FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

LAST MILE SEED DELIVERY APPROACHES IN SUDAN AND BEYOND

Innovations in product packaging (small packs) can help expand delivery in last mile areas. Photo credit: D. Karanja, Kenya Agricultural and Livestock Research Organization

An Annotated Bibliography

1 November, 2023

A study commissioned by the SASAS Project, coordinated by CIMMYT

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LAST MILE SEED DELIVERY APPROACHES IN SUDAN AND BEYOND

– AN ANNOTATED BIBLIOGRAPHY

Everlyne Binyanya[1], Hugo De Groote[1] , Omer Abdalla[2], Paswel Marenya[1], Louise Sperling[3]

[1] International Maize and Wheat Improvement Centre (CIMMYT), Nairobi

(Emails: everlynbinyanya@gmail.com; h.degroote@cgiar.org, p.marenya@cgiar.org)

[2] CIMMYT, Khartoum, Sudan (omerwadelkabashi87@gmail.com)

[3]SeedSystem (sperling@seedsystem.org)

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LAST MILE SEED DELIVERY APPROACHES IN SUDAN AND BEYOND- AN ANNOTATED BIBLIOGRAPHY

1. Introduction

The objective of the literature review is to provide partners with information to help them frame the SASAS project in Sudan. It is solely a desk review on recent literature, scientific journals as well as project documents and popular press gathering data about last mile in Sudan and other comparable locations. The overarching goal is to build on both good and negative lessons acquired to avoid repeating unsuccessful strategies or duplicating work that has previously been done. Sudan and other African countries providing best practices are being examined in this review. In addition, best practices and lessons learnt from other states in relation to last mile are included in this section. This review was conducted prior to the April 15th, 2023, events.

2. Methodology

For this study, we explored the internet, in particular Google Scholar and Research gate for scientific papers, Google for project documents and popular literature. The reviewed documents included literature review documents, journals, project documents (assessment or evaluation reports), and popular press release including blogs, news bulletin, magazine and web page with success stories of implemented projects, conference proceedings. EndNote was used for referencing. Each entry consists of an abstract and keywords. Keywords used: Community based organizations, Last mile delivery approaches, marginal areas delivery approaches, environmental stressed areas delivery approaches, nutritionally stressed delivery approaches, Climate stressed delivery approaches, gender and seed, youth and seed, outreach agents, private input service provider (PISP).

The analysis of this paper was conducted before the disturbances of April 15 2023 . Changes subsequent have not been included in this review.

3. Results - Key findings

- Many organizations and donors have shown a keen interest in last-mile delivery of seed to small scale farmers across Africa.
- Emphasis on local markets and traders
    - Many studies in Africa and elsewhere have shown the importance of local seed systems, including informal systems, but also increasingly agro-dealers and agents.
    - Several studies mentioning local markets/traders as key in Sudan's last mile areas
- Different approaches identified
    - Several studies mentioning small packs as key in introducing new varieties in the market
    - Small packs model seems common for non-maize seed adoption; positive results in legume seed
    - Several studies mention Village Based Advisors as key
- Approaches differ by seed type/crops
    - Several studies focusing on improved seeds delivery; fewer on local seed
    - Several studies focusing on legume seed delivery
    - Seed agents in partnerships with existing agro-dealers or seed companies have been observed with maize and vegetable seeds
- Seed agents somewhat resemble Village-based Advisor (VBA) models and facilitate trade between farmers and associated agro-dealers and seed companies to form the critical last mile link.

4. Annotated bibliography: Summaries of the reviewed documents

4.1. Definitions and concepts

The definitions and concepts can be found in several documents.

1. Definition of last mile and related concepts, (Nagarajan, Muesembi, & Fernando, 2019)

   Reference: Nagarajan, L., Muesembi, T., & Fernando, A. (2019). Review of Existing Last Mile Seed Delivery Models and Approaches. A Feed the Future Global Supporting Seed Systems for Development activity (S34D) report.
   - Describes the last mile as the final leg in point of service delivery or retail sale. In international development terms, Authors mention that reaching the last mile (usually rural and often isolated communities) involves reaching villages without paved roads, with little access to communication and poor infrastructure
   - Authors focus on seed delivery models for non-maize crops that are important to rural small-scale farmers in sub-Saharan Africa (SSA) while providing case studies of countries where the respective models have been applied.
   - Other key topics discussed in the paper include: (i) The seed value chain, (ii) seed marketing systems available in SSA (iii) Emerging themes that support seed systems and provide key lessons learned.

     Keywords: Last mile, Last mile delivery approaches, seed systems, SSA

2. Definition of last mile distribution, (Balcik, Beamon, & Smilowitz, 2008)

   Reference: Balcik, B., Beamon, B. M., & Smilowitz, K. (2008). Last mile distribution in humanitarian relief. Journal of intelligent transportation systems, 12(2), 51-63.
   - The authors describe last mile distribution as the final stage of a humanitarian relief chain referring it to delivery of relief supplies from local distribution centers (LDCs) to beneficiaries affected by disasters
   - Authors consider a vehicle-based last mile distribution system, in which an LDC stores and distributes emergency relief supplies to a number of demand locations.

     Keywords: Last mile, Last mile delivery approaches, seed systems, humanitarian relief

3. Definitions and characteristics of 'fragile states' by key international actors, (Negro, 2016)

   - The paper presents selected definitions and characteristics of 'fragile states' by key international actors
   - DFID has used a broad definition ("Where the government cannot or will not deliver core Department for functions to the majority of its people, including the poor.") but also refers to a combination of International the three widely accepted assessment frameworks: World Bank's CPIA-indicators, the Fund Development (DFID) for Peace's Failed States Index (FSI) and the Uppsala Conflict Database.

- According to European Union, fragility refers to weak or failing structures and to situations where the social contract is broken due to the state's incapacity or unwillingness to deal with its basic functions, meets its obligations and responsibilities regarding service delivery, management of resources, rule of law, equitable access to power, security and safety of the populace and protection and promotion of citizens' rights and freedoms
- Other international actors including the World Bank, (OECD, IMF among others have also defined what a fragile state entails in this document

Keywords: Fragile states, definitions, international actors

4. Seed provision during and after emergencies, (ODI Seeds and Biodiversity Programme, 1996)
Reference: ODI Seeds and Biodiversity Programme. (1997). Seed Provision during and after Emergencies. Good Practice Review 4. London: Overseas Development Institute Relief & Rehabilitation Network. 134 Pages.

    - The paper distinguishes among emergencies such as conflicts, natural disasters or—in worse cases—a combination of these phenomena
    - The Review distinguishes between emergency seed provision (ESP) and longer-term seed capacity building relating to three broad phases of an 'emergency': an 'acute' phase, a 'settling down' period and a 'rehabilitation' phase.

    Keywords: Last mile, seed systems, seed security, disaster/emergencies

4.2. General papers on seed systems and last mile delivery

Six papers analyze the seed systems and how they can be improved.

5. Guidance to assess seed systems during disasters (Louise Sperling, 2008)

    Reference: Sperling (2008). When disaster strikes: a guide to assessing seed system security. International Center for Tropical Agriculture (CIAT).
    - This guide presents a seven-step method for assessing the security of farmers' seed systems in situations of acute or chronic stress.
    - The occasion may be a natural disaster such as a flood, drought, earthquake or insect pest invasion; or it could be a crisis of human making such as violence or economic recession.
    - Whatever the crisis or stress, the guide serves as a practical field manual for donor agencies, government ministries, nongovernmental organizations, and individuals charged with agricultural relief.
    - The guide is divided into 3 main parts. Part 1, introduction is followed by brief but essential background information on seed system and the concept of seed security. The bulk of the guide, part 3, then lays out in seven steps, the nuts and bolts of conducting a seed system security assessment. Three appendixes complete the guide.

    Keywords: seed systems, seed assessment, seed security, disaster

6. Advice for practitioners,(L. Sperling, Remington, & Haugen, 2006)

Reference: Sperling, L., Remington, T., Haugen, J.M. (2006). Seed aid for seed security: advice for practitioners, practice briefs No. 1–10. International Center for Tropical Agriculture and Catholic Relief Services, Rome. http://seedsystem.org/aid-response-advice/

- Case studies show seed-based agricultural recovery to be more complex than is commonly assumed. These Briefs offer advice on how to sustain and strengthen seed systems during disaster response and recovery periods.
- Technical information addresses such issues as introducing new varieties, protecting agrobiodiversity, and exploiting market opportunities during periods of acute and chronic stress.
- Specific aid-response tools are also offered, including methods for assessing seed system security, guidelines for learning-focused evaluations and checklists to ensure quality in seed aid proposal development.
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- Specific aid-response tools are also offered, including methods for assessing seed system security, guidelines for learning-focused evaluations and checklists to ensure quality in seed aid proposal development.
- The document highlights case studies of models and how they have been used to supply seeds to last mile areas including:

✓ The northern Burundi case looks closely at how small traders (generally a specialist group) have been among the primary beneficiaries of seed vouchers and seed fairs. It gives insight into the type of trader involved (gender, scale, barriers to entry), the investment of trading proceeds into the local system, and opportunities for introducing innovations (including new varieties) via established traders

✓ The local seed and grain traders. In Burundi, where seed aid has been given since 1995, 41 traders recounted their experience with seed sourcing over the past 10 years of drought and war. Thirty-seven indicated that there had never been a problem with availability. The other four nuanced their answers, with only one trader suggesting an absolute lack at one point in time

✓ The western Kenya case looks at the effectiveness of different seed channels (informal seed producer groups, local seed/grain markets) for moving new bean varieties during a period of dramatic production decline. Speed and extent of diffusion, as well as the quality of seed put on offer, figure as key assessment variables

✓ The Malawi, Zimbabwe and Ethiopian cases analyze the longer-term patterns and effects of repeated seed aid. Lack of seed security assessments to address targeted problems, the emergence of a separate 'Relief Seed System' and the use of standard default responses (Direct Seed Distribution evolving to Community based Seed Production) are among the trends examined.

Keywords: Last mile, seed aid, seed systems, seed assessment, seed security, stress, established traders, Informal seed producer groups, Local seed/grain markets, community-based seed production, Africa

7. Humanitarian assessment (Byrne, March, McGuire, Meissner, & Sperling, 2013)

Reference: Byrne, K. G., March, J., McGuire, S., Meissner, L. and Sperling, L. (2013). The role of evidence in humanitarian assessment: the Seed System Security Assessment and the Emergency Market Mapping and Analysis. Disasters, 37: S83-S104. doi:10.1111/disa.12014.

- This paper reviews advances in the development and use of two evidence-based assessment toolkits: the Seed System Security Assessment (SSSA) and the Emergency Market Mapping and Analysis (EMMA).
- Both have been employed in a range of acute and chronic stress contexts across Africa, Asia, and parts of the Americas, in periods of public unrest, displacement, and drought, as well as following earthquakes, flooding, and political instability.
- The aims of this paper are threefold: to review advances with regard to each tool; to compare how each toolkit gathers and uses evidence, while considering possibilities for greater complementarity; and to reflect on the nature of 'evidence' used to guide humanitarian response in sudden-onset and chronic crisis situations.
- A comparison highlights the importance of triangulation and informed analysis for drawing conclusions from imperfect evidence, understanding the limitations of each assessment methodology, and confronting tacit assumptions.

Keywords: Seed system security assessment, Emergency Market Mapping and Analysis (EMMA), acute and chronic contexts, seed system

8. Improving efficiency of seed aid in Africa, (Louise Sperling, Cooper, & Remington, 2008)

Reference: L. Sperling, Cooper, H.D. and Remington, T. (2008). Moving Towards More Effective Seed Aid, The Journal of Development Studies, 44:4, 586-612.

- Seed aid is increasingly applied as an emergency response throughout Africa. This article describes its rise, its goals and the seed security principles which should shape it.
- Drawing on evidence of the effects of disaster, the article reviews the appropriateness of current seed aid responses and suggests ways to link the type of seed security problem with the type of response employed.
- Direct seed distribution, the dominant form, seems suited for a subset of conditions when farmers procure seed through formal channels and when seed is not sufficiently available in an area.
- Seed vouchers and fairs may be more widely applicable as this approach strengthens channels that farmers normally use (both formal and informal) and addresses the more common problem of farmers' lack of access to seed.
- Key for improving seed aid is a better understanding of how local seed markets function, as these provide a core of seed security in normal and stress periods.

Keywords: Seed systems/formal/informal, seed security, stress periods, Africa

9. Disaster mitigation (Chemonics International & USDA, 1996)

   Reference: Chemonics International and USDA. (1996). Seeds for Disaster Mitigation and Recovery in the Greater Horn of Africa. Report prepared by Chemonics International and USDA Famine Mitigation Activity. USAID Contract Number DHR- 5438-Q- 00-1091-00. Washington, DC.

   - This report provides information useful to agencies planning and implementing programs dealing with seed for disaster mitigation and recovery (SDMR) for farmers who have suffered natural or complex disasters.
   - It focuses on the Greater Horn of Africa (GHA) and describes the social and economic dynamics of seed distribution in the GHA region.
   - It recounts recent experiences, including lessons learned while conducting SDMR, and provides guidelines for planning SDMR interventions.
   - It also furnishes information on potential seed sources, issues of seed quality relevant to SDMR in the region, and the opportunities and constraints for matching crop varieties to agroecological contexts. Annexes provide further information on seed-production techniques and on seed sourcing for the GHA.

     Keywords: Great Horn of Africa, seed guidance handbook/institutional capacity building, technology transfer, seed assessment, disaster, seed systems/farmer, seed security

10. Making seed systems more resilient to stress (S. McGuire & Sperling, 2013)

    Reference: McGuire, S., and Sperling, L. (2013). Making seed systems more resilient to stress. Global Environmental Change, 23(3), 644-653.

    - This article discusses seed system security in relation to building resilience to climate stresses and shocks. Provides case study data in contexts of political and civil conflict (Zimbabwe and South Sudan), earthquake (Haiti) and drought (Kenya).
    - It highlights a new toolkit i.e. the Seed System Security Assessment (SSSA), examines what actually happens to seed systems during crises and shows specific features that foster or undermine resilience.
    - It shows that seed systems prove to be relatively resilient, at least in terms of meeting farmers' planting needs for the upcoming season. Altering crop profiles, making use of multiple delivery channels, and innovating (for example, with new barter mechanisms) all become key, as does mobilizing cross-scale seed supply linkages.
    - Key is that formal seed systems will play a catalytic but supporting role, with the onus on resilience response lying within informal systems, and especially with local markets and their traders.
    - It further defines seed system resilience, identifies eight principles linked to processes that build such resilience, and makes 15 practical recommendations for enhancing seed system resilience in the short and medium term. Finally, drawing insights from seed systems, processes central for building resilience in other development sectors are highlighted.

      Keywords: Seed systems/formal/informal, seed system resilience, seed system security, climate stresses and shocks, case studies

11. Understanding and strengthening seed security (Louise Sperling & Cooper, 2003)

Reference: Sperling L. and Cooper, D. (2003). Understanding Seed Systems and Strengthening Seed Security. Background paper prepared for workshop on Effective and Sustainable Seed Relief: A Stakeholder Workshop, Rome, 26–28 May 2003. Rome: Food and Agriculture Organization of the United Nations. 32 pp.

- This background paper reviews the rationale for and goals of seed aid. It also provides an overview of seed systems, particularly the "local" or "informal" seed system that provides most farmers with seed most of the time.
- It also discusses the parameters of seed security, including the distinction between availability, access and use attributes.
- Acute and chronic emergency seed situations are further described. Lessons learned in the field, particularly in Africa, are summarized and discussed. The paper also compares and contrasts current relief options, focusing on the two dominant responses: direct seed distribution and seed fairs and vouchers.
- At the end, the authors consider key challenges for moving the seed-aid field forward. The contents include: • The rationale and goals of seed aid • Overview of the seed systems farmers use • Thoughts about seed security in emergency situations: some conceptual aids • Major response options currently being used in emergencies • Major challenges: moving forward

  Keywords: seed systems/relief, seed systems/farmer, seed assessment/disaster, seed assessment/security

4.3. General papers on seed systems and last mile delivery

4.3.1. Country-wide studies last mile Sudan

12. Sudan Seed sector study (Ali, Samani, & Yousif, 2018)

    Reference: Mohamed Abdulla Ali, Isam Ibrahim AL Samani, & Nuha Yousif. (2018). Sudan Seed Sector Study. https://www.netherlandsandyou.nl/binaries/netherlandsandyou/documenten/publications/2019/05/29/index/SUDAN+SEED+SECTOR+RESEARCH+-+FINAL+REPORT+MAY+2018+AMENDED.pdf

    - The Sudan seed sector research is intended to investigate the seeds sector market potentiality in terms of supply demand and future prospects. 14 states were represented in the study.
    - The study identifies seed supply and distribution network as including farmer saved, farmer – to- farmer, local traders and local markets. Findings reveal that the farmer-saved seed systems represent the majority of seed volume in Sudan. Sudanese seeds had the highest perception among small farmers, mainly because they have been tried.
    - The small holder farmers surveyed were asked on the types of crops they have grown and the type of seeds used. 53% suggested they had used local traditional seeds while 18% used local improved varieties. 29% of the farmers suggested that they used imported improved varieties for their crops.
    - The report also shows that agro-dealers are an important link in the seed supply chain indicating that they are the main provider of small farms with access to inputs such as seeds, fertilizers, and plant protection products. It estimates the number of agro-dealers active in Sudan at approx. 1,050, as advised by Importing companies, the bulk of their business 85% is with small farms vs, 12 % who serve commercial farms as indicated by our survey.
    - Interviews with importers conducted for the purpose of this study suggests that the network of agro-dealers are well distributed across the country and provide good density of coverage across. The seeds sector survey had covered 144 agro-dealers distributed across localities within 14 of the 15 states nationwide.

    Keywords: Sudan, seed system/formal, seed system/informal, agro-dealers

13. Seed security assessment in Sudan (FAO, 2022)

    Reference: FAO. (2022). Seed security assessment in Sudan. FAO.

