



A3-SEED South Sudan

Internal Project Evaluation

KIT Institute, Amsterdam

International Fertiliser Development Centre (IFDC), Juba

December 2025



Colophon

Authors (alphabetical order):

- David Deng **Chol**, MEL manager at IFDC
- Nicola **Francesconi**, *PhD*, Senior Economist at KIT
- Lisa de **Graaf**, Junior Economist at KIT
- Turo Thomas **Mono**, MEL officer at IFDC
- Alida **Sangrigoli**, *PhD*, Economist at KIT
- Esther **Smits**, Economist at KIT

Institutions:

KIT Institute
Mauritskade 63
1092 AD Amsterdam
The Netherlands

The International Fertilizer Development Center (IFDC)
Rahwa Apartment
Plot 710 3K
South Airport Rd
Juba, South Sudan

Contact: n.francesconi@kit.nl

Photos : all photos included in this report were taken by and belong to the authors

Acknowledgements:

The A3SEED project and this report were made possible thanks to the financial support provided by the Embassy of the Kingdom of the Netherlands (EKN) in South Sudan. The authors would like to acknowledge the input and support received from Robinah Duku and Arend van Vuren from EKN; Justin Miteng (SNV); Martijn Breedveld (Glexcon); Kiden Zaida Ibrahim, Rikaju Julius Wani, Peter Majur Ador, Wani Gonda, John, Poni Nancy Kajokaya and the rest of the IFDC team; Boudy van Schagen, Sandra Quintero and the rest of the KIT team; Isaac Woja Enoch and all the other members of STASS, Hon. Alison Barnaba Minister of Agriculture in Western Equatoria State; and the King of the Azande people his Majesty Atoroba Peni Rikito Gbudue.

Executive summary

This report analyses a wealth of quantitative data and qualitative information to produce a 360 degree evaluation of the impact generated by the A3SEED project, between 2021 and 2025. This 5-year and 10-million euro project was funded by the Embassy of the Netherlands and implemented by IFDC in partnership with KIT, with the ambition to contribute to the transformation of the the seed sector in South Sudan.

The A3SEED project was justified by the realization that the agricultural potential of South Sudan is enormous but largely untapped, despite 15 years of continued seed aid distribution by FAO and multiple humanitarian agencies. Protracted and mass distribution of free seeds was expected to boost farmers' production in the presence of recurrent conflicts, but failed to do so because seed aid has largely consisted of low-quality seeds imported from abroad, especially from Uganda, and has culminated in a state-endorsed monopoly for seed supply.

To reduce dependency on foreign seed-aid, the project deployed a “private sector led” approach, involving the provision of technical and financial support to 9 seed producing and trading companies (all SMEs) affiliated with the Seed Trade Association of South Sudan (STASS). The purpose of this report is to identify and measure the project's impact, as well as its scalability across space and sustainability over time. To do so, we focus on key performance indicators (KPIs) related to agricultural production and commercialization, food security and nutritional diversity among smallholding farm-households in 5 target counties across the southern equatorial states (the “green belt”) of South Sudan.

Our analysis emphasizes that the development of a domestic and private seed sector is key to introduce different and higher-yielding varieties that are better adapted to local preferences and agroecological conditions. In particular, our results indicate that average maize productivity almost doubled for those farmers that managed to gain access to the seeds produced by project-supported companies. And this impact appears to endure or to be sustainable over time, given that it was identified in 2023 and was still evident, if not larger, by the end of 2025.

However, the amount of seeds produced and sold with the support of the project remains quite limited, mostly because the majority of farmers appear to be neither willing nor able to access the marketplace and pay for seeds. And even if domestic companies have been selling a growing quantity of seeds to humanitarian agencies, the vast majority of seed-aid continues to be procured from abroad. As a result, we do not observe clear improvements in the average values of our KPIs at the aggregate level, across the five target counties, and we conclude that the project has failed in bringing its impact to scale.

This shortcoming was discussed in a multi-stakeholder workshop, which we organized at the end of the project, in the form of a “Science-Policy Interface”. Collective deliberations pointed out that the “localization” of seed-aid procurement has the greatest potential to up-scale both the production and adoption of improved seeds in South Sudan, but it is constrained by the absence of a national seed quality control and certification system. Such a localization strategy also has the potential to create a “humanitarian-development-peace nexus” in a country that is struggling to come out of a protracted crisis.

Contents

1	Project background	5
2	Baseline data	7
2.1	The impact of seed-aid	9
3	Midline data	16
3.1	The impact of the project	18
4	Endline data	22
4.1	Impact scalability	24
4.2	Impact sustainability	29
5	Science-policy interface	31
5.1	Seed system transformation	33
6	Concluding remarks	36

Tables & Figures

Table 1.	Baseline household data (2021)	11
Figure 1.	% of households that received seed aid in 2021, by crop & county	12
Table 2.	Probability for a household of receiving seed aid in 2021	13
Table 3.	The insignificant impact of seed aid on maize yield in 2021	14
Figure 2.	The insignificant impact of seed-aid on maize productivity in 2021	14
Table 4.	The impact generated by the project in 2023	18
Figure 3.	The impact generated the project in 2023	19
Figure 4.	The willingness and ability of treatment farmers to access and buy local and improved seeds (2023)	20
Figure 5.	The willingness and ability of control farmers to access and buy local and improved seeds (2023)	20
Figure 6.	production and commercialization of seeds by project-supported companies in 2024	25
Table 6.	Seeds availability in 2021 (baseline) and 2025 (endline)	26
Table 7.	Agricultural performance in first/main season of 2021 and 2025	27
Table 8.	Food security and nutrition diversity in 202 and 2025	28
Figure 7.	The evolution of project's impact over time	29
Table 9.	Multistakeholder deliberations (February 2025)	35



1 Project background

A3-SEED was a five-year (2021-2025) and about 10 million euro project, funded by the Embassy of the Kingdom of the Netherlands (EKN) and implemented by IFDC in partnership with KIT. The project aimed to reach 100,000 farm-households located in relatively stable counties such as: Yambio, Nzara, Torit, Magwi, Bor, Rumbek, as well as Juba, which are spread across the green belt and the three southern and equatorial states of South Sudan.

By 2021 the seed sector in South Sudan was overwhelmingly dominated by humanitarian support in the form of seed-aid, i.e. imported seeds distributed for free by FAO and multiple humanitarian agencies throughout South Sudan. To reduce dependency on foreign seed-aid, the project was designed to deploy an innovative “private sector-led approach”, involving the provision of technical and financial support to 9 seed producing and trading companies (SMEs and cooperatives) affiliated with the Seed Trade Association of South Sudan (STASS).

In turn, these companies provided improved varieties of early-generation seeds (EGS) to out-growers (mostly smallholding farmers) to multiply and sell them back to the companies. Seed supplies of satisfactory quality were thus purchased back by the companies and then marketed through two main channels: 1) local networks of agro-dealers, who offered last-mile extension (i.e. demo-plots, training sessions, radio jingles, etc.) and retail services to sell the seeds directly to farmers; and 2) FAO and humanitarian agencies, which purchased seeds through public tender processes and then re-distributed them for free to farmers.

Such a private-sector led approach was expected to generate significant and positive impacts on agricultural productivity and revenues, food security and nutritional diversity for farm-households based in target counties. The project focused on a selected number of value chains, including: maize, sorghum, groundnut, sesame, beans, horticulture, rice, cowpea and millet. Further details about the project approach will be presented and discussed in the following sections.

A maize farmer



A tomato farmer



2 Baseline data¹

Baseline data was collected right before the beginning of project, to assess the characteristics and performance of a representative sample of about 2,000 farm-households based in a selection of 5 target counties (Nzara, Yambio, Torit, Magwi and Juba), before the beginning of the project. Baseline data was collected in the period September-December 2021 using a structured and digital questionnaires. A total of 1,990 farm-households were successfully surveyed. The sample size for each county was determined proportionally to the expected number of beneficiaries. Farm households were interviewed in relation to their two most important crops.

To comply with local cultures and languages, the enumerators were recruited from within each county. All enumerators received a three-day training on how to administer the questionnaire in compliance with South Sudan's and global ethical requirements. IFDC obtained the approval from relevant authorities at the national (federal), state and local levels, before commencing survey work.

The sample included 501 farm-households from Yambio, 500 from Nzara, 722 from Magwi, 194 from Torit and 65 from Juba.

