

Demand, Distribution and Supply in Ghana's Vegetable Seed System: A Farmer, Dealer and Importer Survey

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GHANA SEED
PARTNERSHIP



COLOPHON

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Authors

Nieke Westerik and Sjoerd Herms

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Nieke Westerik

Contact

www.advanceconsulting.nl;
info@advanceconsulting.nl

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The findings and conclusions in this report are those of the authors and do not necessarily reflect the views of the Netherlands Embassy in Accra.

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EXECUTIVE SUMMARY

This study was commissioned under the Ghana Seed Partnership, a Netherlands-funded programme working to strengthen the commercial vegetable seed sector in Ghana. It turns the sector-level picture from the 2024 Wageningen University & Research assessment into actor-level, demand-side evidence on how vegetable seed moves from importers and distributors, through agro-input dealers, to farmers, and on how farmers choose and use it. The findings draw on interviews with 409 vegetable farmers across thirteen regions, 53 agro-input shops, and 20 importers and distributors. They are intended to guide the Partnership's interventions, to help seed companies assess the market and its distribution channels, and to inform a campaign promoting improved and hybrid varieties.

Summary of findings for the Ghana Seed Partnership

Vegetable growing in Ghana is overwhelmingly a smallholder activity, and for most growers a commercial one. Farmers draw on three types of seed: around 56% plant farmer-saved seed on their main crop, against 20% for purchased open-pollinated varieties (OPV) and 24% for F1 hybrids, while 35% use hybrid seed on at least one crop. Access to improved seed is markedly unequal, most visibly by gender: 47% of male-owned farms use hybrid seed against only 15% of female-owned farms. Field observations suggest this gap is driven less by awareness or preference than by cost and access, as women, who typically farm smaller plots, lean on farmer-saved seed because it is affordable, familiar and easy to obtain. Reaching women and cash-constrained smallholders will therefore depend on improving affordability and access, not on raising awareness alone.

The seed system that supplies these farmers is still maturing. Seed enters the country through a small group of importers, who hold the relationships with the international seed brands and supply agro-input dealers either directly or through regional distributors; the dealer is the common point at which about half of farmers (51%) buy. Moving seed depends heavily on public infrastructure, with importers and distributors reaching dealers mostly by public transport, and trade credit is thin along the chain, as only 10% to 17% of dealers buy their seed on credit and just 13% extend credit to farmers. The cost of seed, high transport costs, poor roads and inadequate storage recur as challenges at every step. Reliability of supply is a further concern: although 80% of dealers stock hybrid seed, farmers whose preferred seed is out of stock overwhelmingly fall back to farmer-saved seed. For the Partnership, this points to priorities that lie as much in a more reliable distribution chain, better access to finance, and deliberate efforts to reach women and cash-constrained smallholders as in stimulating demand.

Summary of findings for international seed companies

Demand fundamentals are strong. Hybrid seed presents a compelling case for international companies. Hybrid users report a median profit of around 6,350 GHS per acre, roughly three times that of farmer-saved and OPV users. Because downside losses are similar across all seed types (about a quarter of farmers lose money regardless), hybrids raise the income ceiling without lowering the floor, an argument that resonates well with risk-conscious farmers.

Adoption is concentrated and condition-dependent. Farmers recognise hybrids perform best with good management, irrigation and fertiliser. Uptake reflects this, as 80% of hybrid users have irrigation versus 39% of farmer-saved users. Adoption clusters in higher-value crops like cabbage (70% hybrid), while common, lower-margin crops (pepper, tomato, okra, garden eggs) stay dominated by farmer-

saved seed. Despite this, perception is broadly positive, as 63% of interviewed farmers are aware of hybrids, 90% believe they raise income, quality and yield, and satisfaction among users is near-universal (99% would replant, 98% would recommend).

The route to market runs on trust, not reach. Only 51% of farmers buy at agro-input shops, and 43% bypass the nearest dealer for a preferred one, so dealers and brands that build a reputation for quality and reliability gain an edge. Technisem leads in stocking (74% of shops), ahead of Advanta (36%) and East-West Seed (30%), with dealer support varying widely and leaving room for new entrants to differentiate through agronomic training. The overarching implication: there is a genuine, data-backed market for hybrid seed, but it is built on quality, agronomic performance and trust, not on price or distribution breadth alone.

Summary of findings for a potential marketing campaign on hybrid varieties

Importers and distributors currently move their brands by securing shelf space with agro-input dealers and then creating farmer demand, primarily through demonstration fields, with social media playing a supporting role mainly at dealer level. Because dealers are far more reachable via social channels than farmers (21% of dealers receive information through social media versus 3% of farmers, despite high WhatsApp use on both sides), any social campaign should also target dealers. That said, farmers form their views above all through fellow farmers (41% influence, versus 8% radio, 6% demonstration fields, 3% social media), so the core campaign should be peer-driven, timed to the planting season and tied to genuine market demand for the produce.