    - The SSA took place in Northern, North Kordofan, South Darfur, Khartoum, Gezira and Gedarif states of Sudan representing the various farming system. The document describes the farming systems in Sudan reflecting the various agro-ecological zones
    - The document additionally elaborates the concept of seed security. It further defines and discusses what it means by acute seed insecurity and chronic seed insecurity. It further discusses the seed systems in Sudan revealing how the informal sector dominates by producing about 86% of the seed requirements before the SSA.

- The high contribution of informal seed production is attributed to preference of local varieties, easy access of local seeds through borrowing from farmers or lending from local market and local merchants and availability at time of planting compared to high prices of certified seeds, difficulty in obtaining certified seeds at time of planting.
- The adoption rate of new varieties is noted to be low especially in sorghum compared to the number of varieties released and reveals that farmers depend on their local varieties for cultivation.
- Key is that the informal seed sector produces, stores, markets and disseminates seeds, of local varieties and materials that originated from improved varieties, among farmers and through local markets. The informal system provides most of the popular seeds the farmers use because of its ability to meet local needs and preferences. Grains/ potential seeds available with farmers and in the local markets are a mixture of improved seeds crossed with land races
- The main sources of certified seeds indicated in the HHs survey in 2021 were seed companies/agro-dealers, seed growers, partnership between seed companies and community, distribution by NGOs and MoPER
- The main sources of informal seeds were farmers' saved seeds, traders/ local market, local seed producers, exchange between farmers and gifts. The document further shows that buying of certified seeds depends on the type of the crop; farmers buy certified seeds of watermelon and tomato every season as the seeds saved by farmers from these crops are inferior in quality and germination.
- The document gives a noticeable example of a success from packing faba beans in small packs of 20 Kg or less from some traders who had imported faba beans from Egypt in small packages which it suggests could be replicated.

Keywords: Traders/ village or local markets, Local seed producers, local merchants, acute/chronic stress, Sudan

14. Seed system, Sudan (ICD, 1987)

Reference: Industry council for development. (1987). An assessment of the national seed system in Sudan. ICD Mission Report, New York. https://pdf.usaid.gov/pdf_docs/PNABB586.pdf

- The mission found that even though large investments in economic resources, training, and other support from government and international aid agencies had been made, only a small fraction, barely 5%, of the total potential demand in the country for high quality seed of improved varieties was being met.
- The document describes the private seed sector in Sudan as being made up of seed producers, seed importers, international seed companies operating directly or indirectly in Sudan, seed distributors, and dealers and local seedsmen.
- The article describes local seedsmen as farmers who have acquired good reputations for tending crops and selecting the fields best for their own seed production, tend to become resource persons for seed production and distribution among their neighbors, either on a permanent or occasional basis. This is a system observed by the author as emerging in the traditional rainfed areas for sorghum, millet, groundnut and sesame seed arid, to some extent, in the irrigated areas for certain vegetable seeds.

- The document further indicates that the establishment of nuclear seedsmen in these communities may be of great effectiveness in the future for distributing seed of high yielding varieties.
- It concludes that farmers tend to distrust merchants, particularly in terms of quality and exploitation, and that any merchant dealing in seed would need to overcome those suspicions. Farmers tend to prefer other farmers to merchants as a source of seed.
- Both mobile and permanent kiosks are envisioned, with the mobile kiosk moving from village market to village market
- The document presents the case for farmer cooperatives describing how farmers in Karen Karen, southeastern Blue Nile Province, lost their entire sorghum and sesame crop to drought in 1984. Their local sorghum and sesame varieties were long season maturity types. In 1985, all of the farmers requested Dabar sorghum and Zira 7 sesame seed supplied from the Blue Nile Project through their farm cooperative association. However, the document notes that it is not clear if these short-season maturity varieties

The document further discusses the following content in relation to Sudan:

- Crop Production and Distribution Systems
- Sources of Seed Supply
- The Present Institutional Framework
- The Regulatory Environment for Seeds
- Infrastructure for Seed Processing and Storage
- Marketing and Distribution of Seeds in Sudan

Keywords: Sudan, Blue Nile, local seedsmen, farmer cooperative, mobile and permanent kiosks, high yielding varieties, local merchants

15. Agriculture with challenges and opportunities, Sudan (Elbadawi et al., 2022)

Reference: Elbadawi, I., Elbashir, A., Osman, A., Elobaid, A. H., Eltahir, E., & Alhelo, A. (2022). Sudan's Challenges and Opportunities: A Renaissance Project for Sudan: From Poor Agriculture to Agro-Industrial Growth and Sustainable Development. Economic Research Forum Working Papers.

- The report falls into four parts. Part 1 contains a preliminary analysis of the aggregate and sectoral value-added in Sudanese agriculture as well as the assessment of the determinants of conditional convergence of agricultural value-added by estimating an empirical agricultural growth model, using global data covering more than 120 countries. In this context, the report compares and contrasts agricultural VA in Sudan to other comparators and analyze factors associated with three pillars of productivity: policies and institution (macroeconomic environment, pricing policies …etc.); inputs and capital base of agricultural supply (fertilizers, road infrastructure, finance); human capital and empowerment.
- Part 2 provides detailed SWOT (strength, weakness, opportunities and threats) analysis of the three main agricultural sub-sectors (traditional rain-fed, non-gum Arabic field crops and gum Arabic; semi-mechanized; and irrigated). Building upon the SWOT analysis of the sector and the factors shaping its VA, Parts III-V address the challenging question as to how to achieve the overarching objective of "transforming Sudanese agriculture".

- Part 3 considers the role of institutions and empowerment of rural communities through establishing robust agricultural commodities development council, agricultural research system, seed industry, and farmers' cooperatives.
- Part 4 discusses the critical need to invest in agricultural supply for effecting the much-needed transformation, including by mainstreaming fertilizers use; expanding irrigation systems and renewable energy; and, considering the impending digital revolution, incrementally embracing adoption of technology and precision agriculture.
- Part 5, proposes a new business model for transforming agriculture by making the sector looking more like industry. The proposed business model is built around agro-industrial Growth Corridors and private sector-led contractual agriculture.
- Finally, Part 6 presents the key elements of the envisaged strategy for transforming Sudanese agriculture.
- This document characterizes seed systems in Sudan referring the informal system to as farmer, local, and traditional. The document indicates that in this system, farmers save from their own harvest and receive donations from friends, neighbors, and relatives, or they buy from local grain markets or traders. It describes the informal seed production/distribution chain as community-based, short, and simple, without any regulations
- Type of varieties and crops in the informal system include local landraces or mixed populations; Food and subsistence crops

Keywords: Sudan, Local landraces or mixed populations, local grain markets or traders, farmer-saved seed, social networks

16. Community seed production – National plan, Sudan (FAO, 2021b)

Reference: Food and Agriculture Organization of the United Nations. (2021). Views, Experiences and Best Practices as an Example of Possible Options for the National Implementation of Article 9 of the International Treaty.

- This document presents the updated information on best practices and measures of implementing Article 9 of the International Treaty submitted by Sudan on 11 July 2019.
- The paper presents best practices from various projects. Key is the Community-based Seed Growers Groups (SGGs) to produce certified seeds of improved and traditional varieties in Sudan for the Seed Development Project, which was approved in 2011, became effective in 2012, and completed on time in March 2018. Component 3 of the project intended at supporting seed and market development, including support to farmers' groups and associations and the private sector providing relevant technologies, goods and services.
- Community-based Seed Growers Groups (SGGs) are enabled to produce certified seeds of improved and traditional varieties. The cumulative number of SGGs reached 17 groups (against 12 groups planned at project design) including 853 farmers (530 men and 323 women). These groups were provided technical training by the extension teams and the PSCs technicians to multiply certified seeds using registered seeds produced by the ARC.
- Project records show a total area of 4,451 feddan is under seed production by the SGGs members. SGGs members and PSCs clearly confirm the success of the project-supported business model in which private seed companies contract seed growers for the multiplication of registered seeds to produce fully certified seeds. The seed growers sell their seed to the seed company by price higher than the market price not less than 20%.

- These achievements have led to an increase of the cultivation under seed production, which has resulted in a significant improvement in food security nationally.
- The document additionally shares lessons learnt and challenges faced. Key is limiting the purchase and selling of seeds through contracting a seed company. However, in some villages, members of the SGGs managed to establish business deals for seeds supply on a commercial basis to neighbors' and other farmers outside the project area, such as West Kordofan and Darfur states.

Keywords: Community-based Seed Growers Groups (SGGs), North and South Kordfan, certified seeds of improved and traditional varieties

4.3.2. Local studies on seed and innovation systems on Sudan

17. Agricultural innovation in a locality in South Kordofan State, Sudan (Adam, Hamad, Mohamed, Ibrahim, & Abutaba, 2015)

Reference: Adam, M., Hamad, A., Mohamed, S. A., Ibrahim, Y., & Abutaba, M. (2015). Challenges relating to application of some agricultural innovation in Elgouz locality, South Kordofan State, Sudan. The Journal of Agriculture and Natural Resources Sciences, 2(3), 487-490.

- This paper was dedicated to deal with challenges concerning the application of some agricultural innovations in Elgouz locality, South Kordofan State, Sudan. This study aimed specifically to find out the type of innovations and farmer perception toward innovation and what extension services were delivered.

The results of study indicated that two innovations were delivered to farmers; improved seed and agricultural mechanics, also the results showed that ineffective role of extension services, and majority of farmers have positive perceptions towards agricultural innovations (72%).

Keywords: Agricultural Innovation, Improved seed, farmer seed enterprises, Elgouz Locality, South Kordofan State, Sudan.

18. Seed enterprises in North Cameroon. (Guei, Barra, & Silue, 2011).
Reference: Guei, R. G., Barra, A., & Silue, D. (2011). Promoting smallholder seed enterprises: quality seed production of rice, maize, sorghum and millet in northern Cameroon. International Journal of Agricultural Sustainability, 9(1), 91-99.

- The paper gives an example of Cameroon revealing how the agriculture research institute developed adapted early maturing varieties of these crops and with the support of FAO, farmer seed enterprises were organized to produce certified seed for sale to farmers in the surrounding villages

19. FAO Assessment situation in Darfur, Sudan, (FAO, 2021a)

Reference: FAO. (2012). Assessment Report for Darfur Region. https://www.fao.org/3/i2787e/i2787e.pdf

- The Darfur Seed System Security Assessment (SSSA) report aims to provide the reader with the following: (i) insight into seed system security scenarios; (ii) Processes and methods used; (iii)a clear picture of past and current situations; and (iv) opportunities and actions that may be undertaken to improve the current situation. The document is organized in terms of chapters.
- Chapter IV describes the functioning of the seed system in Sudan by reviewing both the formal and informal sectors. It reviews the past and current formal plant breeding structures and processes, and how the formal seed production has been organized in the past and present, with specific reference to Darfur. It provides an extensive section describing how decentralized seed multiplication and distribution unfolds in Darfur.
- Chapter V is the heart of the field findings and presents the current seed security situation in Darfur. It a) reviews the major crop types and varieties being grown; b) looks at issues related to seed availability, access, and quality (for 2010 and also projecting to 2011) at household level; c) reviews the functioning of the local grain/seed markets and agro-input dealers in improving availability, access and quality of grain for seed, as well as d) suggests alternative sources of quality vegetable seed and other agro-inputs.
- Key is that in Darfur, farming households obtain their seed from multiple sources including: their own saved seed, local grain/seed markets, social networks, seed aid from the Government and other humanitarian and development partners, local seed banks and agro-dealers. In the 2010 planting season, over 75 percent of the seed sown by farmers came from local channels, including from farmers' own stocks (27.6 percent), the local market (44.1 percent), or through social networks (2.6 percent), demonstrating the importance of the informal seed system as the primary source for seed.
- Chapter VI focuses on agro-processing that could indirectly stimulate demand for increased production of specific crop varieties. It also reviews other related opportunities in support of income generation and agricultural development.
- Chapter VII presents the overall conclusion and recommendations. These are intended to lead to specific actions in a range of areas of agricultural research, seed security interventions and agro-enterprise development for improved food security and livelihoods.

Keywords: Local grain/seed markets, own saved seed, last mile, Darfur

20. Farming systems research, North Kordofan, Sudan (INTSORMIL, 1982)

Reference: INTSORMIL. (1982). Socioeconomic constraints to the production, distribution and consumption of sorghum, millet and cash crops in North Kordofan, Sudan. Farming Systems Research in North Kordofan, Sudan Report No. 2. Aspects of Agricultural Production, the Household Economy, and Marketing. University of Kentucky. https://agris.fao.org/agris-search/search.do?recordID=XF2015030932

- This research report is of the University of Kentucky INTSORMIL (International Sorghum and Millet) Project carried out in the el-Obeid area of Sudan
- Part I of the report presents an analysis of the data collected from a preliminary survey of 40 farm households in three villages. Part II describes major aspects of the rural marketing system in the area based on data collected from four marketing centers.

- Part III is an analysis of the main constraints to agriculture in the area. This section also describes how farmers attempt to deal with these constraints at present, and it proposes new strategies for alleviating each constraint. Following Part III, there are a number of appendices which present additional data that could not be easily reviewed in the main body of the report. A glossary of Arabic terms and a copy of the questionnaire used for surveying the 40 households are also found in the appendices.
- The research identified a number of farming system constraints including seed accessibility and suggested use of village merchants as primary distributors of improved seeds. It shows that Village merchants already perform this role in many villages in the area. Key is that they are responsible for the introduction of several new varieties of sesame and sorghum through seed sales to farmers.
- Findings further show that 45 percent of the farmers purchased millet seed. Most of these seed purchases were made from other farmers (12 of 17 or 71%), but some farmers purchased seed from local merchants as well (5 of 17 or 29%). Farmers also purchase seeds from the el-Obeid market.
- There is a common belief among farmers that other farmers are the best sources of obtaining seeds because they tend not to mix seed varieties. Seeds obtained from other sources are more questionable.

Keywords: Seed systems, Rural crop market, village merchants, Local varieties (Millet, groundnut, sesame), Sudan/ (North Kordofan)

21. Production constraints North Kordofan, Sudan (Murakah & Breima, 2018)

Reference: Ahmed M Murakah and Elkhalil Elnour Breima. (2018). Identification and Description of Production Constraints of Main Food and Cash Crops in North Kordofan State. Agricultural Research & Technology: Open Access Journal, 16 (5).

- This study was carried out in Elkhwei locality of North Kordofan state during 2012/2013 cropping season to identify production constraints of food and cash crops.
- Results showed that 77.9% of participants used traditional methods of seeding, 65% used seeds from own farm whereas 27 % obtained their seed from the market
- Results further showed that 21.3% used improved seed, 70.7%-Local and 8% improved seed

Keywords: Sudan/North Kordofan, market, seed system

22. Faba bean production and marketing, River Nile State (Ahmed, 2004)

Reference: Ahmed, E. A. (2004). Economics of Faba Bean Production and Marketing In The River Nile State (A Case Study Of Eddamer District) (Doctoral dissertation, University of Khartoum).

- This study was conducted in Eddamer district of the River Nile State. The River Nile State is considered as one of the main suppliers of faba bean to the country. The production and marketing of faba bean in the River Nile State is faced by manifold problems such as low

level of productivity, high cost of production, fluctuations of prices, inadequate credit and marketing arrangements

- By traditions farmers in the Northern Sudan retain their seeds from the previous harvest. Due to this reason and the sustainable shortage of improved seeds, surveyed farmer revealed that they rely on their seeds stock.
- The field survey revealed that, half of the farmers reported storing 3.35 sacks, as seeds for the next season. This is equivalent to about 13% of their production.

Keywords: River Nile state, Sudan, Traditional varieties/Faba bean, retained seed

23. Impact seed distribution on subsistence farming in Central Darfur State, Sudan (Hassan & Abaker, 2015)
Reference: Thabit A. Hassan and Adam Salih Abaker. (2015). Impact of seed distribution on subsistence farming production in Zalingei area of Central Darfur State – Sudan. International Journal of Current Research in Life Sciences. Vol. 4, No. 09, pp. 375-379.
    - In Darfur Region in western Sudan, the population is predominantly rural consisting of about 89 per cent of the total with the main occupation of the people being agriculture, as their main source of food and income
    - The main source of seeds in the study area is mainly from previous crops (46.4%) where social network and NGOs/ Government shared by about 27% and 9.6% respectively
    - Seed distributors (or agro-dealers) buy seeds from seed companies or their representatives and sell them to farmers. A small number of vendors sell both grain and seed from seed companies, leading to a third category – grain traders/distributors
    - The paper reveals that grain market is an important source of seed in the area that even though traders bring grain from distant areas, farmers are aware that not all varieties are suitable to the local conditions and recognize the adapted ones

    Key words: Central Darfur State, Grain traders, Social networks; Local seeds (Sorghum, millet), rural, droughts

24. Small scale seed production in Central Sudan (Numan, 2000)

Reference: Numan, N.H.A. (2000). Small scale seed production in Central States of Sudan. In Finance and management of small scale seed enterprises. ed. Kugbei, S., Turner M., Witthaut, P. (eds). ICARDA, Areppo, Syria, Viii, 191pp.
https://books.google.com/books?hl=en&lr=&id=MxbHV0WGG4UC&oi=fnd&pg=PA150&dq=Small-scale+seed+production+in+central+states+of+Sudan&ots=f6ifvt-UX-&sig=TyJCD0MUt3ffl8hiqz4cjp6MeBw

- In Sudan, individual farmers are the main producers for seeds for local vegetables, fodder, sorghum, Alfafa and maize. Besides individual farmers, a few other enterprises produce and market seeds on a small scale.
- The document analyses small scale seed production in Central Sudan. It discusses the operations in Central Sudan for Agriculturalist Cooperative and Agribusiness enterprise Sudan as small scale seed enterprises.