In 81% of the cases interviews were conducted with the head of household, otherwise with the household member that was most knowledgeable about agricultural activities in the household. With 45% of the respondents being female, the sample was relatively balanced in terms of gender. A Gender-balanced survey was made possible because female-headed households were relatively abundant (29%). This may be a consequence of the many and recurrent conflicts that have affected South Sudan since its independence. Around 24% of the respondents considered themselves as village-leaders. The majority of respondents (89%) were local/native to the community they currently live in. About 2.5% were internally displaced persons (IDPs), while 7% were returnees. On average, IDPs had been displaced for 14 years. Baseline data is described throughout the rest of this report.

¹ This section is an extract of the internal baseline report of the A3SEED project, produced by KIT and IFDC

A training session for enumerators



A team of survey enumerators



2.1 The impact of seed-aid²

Baseline data was also used to assess the impact of seed aid distribution on maize productivity in South Sudan, so as to better understand the context in which the project was being implemented.

Seed aid—or free distribution of seeds to farmers—is a widespread and longstanding intervention in South Sudan. It is often justified by the need to simultaneously reduce food insecurity and dependency on food aid, in a protracted crisis context. However, seed aid distribution also has the potential to hinder or distort the development of local seed markets.

In this study we analyze the targeting and impact of seed aid across the green belt of South Sudan, which cuts across the three southern equatorial states. Using our primary and baseline data on 1,990 farm households (described in Table 1), we find that seed aid is widely rather than selectively distributed.

Almost a third of farm households receive seed aid despite the general availability of locally recycled seed varieties (Figure 1). Seed aid distribution does not seem to favor particularly poor, vulnerable and food insecure households, but those that are embedded in community networks, organizations and institutions (Table 2).

Using a double robust methodology based on Inverse Probability Weighted Regression Adjustment (IPWRA), we also find that the adoption of seed aid by farm households does not result in increased maize production, as it is neither associated with agricultural intensification nor with the expansion of cultivated land (Table 3).

Our findings emphasize that seed aid is substituting rather than supplementing local seed varieties, given that these latter appear to be locally recycled offsprings of those imported seeds that have been distributed for free by humanitarian agencies over the past 15 years.

These findings also emphasize a lack of intentionality in seed aid distribution. Still, it must be noted that the effectiveness of seed aid distribution may be greater outside our study area, or above the green belt, where conflicts and natural disasters remain more frequent and intense, and where farmers are more likely to be seed deprived or “seed insecure”.

² This section is an extract of the following article:

Smits E., Kuijpers R., Miteng J.A., Chol D.D., Mono T.T., Francesconi N. (2024). Is seed aid distribution still justified in South Sudan? *World Development Perspectives*, 36: 100638.

<https://doi.org/10.1016/j.wdp.2024.100638>

But overall, this study supports the widespread perception that seed-aid distribution is highly inefficient and ineffective in a protracted crisis context like that of South Sudan. And yet, seed aid distribution consisting of low-quality seeds, mostly sourced from Uganda, has culminated in a state-endorsed monopoly for seed supply, eroding diversity in the seed genetic pool of South Sudan.

Hence, this study provided also an evidence based justification to the private-sector led approach pursued by the A3SEED project, and to the project’s ambition to build a seed market in South Sudan. Still, such an ambition clashed with evidence showing that by the end of 2021 the quantity of seeds purchased by farmers from local markets remained negligible throughout the country. And the constraints to the development of a seed market in a protracted crisis context continued to be poorly understood.

As such, this study raised a follow up question for further research, which is addressed in the next section: is South Sudan ready for a transition towards a market-based seed distribution system?

Field transportation



Table 1. Baseline household data (2021)

Variables	Full sample Mean (Std. Dev.)	Maize farmers Mean (Std. Dev.)
Household received seed aid in 2021 (yes/no)	26 % (44 %)	27 % (44 %)
<i>Vulnerability:</i>		
Displaced household (yes/no) ³	4 % (20 %)	5 % (21 %)
N. of months of adequate food provisioning (min = 0; max = 12)	10.8 (1.2)	10.9 (1.1)
Number of shocks experienced by the household	2.22 (1.8)	2.28 (2.2)
<i>Assets:</i>		
Tenure security (yes/no)	71 % (46 %)	73 % (44 %)
House ownership (yes/no)	94 % (23 %)	96 % (19 %)
Motorbike ownership (yes/no)	29 % (45 %)	32 % (47 %)
Radio ownership (yes/no)	50 % (50 %)	55 % (50 %)
Land holdings (hectares)	2.30 (3.1)	2.48 (3.1)
Household head is educated beyond primary school (yes/no)	33 % (47 %)	34 % (47 %)
<i>Social network:</i>		
CBO membership (yes/no)	59 % (49 %)	61 % (48 %)
Households regularly visits religious house (yes/no)	83 % (38 %)	84 % (38 %)
Village leader (yes/no)	24 % (43 %)	22 % (43 %)
Mobile phone ownership (yes/no)	36 % (46 %)	37 % (46 %)
<i>General characteristics and fixed effects:</i>		
Children in school (yes/no)	81 % (39 %)	80 % (39 %)
Household size	8.7 (4.7)	9.0 (4.8)
Dependency ratio ⁴	74.4 (77)	72.1 (71.1)
Household head is young (age < 35; yes/no)	38 % (48 %)	39 % (49 %)
Household head is female (yes/no)	29 % (45 %)	25 % (45 %)
County of residence = Juba	3 % (18 %)	2 % (17 %)
County of residence = Yambio	25 % (43 %)	23 % (43 %)
County of residence = Nzara	25 % (43 %)	30 % (45 %)
County of residence = Torit	10 % (29 %)	3 % (18 %)
County of residence = Magwi	36 % (48 %)	42 % (49 %)
<i>Maize-specific indicators:</i>		
Input use: fertilizer (yes/no)	/	1 % (9 %)
Input use: pest-management ⁵ (yes/no)	/	9 % (12 %)
Land under maize cultivation (ha)	/	1,59 (1.6)

Variables	Full sample Mean (Std. Dev.)	Maize farmers Mean (Std. Dev.)
<i>Performance indicators:</i>		
Maize production (kg)	/	1380 (2215)
Maize productivity (kg/ha)	/	1177 (1708)
Share of maize harvest sold (%)	/	42 % (27 %)
<i>Number of observations</i>	1990	1461

³ Includes households that were displaced or returned to their communities within the last three years.

⁴ The dependency ratio is calculated by dividing the number of dependent household members (those under the age of 15 and above the age of 65) by the total number of household members.

⁵ This includes the use of insecticides, herbicides and fungicides.

Figure 1. Percentage of households that received seed aid in 2021, by crop and county

