remain hopeful that they will modify purchasing behavior. This dynamic needs to be reconsidered. If the major complaint of local market potential seed purchase is questionable quality, there is an unexplored potential benefit to making sure the seed on offer is of the best quality possible. There are few well-documented examples of this supportive practice in humanitarian programming. One emergency relief program in Chad [35] included training of traders during stages of field selection, sorting and storage to ultimately raise the quality of what was put on offer. Traders might be the key to raising the quality of potential seed on offer in informal markets and could also take on novel roles, e.g., helping to forecast demand.

Note that building trader capacity in seed-linked assistance and/or development programs, currently may get limited attention as it falls just beyond immediate emergency needs and is not a key focus for more formal sector activities. That said, enhancing trader capacity may be absolutely critical to smoothing a humanitarian to development nexus. Traders have operational capabilities that are unique (and likely different from relief organizations or formal market channels). Support to a broader array of market actors, including traders, will require frank discussions around seed quality. It may also require a balancing of standards that meet the humanitarian Do-No-Harm premise while also allowing those in need to be served in a timely manner. Some donors have already come to that fork in the road, opening the door to provision of non-certified seed by ensuring other quality standards are met or exceeded [36].

## 5. Conclusions

This paper has presented substantial quantitative and qualitative evidence charting traders' involvement in enhancing farmers' seed security. This is an emerging area of learning and analysis. All answers are not known, but the paper aims to open the discussion concretely, not theoretically, in terms of traders' practical roles. A first step may be to agree on an initial overall goal—that humanitarian and development practice needs to better engage traders as they are central to smallholder farmers' seed security. In moving forward toward possible enhanced traders' roles, donors, program managers and implementers might logically adopt a stepwise approach. For which roles are there no additional risk: e.g., information sharing? For which roles might there be medium risk, maybe sale of certified seed in well-labeled and traceable small packs? For which roles are there truly high risk? Understanding risks in detail may also lead to detailed testing as well as mitigation measures.

Smallholder farmer ability to pivot in real time—vital for responding to shifts in climate, displacement, conflict, etc., depends on a responsive market that can offer quality seed of the right type, at the right time. Donors should begin to see traders as a key tool, and a nimble one, for strengthening the seed security and resilience of smallholders.

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