- It highlights their role particularly in financing contract farmers and estimates their margin profits in their seed businesses. It highlights what comprises the formal seed system in Sudan and gives a brief historical background of what led to formation of Seed Administration and what constitutes its role.
- It further provides a list of seed crops cultivated by farmers in Sudan which range from cereals, oil crops and horticulture crops. It also shows the list of crops produced and sold by small scale enterprises. It gives an overview of what constitute an informal seed sector and farmer engagement in the whole process.
- It recognizes that 90% of seed used nationwide is produced by informal sector and from open pollinated crop varieties and suggests that small scale enterprises could be good sources of quality seeds of appropriate varieties that are required by NGOs which support households in hostile and drought prone areas of the country with seeds and tools.

Keywords: Small scale enterprises, seed systems, drought prone areas, Quality seeds of appropriate varieties, Sudan

25. Community based seed supply in North Kordofan, Sudan (A.K., 2007)

Reference: Osman, A.K. (2007). Community based seed supply in Sudan. Leisa Magazine, 23 (2):2. June 2007: http://ileia.leisa.info/index.php?url=article-details.tpl&p[_id]=113358

- In several surveys conducted in North Kordofan, communities identified availability of seed as the most important constraint, and seed as the input most needed to raise productivity.
- Between 2002 and 2005, CARE International in Sudan implemented a project to enhance the food security status of approximately 65 000 rural families in Sheikan and Enhoud, two localities in North Kordofan.
- Some of the main components of the project were: to improve seed availability through distribution of high-quality seeds of improved varieties released by research, capacity building and training of local communities, and the promotion of seed multiplication at community level.
- The article highlights how Elobeid Research Station supported the project in providing appropriate seed varieties, conducting on-farm trials and participatory diagnostic surveys which led to development of a number of improved, early maturing, stable, and drought tolerant varieties of millet, sorghum, groundnut, sesame and cowpea, which were later used for distribution and multiplication in the three-year project.
- Low seed repayment rates were a challenge experienced in the dissemination and supply of the improved varieties. However, this was addressed, and a sustainable supply of seed was enhanced through establishing community-based organisations such as Village Agricultural Committees, and strengthening the links between these committees and other stakeholders, including the Ministry of Agriculture, the Farmers' Union, local seed companies and ElObeid Research Station.
- The station now advises farmers associations or development projects that are planning to multiply or distribute seeds. The article recommends the local distribution channels

noting that the community-based system is very effective in improving the dissemination, accessibility and availability of quality seeds of the adopted improved varieties.

Keywords: Sudan, North Kordofan, Seed distribution, Improved varieties, Community based organisations, repeated droughts, humanitarian relief

26. Groundnut, sesame, market systems, West Kordofan and East Darfur (Hudson, 2022)

Reference: International Labour Organization. (2022). Integrated enterprise and market systems assessment on the refugee and host community livelihoods in Sudan: Groundnut and sesame value chains in West Kordofan and East Darfur. ISBN: 9789220369722 (web PDF).

- This report details the findings of market assessments conducted on the groundnut and sesame value chains in East Darfur and West Kordofan.
- According to the survey results, farmers generally use improved seeds provided by the MoPER. 5and the farmers use local types that are kept over from the previous seasons, either from their own stock or purchased from other farmers/seed sellers at the community level.
- Nearly 90 per cent of the refugees in Al-Nimir camp are involved in the production of groundnuts using the same types of seed and traditional production process as in West Kordofan

Keywords: Local types that are kept over from the previous seasons (Sesame), From their own stock, Purchased from other farmers

4.4. Last mile seed delivery models and approaches in Afica

27. Africa (Walsh, Remington, Remington, & Ojiewo, 2015)

Reference: Walsh, S., Remington, T., Kugbei, S., and Chris O. Ojiewo, C.O. (2015). Review of Community Seed Production Practices in Africa Part 2: Lessons Learnt and Future Perspective. Conference paper. https://www.researchgate.net/publication/277546059_Review_of_Community_Seed_Production_Practices_in_Africa_Part_2_Lessons_Learnt_and_Future_Perspective

- A general theme running through all of these case studies is improving farmers' access to quality seed of desired varieties. Topics include varietal identification, seed production, seed quality, seed policy, and seed marketing.
- CSP in Tanzania followed three models: 'lead farmers', 'farmer groups', and 'primary school gardens', each model reflecting desired outcomes of different donors. The church funded model was based on farmer groups at village level, one bilateral funded model focused on raising public sector capacities and targeted lead farmers for seed production, and a second bilateral funded model targeted school gardens. Government attempted to mandate the sourcing of Foundation seed at fixed prices. This was impossible to enforce (Foundation seed was priced at a multiple of five to certified seed and in some cases at a multiple of fifty

to the local price of grain) and this led to a large variance in the prices for starter seed as reported by farmer groups, lead farmers, and schools.

- In Tanzania, Seed sales was a major challenge and undermined the incentives of community seed producers, particularly the lead farmers who had higher input costs and were initially prevented from selling outside of their community. Where seed producers groups reported successfully selling seed, it was due to a large brokered sale, between the church organization supporting farmer groups and FAO, or where there was a high market demand and strong promotion, for example schools in Singida.
- CSP in the Sudan case study was organized through 'village agricultural committees' that were the focus of seed provision and training from extension staff and seed inspectors from the Ministry of Agriculture on agronomy, production, storage, and seed quality. Village agricultural committees were expected to identify lead farmers for seed production, distribute seed to other farmers through a repayment system, and keep records.
- CSP in the Ethiopia case study was organized by 'cooperative community based seed enterprise', membership ranged from 40–300 across nine cooperatives, with a median of 68. These cooperatives were furnished with seed, irrigation equipment, seed cleaning equipment, seed stores, as well as training from local government extension agents. Successful cooperatives were characterized by strong collaboration with public sector actors (research, local agriculture and development offices, national trade organization). This reflects the presence of strong cooperatives in Ethiopia. Actual numbers of farmers served are not indicated in the case study but based on the median CSP of 5 ha, we estimate 1,000 farmers were served annually per CSP.
- CSP in Kenya was organized by 'producer market groups' that linked farmer groups with certified and commercial seed and with buyers of high value legumes. The groups were highly dispersed, operating across four districts and comprising more than 17,000 farmers, of which 65% were women. The community seed production efforts in Kenya promoted knowledge and access to new varieties through a value chain approach aimed at marketing seed and legumes by raising collaboration between producer groups, early generation seed producers, research partners, and buyers. In Kenya, more than 17,000 farmers were supplied with legume seed of improved varieties over a period of two years, which induced a 'spill-over effect'.

Keywords: seed accessibility, Community Seed Producers, certified seed, case studies

28. Synthesis of 6 countries and 40 crops in Africa show importance of informal sector (S. McGuire & Sperling, 2016)

Reference: McGuire, S., & Sperling, L. (2016). Seed systems smallholder farmers use. Food Security, 8, 179-195.

- While investments have primarily focused on strengthening the formal sector, this article documents the degree to which the informal sector remains the core for seed acquisition, especially in Africa. Conclusions drawn from a uniquely comprehensive data set, 9660 observations across six countries and covering 40 crops, show that farmers access 90.2 % of their seed from informal systems with 50.9 % of that deriving from local markets. Further, 55 % of seed is paid for by cash, indicating that smallholders are already mSaking important investments in this arena.

- The document provides case studies of models and how they have been used to supply seeds to last mile areas in respective countries including:
  - ✓ Seed sale has been added to rural 'Mom and Pop' stores which sell basic staples in both Zimbabwe (through the CARE Agent Program; Zimbabwe SSSA and NRI 2003) and Timor-Leste (through a Mercy Corps initiative; TL SSSA). (New variety)
  - ✓ Seed sale also routinely takes place in supermarkets of Malawi. Colored green or pink maize seed, along with clear variety labels, signals that seed is being sold. (Horticultural and bean seed)
  - ✓ Drylands in eastern Kenya packed 50MT of beans in small packs in 2013 (Sperling et al. 2014) and AGRA now also trains its private sector grantees to pack seed in smaller units (Sperling and Boettiger 2013).
  - ✓ The local market was also the dominant seed source in four out of the six SSSAs: Haiti, Kenya, Malawi and DRC. Female-headed households were slightly more likely to use local markets, though only significantly so in DRC ($p<0.10$),
  - ✓ Large traders (e.g., moving 50–200 MT/season in the SSSAs monitored) have been known to respond to quality innovations if new business opportunities arise. For example, in order to participate in CARE's seed relief program in eastern Ethiopia in 2002, traders adopted several seed quality enhancing practices: improving warehouse conditions, maintaining specific seed stores, separating out specific varieties (McGuire and Sperling, 2008)
  - ✓ Key is that agro-dealers, that is, the private input company networks which put on offer modern varieties and certified seed, proved to be an insignificant source of seed for smallholder farmers, across crops and sites, supplying 2.4%ofseed used. Key to emphasize is that for over 2500 farmers spread across 31 sites in six countries, seed sources utilized were few in number and overwhelmingly dominated by two: local markets and own stocks.

Keywords: Zimbabwe/ Declining purchasing power/ new variety, Malawi/ Low purchasing power; Repeated droughts/ Horticultural and bean seed; Eastern Ethiopia/ Improved seed, Kenya/ Certified seed for maize and greengram

29. Case studies on last mile legume seed delivery in Africa (Hanif & Sperling, 2016)

Reference: Hanif, Charity and Louise Sperling. (2016). Delivery of Legume seed at the last mile: Theory and practice. With central contributions from Sara Boettiger, Travis Burke, Mark Huisenga, Fred Muhhuku and Irv Widders.

- This assessment started with a literature review, and attempted to discern pivotal characteristics within legume seed technology that have significant implications for commercial delivery business models and delivering customer value to diverse customer segments. Key gaps of evidence and understanding within customer segmentation and reach, as well as constraints within the enabling environment for pursuing alternative models of delivery, have been identified.
- The document provides case studies of models and how they have been used to supply legume seeds to last mile areas including:
  - Commodity grain traders: Ethiopia: traders of potential seed in Ethiopia moved 200-300Mt of chickpea the 2016 main season (SSSA Ethiopia, 2016). in the context of

relief interventions (from 2002 and onwards), the NGO CARE in Haraghe, Ethiopia even commissioned select traders to seek good seed for sale. Traders were required to have business licenses, separate out varieties, and maintain clean warehouses—and in return captured an impressive emergency market (Sperling and McGuire 2010.)

- Small packs (Kenya): Dryland sells small packs at agricultural fairs and promotion demos in order to introduce the new varieties or quality seeds, though the production seeds are now mainly sold in 2 kg packs (80%), and 1 kg packs (20%).
- Agro-dealers: Results have been positive according to Rockefeller, when evaluating CNFA's agro-dealer program in Malawi, Kenya, and Uganda: between 1997 to 2004, average distance to nearest dealer declined for smallholders from 8 km to 4 km; $900,000 worth of agricultural inputs and seeds had moved into the smallholder realm; and the default rate on credit guarantees was found to be less than one percent (2011).
- Agent model (Zambia and Zimbabwe): Agents were identified and trained by individual companies (with assistance from the NGO) and given exclusive credit lines; these newly trained agents worked with agro-dealers (or were agro-dealers themselves) to travel to communities, disseminate information, and sell new varieties and inputs. The agent model shows positive evidence, especially considering the difficult operating environment in Zimbabwe during 2003-2004, but challenges still arise as highlighted in the document
- In the Uganda ISSD program, the local seed businesses (LSBs) are community based seed producer groups and are selling only a small proportion of their seed production commercially within their communities and neighboring geographies
- CLUSA's VBA model notes 247 active PSPs, with over 600 in training in Senegal, and over one million customers served in Zambia. However, despite USAID evaluations, there is little beyond the locales where programs are taking place. The sustainability and scalability of this model is yet to be proven.
- However, VBA method has produced significant results: USAID in a compendium report reviewing VBAs under FIPS noted adoption rates of root crops in Kenya as high as 85%, with the average rate between 30-60% per village, across a timeframe from 2006 to 2010; this study evaluated not only the sales of produce, but also on-farm consumption (Compendium Report, 2012).
- In the Singida and Dodoma regions of Tanzania, characterized by poor soil and growing conditions. Due to the 4 VBA associations FIPS helped create, 1,010kg of dolichos lablab (a legume) was distributed, though the literature does not note whether this distribution was a sale, a giveaway, or a loan
- programs that are developing decentralized community based seed producers and producer groups include the Senegalese Feed the Future Mbay Naatal program with rice seed, and the ISSD program in Ethiopia and Uganda which includes various crops including legumes.8 Many of the seed producer groups have been recruited, started, and developed within broader value chain programs and the literature and program reporting was not specifically focused on the seed production, rather than broader value chain work.
- Pigeon pea received little attention until demand rose in India, underlining the difficulty in predicting any potential game changer in which an enterprise may invest.

Now a majority of smallholders grow pigeon pea, many in a form of outgrowing for pigeon pea seed providers.

- IRRAS (Improved Rice-based Rainfed Agricultural Systems project) in India is also utilizing credit and savings groups as a foundation for VBAs (PISPs) alongside a technology pipeline out of research. Wheat, rice, and grain legume production technologies are commercialized through the model. The VBAs (PSPs) sell not only seed and inputs, but also tractor services and ag chemicals and ag chemical application services
- Some companies have also traced the small pack reframing as one of the driving engines for their increased sales: for example, Drylands in Eastern Kenya first put different legume varieties in small packs ranging from 100g to 1kg in the year 2012 and assert that it was this format that boosted certified seed legume demands in 2013. A total of 1,824 100g packs, 1,860 250g packs, 883 small packs of 500g and 81,352 small packs of the assorted legume varieties were sold between 2013 and 2015 (Mutisya et al. 2016). Kenya companies and their agro-dealers now mostly use a standard of 1-2 kg only, although this may be tailored by crop, climbing beans may sell in 500g given their intensive use over small plots
- Community based seed producers may not fare much better. As noted in the business model section above, most community-based seed producers are selling the majority of their seed back to the programs which are supporting their development, to NGOs or public institutions, or to larger seed companies
- The paper in conclusion provides several action points in terms of moving forward toward an impact-oriented legume seed sector strategy.

Keywords: Last mile, Kenya/New varieties; assorted legume varieties, Zambia and Mozambique/ Modern inputs,

30. Experience of CARE with last-mile providers in Africa (Ethiopia, Ghana, Zambia) (Patterson, 2020)

    Reference: Patterson, A. (2020). Solutions to Keep Agricultural Inputs Flowing During Crisis. https://www.marketlinks.org/resources/solutions-keep-agricultural-inputs-flowing-during-crisis

    - CARE's experience points to massive market disruptions and food insecurity as a result of quarantine, restrictions on mobility, and a sudden diversion of additional resources into the immediate pandemic response.
    - Staff members work directly with last-mile suppliers to be responsive to the needs of women, which is key to ensuring that products are available to women. This includes packaging of inputs in smaller packs that women can afford and working around cashless payment methods.
    - To get closer to reaching the last mile, CARE Ethiopia SPIR program introduced mobile farm shops with which agro-dealers can move from their permanent shop into central and community marketplaces and to deliver inputs for farmers.
    - CARE is continuing to address end-market opportunity constraints and enhance the business skills of small-scale producers in order to unlock end market opportunities and ensure that farmers can profit from their agricultural products.

Keywords: Mobile farm shops, Ethiopia; improved seed, small packs, end market

31. Seed systems in SSA, experienced tropical legumes project (Rubyogo et al., 2019)

Reference: Rubyogo, J. C., Akpo, E., Omoigui, L., Pooran, G., Chaturvedi, S. K., Fikre, A., ... & Kalemera, S. (2019). Market-led options to scale up legume seeds in developing countries: Experiences from the Tropical Legumes Project. Plant Breeding, 138(4), 474-486.

- The experiences reported here are collated through a 10-year partnership project, the Tropical Legumes in SSA and SA. It fostered innovative public–private partnerships in joint testing of innovative market-led seed systems, skills and knowledge enhancement, de-risking private sector initiatives that introduced in new approaches and previously overlooked entities in technology delivery.
- The article documents how the engagement of commodity traders/off-takers (e.g. Raphael Group in Tanzania and ACOS in Ethiopia), private seed companies, individual seed entrepreneurs, NGOs, grain traders, community based organizations (CBOs) and FOs greatly enhanced the prospects for demand-led seed systems which is key to the sustainability of intended outcomes.
- The article emphasizes the need for a strong partnership. Key are the local seed traders and the Local grain traders, Farmers' groups and Cooperative Unions, Decentralized seed producers among others. Their roles and responsibilities in in collaborative legume seed systems approach are highlighted in Table 1.
- Using small and affordable packs has been a success in this project which has enabled the project to spur the growth of private companies by supporting them to expand their distribution and marketing networks in remote rural areas through diverse market channels.
- Between 2007 and 2017, nearly half a million packs were marketed with more than 50% of buyers being women. Between 2015 and 2017, an average of 20% of the entire seed produced was sold in small packs of 0.5, 1, 2, 5 and 10 kg across target countries and legume crops
- Strikingly, in remote areas of northern Tanzania (200 km from Arusha—major city), Mr Byda, one of largest seed distributors in Manyara region saw the bean seed business opportunities. He opened more rural shops and bought mobile vender trucks which are linked to the seed companies. He sold certified bean seed in 18 market places and in public gatherings associated with churches/mosque, schools and health centres in three neighbouring districts (Babati, Hannang and Mbulu).

Key words: legumes, SSA, legume, last mile, the Tropical Legumes Project

32. Models for legume seed (L Sperling, Dey, & Leege, 2017)

Reference: Sperling, L., Dey, B., & Leege, D. (2017, March). New Models for Legume Seed Business–Resilience, Nutrition and Reaching Farmers at the Last Mile. In Report of a Meeting, USAID, Washington DC (pp. 1-2).