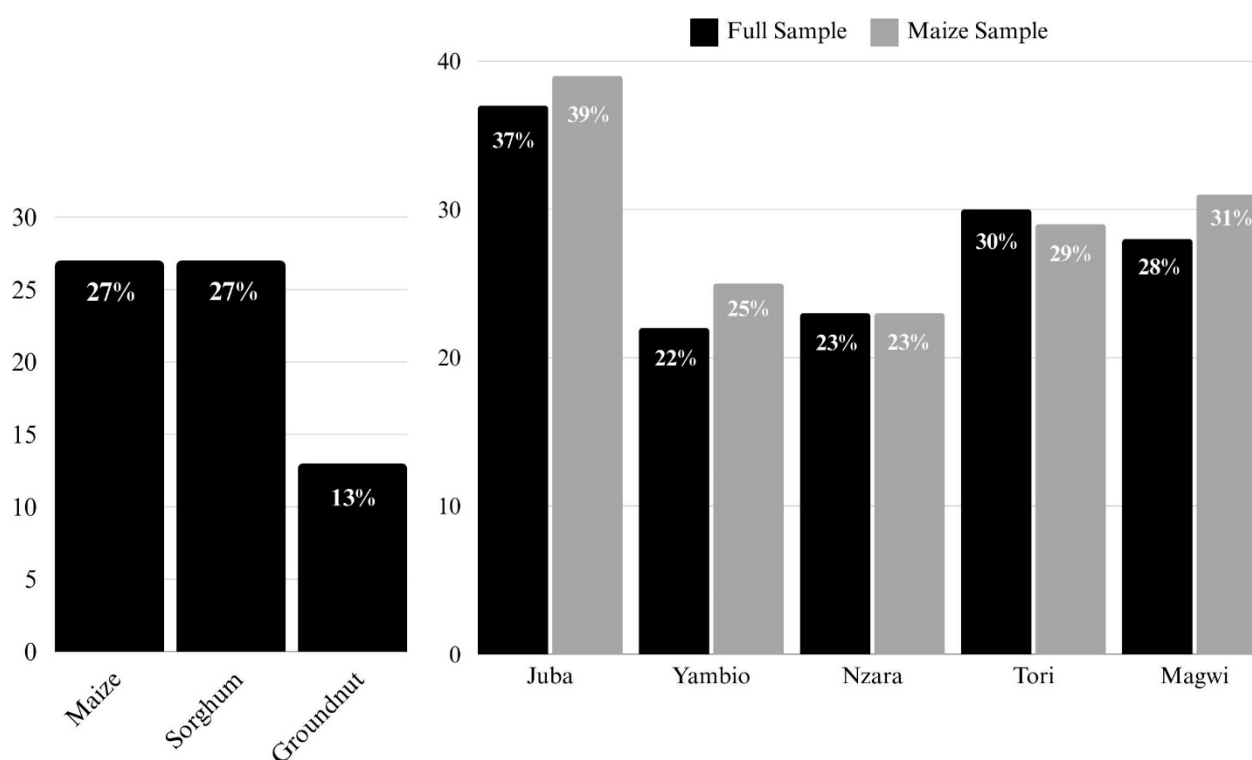


Table 2. Probit regression: probability for a household of receiving seed aid in 2021

VARIABLES	Coefficient (Robust Standard Error)
<i>Vulnerability:</i>	
Displaced household	0.314 (0.153) **
Number of shocks experienced by the household	-0.014 (0.018)
Months of adequate food provision before planting season	-0.029 (0.044)
<i>Social networks:</i>	
CBO membership	0.338 (0.078) ***
Households regularly visits religious house	0.262 (0.096) ***
Village leader	0.187(0.074) **
Mobile phone ownership	0.061 (0.029) **
<i>Assets:</i>	
Asset index ⁶	-0.024 (0.024)
Land owned (ha)	0.004 (0.010)
Household has land rights	-0.064 (0.081)
<i>Household characteristics and fixed effects:</i>	
Household size	0.009 (0.007)
Children are attending school	0.025 (0.085)
Dependency ratio	0.001 (0.000)
Household head age < 35	-0.018 (0.067)
Female-headed household	-0.087 (0.075)
Household head is educated beyond primary school	-0.068 (0.072)
County = 2, Yambio	-0.578 (0.192) ***
County = 3, Nzara	-0.499(0.182)***
County = 4, Torit	-0.162 (0.192)
County = 5, Magwi	-0.444(0.180) **
<i>Constant</i>	-0.530 (0.356)
<i>Pseudo R²</i>	0.0325
<i>Wald chi²</i>	70.17(***)
<i>Observations</i>	1,955

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

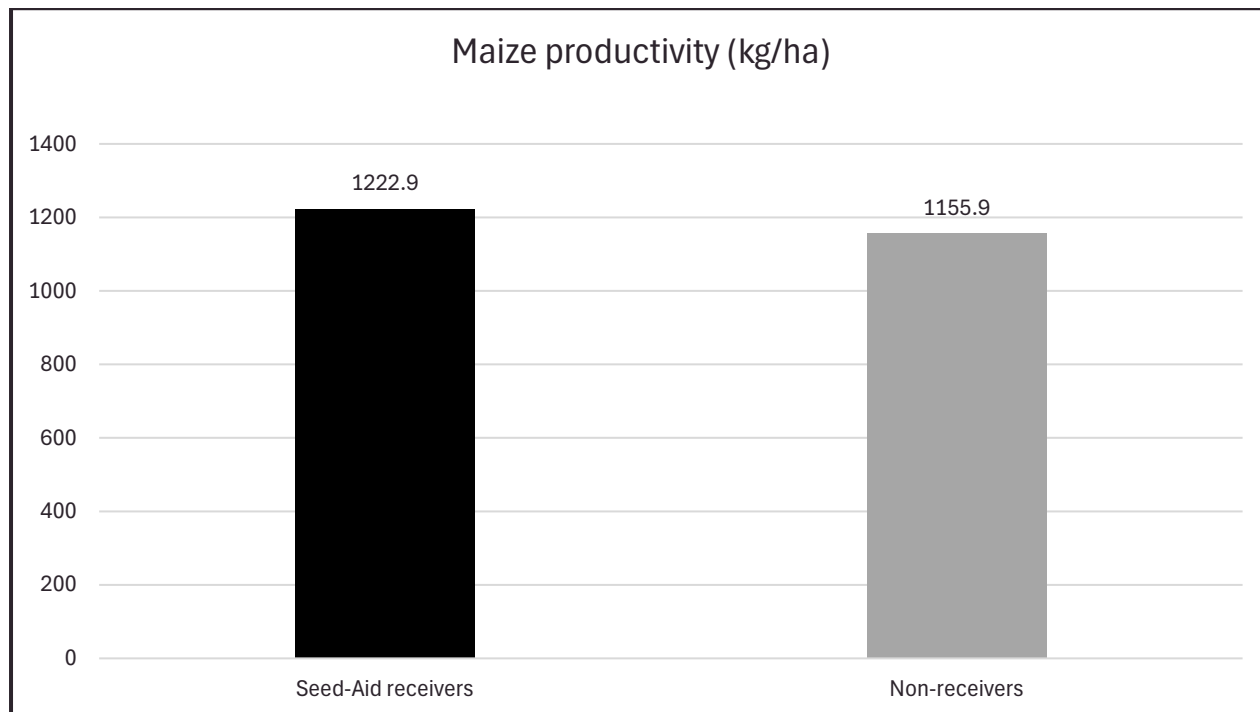
⁶We use an asset index, created through a Principle Component Analysis. The following variables are included in the index: house ownership, access to electricity, motorbike ownership, radio ownership and the ownership of smaller assets (chair, table).

Table 3. The insignificant impact of seed aid on maize yield in 2021 (measured as the Average Treatment Effect on the Treated, ATET, using Inverse Probability Weighted Regression Adjustment, IPWRA)

Outcome indicators	Treatment status		ATET
	Non-receivers	Receivers	
Maize productivity (kg/ha)	1155.9 (55.50)	1222.9 (80.38)	95.42 (107)
Maize production (kg)	1312.4 (47.69)	1528.1 (143.55)	257.2 (196.9)
Land under maize cultivation (ha)	1.57 (0.048)	1.62 (0.061)	0.078 (0.074)
Observations	909	326	1235

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 2. The insignificant impact of seed-aid on maize productivity in 2021



Interview with a maize farmer



A field survey



3 Midline data³

In March 2023 IFDC and KIT organized a Seed Fair within Magwi county, right before the beginning of the first agricultural season. This seed fair allowed to gather the seed companies supported by the project, as well as local farmers.

The seed companies were invited to participate in the fair with the objective of selling their improved seeds – which had produced with the financial and technical support of the project – directly to local farmers. The fair was open to all farmers from the Magwi county and public announcements were made through the radio to encourage participation.

In addition to this, we randomly selected 100 farmers out of the 717 that had been surveyed at the baseline, in 2021, within the Magwi county. This group of 100 “treatment” farmers were formally invited to attend the fair and received: i) a financial incentive in the form of a promise to reimburse them (in cash) all travel expenses incurred to attend the fair (these reimbursements were handed out at the end of the fair); plus ii) technical information concerning the quality of the seeds sold at the fair and the farming practices needed to maximize their yield-potential (this information was delivered during a training session held in the morning before the fair).

A “control group”, also comprising 100 farmers who participated in the original baseline survey, was randomly selected as well. The difference being that this group did not receive any incentive nor information. Hence, control farmers could have still participated in the fair, but only if they heard about the fair from the radio or indirectly from relative, friends, neighbors, etc..

The effect of the treatment, i.e. of the “invitation + incentive + information to attend the seed fair” was expected to provide a good proxy for the impact of the project; given that between 2021 and 2024 the project had provided similar financial and technical support to 9 seed companies for these to offer extension services and sell improved seeds to farmers, through either local agro-dealers and similar seed fairs.