- The goal of this conference was to convene partners and stakeholders to examine and develop a concrete set of building blocks for getting new varieties and quality legume seed into farmers' hands
- Key among other foci of the proceeding is: Last mile approaches - Are there better ways (even ones not yet explored) how to get seed in remote geographies (without just relying on emergency aid)?
- The document provides case studies of models and how they have been used to supply legume seeds to last mile areas including:

  - ✓ Small packs: In Kenya some companies are now packing at least 10% of the seed in 1kg or 500g. Through PABRA, the approach has been expanded to other countries (Uganda, Tanzania, Ethiopia, Zimbabwe, Burundi) enabling farmers to access seed
  - ✓ In Zimbabwe, its relatively advanced seed industry largely relies on formal system (10 seed companies) to supply seed for most field crops including common beans. Certified seed is purchased and distributed through outlets that include supermarkets, and ordinary rural grocery stores. One of the challenges which is being tackled is to increase the efficiency in the supply e.g. how to aggregate seed demand.
  - ✓ In Burundi, one approach used is providing initial seed to farmers (groups) which after a cycle of multiplication, is sold by farmers to other farmers in local grain markets and seed fairs etc. Following the adoption of the quality declared seed notion in Burundi, some NGOs are supporting QDS production. However, there is an emerging entrepreneurial spirit in seed production involving several individual entrepreneurs who are producing an average of 10 ton per year.
  - ✓ In the LSB model in Ethiopia, voluntary farmers are organized into seed producer and marketing cooperatives to pull their resources (land and other physical resources, cash, and human resources) to produce and market quality seeds of improved/farmer preferred varieties that have high demand in the locality and beyond. The paper reveals that local seed businesses have contributed more to grain legumes seed production and access in Ethiopia than the formal public and private seed companies.
  - ✓ Bundling of certified seed: In Mozambique, few agro-dealers exist, so seed companies Lusosem and Phoenix are developing a network of farm business advisors that can market and distribute certified seed in rural areas. Along with seed sales, these farm business advisors provide advisory services to smallholder farmers who purchase seed. The farm business advisors are compensated by charging a markup on the cost of the seed
  - ✓ In Mozambique, community seed production has continued to increase in Mlangeni area of Angonia district. To support seed business by local agrodealers. To build the capacity of local agrodealers in marketing of bean seed, CIAT/NARS engaged seven (7) private agrodealers from the Agrodealer Association of Angonia to pilot sales of small packs of 100g, 250g, 500g, and 1kg. This effectively demonstrated farmers' willingness to purchase bean seed in remote areas of Mozambique
  - ✓ In Mozambique, Phoenix Seeds in Mozambique is expanding its reach into rural areas by developing input hubs that are located closer to farmers and that can supply additional, smaller hubs reaching even more rural areas in a timely manner
  - ✓ Decentralized Community Seed Banka: In Nicaragua, local extension agents were responsible for assisting farmers in the development of local CSBs s, training the members in quality seed production, and providing the registered seed and other inputs

for seed production. The individual CSB structure was made up of one experienced seed farmer and did not have community input. In the context of the BTD project, INTA used such farmers to produce seed for dissemination in other regions of the country

- ✓ Community seed production: In Nigeria: To ensure that farmers have access to most of these introduced varieties within the communities in subsequent planting seasons, 257 seed entrepreneurs were identified and trained. The project supported 168 Seed entrepreneurs with foundation seed of improved varieties of soybean, cowpea and groundnut in FCT (50), Sokoto (61) and Kebbi (57) to establish seed farm of maximum of 0.25Ha per SE. 74.5% of quantity of seed given as foundation were also recovered.
- ✓ Benin: Use of cooperatives through an existing farmers' organization. The paper describes how the model is run, success factors and challenges experienced
- ✓ Kenya: In 2015, companies sold 30 tons and in 2016, 100 tons of quality seed (certified and treated), through village based agro-dealers in small and affordable size packs. Through this initiative, 12.1 and 20.4 tons of seeds were produced by ASA in 2015 and 2016 and reached 845 and 5456 respectively. The volume of seed sold by seed companies through agro-dealer network has increased and the latter offers linkages between farmers and seed companies.
- ✓ Uganda: Local Seed Businesses (LSBs) - farmer groups producing, and marketing quality declared seed (QSD), is a business model that avails affordable seed to smallholder farmers at the last mile. Though the volumes per group are still small, and access to foundation seed remains a challenge, the smallholder farmer customer base has been slowly growing over the past 4 years
- ✓ In Uganda, PABRA has partnered with several stakeholders to support decentralization of seed production including QDS in several districts of Uganda (Figure 4). Through this approach, some of the farmer groups have formed small and medium companies such as CEDO and SHUPO. Each of these two companies produce more than 200 tons of certified bean seed every year
- ✓ Kenya: Targeted bean seed marketing approach using small packs (one kg and less). Initiated in Kenya in collaboration with private companies under the Tropical Legume II project, the approach has used various sale strategies e.g. agro-dealers, open market and seed fairs/agricultural shows to enhance access, affordability and efficiency
- ✓ Kenya: local seed producers. The paper elaborates how Caritas facilitated the establishment of local seed production, how seed multiplication was done and what was key to get reach. Key is this increased the reach every season while farmers retained the rest of the grain
- ✓ Tanzania: In absence of affordable and sources of seed which are closer to farmer, the latter opts to use farm saved seed or from grain markets. Through use of agrodealers, access to seed was made easy by a 70% reduction in the distance travelled to purchase, in some instances to less than 2km in Tanzania
- ✓ Tanzania: Traders multiplying/moving popular seed of non -released high popular varieties (e.g. yellow bean in northern Tanzania

Keywords: Legume, last mile, case studies, Certified seed, improved varieties, Quality declared seed, improved varieties, biofortified varieties, foundation seed, Self-pollinated crops

33. Legume seed markets for smallholders in Africa L(Louise Sperling, Gallagher, McGuire, & March, 2021)

Reference: Sperling, L., Gallagher, P., McGuire, S., & March, J. (2021). Tailoring legume seed markets for smallholder farmers in Africa. International Journal of Agricultural Sustainability, 19(1), 71-90.

- This paper focuses on Africa and legumes, crops key for nutrition, soil enhancement, resilience to climate stress and rapid income generation. The default design for seed sector development, based on maize, proves inadequate for moving legume varieties and seed to smallholder customers. The paper draws from a large dataset including 10,209 transactions from nine African countries.
- Findings show that legume seed is overwhelmingly bought (50% of transactions), with 89% of purchases unfolding in the informal sector, mostly from local markets. Unlike with maize, farmers' use of agro-dealers to obtain legume seed is minimal.
- In practice, the data in this paper has shown that farmers do not buy important legume quantities from agro-dealers, cooperatives, or even CBSGs (the exception being those involved in modest customer segment #2). In contrast, farmers do buy from informal sector markets, especially from a range of traders who vend sowing materials.
- The paper identifies six legume customer seed market segments, but only the two smallest are served by current strategy. The paper suggests that refinements to formal sector delivery can help extend reach (e.g. with small packs), but real advances demand strong informal sector innovations, such as expanding sale and seller categories to embrace traders and local markets. A recent multi-country review of seed legislation suggests there may be room for such expansion.
- In terms of moving forward and focusing on legumes, select strategies are suggested that can enhance legume seed system functioning, for smallholders including:
    - Product pack size: The paper elaborates on the small packs sales and how they have been scaled up in recent years. It further clarifies on quantities that may deem feasible for legume seed. The novelty put forward in this paper is that small pack sale might be reframed to stimulate new variety sale (rather than to spur markets for certified seed). As examples, the BMGF-funded project TL II, moved 943, 170 small packs of legumes in 2012 in 13 African countries (Sperling and Boettiger, 2013) and Drylands Seed company in Eastern Kenya, sold 85,919 small packs in 2016 (Kimotho, 2017). Rwandan data charted farmers buying packs at twice the price of market seed to get a small variety packet. This Rwandan work also documented an explicit approach to sell new varieties, (i.e. not samples of certified seed).
    - Venue of sale: Non-seed outlets to sell seed have been tested and even institutionalized in a number of African countries. For example, the CARE agent program in Zimbabwe trained rural kiosk managers to sell seed and provide technical information (NRI, 2003; Zimbabwe SSSA). In Malawi, maize seed is routinely sold in supermarkets (even in 100 kg bags), as have bean seed packs (Chirwa et al., 2007; Malawi SSSA); in many open markets, vegetable seed packs are available in open stalls and in surrounding kiosks, sometimes with nice glass display stands.
    - The paper sees the clear labelling on the packet or basket, along with producer contact information as key as it can help drive down inevitable instances of seed counterfeiting (a possible by-product of seed commerce more generally, not just legumes).

- Actors-sellers: Traders' active management of potential seed has been documented via 11 explicit actions (such as seeking out specific varieties, sorting out waste and immature grains, keeping freshly-harvested stocks apart (e.g. SSSA- Kenya). The paper also discusses how the scale of commerce varies in relation to the traders. Key are concerns that have been raised that national seed laws may restrict support to informal seed systems (e.g., ISSD Africa, 2017; Visser, 2017).

Keywords: Seed systems, legumes, informal and formal markets, African smallholders, variety development, livelihood impacts, Last mile, Zimbabwe, Malawi, Rwanda

34. Case studies Emergency Seed Security Response (Walsh & Sperling, 2019)

Reference: Walsh, Stephen and Louise Sperling. (2019). Review of practice and possibilities for market-led interventions in Emergency Seed Security Response. A Feed the Future Global Supporting Seed Systems for Development activity (S34D) report.

- This review focuses on the current and future potential use of markets to support smallholder farmer seed security in emergency and chronic stress contexts. The first objective is to review and categorize past experience across different types of market-oriented interventions and the second objective is to explore possible approaches for moving better practices forward, recognizing both the enablers and barriers for doing so.
- The discussion and findings are based on a portfolio of ten cases that were identified as having a supply-side focus. The cases were drawn from eight countries (Afghanistan, DRC, Ethiopia, Kenya, Niger, Rwanda, Uganda, and Zambia) and included nine crops (common beans, groundnuts, maize, millet, potato, soya, sorghum, sweet potato, and wheat).
- Niger Focus on multiplication and sale to union members/Cooperative-based Seed Production and Marketing of Millet in Niger. Niger had faced chronic stress coupled with 2017 there were failed rains. Ten millet seed producers were identified by the cooperative on the basis of having at least one hectare to allocate to millet seed production and willingness to apply a technical package as recommended by the Niger national research program (INRAN). Over the course of three years, more than 12 MT of millet seed have been produced. In 2018, seed was purchased from seed producers at .58 USD per kg (350 CFA) and sold at .62 USD per kg (375 CFA). In 2019, seed was purchased from the seed producers at .62 USD per kg (375 CFA) and sold at .71 USD per kg (425 CFA).
- Kenya Focus on promoting small packs. Dryland Seed began operation in 2004 with a focus on legume seed: beans, cowpea, and green gram. Seed is packed in affordable small packs ranging from 100 grams to one or two kilograms. The 100 gram small packs are provided to farmers during field days and the one – two kilogram packs represent the most common units of sales through their agro-dealer networks
- Uganda focus on community-based common bean seed producer. Seed production has ranged from approximately 150 to 400 metric tons annually. Individual farmers account for 60% of seed buyers; agro-input dealers account for 15% of buyers; seed processing companies account for 15% of buyers, and NGO and government programs account for 10% of buyers.
- CEDO has an innovative marketing strategy which consists of the use of small packs and distribution through mom & pop village-based shops an village- based agents; advertising in media and through market days and agricultural fairs; and providing credit for both large and small scale buyers

- The northern Uganda case focus on local multipliers. This case focuses exclusively on the informal sector in a periodic rivalry zone with insecurity spurred by the Lord's Resistance Army. Sweet potato vine purchases and sales were monitored among a group of local vine multipliers and town vine sellers. In contrast to the local multipliers selling to local farmers, multipliers working for NGOs seemed to suspend normal market-based economic behavior as these multipliers produced and sold at scale to NGOs and received a price premium of 60-250% over that of the local vine multipliers.

  Keywords: Last mile, case studies, delivery models

35. Mercy Corps' models for strengthening last mile seed distribution, SSA countries (Mercy Corps, 2022)

    Reference: Mercy Corps. (2022). Models for Strengthening Last Mile Seed Production and Distribution in Fragile Contexts. (Produced by Mercy Corps as part of the Strengthening Capacity in Agriculture, Livelihoods, and Environment (SCALE) Associate Award and Integrated Seed Sector Development in Africa (ISSD Africa) Issue. https://www.fsnnetwork.org/sites/default/files/2022-05/Models_for_Strengthening_Last_Mile_Seed_Production_and_Distribution_in_Fragile_Contexts.pdf

    - Integrated Seed Sector Development in Africa (ISSD Africa), through the Mercy Corps-led action learning activity Developing the Seed Sector in Fragile States, and the USAID Bureau for Humanitarian Assistance (BHA)-funded SCALE Award requested inspiring examples of models for strengthening last mile seed production and distribution for better seed systems resilience in fragile environments.
    - Both SCALE and ISSD Africa wish to promote innovative approaches to seed sector development and to enhance equitable and sustainable access to quality seed of farmer-preferred varieties.
    - In Burundi, the PSSD project supports seed producers to develop last mile distribution capabilities through rural points of sales and mobile sales agents and builds their capacity to set up micro demonstration plots and conduct field days in remote communities. During this time, the project partnered with seed producers to install 9,931 micro-demonstration fields and trained 93,613 farmers (of which 45%, or 42,211, were women) in GAPs. Farmers reported that access to certified seed was most improved by the micro-demonstration plots (81% of respondents), proximity to rural points of sale (52%), sales agents (22%), and micro-packages (7%).
    - In Mozambique, Promotion of Conservation Agriculture Project II (PROMAC II), introduced an input subsidy scheme, the Green Discounts Initiative. PROMAC II encouraged smallholders to try the full CA package alongside improved inputs. Unlike many inputs subsidy projects, the Green Discounts Initiative works through established commercial input channels to strengthen existing market systems. By making it easier and cheaper for input firms to reach last mile consumers with a product that is suited to their means and needs, the approach builds a compelling business case for these firms. 2,350 farmers accessed inputs packages via the Green Discounts. Those farmers accessed 37 metric tons of seed and 298 tons of other yield-enhancing inputs such as nitrogen phosphorus-potassium (NPK), urea, and herbicides

- In Niger, The Girma Project, takes a market-based approach to enabling producers to buy and use certified seeds of improved varieties. In 2020, approximately 300 farmers bought 2.9 tonnes of certified seeds from the 22 Girma agrodealer partners. In 2021, this increased to 1500 buyers purchasing 3.9 tonnes from 44 agro-dealers, well beyond the anticipated project target of 900 buyers. On average, farmers bought about 2.5 kg of seed per person in 2021. Seed purchases are not subsidized; farmers use their own money to buy the seed.
- South Sudan focus on working with lead farmers. They were provided with foundation seed, which was obtained from accredited input suppliers in South Sudan and abroad, to grow a number of prioritized crops on three feddans (approximately three acres) per farmer during the 2019/20 season. Each lead farmer worked together with a group of 25-30 outgrowers from their communities, providing technical guidance and support as needed. At the same time, IRC facilitated the establishment of the Farmer Economic Marketing Association (FEMA), a formal group of farmers focused on the production of quality seed and surplus food crops for local markets. With the support of FEMA, the lead farmers and outgrowers were able to network, make market linkages, and increase sales. The farmers connected with agro-dealers who would appropriately store and resell the quality seeds through sales agreements. These agreements were a key source of income for the local seed producers, which they could reinvest in the next agricultural season.
- For each of the case studies presented, key lessons learnt, what next, how, what makes our model work, and How did we tackle this was presented in detail.

Keywords: Last mile, business models, case studies

36. Literature review of agricultural technology delivery - Africa (Burke & Hanif, 2016)

Reference: Travis Burke (2016). Literature Review of Agricultural Technology Delivery Experience: Legume Seed and Last Mile Smallholders

- This review looks at seed distribution and other technology dissemination models that may be relevant to legume seed, and the challenges that those models have encountered.
- The review notes and describes seven specific models of seed distribution. It then charts potential solutions that have been pioneered from outside companies and social enterprises, solutions that could be applied to the models to get quality and improved seed into the hands of smallholders.
- Overall, this review is an effective starting point for understanding what models exist to move seed but notes that no single model has the proverbial nut cracked.
- It also highlights key gaps in the literature that can provide a learning agenda for programs and pilots going forward. Finally, the review concludes with lessons that could potentially help models reach marginalized producers, 'the last mile'.
- The document provides case studies of models and how they have been used to supply seeds to rural farmers including
  - VBA model: CLUSA has pursued a VBA model in Zambia, Mozambique, and is currently working to replicate the dissemination model in Senegal. Their VBA model utilizes an individual who represents community interests in procuring inputs and ensuring knowledge is disseminated within the community. This community elected individual

representing the community in purchasing and interactions with trusted input companies and/or agricultural agents. The focus is on maize seed, with only secondary focus on development of legume or other cereal seeds

- USAID in a compendium report reviewing VBAs under FIPS noted adoption rates of root crops in Kenya as high as 85%, with the average rate between 30-60% per village, across a timeframe from 2006 to 2010; this study evaluated not only the sales of produce, but also on-farm consumption (Compendium Report, 2012).
- Drylands Seed Ltd. credits the tripling of sales of their seed from 2012 to 2014 to their breakdown of seeds into packages of 100 g, 250 g, 500 g, and small assorted packs in Kenya
- The agent model shows positive evidence, especially considering the difficult operating environment in Zimbabwe during 2003-2004, but challenges still arise which are highlighted in the document
- LSBs and community-based seed producers do not become direct distributors of seeds but rather sell into differing distribution models. In Uganda, CEDO, in their review of the program running since 2000, states that organizations have adopted 85% of high-yield bean varietals, and from 2006 to 2011 they have seen an increase in bean cultivation per farm from 4.46 acres to 7.6 acres (2015).
- Another LSB model exists in Ethiopia. A recent preparatory study for a seed system security assessment conducted in the country found that there are 275 Seed Producer Organizations supported by the ISSD program. The study states that the Ethiopian smallholder market is still relying on up to 90% farmer saved seed, farmer to farmer 'seed' grain sales, and cooperative or NGO based seed multiplication and distribution systems. The LSBs that are members of the Seed Producer Organizations were found to produce approximately 10% of the national seed supply, which accounts for only about 3-6% of the seed planted by farmers (the rest covered by the saved seed, farmer to farmer 'seed' grain sales, etc.).

Keywords: dissemination models, legume seed, last mile, Kenya/ Drought tolerant varieties, Zambia/Mozambique/maize seed

37. Lessons from bean seed systems research in SSA (David & Sperling, 1999)

Reference: David, S., & Sperling, L. (1999). Improving technology delivery mechanisms: lessons from bean seed systems research in Eastern and Central Africa. Agriculture and Human Values, 16(4), 381-388.

- This article addresses concerns of technology dissemination for small farmers, specifically focusing on the diffusion of new varieties of a self-pollinating crop. Based on bean seed systems research in Uganda, Rwanda, Burundi, and the Democratic Republic of Congo
- It shows four commonly held basic assumptions to be false, namely that: first, small-scale farmers do not buy bean seed; they mainly rely on their own stocks or obtain seed from other farmers; second, that small-scale farmers cannot afford to buy seed of newly introduced bean varieties or will not risk it; third, that farmer seed networks function efficiently in varietal diffusion; and lastly, that a good variety will sell itself.
- Grounded in the reality under which small farmers actually operate, the article offers recommendations for improving the delivery of newly introduced bean cultivars by NARS

and seed suppliers. Most of the recommendations are relevant to other self-pollinating crops.

- In terms of delivery, in all cases, seed was packaged in small quantities (50–250 g for climbing varieties in Rwanda, 200–500 g for bush beans in Rwanda and Uganda and 1–2 kg in Tanzania) in heat-sealed clear plastic packets containing an informational leaflet in the appropriate local language. The name of the variety, number of days to maturity, tolerance to disease, yield, and cooking time relative to popular bean varieties were described in the leaflet.
- Seed was distributed through both market (shops, markets) and non-market channels (clinics, nutritional centers, agricultural training centers, NGOs, and farmer groups).
- In the DRC, local and large town markets were important for over half of surveyed farmers; in Rwanda, farmer merchants were an important source for 11% of surveyed farmers and in Burundi, 23% of farmers purchased seed from local sources-either farmer-sellers or local merchants
- Key is that Ugandan farmers, overall, express dissatisfaction with seed purchased from commercial sources. Farmers in both regions tend to rank seed purchased from stores or markets lower than their own seed and that of other farmers and consider it potentially riskier to sow.
- About half of the Ugandan farmers surveyed shared a mean of 10 kg of bean seed with other farmers in 1993, although the majority claimed to rarely or never share seed (Table 3). Despite the declining importance of local networks as a source of seed, farmers in Burundi, Rwanda, and Uganda ranked seed obtained from other farmers second in preference to their own seed because of the perceived good quality of the seed and access this source provides to preferred, locally adapted, diverse varieties

Keywords: Beans, East and central Africa, Seed systems, Technology adoption, Technology diffusion.

4.5. Country specific studies – East Africa

4.5.1. South Sudan

38. Seed sector development for South Sudan (TANGO International, 2022)
Source: TANGO International, Inc. (2022). Seed Sector Development for South Sudan (SSD4SS) Project: End of Programme Evaluation, 2022.
https://www.government.nl/documents/reports/2022/02/04/seed-sector-development-for-south-sudan-end-of-project-evaluation
    - The evaluation seeks to assess the degree to which the SSD4SS project achieved its objectives, its effectiveness in achieving its outcomes and objectives, whether its achievements are sustainable over the long-term, and what, if any, lessons learned can be used for future programming.
    - In order to help ensure availability of agricultural inputs to farmers, business training was provided to agro-dealers and village-based advisors (VBAs). Agro-dealers were also supported to develop and provide small seed packs and demonstrations to farmers, which is highlighted as positive in disseminating new varieties that farmers can experiment with before investing their limited resources. Approximately 18,000 farmers received seed demonstration packs.
    - Training of village-based advisors (VBAs) is also highlighted in this document but their role is not well captured in the report.

      Keywords: Last mile, South Sudan, Small seed pack, Improved varieties, Rice, maize (OPVs), cowpea, groundnut, sorghum

39. South Sudan A3-SEED achievements, lessons, (IFDC, 2022)

    Reference: IFDC (2022). Accelerating Agriculture and Agribusiness in South Sudan for Enhanced Economic Development (A3-SEED). Annual Narrative Report Submitted to the Embassy of the Kingdom of the Netherlands in South Sudan.
    - This report covers activities, outputs, achievements, and lessons learned during the first year of the implementation of A3-SEED between December 2020 and December 2021.
    - A3-SEED works with existing private sector seed companies that will in turn work with groups of farmers (individual commercial seed producers as well as outgrower farmers) to improve seed production, marketing, and distribution down to the last mile.
    - A3 SEED has established an entry point to work to strengthen agro dealers and ensure a well-connected agrodealer businesses model that bring seeds directly to the farmers through village agents.
    - The report indicates that this will help create an effective and efficient last-mile seed retail system that offers easy access to quality seed and other agro-inputs for rural farming communities. The existence of a seed testing laboratory will further play a pivotal role in last-mile quality assurance by testing the quality of seeds.

      Keywords: Last mile, individual commercial seed producers, outgrower farmers, agro dealer, village agents, Foundation seed, South Sudan

40. Accelerating Agriculture and Agribusiness in South Sudan (IFDC, 2023)

Reference: IFDC. (2023). Accelerating Agriculture and Agribusiness in South Sudan for Enhanced Economic Development (A3-SEED): https://ifdc.org/projects/accelerating-agriculture-and-agribusiness-in-south-sudan-for-enhanced-economic-development-a3-seed/

- A3-SEED seeks to reach more than 100,000 farming households that will see a doubling of income from marketable surpluses of targeted commodities, thereby improving livelihoods.
- A3-SEED aims to move the seed sector from humanitarian support to a commercial, sustainable, and adaptive agriculture sector in South Sudan.
- Key is that A3-SEED ensures the availability of improved seed down to the last mile through agri-entrepreneurship and support of existing private-sector seed companies. The project improves seed and input marketing, distribution, and production practices.
- Additionally, A3-SEED supports the emergence of individual commercial seed producers that produce for the local market and/or are outgrowers for a seed company.

Keywords: Last mile/rural farming communities, individual commercial seed producers that produce for the local market and/or are outgrowers, improved seed, South Sudan,

4.5.2. Kenya

41. Red cross and seed distribution in Kenya DRC (ICRC, 2016)

Reference: ICRC. 2016. Protracted conflict and humanitarian action: some recent ICRC experiences, Geneva, Switzerland: International Committee of the Red Cross. https://www.icrc.org/sites/default/files/document/file_list/protracted_conflict_and_humanitarian_action_icrc_report_lr_29.08.16.pdf

- The ICRC often distributes seeds and tools as part of its economic security (ECOSEC) programs in continued hostilities like those in the DRC, CAR and South Sudan. The aim is to provide people with the material they need to plant and harvest.
- But the poor quality of some seed has heightened the risk of lower yields for some people, and the ICRC has decided that program performance could be raised by improving seed quality and, simultaneously, by developing local seed- production capacity and expertise.
- Working upstream with local seed producers is a long game but one that may achieve several goals: better seed, capacity-building and cost reductions.
- Results from one study in DRC showed that investing in high-quality seed production may increase the yield of a harvest by up to 300 per cent. To do so successfully, however, requires an investment of at least three years to harvest and breed the seeds with a reliable local partner

Keywords: DRC, Local seed producers, Improved seed/ high-quality seed, protracted crisis

42. Farmers Pride as a last mile distribution of agricultural technologies in Kenya (Farmers Pride)

    Reference: Farmers Pride. Our model. https://farmersprideafrica.com/our-model/

    - The article describes the Farmers Pride as a Last mile distribution of life changing agriculture solutions enterprise through agro dealer franchise model, village youth agents and mobile technology
    - The article describes the Farmers Pride social enterprise business
    - It also presents Products and Services it offers. Key is that Farmers Pride identifies local agro dealer entrepreneurs in rural markets. These partner shops are staffed with trained agronomists and livestock specialists to provide farmers with correct information. Apart from serving as a sales center for Farmers Pride products and services, the shops become the center point for a range of extension, training and awareness creation activities including farmer clinics, product promotions and other forms of farmer extension services.
    - Farmers Pride is building an ecosystem that enables other products and services use our platform interface as a medium to provide their already created products and services like climate information, insurance and soil testing.
    - Targeted Market and Customers are also presented. Key is that Farmers Pride targets rural smallholder farmers and agro dealer shops.
    - At the end, the article illustrates how the farmer's pride model works.

    Keywords: Last mile/rural areas, agro dealer franchise model, village youth agents and mobile technology

43. Transforming the input sector, Kisumu, Kenya (Kenya Markets Trust, 2019)

    Reference: Kenya Markets Trust (August 2019). Transforming Kenya's Agricultural Inputs Sector. KMT Agri-Inputs Case Study 01. Nairobi, Kenya. Accessed at: https://www.kenyamarkets.org/wp-content/uploads/2019/11/KMT-Agri-Inputs-Case-Study.pdf

    - KMT subsequently contracted Dot Matrix – a marketing and strategy consulting firm– to redevelop Magos' retail strategy and to work with a select few agro-dealers in Kisumu County.
    - Key is the creation of outdoor kiosks in select towns and villages of Kisumu County during the pre-harvest season to attract local agro-dealers and farmers

    Keywords: Kenya, Outdoor kiosks, Kenya, Maize seeds

44. Farmer hubs to introduce new varieties in Kenya Kenya (Kol, 2020)

    Reference: Akinyi Kol. (2020). Improving farmer prospects through partnerships. FarmKenya. https://www.standardmedia.co.ke/farmkenya/article/2001382133/improving-farmer-prospects-through-partnerships

- SFEA's Agriservices portfolio is done by setting up rural entrepreneurs who each serve about 200 farmers, offering four types of services: advisory services (demo sites and trainings), access to quality inputs, mechanization, and market linkages. These entrepreneurs are referred to as Farmers Hub Owners.
- Through the farmers' hubs, farmers are exposed to new technologies, including new seed varieties introduced through SFEA's Seeds2B.
- In collaboration with public partners like KALRO, we have successfully introduced three new bean varieties to farmers in both Nakuru and Nyandarua counties.
- Further, SFEA has partnered with Kisima Farm, Agrico EA and ADC Molo to introduce five new seed potato varieties, most recently in Samburu County with critical support provided by KEPHIS and Samburu County Agriculture office.
- On input supply, SFEA has partnered with various input suppliers to supply agrochemicals, fertilizers, financing, crop insurance, and soil analysis to the farmers through the farmers' hubs.

Keywords: Kenya, Farmers' Hub Owners/ Rural entrepreneurs, new seed varieties/ bean, potato varieties

45. Seed dryland crops Kenya (Nagarajan, Audi, Jones, & Smale, 2007)

Reference: Nagarajan, L., Audi, P., Jones, R., & Smale, M. (2007). Seed provision and dryland crops in the semiarid regions of Eastern Kenya. Intl Food Policy Res Inst. https://www.semanticscholar.org/paper/Seed-provision-and-dryland-crops-in-the-semiarid-of-Nagarajan-Audi/58b577413d75b86b51b05dedf5d06551428f4c5a

- The paper examines the role of various seed-intervention programs in eastern Kenya, along with the strengths and weaknesses of each program. Some of the programs included community-based seed production programs, producer marketing groups, and small seed packs distribution.
- The paper notes that these initiatives were not designed as seed-emergency tools, but as mechanisms to provide long-term, sustainable solutions to local seed market failures by improving access to improved varieties that are locally adaptable. However, they could not be sustained in the long run due to poor marketing linkages and quality standards adopted by the farmers' groups.
- It further underscores the importance of local markets and their actors in meeting the needs for non-maize and bean seeds in these marginal environments. It estimates that more than 90 percent of the seeds are accessed through open-air markets during the short-rains season in eastern Kenya.
- The seeds in open-air local markets were sold by four types of vendors: farmer-traders, resident traders, mobile traders, and agro-vets. It was also found that the role played by local markets and their vendors in any seed-relief mechanism was inevitable.
- More than 70 percent of the seeds provided in the seed fairs were supplied by local vendors and/or farmers. The paper however shows that despite local markets being able to meet the existing demand, the quality of the materials supplied is often questionable and compromised, as the distinction between grain and seeds is very thin.

Keywords: seed interventions, local markets, seed systems, dry lands, seed access, Eastern Kenya

46. Reaching the farmers, last mile delivery, Kenya. (SEFA, 2020)

Reference: SEFA. (2020). Reaching the farmers, last mile delivery, Kenya. Retrieved from https://www.standardmedia.co.ke/farmkenya/article/2001382133/improving-farmer-prospects-through-partnerships

- In Kenya, SFEA's Agriservices set up rural entrepreneurs who each serve about 200 farmers, offering four types of services: advisory services (demo sites and trainings), access to quality inputs, mechanization, and market linkages. These entrepreneurs are referred to as Farmers Hub Owners.
- Through the farmers' hubs, farmers are exposed to new technologies, including new seed varieties introduced through SFEA's Seeds2B.
- In collaboration with public partners like KALRO, we have successfully introduced three new bean varieties to farmers in both Nakuru and Nyandarua counties.
- Further, SFEA has partnered with Kisima Farm, Agrico EA and ADC Molo to introduce five new seed potato varieties, most recently in Samburu County with critical support provided by KEPHIS and Samburu County Agriculture office.
- On input supply, SFEA has partnered with various input suppliers to supply agrochemicals, fertilizers, financing, crop insurance, and soil analysis to the farmers through the farmers' hubs.

Keywords: Farmers Hub Owners, new seed varieties, rural areas, Kenya

47. Last mile seed delivery for beans, Kenya, (Mabeya et al., 2021)
Reference: Mabeya, J., Bhramar Dey, Templer, N., Wilcox, M, Odhiambo, C. A., Buruchara, R., Karanja, D and Rubyogo, J. C., (2021). Transforming Last Mile Seed Delivery: Case of High Iron Beans (HIBs) Niche Market Business Model in Lower Eastern Kenya - Second Season Study Report. A Feed the Future Global Supporting Seed Systems for Development activity (S34D) report. Accessed at: https://www.crs.org/sites/default/files/transforming-last-mile-seed-delivery.pdf

- The Kenya Agricultural and Livestock Research Organization (KALRO) in partnership with the Alliance of Bioversity International and CIAT (ABC) through the Pan Africa Bean Research Alliance (PABRA) released four micronutrient rich bean varieties in 2017. The iron and zinc rich varieties are Angaza, Metameta and Nyota, while Faida is zinc rich. These varieties were released to address prevailing micronutrient deficiencies, particularly among women of reproductive age and children under the age of five.
- As part of the S34D activity, the Alliance and CRS conceptualized the niche market business model with the objective of ensuring efficient and effective last mile delivery of the niche variety to farmers by linking Bubayi Products Ltd. and agrodealers to motorbike riders commonly known as boda boda.

- The study aimed to: i) test the capacity of farmers to purchase the certified seed; ii) assess new varietal dissemination using geospatial data and near real-time analyses; iii) capture and understand factors affecting adoption of the niche varieties along the supply chain; and, iv) understand the prevailing regulatory framework affecting the use of boda boda in seed distribution.
- Findings show that Motorbike riders are used by agrodealers to deliver farm inputs to customers around western Kenya.
- The study recommends boda boda should be integrated in the last mile distribution of bean seeds and other agricultural inputs. It elaborates that using motorbike riders, there is great potential in improving availability, access and utilization of seed and non-seed technologies to smallholder farmers
- Finally, network analysis using geospatial data revealed that farmers do not always purchase their inputs from the nearest agrodealer. While further investigation on what informs the choice of the agrodealers from where farmers buy their seed would be necessary, it has implications for development partners on how to build agrodealer capacity at the last mile with business models and practices that sustainably meet farmers' needs.

  Keywords: Kenya, Certified High Iron Beans (HIBS), Motorbike riders (boda bodas), micronutrient deficiencies

48. Kenya: inclusive seed delivery (Kramer et al., 2021)

    Reference: Berber Kramer, Carol Waweru, Lilian Waithaka, Jean Eyase, Joseph Chegeh, Benjamin Kivuva, & Francesco Cecchi. (2021). A new model for inclusive seed delivery: Lessons from a pilot study in Kenya Leveraging champion farmers' entrepreneurial know-how to reach the last mile. IFPRI.

    - To deliver their products, ACRE works through village extension service providers, also called champion farmers. The article defines champion farmers as key opinion shapers with substantial knowledge of agricultural practices in the villages where they reside, with the ability to promote gender inclusivity and diversity.
    - The article describes in detail how the champion farmer model works detailing how in previous seasons, ACRE had worked together with two seed companies, to distribute small demo packs of stress tolerant varieties of maize (Sawa) and sorghum (Advanta) to 190 champion farmers and close to 3,000 farmers that they had registered in seven counties. ACRE did this to make sure that farmers would have knowledge of and experience with (and would want to purchase) the varieties that the project was planning to distribute in future seasons.
    - In the first season, despite high demand from the original demand inventory (champions collectively booked 2,091 bags of maize and beans) only 4 champion farmers were able to actually sell seeds; combined, they sold 54 bags of sorghum and 15 bags of maize seeds to their farmers.
    - The document highlights the attributes leading to the large gap between the original seed demand inventory and the actual sales. Further, it provides lessons learnt along the way.
    - Key is that Margins between negotiated wholesale prices from regional distributors and retail prices are insufficient to cover distribution logistics. In the future, ACRE Africa plans engaging

with seed companies to distribute seeds to champions directly, thereby bypassing regional distributors, and increasing margins.