The seed fair organized in 2023 provided the ideal setting to assess the impact of the project and its private seed sector led approach, on farm-households. In particular, the fair brought

³ This section is an extract of the internal midline report of the A3SEED project, produced by KIT and IFDC.

together seed companies and farmers in one confined place at a given time, at a moment in which the seed companies had been supported by the project for about two years. As such the fair allowed us to overcome the main challenge in assessing the impact of a private-sector led project like A3SEED; given by the inherent difficulties of tracing itinerant marketing activities and spot-transactions, and the intrinsic reluctance of business owners and operators to disclose transactional and confidential data.

The seed fair was ultimately attended by a total of 747 farmers. The transactions that took place during the seed fair involved sorghum, groundnut and vegetable seeds, as well as maize. In particular, a total of almost 400 kg of maize seeds (sufficient to cultivate approximately 20 hectares of land) was sold during the fair. Overall, the fair attracted a relatively large number of farmers, who however bought a relatively small volume of seeds, thus demonstrating limited willingness and ability to pay for seeds.

Both the treatment and control sub-groups were surveyed again at the beginning of 2024 to assess the impact of the seed fair on maize productivity by the end of the first agricultural season in 2023. Like for the baseline survey, we recruited the enumerators locally in such a way to comply with local cultures and languages and minimize survey-related risks. All enumerators received a three-day training on how to administer the questionnaire in compliance with South Sudan’s and global ethical requirements. IFDC obtained the approval from relevant authorities at the national (federal), state and local levels, before commencing survey work.



3.1 The impact of the project⁴

Due to the high frequency of households' displacement in South Sudan, our midline data was affected by some attrition (or drop-outs): 16 treatment farmers out of the original 100 could not be retraced and one control farmer refused to be interviewed in 2024. As a result, our final sample comprised 183 farm-households, of which 84 belonged to the treatment group and 99 to the control group.

Table 4 shows that a farmer's assignment to the treatment group resulted in an average maize-yield increase of 347 kg per hectare, significant at the one percent level, when compared to the average control farmer. This result remains significant once control variables are included in the regression analysis (Table 4, column 2). Since average maize productivity was basically the same (approximately 500 kg/ha) for treatment and control farmers before in 2021, our regression results suggest that the project's impact is equivalent to an almost two-fold increase in average maize productivity (Figure 3).

Table 4. The impact generated by the project by August 2023

Dependent Variable	(1)			(2)		
	Coeff.	Std. Error		Coeff.	Std. Error	
Maize Yield (kg/ha)						
Treatment	347.17	82.84	***	338.67	78.26	***
HH head age	--	--		-2.56	3.30	
HH size	--	--		1.70	9.70	
HH head educated above primary level (0/1)	--	--		370.78	90.49	***
HH head sex (1=Female)	--	--		187.02	97.33	*
Respondent is village leader (0/1)	--	--		70.29	90.82	
Number of assets	--	--		41.16	40.51	
Control group mean (constant)	442.01	42.33	***	213.54	202.41	
Observations	168			167		
R-squared	0.102			0.222		

*denotes that the result is barely significant (at the 10% level)

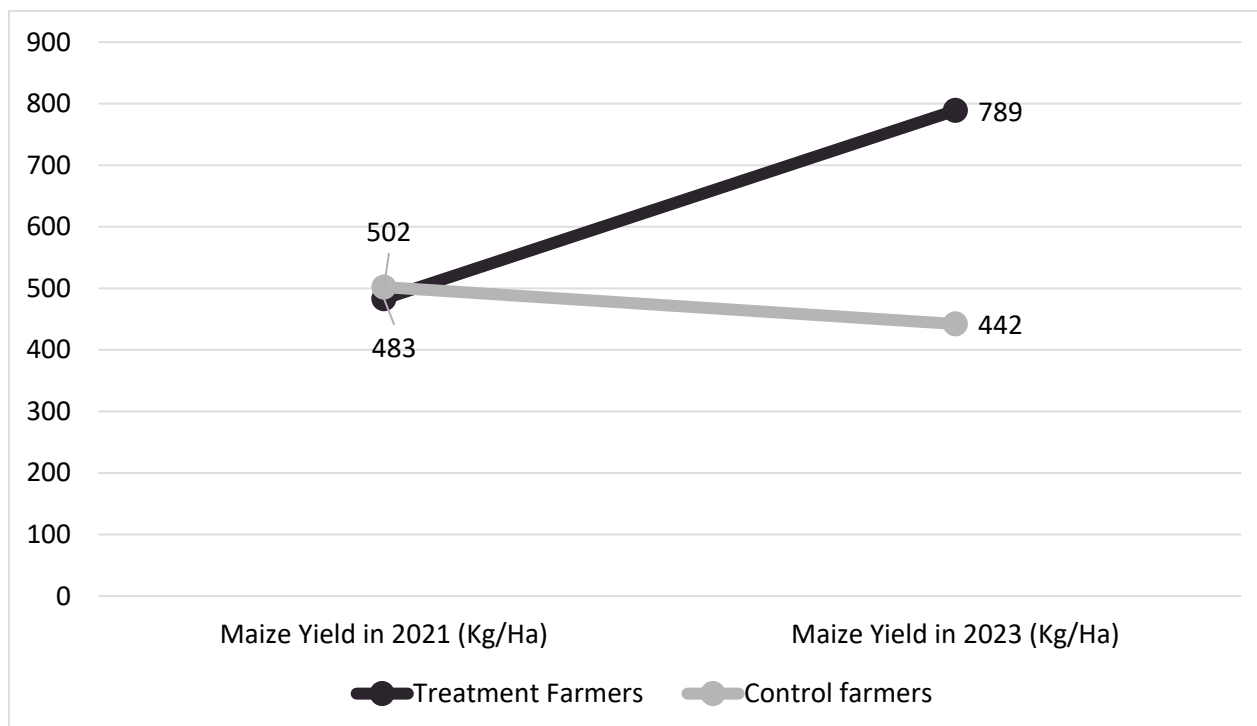
**denotes that the result is significant (at the 5% level)

***denotes that the result is highly significant (at the 1% level)

⁴ This section provides an extract of the following article:

Chol D. D., de Graaf L., Francesconi N., Herrington C. L., Mono T. T. and Smits E. (2026). The role of seed aid in a protracted crisis context. A localization strategy from South Sudan. Forthcoming in International Food and Agribusiness Management Review.

Figure 3. The impact generated by the project by August 2023



The uptake of the treatment – resulting in seed fair attendance and seed purchase during the fair – was voluntary. Therefore, it is also important to understand the level of compliance – or willingness and ability to participate in the fair and purchase seeds – as this can reveal scalability and sustainability of the project’s impact, or the potential of the project to scale-up its observed impact across space, and sustain it over time (beyond the project’s lifespan).

Figure 4 shows that 54 percent of treatment farmers participated in the market-fair, and 60 percent of these (27 farmers) also bought seeds. On the other hand, Figure 5 shows that only 19 percent of control farmers participated in the market-fair and just 37 percent of these (7 farmers) bought seeds.

Hence, we could conclude that farmers’ willingness and ability to spontaneously participate in the market and pay for local and improved seeds is low, if not negligible; and that financial and technical encouragements are needed to change farmers’ behavior and convince them to access and purchase local and improved seeds.