Keywords: inclusive, champion farmers model, small demo packs, stress tolerant varieties, rural areas, Kenya

49. Micro-Franchise Model for Last-Mile Seed Delivery in Kenya Kenya, (IFDC, 2021)
IFDC. (2021).
Reference: Micro-Franchise Model for Last-Mile Seed Delivery in Kenya. A Feed the Future Global Supporting Systems for Development activity (S34D) report. Accessed at: https://pdf.usaid.gov/pdf_docs/PA00ZDD1.pdf
    - The Feed the future Global Supporting Seed Systems for Development (S34D) activity is responsible for (a) designing and implementing innovative last-mile delivery options, seeking to build integrated seed supply mechanisms involving formal and informal seed systems and (b) building the capacity of last-mile supply actors in the seed value chain, with a particular focus on legume crops as well as root and tuber crops and other non-maize cereal and fodder crops.
    - The report describes the Micro Franchising Prototype Model for Last-Mile Seed Delivery. It defines Micro-franchising as a subset of the franchising concept, which refers to smaller scale or even single person enterprises that distribute standardized branded products and services.
    - Further revealing that a micro-franchise network offers existing businesses a road map to penetrate the market in the last mile through partnerships with locally based micro-entrepreneurs by offering them access to supply chains, equipment, products, finance, training, branding, and marketing, with a strong support system built into the business model.
    - Rollout of the Micro-Franchising Model Prototype was done in the lowlands of Tharaka Nithi in Eastern Kenya, a semi-arid region.
    - Freshco Seeds, rural entrepreneurs were identified as an ideal anchor organization for piloting this model, as they were seeking to expand their presence in the region. Their product portfolio also aligns with the crops that the S34D program focuses on – legumes (cowpeas, beans, soybeans, green gram), non-maize cereals including drought-tolerant varieties (sorghum, finger millet), and a wide variety of others that are important to small-scale farmers This was especially applicable to the seeds of interest in the S34D project – legumes and other non-maize cereals, such as sorghum and millet
    - In a validation Workshop, use of motorcycle riders was seen as a last-mile distribution service which is very important for agrodealers and, by extension, the farmers they serve. However, the report notes that there need to be a concerted effort to train these service providers, not just on seed but also on other farm inputs, which will improve overall customer satisfaction.

Keywords: Last mile, Micro Franchising Prototype Model, certified seed, Kenya

50. Seed delivery systems for development, CRS experience in Kenya (CRS, 2021)
Reference: Catholic Relief Services. (2021). Feed the Future Global Supporting Seed Systems for Development activity. Feed the Future. FY21 Annual Report. https://pdf.usaid.gov/pdf_docs/PA00Z2QJ.pdf
    - S34D aims to meet the activity goals by increasing the capacity of the formal and informal seed systems and humanitarian and relief programming to sustainably offer quality, affordable seeds of a range of crops (Objective 1) and increasing collaboration and coordination among all seed systems actors and actions (Objective 2).
    - In a follow-up feedback survey 79% (80% of women and 78% of men) said that they would use Bodaboda services in the future for seed access and complementary inputs. However, farmers identified gaps that could hamper Nyota seed uptake. These include i) limited awareness of the seed delivery services offered by Bodaboda; ii) difficulty in finding supplies for Nyota seed from local agro-dealers, and iii) the higher cost of the 2 kg pack of Nyota seed.
    - The majority of farmers showed interest in using the boda boda services to deliver seeds. This shows there is market and demand for 'Uber'-ization of improved agricultural inputs, including improved seeds at the last mile in Kenya.
    - The micro-franchise model prototype was rolled out during the short rain season in the semi-arid lowlands of Tharaka Nithi in Eastern Kenya. The prototype targeted improved service delivery to farmers with improved seeds of non-maize cereal crops, such as sorghum, millet, beans, green gram, groundnut. FreshCo Seeds was identified as an ideal anchor organization for piloting this model, as they were seeking to expand their non-maize crop portfolio of crops in the region.
    - Outcome for FreshCo was that this pilot offered them, through meetings and awareness, a platform to link with a network of MFEs, just before the short rainy season. This resulted in twice the normal sales for their branded seed; FreshCo sold all their Katumani Bean 56 (Kat-B56) stock after overwhelming response to their trainings. The firm reported selling 4 MT of cowpeas, 5 MT of Kat X56, and 4 MT of green gram N26, including 3 MT of Sorghum Gadam, in a region that they had not previously targeted. This gives them confidence to increase their seed production in subsequent seasons and expand activities in the areas that they had previously not targeted.

    Keywords: Case studies, Last mile, certified seeds, Bodaboda services, micro-franchise model

51. Lead farmers and farmer groups for last mile delivery of extension services Kenya (Onyango, Waswa, Nchanji, & Kamanda, 2020)

    Reference: TAAT (2020). Bundling Inputs and Extension Services Increases Bean Production in The Lower Rift of Kenya. https://taat-africa.org/bundling-inputs-and-extension-services-increases-bean-production-in-the-lower-rift-of-kenya/

- The Cereal Growers Association (CGA) has introduced the Farmers Service Center (FSC) model – aimed at training champion (lead) farmers in different communities tasked to work closely with farmer groups.
- The article describes the FSCs model as being about last mile delivery of extension service to the farmers. The article describes the FSC model as entailing empowering trainers of trainee within the community to bridge the gap of poor extension services. It notes that FSC serves as a one stop shop in the surrounding farming community, run by a community mobilizer or group, and providing agricultural extension support, inputs and other services to the community.
- The article further discusses about a success story of a lead farmers trained by (CGA) and empowered to be a trainer at the community level bringing the FSC model to life.
- The lead farmer takes time to explain and demonstrate to the farmers the importance of using improved seed, managing weeds and ensuring the crops are properly nourished. Today, his training is focused on the importance of growing the new high iron and zinc beans (Nyota, Angaza and Faida).
- The group comprises of 56 members of which 20 are males and 36 females with 13 being young girls and boys. This group was introduced to the new high iron and zinc beans by CGA through an initiative by the Pan Africa Bean Research Alliance (PABRA) and the High Iron Beans Compact of Technologies for African Agricultural Transformation (TAAT). The programme increases agricultural productivity through the deployment of proven and high-performance agricultural technologies at scale along selected nine commodity compacts which include High Iron Bean.
- The lead farmers' passion in growing beans is evident and most of the farmers in the group look up to him for support. Even though this is predominantly a wheat and maize zone, farmers are attracted to grow beans to supplement their protein needs and earn extra income. The biofortified beans with higher iron and zinc were incredibly fascinating to farmers as besides protein; they provided additional health benefits like reduced anaemia especially in women of reproductive ages, improved physical and mental development of children and enhanced immunity especially now with the pandemic.

Keywords: Kenya, last mile/floods/rural, Improved bean seed varieties (new high iron and zinc beans (Nyota, Angaza and Faida)

52. Role of motorcycles in rural economy in Laikipia, Kenya (Karema, 2015)

Reference: Karema, F. M. (2015). The role of commercial motorcycles in the rural economy: A case study of Laikipia east sub-county, Kenya (Doctoral dissertation, University of Nairobi).

The aim of this study was to determine the contribution of commercial motorcycles in promoting agriculture in Laikipia East Sub-County

- Research findings indicate that agricultural inputs transported by commercial motorcycles include: fertilizer had 65 percent and had the highest share, while manure accounted for 10 percent, herbicides had 7 percent, maize seeds had 4 percent, while agro-chemicals accounted for 2 percent. This is mainly because the fertilizers are not available within the fields but manure is available within the fields‟ proximity

- Further results show that these agricultural inputs are usually bought and transported from the market centers. Commercial motorcycles find use in the transport of the agricultural inputs from the market centers to the farm fields

Keywords: Kenya, Commercial motorcycles, maize seeds, last mile/rural areas

4.5.3. Uganda

53. Enhancing resilience farmer seed systems Uganda, (Monica K Kansiime & Mastenbroek, 2016)

Reference: Kansiime, M. K., & Mastenbroek, A. (2016). Enhancing resilience of farmer seed system to climate-induced stresses: Insights from a case study in West Nile region, Uganda. Journal of rural studies, 47, 220-230.

- Using data from a case study in West Nile region in Uganda, we studied practices in farmer seed systems and decisions, particularly in response to climate-induced stress. Results helped to generate recommendations for enhancing seed system resilience.
- The article defines what a seed system is and characterizes the informal and formal systems. It uses the term farmer seed system to encompass both the informal and intermediate system, where farmers have direct control over seed selection, production, quality and distribution
- The article additionally shows how relative importance of seed sources varied during normal and stress periods, and by crop. Farmers tended to shift from farm-saved seed to social networks and local markets during stress periods. Local Seed Businesses emerged as an alternative source of planting material during stress periods.
- The article reveals how formal seed enterprises were important in delivering improved seed, especially for maize, though their importance during stress periods diminished.
- Interestingly, farmers reported use of improved bean varieties in relation to their local varieties/landraces, but are technically farmer recycled varieties. The article classified local varieties as farmer varieties that have been around for a long time and have well defined characteristics. They included landraces and creolized improved varieties. It further defines recycled varieties as improved varieties re-used on farm for two or more seasons
- While farmers obtained seed from multiple sources, farm saved seed dominated, providing between 49% and 69% of farmers' seed. Local market played a key role in providing seed for beans and maize, supplying on average 43% and 20% respectively. Local markets sell grain that farmers plant as seed.
- The article suggests an approach that integrates farmer seed systems with the formal system in general, but specifically focusing on strengthening social networks, promoting farmer seed enterprises and crop adaptation practices at farm scale.

Keywords: Climate induced stress, West Nile region in Uganda, Local market/ Local Seed Business, Local varieties, Landraces

54. Scaling up bean seed delivery with village based advisors in Uganda, Western Region, (Monica K. Kansiime et al., 2018)

Reference: Monica K. Kansiimea, James Watitia, Abigael Mchanaa, R. J., & Richard Musebea, H. R. (2018). Achieving scale of farmer reach with improved common bean technologies: the role of village-based advisors. The Journal of Agricultural Education and Extension, 24(3), 215-232. https://doi.org/10.1080/1389224X.2018.1432495

- The paper assessed the effectiveness of Village-based Advisors (VBAs) as a novel approach for scaling up improved common bean technologies in southern highlands of Tanzania. The effectiveness of VBAs was assessed based on farmer reach, farmer knowledge, and application of new technologies
- Results reveals that VBAs played important roles in reaching a wide audience of farmers, with common bean technologies. There was evidence of uptake of promoted common bean practices by farmers, enhanced by judicious incentives such as higher yields, increased land productivity, and labor-saving.
- Further, VBAs shared information mainly through farm visits and community meetings. Extension materials facilitated VBA engagement of farmers even in informal settings, enhancing information flow beyond village boundaries.
- The paper however notes that the current success of the VBA approach stems from the fact that VBAs are motivated by the rewards they receive – both cash and non-cash.
- On practical applications, the paper notes that VBAs are relevant in scaling up improved common bean technologies in rural Tanzania and similar settings, because of farmer understanding and trust. For sustainability, there is need to develop a more systematic incentive structure for VBAs through business development, and knowledge enhancement to keep pace with innovations to address emerging production challenges.

  Keywords: VBAs, improved seed, Poor soil and growing conditions, input dissemination; social networks; scaling-up; voluntary, Tanzania

55. Engaging youth and private sector in extension, Uganda (USAID, 2020a)

Reference: USAID. (2020). Engaging Youth and Private Sector in Agricultural Extension and Advisory Services. East Africa Community of Practice Knowledge Sharing Event. https://www.digitalgreen.org/wp-content/uploads/2017/09/Engaging-Youth-and-Private-Sector-in-Agricultural-EAS_East-Africa-CoP-Event-Report-2020.pdf

- The event offered a platform for showcasing innovative extension approaches and models by youths and private sector actors across the region.
- The article articulates the Village Agent Model as a relatively new extension approach with prospects in countries where it has been implemented such as Uganda where it is being piloted. The model consists of Village Agents (VAs) who are often aggregators recruited by large buyers or exporters into their supply chains.
- The article shows that since the VAs are integrated into buyer supply chains and have regular interaction with the farmers, they offer an opportunity for realization of extension service provision to the last mile. They can thus offer extension services and also link farmers to markets and other value chain actors including input suppliers.
- Due to their structured and formalized relations with market players, VAs, bring these strengths into extension service provision. The article notes that this is important owing to

the disproportionate relationships between smallholder farmers and market actors which often leaves farmers disadvantaged.

Keywords: Uganda, Village based model, youth, Last mile/Rural areas

4.5.4. Somalia

56. Supporting seed systems in Southern Somalia (Longley, Jones, Ahmed, & Audi, 2001) Reference: Longley, C., Jones, R., Ahmed, M. H., & Audi, P. (2001). Supporting local seed systems in southern Somalia: A developmental approach to agricultural rehabilitation in emergency situations. London: Overseas Development Institute.
    - Based on a study undertaken in southern Somalia, this paper describes the impacts of insecurity, shocks and stresses on agriculture, and examines whether relief seed distributions are the most appropriate way of providing assistance to farmers affected by disaster.
    - Key research findings include: A very well-developed seed marketing system exists in southern Somalia and this should be supported, not undermined by aid interventions.
    - The most important source of off-farm seed, however, tended to be from local markets, closely followed by other farmers in the same village
    - Informal discussions with market women in Baidoa uncovered a network of small seed traders, all women, who specialise in marketing seed in addition to grain.
    - These female petty traders buy grain at harvest time from farmers in the surrounding villages and pay a premium of about 20%–25% for good quality seed (described as freshly harvested, properly dried, pure in colour, with large, healthy grains).

      Keywords: Southern Somalia, Local markets, Traders, Gifts (including gifts of relief seed), rival militia

4.5.5. Other East African countries

Northern Ethiopia (Louise Sperling, Gallagher, McGuire, March, & Templer, 2020)

57. Sperling, L., Gallagher, P., McGuire, S., March, J., & Templer, N. (2020). Informal seed traders: the backbone of seed business and African smallholder seed supply. Sustainability, 12(17), 7074.
    - 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
    - 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

Keywords: potential/local seed; traders; local markets; Africa; smallholders; informal seed sector; last mile delivery; high stress contexts; sustainable seed systems, Local seeds (Chickpea and barley), prolonged, severe drought, Northern Ethiopia

58. Tanzania: Emergency supply of maize seeds to drought-affected farmers (DFID, 2012)

Reference: DFID (2012). Project completion review: Emergency supply of maize seeds to drought-affected farmers in Tanzania. 12 pp.

- Evaluation of a project to distribute relief seed (UK provided GBP 2.3 million ≈ US$3.5m to FAO) and describes how plans had to shift because FAO could not procure all the maize seed required.
- Phase III of the project shifted away from maize to drought tolerant crops.
- Phase I: 425 tons of seed given to 42,490 HHs in 9 districts (27% of original target).
- Phase II: 919 tons (as 398 tons maize, 420 tons sorghum, and 121 tons paddy rice) given to 229,049 HHs in 34 districts. Phase III: with remaining US$570k, targeted 20,000 HHs with seeds of drought tolerant crops, using seed fairs and existing agro-input dealers instead of direct delivery of seed by NGOs.

Keywords: drought tolerant crops, seed fairs, existing agro-input dealers, Tanzania

59. Rwanda: effect of war on seed security (Louise Sperling, 1997)

Reference: Sperling L. (1997). The Effects of the Rwandan War on Crop Production, Seed Security and Varietal Security: A Comparison of Two Crops. See also AgREN Network Paper No. 75, July 1997.

- This article focuses on the effects of the 1994 Rwandan war on the seed security of two major crops: beans and potatoes. It reveals that bean varieties at the household, local and national levels were not much affected by the fighting because of the farmers' dependence on local seed channels (the informal seed sector).
- Substantial quantities of seed were therefore routinely obtained through off-farm informal channels, mostly purchased from local markets, or sometimes from neighbours or town merchants.

- As had been the case pre-war, Rwandan farmers relied heavily on markets - usually the very small local ones located within a few kilometres of their homes - for seed during both the emergency relief and the rehabilitation seasons
- However, the potato seed system was significantly affected, both in quantity and quality, because of the farmers' dependence on formal seed systems, which ceased functioning early in the battles.
- At the end of the paper, the author draws several lessons from the Rwandan case that affect broader issues of assessing seed security and crop variety such as suggesting that equal attention should be paid to understanding and, if possible, safe-guarding the seed channels that can re-supply germplasm.
- The author also shows the importance of distinguishing between farmers' absolute (a true scarcity of varieties or seed in a region) versus relative lack of varieties or seed. Remedial action in such circumstances should focus on re-introduction, seed delivery, or interventions to build seed capacity. Relative lack, the common scenario in Rwanda, however, implies a problem with accessing seed (e.g., farmers may not have adequate funds to get the seed which is on offer)

  Key words: Rwanda, potato and beans, last mile, local markets, seed assessment, seed systems/formal/informal, seed interventions

60. Securing access to seed, sorghum in Eastern Ethiopia, (S. J. McGuire, 2008)

Reference: McGuire, S. J. (2008). Securing access to seed: Social relations and sorghum seed exchange in eastern Ethiopia. Human Ecology, 36, 217-229.

- This paper uses empirical data of seed exchange practices for sorghum in eastern Ethiopia to analyze how social relationships influence access to off-farm seed for a major crop.
- Seed shortfalls are common, and farmer-farmer exchange is important for providing locally-adapted seed to fills this gap, but access varies considerably among households, also affecting quantities supplied and terms of exchange.
- Preferred sources for off-farm seed (neighbors, government, market) also vary among farmers, reflecting agroecology and asset-ownership, but also differing access to these sources.
- Local markets play an important role in seed exchange. This is especially the case in the lowlands when widespread rain failure reduces the availability of seed from other farmers.
- Social network theories highlight the importance of reciprocal ties, and the cultural norms underpinning them, in accessing seed. These cultural norms are contested, with some claiming that commercial transactions are increasingly common. Implications for interventions supporting farmer seed systems, particularly emergency seed aid, are discussed in relation to the socially-mediated nature of seed access.
- Preferences for off-farm seed sources vary considerably within communities and between agro-ecologies, and a single channel, such as local markets, may not be acceptable to all.

  Keywords: Social networks; resource access; mutual aid; farmer to farmer exchanges, local market, seed systems; emergency seed aid; Ethiopia; Locally-adapted seed, sorghum

4.6. Country specific studies - Southern Africa

61. Market systems development in Mozambique, (USAID, 2020b)
Reference: USAID. (2019). Feed the Future Mozambique Agricultural Innovations Activity (FTF Inova) Quarterly Report (October 1–December 31, 2019). USAID. Maputo.
    - The Feed the Future Mozambique Agricultural Innovations Activity (FTF Inova) is a five-year market systems development (MSD) activity that began in February 2017. It works with businesses to increase productivity, access higher value markets that offer inclusive income generating opportunities and become more resilient.
    - This report provides quarter assessments whereby FTF Inova registered significant progress and investments by input companies in intensifying collaboration and expanding outreach into rural areas. Innovations that were, until now, probed within individual partnerships are being brought to scale by establishing and strengthening partnerships and broader changes in the market system.
    - Some early signs of market changes include input suppliers' increased interest for collaboration and market alliances as well as increased investments in customer services and value; these have led to increased adoption of seeds by smallholder farmers (SHFs) and more sales, a sign that will be reinforcing the need to further expand outreach and deliver value to farmers. The work with scale agents such as Casa do Agricultor (CdA), Bayer, and UniLurio Business School (UBS) offer opportunities to bring these innovations to scale, reaching more agro dealers and their smallholder customers.
    - Key last mile deliveries include:
        - Truck rentals - solution to the last mile. FTF Inova awarded Adicional Moçambique (Adicional) with a blanket purchase agreement (BPA) to support CdA's input distribution routes to the last mile within Manica, Nampula, and Tete. Q1 data shows that across the routes, CdA recorded total sales of over 1.8 million meticais (MZN) and reached about 60 retail points and an estimated 6,000 final customers. However, the pull distribution system tested with CdA has yet to reach a break-even point as the volumes of inputs sold are still low.
        - K2. FTF Inova is co-creating Deal Note 3 with K2, which will focus on strengthening K2's agro-dealer networks and its VBA model. The report notes that agro-dealer networks and VBAs are crucial for disseminating information on products and services, taking pre-orders from farmers, and capitalizing on opportunities that increase demand like product promotion, raffles, and discounts among others.
        - In the same partnership, FTF Inova and Oruwera will work together to improve Oruwera's brand design in order to better serve the expectations of their target market and deliver a more attractive product.
        - In collaboration with Inovagro, FTF Inova organized a business meeting in November 2019 in Ribaue to introduce CdA to some of the commodity aggregation traders (CATs) supported by Inovagro.
        - The report notes that CATs represent a "reverse last mile logistics" solution whereby buying points are used also as input retail points; as such, CATs can be leveraged to expand CdA's retail networks. CdA has started delivering to those who attended the meeting, which include 1 agro-dealer, 1 CAT, and 1 village savings group. In Q2, CdA will integrate more CATs and agro-dealers working with Inovagro into the truck distribution routes

- FTF Inova is developing a profitability model together with Ecotri in an effort to expand their sales of motor tricylcles to agro-dealers. The solution will increase the provision of affordable, right-sized vehicles to improve the distribution of inputs to the last mile as well as increase the uptake of products from farm gate to aggregation centers to markets
- Key is when FTF Inova engaged with input providers in Q1 to create an internal system for selecting the best performing agro-dealers, but with no success. The report indicates that the system will require dedicated personnel to focus on its development, define performance indicators, communicate with agro-dealers, and conduct follow-ups to ensure changes are integrated
- The report ends with Annexes on Key Activities as of Q1 FY 2020 and for Q2 FY 2020.

Keywords: Mozambique, New seed varieties; improved seeds, remote rural areas

62. Female agro-dealers in Mozambique (Hakspiel & Mondlane, 2020)

Reference: Julia Hakspiel, & Hirondina Tavasse Mondlane. (2020). How Female Agro-Agents Can Help Input Distributors Better Respond to Community Needs. https://agrilinks.org/post/how-female-agro-agents-can-help-input-distributors-better-respond-community-needs

- Feed The Future Mozambique Innovations (FTF INOVA) carried out a study in 2018 to understand how women are increasingly entering the input distribution market system, as agro-dealers, retailers, agents, and extension workers.
- The study found that by investing in female agro-agents, input distributors and retailers could effectively target the last mile, particularly female farmers who face restrictions on their mobility and time.
- Using a success story of a farmer, FTF INOVA recognized the need to help entrepreneurs to continue to grow, as well as a number of other input distributors, to develop a Village Based Agent (VBA) model where agro-dealers employ local staff to expand their sales into the hardest to reach areas.
- The documents highlight the benefits offered by the VBA model to female farmers and agro-agents and their communities:
- The VBA system is noted to already showing a lot of promise; her sales have increased by 50%. The most active of Rumbidzai's VBAs orders an average of 20kg of inputs per month in high season. With the VBAs leading on sales and delivery directly in her community, Rumbidzai now has time to focus on further business expansion. With the growth prospects brought by the VBA model, Rumbidzai has now decided to build a small shop, the only one in her community.

Keywords: Mozambique, Superior quality, Last mile, Female agro-agents; Village Based Model

63. Lessons learned from smallholder seed market project in Mozambique (Gardner, 2017)

Reference: Pippy Gardner. (2017). Breaking into the smallholder seed market: Lessons from the Mozambique smallholder effective extension driven success (SEEDS) project. White paper

- The SEEDS project was a USAID, Feed the Future – Partnering for Innovation-funded project designed to address the lack of access to certified, improved seed in northern Mozambique.
- Managed by NCBA CLUSA, SEEDS aimed to increase yields for six key value chains: sesame, peanut, soya, pigeon pea, cow pea, and sugar bean by supporting two local seed companies, Oruwera Seed Company based in Nampula province and Phoenix Seeds Limitada based in Manica province, to create rural seed distribution systems through a network of seed retailers or agrodealers.
- At present, only 10% of the seed used to produce Mozambique's total production of cereals, pulses, and oil seeds is actually produced and traded within the formal system as seed - the rest is simply grain stored from one season to the next, or is exchanged informally between farmers.
- There is Inefficient distribution systems in rural areas, making it difficult for seed suppliers to deliver product at an affordable price;
- During the first year, 85% of Phoenix seed sales were conducted through seed fairs. 15% of sales were made from agrodealers' stores which, given that there was no credit facility available in Year 1, was a promising sign that local entrepreneurs even at the start of the project saw the value in setting up as seed retailers and using their own funds to purchase seed for re-sale.
- The proportion of Phoenix sales from CBSPs' stores further increased to 92% by Year 2. This change in focus was largely a result of Phoenix's decreasing focus on seed fairs and increased focus on creating hubs/retailers, combined with the decision to supply seed on credit/consignment basis during Year 2;
- The hubs' increased capacity to trade product spilled over into increased seed trading for smaller CBSP retailers since seed was more readily available for these smaller CBSP retailers to purchase and re-sale;
- Phoenix's Last Mile approach using hubs and retailers appears to be the most viable option for seed firms and CBSPs. In comparison, Oruwera's distribution method of delivery to CBSPs' stores likely contributed to lower seed sales and a limited reach geographic reach.
- Key conclusion is that by focusing on setting up a hub and spoke (smaller CBSP retailers) network that draws not specifically from agro-dealers but mostly from a network of existing rural microenterprises, SEEDS has begun to establish a seed distribution network which is not affected by seasonality and other limitations (as is the case of the sale of seeds only) but which packages seeds together with other product lines that small shop owners are already profitably trading in their communities.

  Keywords: Mozambique, Last mile/rural areas, community seed producers, hubs/retailers, certified seeds

64. Building the market for certified seed for smallholders in Mozambique (Grant, 2021)
    Reference: William Grant. (2021). Case Study Building the Market for Certified Seeds for Smallholder Farmers in Northern Mozambique.
    https://www.shareweb.ch/site/EI/Documents/HowTo/M4P/PSD%20inovagro%20Case%20Study%20on%20Seed%20Sector%20March%2021.pdf

- The report highlights the range of activities which InovAgro supported with the seed companies. Key is stimulating new marketing channels including continued to support participation of distributors and agro-dealers in the self-organized village markets. In addition, a number of the agro-dealers also invested in opening community-based retail outlets, where the seed fairs had proven a viable market for seed sales.
- This study highlighted the fact that 80% of all seed being used by smallholders was from retained seed or purchased from traders in local markets, and that the majority of other improved seed was given to SHF by NGOs or government
- Hundreds of lead farmers had been trained to organize demonstrations and field days, and many of the agro-retailers were increasingly working through mobile sales teams, agri-shops and village-based agents to reach the last mile
- On the InovAgro Realigned Seed Strategy Components, demand creation initiatives included Village Fairs, Road Shows, Agri-shops branding, banners
- In its new strategy, will aim at improving the availability of seed close to the farmers which would require developing better distribution channels reaching down to the last mile through small shops, village/community-based agents (VBAs) and mobile sales teams selling trough village markets.
- On addressing farmer purchasing power, with the limited outreach from commercial banks, InovAgro introduced the Fundo Agricola in 2015. This initiative leveraged Mozambique's extensive village savings and loan association (VSLA) networks to help farmers save for the purchase of inputs at planting season and would connect the farmers more directly to the seed companies, addressing information asymmetries.

Keywords: Mozambique, Last mile/Rural areas, Certified seeds Soybean, maize, Models/VBA, small shops/ village/community-based agents (VBAs)/ mobile sales teams/ village markets model/local markets, model/

65. Sustainable last mile input distribution in Mozambique (USAID)

Source: Sustainable Last Mile Input Distribution in Mozambique
Source: FTF INOVA, USAID. Catalysing systemic market change.
https://beamexchange.org/uploads/filer_public/9a/8d/9a8df937-a890-4bef-b27e-6637e271d898/ftf_inova_-_last_mile_input_distribution_info_sheet_-_final.pdf

- The project is supporting interested private sector input distribution companies to develop sales models – for seeds, fertilizers, and chemicals – that can reach the "last mile" with both products and services, sustainably and profitably. FTF Inova is demonstrating how input distribution companies can reach the last mile by making money with farmers, not simply from them.
- The report defines the Village-based agents as community-based, commercial agents who provide a link between input firms and farmers and are a useful channel to share information on products and services, which helps farmers to adopt improved practices.
- In this report, the VBA model is especially useful in Mozambique because last mile farmers are so marginalized, disconnected from markets, and limited in their ability to access to inputs and information to improve their yields.

- Additionally, the report discusses how the agents were trained with support from FTF Inova and how each partner firm designed a set of performance incentives for agents, in line with the goal of promoting community satisfaction.
- With FTF Inova's support, three "last mile" sales models for agriculture inputs have been piloted: (1) village-based agents (VBAs), (2) fixed schedule delivery service using a mix of orders and cash-based sales, and (3) spraying services bundled with the sale of pesticide.
- Described in more detail in this article, these sales models are showing early signs of being able to catalyze broad system changes that will improve last mile availability of agriculture inputs, competitiveness, and inclusivity in Mozambique.

  Keywords: Last mile/ Marginalized, disconnected from markets, New varieties, Mozambique, Village based agents, Bundling, fixed schedule delivery service

66. Building a network of rural agro-dealers to serve smallholders in Zambia (Pennotti & Fawley-King, 2010)

    Reference: Christian Pennotti, T. F.-K. (2010). The ADAPT Project in Zambia: Successes and Lessons in Building a Scalable Network of Rural Agro-Dealers to Serve Smallholders. A market engagement innovations and impacts case study. U. CARE. https://www.marketlinks.org/sites/default/files/media/file/2020-10/The%20ADAPT%20Project%20in%20Zambia%20Successes%20and%20Lessons%20in%20Building%20a%20Scalable%20Network%20of%20Rural%20Agro-Dealers%20to%20Serve%20Smallholders.pdf

    - Building on the initial maize sector analysis, in 2008 CARE developed a plan to provide 91,000 smallholder households in remote, rural Zambia with access to an increased range of agricultural inputs and technologies at reduced end prices. The strategy was to partner with existing agro-dealers—small input suppliers operating along main roads or in rural bomas (town centers)—to develop a network of rural sales agents. Each agent would collect orders from rural smallholders and facilitate trade between them and their associated agrodealer
    - The case includes a summary of CARE's early intervention strategy, an overview of the maize sector in Zambia, some of the key challenges and CARE has faced and reacted to over the life of the project, a number of innovations and the results to date. The case concludes with a look toward the future of CARE's work to improve access to input and output markets in rural Zambia and beyond.
    - Key is that Project results have caught the attention of market actors and donors alike. MACO, for example, is interested in using the network to distribute Agriculture Support Program supplies to smallholders, potentially a major business gain for rural agro-dealers. "The [Zambian] Government has already asked for list of agro-dealers that we have trained

      Keywords: Zambia, Remote rural areas, Improved seed (Maize), Rural sales agents, Rural ago-dealers, Rural retailers, Rural entrepreneurs

67. Champion farmers seeds cooperative in Zimbabwe (Oxfam, 2019)

Reference: Oxfam Novib. (2019). The Case of Champion Farmer Seeds Cooperative, Zimbabwe. Documenting lessons learned establishing a Farmer Seed Enterprise (FSE). Discussion paper. https://sdhsprogram.org/assets/2019/07/ChampionsSeeds_Discussion-paper_Digital_pages.pdf

- This discussion paper presents the lessons learned in establishing a farmer seed enterprise, the Champion Farmer Seeds Cooperative in Zimbabwe between 2016 and 2018, during phase 114 of the SD=HS program. We reflect the assumptions made at the start of the program, and how the experience can guide us as we develop different models of farmer seed enterprises in phase 2.
- Section 2 of this paper presents the Champion Farmer Seeds model. Section 3 shares experiences and results from establishing Champion Farmer Seeds, addressing the highly interrelated issues of seed production and quality assurance. It discusses experiences in mobilizing growers, accessing planting material, and empowering women and youth.
- Marketing experiences are shared in section 4, while section 5 reflects on the financial sustainability of Champion Farmer Seeds. Challenges experienced are addressed in section 6. The paper concludes with key lessons and recommendations in section 7.

Keywords: Zimbabwe, Champion farmer model, Certified seeds, Drought-tolerant and early-maturing maize (hybrid and OPV) varieties and small grains

4.7. Country-specific studies in West Africa

68. Evolution seed sector in Mali, (Dalohoun et al., 2011)
Reference: Dalohoun, D. N.; van Mele, P.; Weltzien, E.; Diallo, D.; Guindo H.; vom Brocke, K. 2011. Mali: When government gives entrepreneurs room to grow. In P. Van Mele, J. Bentley and R. Guei, eds. African Seed Enterprises: sowing the seeds of food security. Pp. 55–86. Rome: CABI and FAO. https://www.fao.org/3/i1853e/i1853e.pdf

- The paper describes the evolution of seed sector in Mali. It shows how cooperatives were formed: After the state-owned seed farms collapsed or were privatized, people were encouraged to create cooperatives or other organizations to take over seed production. It further lists the cooperatives and describes their structure, cash flow and marketing of the seed produced.
- PAFISEM project supported 136 cooperatives and various private enterprises, such as Faso Kaba, Comptoir 2000, Nakoshi and Niégué Farm. After the project came to an end in 2009, the various organizations approached the Malian government to continue subsidizing seed certification, at least for the costly field inspections.
- While the project supported the transition towards a private seed sector, it focused on seed production, but hardly at all on business management, seed distribution and marketing.
- The Nerica dissemination project of the African Rice Initiative (ARI) started addressing this for rice seed producers' organizations, e.g. by establishing revolving funds.

Keywords: Mali, farmer cooperatives, certified seed/pearl millet, frequent drought

69. Last mile distribution through agents, Moringa in Ghana (Ronald, Tooley, & Meunier, 2019)

    Reference: Erin Ronald, Jean Baptiste Tooley, Kimmie Meunier (January 28, 2019). Last Mile Distribution: Lessons from Agricultural Sales Agents in Ghana. Miller centre for social entrepreneurship. https://www.millersocent.org/2019-1-17-last-mile-distribution-lessons-from-agricultural-sales-agents-in-ghana/

    - The blog gives insight into strategies to successfully build an agricultural sales and extension network, specifically attracting agents, training agents, and contracting and paying agents using moringa case.
    - It further describes the roles for MoringaConnect Field Agent Network and elaborates on the agent types categorizing them into four: (i)Extension services manager (ii) Regional manager (iii) Field agent (iv)Farmer
    - Key is that recruiting women increases success of the network. Throughout the process of defining the geographical scope of sales agents and the roles that are needed within it, we also found that women should be at the core of an agent recruitment strategy.

    Keywords: Last mile distribution, Sales agent, Ghana, Moringa

4.8. Experience in Asia

70. Successes FAO projects including seed enterprise support, Afghanistan (FAO, 2011)
    Reference: FAO. (2011). Afghanistan and FAO Achievements and success stories: FAO Afghanistan Seed Program Summary of Achievements. FAO Representation in Afghanistan. https://www.fao.org/3/at001e/at001e.pdf
    - This publication describes what FAO's seeks to support in Afghanistan including the rehabilitation of irrigation infrastructure, improved seed production and distribution, and increased production of dairy products including milk and eggs.
    - Key is the seed industry development where New private enterprises are driving seed industry growth in Afghanistan.
    - Behind this change in perception are key farmers such as Haji Lal Jan in Chadara District of Kunduz province. He established the Khawja Kafter Baba Seed Enterprises. (KKBSE) with 10 members and 45 contract seed growers in surrounding villages and began producing and selling certified wheat seed in 2005. By 2007, KKBSE sold 530 MT certified seed and was turning over $220 000 with 15 percent profit margin. By 2010, the enterprise had 240 contract growers and produced 1 860 MT with turnover soaring to over US$1 million. The company soon became well known and began diversifying production beyond wheat to other major food crops. Now a whole lot of competitors are emulating KKBES's example and climbing on the bandwagon for producing and marketing certified seed.
    - FAO is working to create 20 new seed enterprises in 17 additional provinces to ensure more farmers have access to certified seeds. FAO is also supporting the enterprises to diversify seed production to help pave the way for long-term profitability and sustainability.
    - Annexes: Success stories, FAO ongoing and closed projects.