Figure 4. The willingness and ability of treatment farmers to access and buy local and improved seeds (2023)

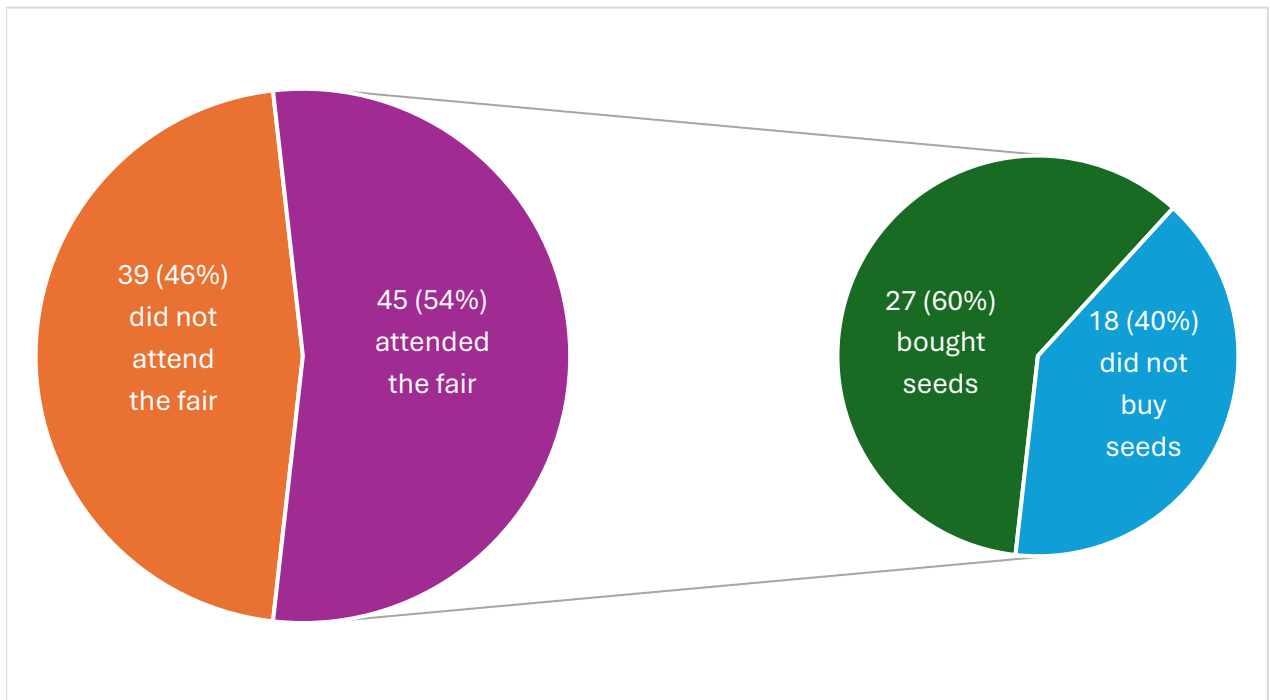
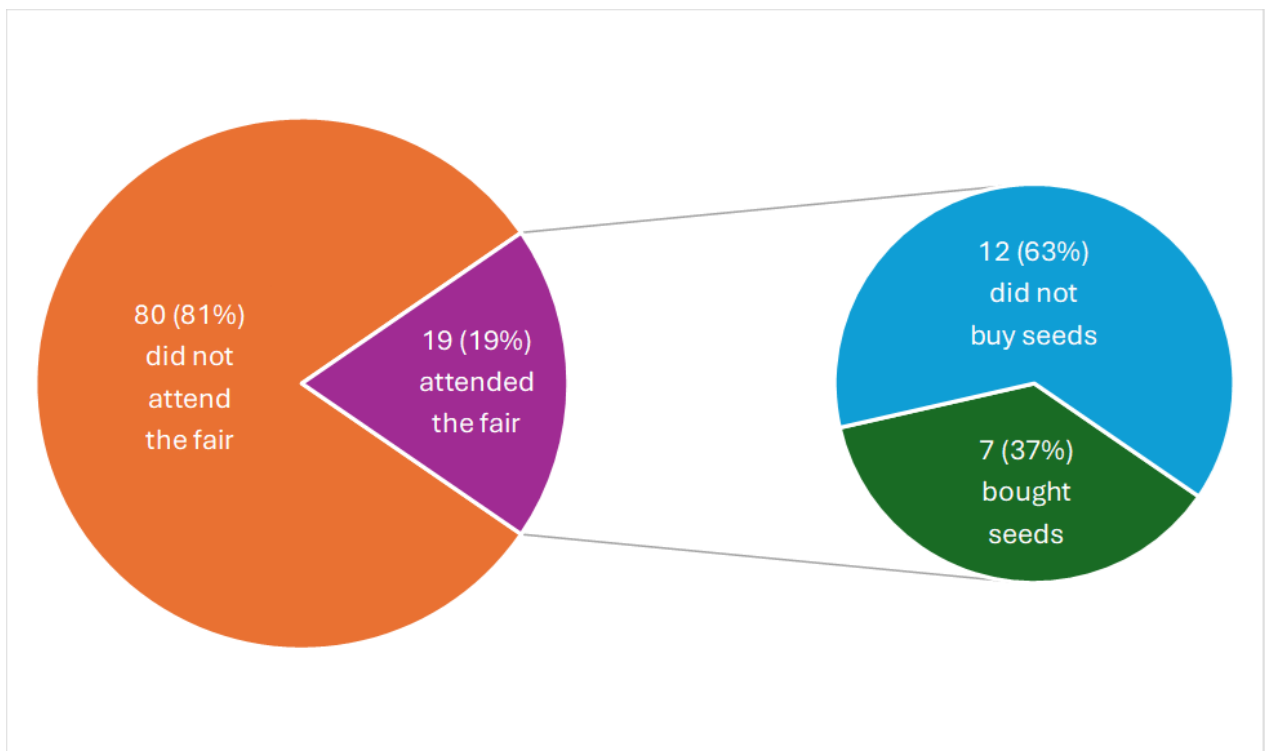


Figure 5. The willingness and ability of control farmers to access and buy local/improved seeds (2023)



*Interview with a
groundnut farmer*



4 Endline data

The endline survey took place between September and November 2025 in the counties of Torit, Magwi, Yambio and Nzara. The aim was to retrace the same households we surveyed at baseline (in 2021), so as to compare their behavior and performance at the beginning and at the end of the project. The re-insurgence of conflicts around March 2025 posed some important challenges for data collection.

First, growing insecurity induced us to anticipate data collection by a few months, compared to the baseline. Second, growing insecurity made households' retracement especially difficult and time-consuming in some areas. In particular, all households surveyed in 2021 from around the capital city of Juba had to be dropped from our sample.

Despite these paramount challenges, the MEL team of IFDC and local enumerators managed to retrace 77% of the households surveyed at baseline, producing a panel dataset of 1,515 households in total (Table 5).

Like for the baseline survey, we recruited enumerators locally in such a way to comply with local cultures and languages and minimize survey-related risks. All enumerators received a three-day training on how to administer the questionnaire in compliance with South Sudan's and global ethical requirements. IFDC obtained the approval from relevant authorities at the national (federal), state and local levels, before commencing survey work.

Table 5. Households retracement rates by location

COUNTY	RETRACEMENT RATE	N. OF HOUSEHOLDS RETRACED
JUBA	0%	0
YAMBIO	97%	478
NZARA	85%	434
TORIT	57%	109
MAGWI	69%	494
TOTAL	77%	1,515



A team of survey-enumerators



A field-survey

4.1 Impact scalability

By the end of 2024 the 9 seed companies supported by the project declared that during the previous 12 months they had worked with 1461 seed out-growers (all smallholding farmers) and managed to produce a total of 5591 tons of improved seeds. Out of the total amount produced, 3936 tons (or 70%) were sold whereas 1655 tons were stocked and carried over to 2025.

Only 757 tons were sold to farmers, either directly or through agro-dealers (Figure 6). This figure is consistent with our previous findings (section 3.1; Figures 4 and 5), concluding that South Sudanese farmers are generally unwilling or unable to purchase commercial seeds.

The majority of the seeds (2335 tons) were sold to humanitarian agencies involved in the distribution of seed-aid (Figure 6). Still, it is important to stress that the seeds supplied by the seed companies supported by this project accounted for just 20 percent of the total amount of seeds (>10000 tons) procured by FAO alone in 2024.

The remainder of the seeds (844 tons) were actually sold as grains, due to the absence of seed buyers and the urgent need for the companies to pay-off their seed out-growers. Therefore, the total amount of project-seeds that ended up being used by farmers in 2024 was just slightly more than 3000 tons (Figure 6). This amount is unlikely to have generated an impact at scale, of the kind that could have significantly increased average crop productivity and commercialization, food security and nutritional diversity across all target counties.

Table 6, 7 and 8 confirm that indeed the impact of the project has not reached the desired and intended scale. First of all, Table 6 confirms that the kind of seeds used by farm-households has not clearly changed between 2021 and 2025. On the one hand 8-11% of the households have gained access to improved seed varieties for maize by 2025. On the other hand, 4-6% lost access to improved varieties for groundnuts. Furthermore, 5-6% of farmers lost access to seed aid for maize, 6-7% lost access to free seeds for groundnuts, but 13-23% gained access to seed aid for sorghum.

Second, Table 7 confirms that average agricultural performance has not improved significantly, between 2021 and 2025, for the farm-households in our panel dataset. The only exception is rice productivity. While rice producers have increased their yields (by 1.2 - 1.4 tons on average) over time, the land cultivated with maize, and the production and



productivity of groundnuts and sorghum seem to have shrunk. Also the average quantity of groundnut sold has decreased significantly over time.

Finally, Table 8 further shows that food security has not improved either between 2021 and 2025, given that the average household continue to be affected by at least one month of inadequate food provisioning per year. Only 34-35% of the households declared themselves as fully food secure both at baseline and endline. However, households’ dietary diversity appears to have increased significantly over time, which is an positive finding but cannot be easily attributed to the project.

Overall these findings stress that the project has not succeeded in scaling up its impact. In some cases agricultural performance appeared to be even to have worse off in 2025 than at the beginning of the project. This may be explained by multiple negative events that characterized 2025, such as the closure of USAID (by far the biggest donor of South Sudan), the resurgence of conflicts throughout the country, as well as the particularly erratic weather observed during the first and main agricultural season.

Figure 6: production/commercialization of seeds by project-supported companies in 2024

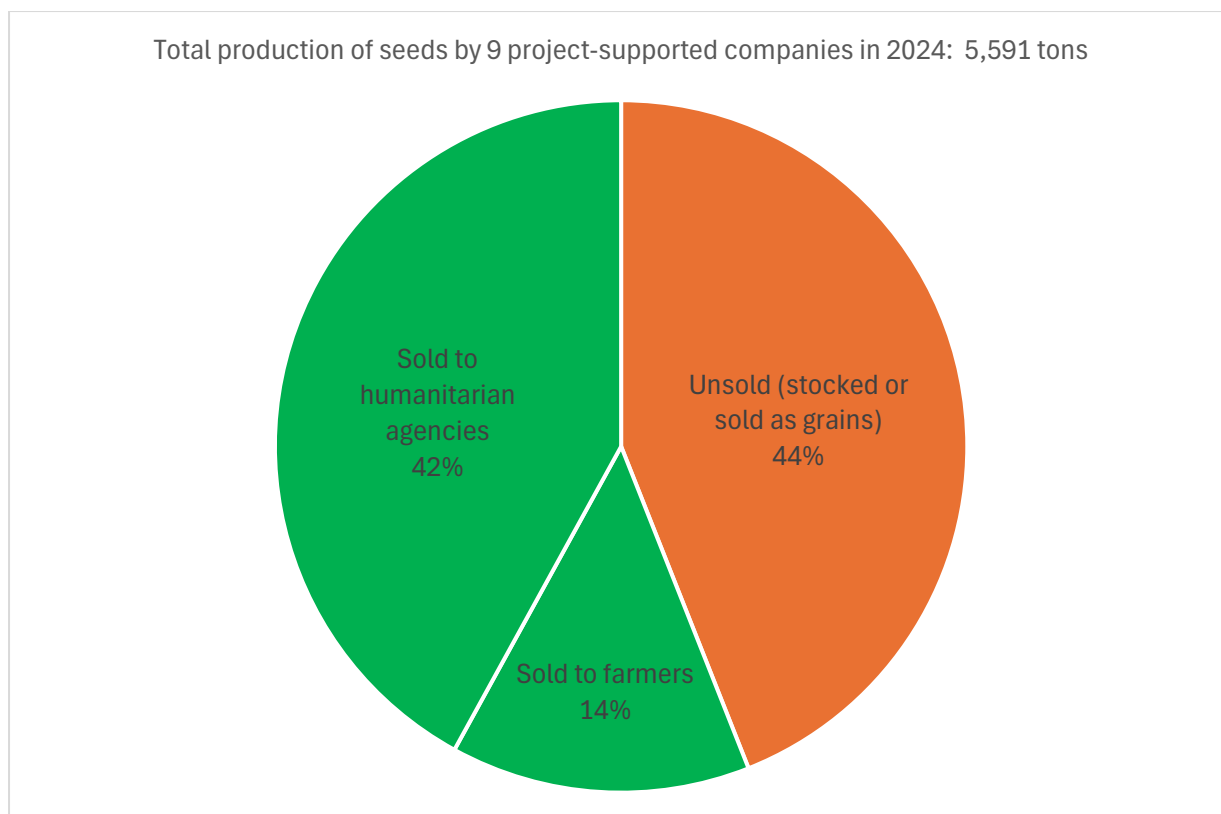


Table 6. Seeds availability in 2021 (baseline) and 2025 (endline)

Indicators	Baseline			Endline			Difference		Paired difference	
	N	Mean	Std.dev.	N	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.
Maize										
% of households that bought seeds	1,035	0.12	0.32	1,158	0.11	0.31	-0.01	0.01	-0.02	0.02
% of households that used improved variety	1,029	0.59	0.49	1,141	0.70	0.46	0.11***	0.02	0.08***	0.02
% of households that received seed aid	1,035	0.27	0.44	1,158	0.22	0.41	-0.06***	0.02	-0.05**	0.02
Groundnut										
% of households that bought seeds	674	0.05	0.22	822	0.06	0.25	0.01	0.01	0.04***	0.01
% of household that used improved variety	666	0.08	0.26	806	0.02	0.14	-0.06***	0.01	-0.04***	0.01
% of households that received seed aid	674	0.13	0.34	822	0.06	0.23	-0.07***	0.01	-0.06***	0.02
Sorghum										
% of households that bought seeds	100	0.10	0.30	115	0.11	0.32	0.01	0.04	0.04	0.07
% of household that used improved variety	98	0.23	0.43	106	0.14	0.35	-0.09*	0.05	-0.08	0.08
% of household that received seed aid	99	0.25	0.44	115	0.38	0.49	0.13**	0.06	0.23**	0.09
Beans										
% of households that bought seeds	100	0.20	0.40	58	0.16	0.37	-0.04	0.06	-0.42**	0.15
% of households that used improved variety	99	0.52	0.50	53	0.38	0.49	-0.14	0.08	-0.23	0.23
% of households that received seed aid	101	0.22	0.41	58	0.24	0.43	0.02	0.07	0.08	0.18
Rice										
% of households that bought seeds	90	0.03	0.18	81	0.11	0.32	0.08**	0.04	0.1	0.1
% of households that used improved variety	90	0.04	0.21	81	0.02	0.16	-0.02	0.03	0.1	0.1
% of households that received seed aid	90	0.10	0.30	81	0.10	0.30	0	0.05	0.1	0.1

*denotes that the result is barely significant (at the 10% level)

**denotes that the result is significant (at the 5% level)

***denotes that the result is highly significant (at the 1% level)

Table 7. Agricultural performance in first/main season of 2021 (baseline) and 2025 (endline)

Indicators	Baseline			Endline			Difference		Paired difference	
	N	Mean	Std.dev.	N	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.
Maize										
Total crop production (kg)	965	1,314	1,369	1,108	1,304	1,479	-9.47	62.91	88.19	65.6
Land for crop cultivation (ha)	965	1.43	1.30	1,108	1.17	1.13	-0.26***	0.05	-0.26***	0.06
Yield (kg/ha)	965	1,215	1,662	1,108	1,264	1,251	49.14	64.13	36.57	74.07
Quantity sold (Kg)	699	712	765	815	580	658	-131.98***	36.57	-80.89	50.21
Groundnut										
Total crop production (kg)	638	1,261	1,240	788	552	674	-709.2***	51.6	-692.9***	66.09
Land for crop cultivation (ha)	638	0.89	0.78	788	0.77	0.70	-0.12***	0.04	-0.06	0.04
Yield (kg/ha)	638	1,571	1,105	788	770	567	-800.9***	45.32	-838.1***	56.06
Quantity sold (Kg)	493	704	842	437	298	442	-405.94***	44.92	-387.9***	72.09
Sorghum										
Total crop production (kg)	76	1,703	2,121	78	885	984	-817.3***	265.39	-981.43**	456.02
Land for crop cultivation (ha)	76	2.35	2.77	78	0.90	0.92	-1.45***	0.33	-1.35**	0.50
Yield (kg/ha)	76	1,866	2,790	78	1,079	806	-787.49**	329.09	-1,072.1*	574.18
Quantity sold (Kg)	42	339	447	28	234	231	-104.95	91.74	150.75	163.67
Beans										
Total crop production (kg)	91	351	776	50	289	375	-61.51	116.74	67.14	159.37
Land for crop cultivation (ha)	91	1.27	0.77	50	0.89	0.86	-0.38***	0.14	0.56	0.38
Yield (kg/ha)	91	338	779	50	461	618	122.78	127.86	-31.61	78.95
Quantity sold (Kg)	47	184	129	37	168	242	-16.02	41.17	-60	151.44
Rice										
Total crop production (kg)	89	1,476	1,968	40	2,837	3,268	1,360.90***	464.92	2,166.67	1,603.03
Land for crop cultivation (ha)	89	0.83	0.61	40	0.91	0.79	0.08	0.13	0.18	0.38
Yield (kg/ha)	89	1,726	1,163	40	2,986	1,768	1,259.77***	262.27	1,433.33**	398.54
Quantity sold (Kg)	61	660	817	31	1,929	2,189	1,269.05***	315.17	570.00	350.00