    Keywords: Afghanistan, last mile/drought, certified seeds, key farmer

71. Afghanistan: village based seed enterprises (Srinivas et al., 2010)

Reference: Srinivas, Tavva, Bishaw, Zewdie, Rizvi, Javed , Niane, Abdoul Aziz , Manan, Abdul Rahman and Amegbeto, Koffi (2010) 'ICARDA'S Approach in Seed Delivery: Technical Performance and Sustainability of VillageBased Seed Enterprises in Afghanistan', Journal of New Seeds, 11: 2, 138 — 163

- ICARDA initiated a novel approach of establishing farmer-led village-based seed enterprises (VBSEs) to ensure rapid access to quality seed of adapted new crop varieties under the Alternative Livelihoods Program (ALP-E) on integrated staple crop development in eastern Afghanistan.
- This article describes VBSEs, their technical performance, profitability, and impact, and assesses their sustainability as alternative options in Afghanistan.
- The technical performance of VBSEs showed that they collectively produced 1,060 and 2,170 MT quality seed of wheat, rice, mung bean, and potato in 2006/7 and in 2007/8, respectively. Average purity and germination of seed produced was 98.67 and 93.47%, respectively, in 2006/7 and 98.13 and 91.25% in the same order for 2007/8.
- It is evident from the profitability analysis of VBSEs' seed operations that all were economically viable by breaking even and covering fixed and variable costs. The net profit from seed business was $315,531 for 15 VBSEs in 2006/7 and it reached $1,311,060 in 2007/8 for 17 VBSEs. For all VBSEs, returns-to-asset ratio showed strong earnings of 3.5% and 4% in 2006/7 and 2007/8, respectively and were lower than an acceptable stress level of 6%.
- All VBSEs had current ratio above the threshold of one and therefore were not vulnerable to meet short-term debts. The average debt-to-asset ratio of all VBSEs was low (5% in 2006/7 and 1.6% in 2007/8) suggesting their strong borrowing capacity with no financial risk. Similarly, the debt-to-equity ratio indicated that in all cases, the farmers' share of the seed enterprise equity averaged about 5.42% and 1.6% during 2006/7 and 2007/8, respectively. The most progressive and experienced VBSEs are using diversification strategies to increase and stabilize revenues.
- The paper provides evidence that quality-seed production at community-level in the form of VBSEs is profitable and an alternative seed-delivery system complementing the formal sector in Afghanistan and elsewhere.

Keywords: Afghanistan, breakeven analysis, impact, liquidity ratios, profitability, village-based seed enterprises, new crop varieties

72. Scalable rural sales agent model, Bangladesh (McKague & Tinsley, 2012)

Reference: McKague, K. and Tinsley, S. (2012), "Bangladesh's Rural Sales Program: Towards a scalable rural sales agent model for distributing socially beneficial goods to the poor", Social Enterprise Journal, Vol. 8 No. 1, pp. 16-30. https://doi.org/10.1108/17508611211226566

- In Bangladesh, 30 percent of the population lives beyond the "last mile" of traditional distribution networks and serving this rural low-income population with socially useful goods is a huge challenge.

- The purpose of this paper is to present one of the most innovative and successful cases of its kind in the world, a social enterprise rural distribution model originally developed by CARE Bangladesh and the Bata Shoe Company, to illustrate the possibility of combining market-based solutions to poverty with socially responsible business growth.
- Findings: The case provides insights into the origins, lessons learned and key success factors of viable rural sales agent distribution networks serving the poor. A key tension to be managed is keeping the costs of the network down while ensuring that every member is adequately incentivized.
- Social implications – The 3,000 women sales agents in rural Bangladesh engaged with the Rural Sales Program have benefited from earning viable incomes in contexts where opportunities for employment and empowerment of women are limited.
- Rural populations have gained affordable access to socially beneficial goods such as fortified foods, seeds, daily necessities and shoes. Companies have benefited from learning how to adapt their product offerings to meet the needs of low-income customers.
- Originality/value – Where rural sales initiatives elsewhere have faced challenges, this case is the first published account of the origins of how CARE, Bata, and other companies established a viable and scalable rural sales agent distribution network for the commercial benefit of companies and the economic and social benefit of poor women and their customers.

  Keywords: Rural sales agents, Poverty alleviation, Distribution networks, Cross-sector partnerships, Women's empowerment, Social enterprise, Bangladesh, last mile/ rural low-income population

73. Last mile delivery - India (Paninchukunnath & Goyal, 2019)
    Reference: Paninchukunnath, A., & Goyal, A. (2019). Innovative VLE model for last-mile service delivery in rural India. Social Business, 9(3), 272-294.

- The paper examines the emerging trend of VLEs (Village Level Entrepreneurs), developed by organisations/corporations in various sectors, for last-mile service delivery in remote rural areas of India.
- The extant literature is reviewed and VLE models adopted by eight pioneering organisations in Indian rural markets are examined after collecting data from websites and secondary sources.
- The common and innovative elements in each model have been identified to arrive at a conceptual model of VLE adoption which can help organisations undertake inclusive rural marketing.
- The article sees the VLE model as one which can achieve the double bottom line by ensuring market penetration (economic) and empowerment of young people and women in rural communities (social) by enabling them to own micro-enterprises.
- The paper notes that corporations can thus play a developmental role in remote rural markets, which are mostly under-served and neglected today, and thereby create shared value. The paper also introduces the concept of 'partsumer', which is closely linked to VLEs.

Keywords: remote rural areas, Village level entrepreneurs, India

74. Seed systems in conflict-affected areas: Syria (Louise Sperling, Holmquist, Ouko, Mottram, & Love, 2022)

    Reference: Sperling Louise, Charles 'Ted' Holmquist, Wilfred Ouko, Andrea Mottram, & Abby Love. (2022). Seed Systems in Conflict-Affected Areas: Context Analysis Tool (Vol. Version 1). Produced by Mercy Corps and SeedSystem as part of the ISSD Africa activity.

    - The Context Analysis Tool (CAT) provides humanitarian actors with an analysis process to understand seed systems in hostility settings. The CAT has three sections. Section 1: Characterizes seed systems and conflicts. Section 2: Phase 1 outlines the methodology for assessing context-specific scenarios with the aim to support seed system functioning. Phase 2 explores practical programming considerations for seed-related interventions in these scenarios. Section 3: The Annexes, presents specific field tools to assess specific seed security situation.
    - The document provides case studies of Syria in supplying seeds to last mile areas stating how Mercy Corps overcome constraints in seed access through its electronic voucher system, worked with different vegetable seed suppliers to provide quality seeds to crisis-affected, vulnerable vegetable farmers.
    - Assessments confirmed that quality seeds were available but vulnerable farmers could not afford the local market prices. Also, there was indication of an increasing number of private sector actors working in the markets to bridge the gap created by a reduction of government subsidies.
    - Mercy Corps decided to support the local seed suppliers by providing vulnerable farmers with e-vouchers. Before implementation, Mercy Corps took seed samples from all the selected hybrid vegetable seed suppliers and arranged a quality check that included a physical check and germination test. A total of 700 farmers received e-voucher smart cards that were redeemed in the seed suppliers' shops.

      Keywords: Local seed suppliers shop, Syria, Hybrid seed Vegetable, last mile, Africa

75. Agricultural Kiosks in India (CARE, 2018)

    Reference: CARE. (2018). Agricultural Kiosks in India: Improving Access to Inputs Among Small-holder Women Farmers: A Case Study. CARE Food and Nutrition Security Unit: Accessed At: https://careclimatechange.org/agricultural-kiosks-in-india-improving-access-to-inputs-among-small-holder-women-farmers/

    - The Pathways program seeks to increase poor women's productivity and empowerment in more equitable agriculture systems at scale using a strong gender focus, working with ST and SC communities in two rural districts of Kalahandi and Kandhamal of Odisha State in India. To address agricultural input access disparities, the program tested an innovation that brings affordable inputs closer to farmers—agricultural kiosks.
    - CARE commissioned this final evaluation of Pathways in December of 2015, three years after the baseline study.

- The study found that women's access to agricultural inputs such as seeds and fertilizers grew significantly over the project period, increasing 2.4 fold, from 37% to 89% at the end of the project.
- Survey data shows that sourcing from cooperatives and governments has decreased since baseline, inputs from local producers doubled to 26%. Similarly, there was a 23% increase in access to inputs from suppliers five or more kilometers away and a 40% increase in access to nearby suppliers such as agricultural kiosks.
- Findings reveal that agricultural products like paddy seed, inputs for kitchen gardens, fertilizers and pesticides are generating revenue for kiosk owners, however, sales are seasonal and kiosk owners find it challenging to maintain cash flow over less productive periods.
- However, the document reveals that while input prices at kiosks are approximately equal to those at input shops in the blocks, farmers save time and transportation costs buying from agricultural kiosks due to their more accessible locations.
- Additionally, the agricultural kiosks serve as important sources of information regarding market conditions. With Pathways' support, they are able to post information to market boards to better support farmers in understanding local markets.
- The document shows that Agricultural kiosks, however, have great potential to close the input supply gap as sustainable providers of inputs and information to assist farmers.

Keywords: Agricultural kiosks, India, CARE, rural areas

76. Dissemination pathways for drought tolerant rice in the Philipines (Corales et al., 2019)

Reference: Corales, A. M., Santos, R. C., Banayo, N. M., Bueno, C. S., Johnson, D. E., & Kato, Y. (2019). Dissemination pathways for drought-tolerant rice cultivars: A farmer-participatory evaluation in the Philippines. World Development Perspectives, 15, 100131.

- The study compared farmer-participatory methods for the dissemination of new stress-tolerant rice cultivars in drought-prone areas in the Philippines from 2016 to 2018.
- The study, involving 10 176 farmers, compared on-farm demonstration-cum-participatory varietal selection, farmer field schools, farmer-to-farmer extension through local farmer technicians, seed systems enhancement, and seed caravans. The paper further describes the characteristics and challenges of these dissemination pathways
- The study defines caravans as a group of people carrying bags of seeds from community to community by trucks, farmers were given seed of new drought-tolerant cultivars and asked to evaluate the performance on their farms. Before each season, 5-kg 116 seed packets per cultivar were distributed to farmers for free by local government officers through the caravans.
- The study further reveals that farmers who belong to an organized group preferred farmer-to-farmer extension through LFTs and the seed caravan, whereas those who do not belong to any association preferred on farm demonstration.

- Key result is that a combination of appropriate pathways for the dissemination of new stress tolerant rice cultivars should match the socio-demographic characteristics of the target farming communities.

  Keywords: Farmer-to-farmer extension through Lead Farmer Technician (LFTs); drought-prone; Dissemination pathways; caravan, gender, Stress-tolerant rice varieties, Seed caravans, Philippines

77. FAO seed security assessment in Syria (FAO, 2020)

    Reference: FAO. (2020). Seed Security Assessment in the Syrian Arab Republic. https://reliefweb.int/report/syrian-arab-republic/fao-syria-releases-seed-security-assessment-findings

    FAO Syria conducted a Seed Security Assessment to analyze the quality and availability of seed of across the country, a representative sample of crop farmers from seven governorates were interviewed to provide their perspectives. The assessment findings included:

    - Although General Organization for Seed Multiplication (GOSM) is an important source for accredited wheat seed, the farmers obtained half of their seed from other sources to supplement what they received from GOSM.
    - Local informal markets are an important source of seed for nearly every major crop (wheat, barley, pulses).
    - Twenty percent of farmers are sowing less seed than they normally would because they cannot afford seed or other inputs like water for irrigation or agrochemicals. This reveals that the combination of challenge between general lack of seed and the ability of poorer farmers to access inputs more generally.
    - Seed is a significant cost for farmers, the estimation of their total expenditure on seed is between 1/6 (rain-fed) to 1/3 (irrigated) in total, which is spent in local informal markets.

      Keywords: Syria, Local informal market, Seed systems/formal, seed systems/informal, Seeds from unknown sources

4.9. Experience in Latin America

78. Seed security assessment Haiti, (L. Sperling, Mcguire, Smale, Bayard, & Shannon, 2010)
Reference: Sperling, L. et al. (2010). Seed security Assessment-Haiti.

https://www.crs.org/sites/default/files/tools-research/seed-system-security-assessment-haiti.pdf

- CIAT, CRS, SNS-MARDNR, UEA, FAO, World Concern, Save the Children, ACDI/VOCA, Save the Children and World Vision, 2010. Seed System Security Assessment, Haiti. A study funded by the United States Agency for International Development, Office of Foreign Disaster Assistance. (USAID/ODFA) August 2010. Arusha, Tanzania: International Center for Tropical Agriculture.
- A Seed System Security Assessment (SSSA) was carried out in Haiti in May-June 2010. The work assessed the impact of the 12 January 2010 earthquake on households and agricultural livelihoods, including possible changes in assets, land holdings, labor availability, income generation activities, crop profiles and seed use.
- The work also analyzed acute seed security issues, monitoring farmers' seed procurement strategies and examining the effects of any aid given. As a third thrust, the SSSA looked at chronic seed security problems, including those related to seed/grain markets, agricultural product transformation and access to modern varieties. Hence the foci included 'very short term', as well as short- and medium-term issues.
- Analysis of the seed sources used in two consecutive seasons (representing routine trends) shows that farmers depend heavily on local markets, from which they access about 75% of their seed across crops. Their own stocks provide 15-20% of seed sown, with other potential sources – input shops, farmer seed producers, gifts via family and friends, and seed aid – providing negligible amounts. Immediately after the earthquake, seed aid (including both emergency and development aid) provided about 4% of the total seed sown. The average farmer spends at least $US 60-70 per season, which is a considerable expense for farmers already hovering near the poverty line.
- The report further focuses on a study of seed/grain markets in two regions: the South (Les Cayes, Cavaillon, Cance, Camp Perrin, Torbeck and Arniquet) and Upper Artibonite (Gonaïves, Poteaux, Terre Neuve). It focuses on four major crops: beans and maize in both areas, plus rice in South, sorghum in Artibonite. While not exhaustive, it advances our understanding of how local markets are used for seed supply.
- The report notes that not all traders are the same. The scale of a trader's operation and her/his relationships with other parts of the market chain affect how a trader may manage seed versus grain. It further illustrates the traders hierarchy. The small pack approach (100 g or less) is elaborated as key for new varieties and the report shows how it has been successfully tested in many countries, especially in Africa
- The report makes 44 separate recommendations (see Chapter VII). Specific recommendations are made in terms of new varieties (not to introduce them under emergency programs) and to ensure review of emergency programs after any three years of continuous implementation.

Keywords: Seed systems, Haiti, Last mile/earthquake, local markets, vegetables/ modern varieties and certified seed

79. Seed systems in fragile states - Haiti case study, (Croft, 2021)

Reference: Croft, M. (2021). Seed Systems in Fragile States - Haiti Case Study. A Feed the Future Global Supporting Seed Systems for Development activity report. https://www.crs.org/sites/default/files/seed-systems-haiti-case-study.pdf

- This overview of seed systems in fragile states focuses on Haiti, with insights drawn from the literature and key informant interviews. While the Haitian context is constantly evolving, the lessons drawn from this case study can help inform seed system development in fragile states.
- Findings reveal that the dominant source for seed is informal markets, providing 70% of all seed but especially critical for beans, peanuts, and cowpeas. Additionally, seed trade at the community level is often a role played by women. Women are generally responsible for selling harvest and purchasing seed for the coming season
- Farmer to farmer exchange is also key. Bean seeds are available year-round through an exchange from the highlands to the lowlands that ensures beans are always present in informal markets. This exchange was however disrupted when international donors funded the distribution of bean seed that was well adapted to lowlands but not the highlands.
- Seed and grain travel to and from these markets through a network of 14 producers, importers, wholesalers, retailers, Madam Saras (as defined on p. 6) and other intermediaries who provide a robust trade network across the country (Seed System Security Assessment – Haiti, 2010). The local seed or grain markets can be weekly in rural locations or permanent in larger towns. Farmers are known to travel to specific (and sometimes distant) locations to procure seed.
- Further, farmers do generally prefer seeds that are local over imported for key staple crops like maize, sorghum, pigeon pea, and peanut, though they may differentiate depending on the crop. While 41.3% of farmers report buying bean seed they did not consider local, this is closer to 12%-14% for sorghum, maize, pigeon pea, and peanut (Walters, & Brick, 2010).
- The report however notes that many ad-hoc seed businesses exist to respond to NGO and institutional buyer needs but do not serve farmers as part of their business model. Working with both Haitian government and other institutional buyers, these local seed entrepreneurs tend to purchase seed from informal markets but often sell the seed as certified.
- Interestingly, though farmer groups are free to sell their seed to anyone, only 10-20 of these groups have the capacity to sell directly to NGOs or the FAO due to the heavy administrative burden on farmer groups of institutional buyers like NGOs. The majority of the groups sell QDS seed to intermediaries or wholesalers who might then sell the seed to institutional buyers or retailers. In general, the farmer organizations do not have the internal capacity to market seeds themselves and so rely on seed intermediaries of all sizes.
- The report also discusses the local and international NGOs involved in seed-related activities in Haiti and provides a summary and vision in relation to the discussions.

Keywords: Haiti, Seed systems/ informal, last mile/ Presidential assassination/ a major earthquake, and a hurricane, Informal traders, Local seed entrepreneurs, Grain market

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