*denotes that the result is barely significant (at the 10% level)

**denotes that the result is significant (at the 5% level)

***denotes that the result is highly significant (at the 1% level)

Table 8. Food security and nutrition diversity in 2021 (baseline) and 2025 (endline)

Indicators	Baseline			Endline			Difference		Paired difference	
	N	Mean	Std.dev.	N	Mean	Std.dev.	Mean	Std.dev.	Mean	Std.dev.
Number of months of adequate household food provision (MAHFP)	1,515	10.85	1.13	1,515	10.85	1.13	0.00	0.04	0.00	0.04
% of households that had adequate food provision around the year	1,515	0.34	0.48	1,515	0.35	0.48	0.00	0.02	0.00	0.02
Household Dietary Diversity Score (HDDS - 0 to 12)	1,513	5.52	2.54	1,515	5.97	2.14	0.45***	0.09	0.46***	0.09
Individual Dietary Diversity Score for infants (IDDS - 0 to 9)	582	4.25	2.10	534	4.15	2.00	-0.1	0.12	0.18	0.2

*denotes that the result is barely significant (at the 10% level)

**denotes that the result is significant (at the 5% level)

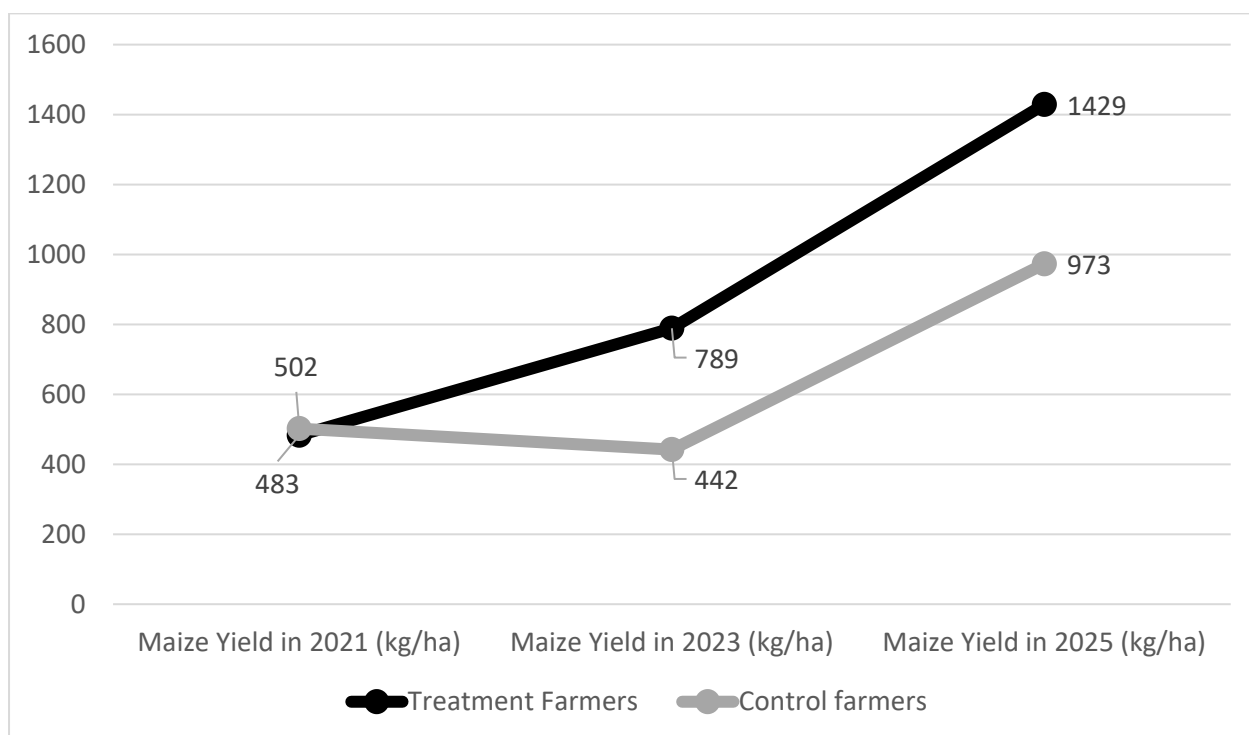
***denotes that the result is highly significant (at the 1% level)



4.2 Impact sustainability

In this section we look at the evolution of the impact generated the project through the seed fair held in Magwi in 2023 (see section 3.1). In particular, we want to understand if the positive impact on maize productivity that we attributed to the project by August 2023 was consequently sustained up until August 2025, or not. To do so, we focus again on those treatment (84) and control (99) farmers from Magwi county who were involved in the RCT we set up in the context of the seed fair held in Magwi at the beginning of 2023. Therefore, in Figure 7 we depict the evolution in maize yields for these treatment and control farmers across 2021 (baseline), 2023 (midline) and 2025 (endline). This descriptive analysis shows that the positive and significant impact we attributed to the project in 2023 has indeed endured, if not increased by 2025. In particular, Figure 7 shows that maize yields increased for both treatment and control farmers between 2023 and 2025, up to 1,429 kg/ha and 973 kg/ha respectively. However, average maize productivity has increased more for treatment than control farmers, thus widening the difference that had been created by the project through the seed fair held in 2023. Hence, we conclude that the impact generated by the project appears indeed sustainable over time.

Figure 7. The evolution of project's impact over time



A field-survey



5 Science-policy interface⁵

The quantitative analyses presented so far suggest that the main shortfall of the A3SEED project concerns impact scalability. Although the project has succeeded in generating and sustaining desired impact on selected farm-households, it has failed to scale-up such impact or to significantly increase average agricultural performance and food security within and across target counties.

Therefore, in February 2025 we organized a multistakeholder workshop with the intention to disseminate the results of our analyses and engage in the co-creation of a strategy to build upon the project's impact and scale it up, in such a way to maximize farmers' access to local and improved seeds. This one-day workshop was held in Juba and brought together about 70 representatives from: local seed companies, agro-dealers, the Seed Trade Association of South Sudan (STASS), farmer and community based organizations, the Ministry of Agriculture and Food security – from both federal and state levels – donor organizations (permanent representation of the EU as well as the Dutch, Swiss, and Norwegian Embassy), and multiple governmental, non-governmental and intergovernmental organizations.

In the first plenary session of this workshop we presented the results of our analyses, with the intention to provide a scientific framing for the subsequent policy debate. For the second session we split the participants into seven break-out groups. Each group included different stakeholders to blend the different interests and competences of participants in discussing potential actions for upscaling farmers' access to local and improved seeds. Group discussions were initially aimed at identifying barriers and opportunities, consequently they were steered towards the development of a strategy for the way forward. At the end of the day each group presented its proposed strategy in plenary and each participant was asked to vote for her/his preferred ones.

How to ensure farmers' access to local and improved seeds at the national scale, in the presence of underdeveloped infrastructure, recurrent conflicts and limited purchasing power? This is the leading question we asked to the workshop's participants, based on the

⁵ This section provides an extract of the following article:

Chol D. D., de Graaf L., Francesconi N., Herrington C. L., Mono T. T. and Smits E. (2026). The role of seed aid in a protracted crisis context. A localization strategy from South Sudan. Forthcoming in *International Food and Agribusiness Management Review (IFAMR)*.

assumption that the right answer to this question could only arise from a multi-stakeholder co-creation process framed as a Science-Policy Interface (SPI) and geared to develop a common or shared strategy. The following section provides a summary of the workshop's discussions and deliberations.



Science-policy Interface: plenary session



Science-policy Interface: break-out session

5.1 Seed system transformation

Participants stressed that South Sudan has been depending on imported seed aid for more than 15 years. While seed aid distribution is still justified in some parts of the country affected by acute conflicts or other emergencies, it is crowding out domestic seed producing and trading companies. Yet, free distribution of foreign seeds continues throughout the country, with the exception of Western Equatoria state where the Minister of Agriculture decided to impose a ban on foreign seeds importation. While the imported seeds that are distributed for free by humanitarian agencies are claimed to be certified, many of the workshop participants argued that those are not even seeds, but grains that are treated to look like seeds. Others claimed that humanitarian agencies are largely procuring and distributing second generation hybrid seeds, which are certified and cheap but also low-yielding (due to hybrid breakdown or inbreeding depression, which is the reason why F1 hybrid seeds need to be re-purchased before each planting season).

In terms of opportunities, the discussion revealed widespread confidence in the capacity of project-supported and STASS-affiliated seed companies to produce better-quality and higher-yielding seeds (as compared to the free or recycled seeds used by the vast majority of farmers). These companies however struggle to sell their seeds to farmers, due to prohibitive transaction costs and risks, as well as because of farmers' limited purchasing power. Humanitarian agencies are overwhelmingly seen as the buyers of choice, but the absence of a formal quality control and certification process within the country is affecting the ability of domestic companies to sell their seeds to these institutional buyers.

First, the seed sector stakeholders that took part in the workshop concluded that even if investments are urgently needed to promote and facilitate the development of a national seed market, all the way to the last mile, these investments should not come at the expenses of seed aid distribution. Despite its suboptimal efficiency and effectiveness, seed aid distribution contributes to legitimize the authority of the government, and therefore has an important stabilizing effect in South Sudan.

As such, the majority of workshop participants supported the idea to focus on investments that have the potential to promote and facilitate the procurement of local and improved seeds by humanitarian agencies. This would allow to keep distributing seed aid, whilst creating an opportunity for domestic companies to boost seed production and commercialization

without worrying about last mile costs and risks. In this way, last mile distribution by humanitarian agencies would also provide access to local and improved seeds to those (many) farmers that are unable to pay for them. Although local seed procurement by humanitarian agencies has been advocated by STASS and the donor community for quite some time, progress in this direction remains limited and slow.

The discussion also emphasized that due to the absence of a seed quality control and certification system within South Sudan, and the logistical uncertainties that prevent humanitarian agencies from scheduling seed procurement processes well ahead of time, certified and bulk seed suppliers from Uganda and the rest of the region continue to retain a competitive advantage. To address these issues, the South Sudan Seed Hub has been working to bring together the various stakeholders of the national seed sector – including seed companies, research institutes, the Food and Agricultural Organization (FAO), and the federal Ministry of Agriculture and Food Security (MAFS) – to develop quality standards and procurement regulations for South Sudan. In parallel, a draft seed sector policy document addressing both seed quality and procurement issues was also developed by MAFS and FAO in August 2024.

The main challenge is that the government of South Sudan seem to lack the capacity to finance and lead the establishment of a formal quality control and certification system. Given the urgency of this matter, workshop participants advanced and supported the idea of establishing a collective and voluntary quality control and certification body, under the supervision of STASS, the government and other key stakeholders. The establishment of a collective and voluntary body based on a viable (cost-recovery) business model would require minimal public administration and funding, and could serve as a stepping stone towards the development of a formal, mandatory and government owned system.

A shift towards local procurement will however and inevitably entail extra logistical costs and risks for humanitarian agencies. For this to happen, the government and donor community of South Sudan will need to stand united and determined in demanding and enabling such a systemic shift. At the same time, workshop participants emphasized that the proposed shift towards local seed procurement by humanitarian agencies is a short to mid-term solution, and it is important for government and donors to pursue also to a longer term vision that will

finally allow the country to break its dependency on seed aid and develop a national seed market all the way to the last mile.

Such a parallel and long-term vision is expected to encourage and enable domestic seed companies to progressively invest in the expansions of networks of field-based and itinerant agro-dealers. The expansion of agro-dealer networks is also expected to happen hand in hand with investments in communication campaigns to increase farmers' access to information on local and improved seeds and where to attain them. For a more detailed overview of all the recommendations that emerged from the workshop and the outcomes of the voting process we refer to Table 9.

Table 9. Multistakeholder deliberations (February 2025)

<i>Thematic Group</i>	<i>Group Propositions</i>	<i>Votes Received</i>
<i>Seed breeding</i>	South Sudan needs its own national research organization (NARO) for breeding early generation seeds. Investments in a South Sudanese NARO are essential for the development of the national seed sector. Researchers and breeders should organize into an associations, like STASS and develop a seed variety catalog.	4 th position
<i>Seed multiplication and seed production</i>	More investment are needed to improve/expand the production, multiplication and quality control of foundation seeds. National seed inspection and certification policy is needed to help the private sector thrive, especially to promote in-country seed production and multiplication.	1 st position
<i>Seed marketing</i>	More investments are needed to expand the agro-dealers' network. Agro-dealers networks need to be expanded for farmers to access quality seeds and improve their productivity. Seed marketing strategies should also involve cooperatives, as cooperatives can buy seeds in bulk.	3 rd position
<i>Seed demand and use</i>	Government extension services are inadequate, South Sudan relies too much on NGOs for extension purposes, the private sector needs to step in. Village Saving and Loans Associations (VSLAs) can provide the necessary credit for farmer to buy seeds.	6 th position
<i>Seed aid</i>	Seed aid needs to be gradually reduced. Everybody is used to seed aid and counting on it, so it cannot be just cut out overnight. To do so, financial resources need to be gradually shifted away from seed aid distribution and towards the development of seed markets.	5 th position
<i>Seed quality assurance</i>	In the absence of a seed law and regulation, it is necessary to develop a voluntary quality assurance standard for seed producers, to be developed by all stakeholders, including government and STASS.	2 nd position
<i>Seed governance</i>	There is a need to better coordinate seed sector governance between the central/federal ministry of agriculture in Juba and the ministries of agriculture in the different states. A national seed policy is still missing, and should not only be led by FAO and Government, there is a need to involve multiple stakeholders. But policymaking is to enough, the government needs to ensure also the availability of financial resources for policy implementation. The problem is that people are losing faith in government processes.	7 th position



6 Concluding remarks

This report provided a final and comprehensive evaluation of the A3SEED project (2021-2025). It analysed what we believe to be the largest and longest dataset available today on South Sudanese farm-households. In particular, the report was designed to present such a wealth of data through multiple statistical and econometric, descriptive and impact analyses, without losing focus over the main story and key messages that emerged from the evaluation of A3SEED. Our intention was to avoid overwhelming the reader with methodological and analytical details, so as to keep the report as light and readable as possible, and to the point. Readers interested in digging deeper into our methodologies and analyses can however do so by looking at the two scientific publications that we produced along with this report:

- Smits E., Kuijpers R., Miteng J.A., Chol D.D., Mono T.T., Francesconi N. (2024). Is seed aid distribution still justified in South Sudan? *World Development Perspectives*, 36: 100638. <https://doi.org/10.1016/j.wdp.2024.100638>
- Chol D. D., de Graaf L., Francesconi N., Herrington C. L., Mono T. T. and Smits E. (2026). The role of seed aid in a protracted crisis context. A localization strategy from South Sudan. Forthcoming in *International Food and Agribusiness Management Review*.

It is also important to stress that this is an internal project evaluation report, produced by KIT and IFDC, which have also co-led the implementation of the project. Because of that, we decided to produce a report that sticks to data analyses and stakeholder opinions, and avoids to report our own interpretations and aspirations. However, we do want to say that the A3SEED project has been a great professional experience, through which KIT and IFDC have forged a deep partnership and undoubtedly contributed to advance and enhance the transformation of the seed sector in South Sudan.

In particular, the A3SEED project has created the basic conditions for local seed companies, international aid agencies and national agri-food policymakers to work together at the Humanitarian-Development-Peace (HDP) nexus. Further grants and investments that are geared to promote and facilitate the localization of seed-aid procurement are therefore expected to generate substantial returns for South Sudanese seed companies, as well as for the country's agricultural growth and food security. For this reason, we regret very much the decision of the government of the Netherlands to close its Embassy in South Sudan and stop funding the project, and we encourage other donors and investors to step-in and continue to support South Sudan in its conflict-sensitive transition from seed-aid distribution to seed-market development.