A campaign will also need to dismantle entrenched misconceptions that hybrid seed is "unnatural," lab-created (64%), genetically modified (51%) or unfit for consumption (22%), while giving farmers practical support to lower, both the perceived and actual, risk of the higher up-front investment. Addressing perception and risk together through trusted peers is likely more persuasive than yield and income claims alone, and the effort should concentrate where hybrids visibly pay off: higher-value crops like cabbage and better-irrigated regions where farmers achieve the strongest returns.

Summary of findings for seedling businesses

Almost all farmers currently raise their own seedlings (89%), with fewer than 1% buying them in, and most are satisfied with home-raised results. However, a latent market exists, as 43% of hybrid-using farmers would consider buying from a professional producer. On the supply side, sentiment is more cautious: 92% of dealers see little or no demand, though 25% of dealers and 39% of importers/distributors would consider venturing into seedlings. The main obstacle is price, as farmers will pay around 1 GHS per seedling, while dealers say they'd need roughly 2 GHS.

Overall, demand isn't universal but is sufficient to build a business case on, concentrated among commercial, hybrid-using farmers rather than the smallholder majority. A workable model will need to close the willingness-to-pay gap between farmers and suppliers, for instance by focusing on high-value crops where the economics of bought-in seedlings are most compelling.

I ABOUT THE RESEARCH

By capturing first-hand evidence from farmers, agro-input dealers and distributors, this study turns a sector-level understanding of Ghana's vegetable seed system into the actor-level, demand-side insight needed to expand the market for improved varieties

I.1 Background and introduction

This report presents the findings of a national study on the distribution, supply and use of vegetable seeds in Ghana. The study was commissioned under the Ghana Seed Partnership, a programme that aims to improve the performance, sustainability and resilience of the commercial vegetable seed sector in Ghana. The Partnership is funded by the Embassy of the Kingdom of the Netherlands, and brings together thirteen organisations from the Ghanaian and Dutch seed sectors, including seed companies, distributors, research institutes and consultancies.

Dutch seed companies operating in Ghana report encouraging growth in sales, but are held back by low awareness among farmers, limited access to finance and weak last-mile distribution. A clearer picture of how vegetable seeds actually move from importers and distributors through agro-input shops to farmers, and of how farmers choose and use seeds, is therefore an important first step in addressing these barriers. The study builds on the Ghana Seed Sector Assessment carried out by Wageningen University & Research in 2024 (Bonnand et al., 2024), which described the structure of the vegetable seed system at sector level. By capturing first-hand evidence from farmers, agro-input dealers and distributors, this study turns this sector-level understanding of Ghana's vegetable seed system into the actor-level, demand-side insight needed to expand the market for improved varieties.

While the study was commissioned within the Ghana Seed Partnership, its findings are relevant well beyond that immediate purpose. They can inform policy makers shaping the regulatory and enabling environment for the seed sector, other private sector players active in Ghana's vegetable seed market, and donors and project developers designing interventions in this space. The data may also serve research institutes wishing to build on this work through further study.

I.2 Study objectives

The objective of the study is to understand the structure, challenges and opportunities within the vegetable seed distribution network in Ghana, and to document the seed sourcing behaviour, purchasing decisions and perceptions of the actors along the chain. The results are intended to inform the interventions of the Partnership, to provide seed companies with data on market penetration and

potential new distribution channels, and to serve as a key input for the design of a campaign promoting hybrid varieties. The study covers three groups of actors: vegetable farmers, agro-input dealers, and seed distributors and importers. The findings for the farmer and agro-input dealer surveys are presented in chapters 2 and 3 respectively, followed by the findings from the distributor and importer interviews in chapter 4. The conclusions of all three surveys are summarized in chapter 5.

1.3 Methodology

The study was led by Advance Consulting, which was responsible for the overall design of the study, the data analysis carried out using the R statistical software, and the development of this report. Advance Consulting developed the three data collection tools, in consultation with the partners under the Ghana Seed Partnership project. For the fieldwork, Advance Consulting engaged Participatory Development Associates (PDA), a Ghanaian research firm, to facilitate and carry out the data collection. PDA also contributed to the finalisation of the data collection tools.

Data were collected through three questionnaires, one per respondent group. The tools were programmed in XLSForm and administered on tablets via KoboCollect, with built-in skip logic, validation rules, consistency checks and GPS capture to safeguard quality. Interviews were synchronised daily, so inconsistencies, missing values and outliers could be identified and corrected in near real time. Fieldwork was carried out by enumerators recruited, trained and managed by PDA. Twelve enumerators in three teams were deployed concurrently across Ghana's four vegetable production zones (Northern, Middle Belt, Southern-Eastern and Western). All had prior data collection experience and are fluent in the local languages of their areas. They completed a two-day training on the questionnaires, field protocols and data protection, followed by a one-day pilot.

Enumerators interviewed vegetable farmers and agro-input dealers, as well as a small number of local and regional distributors encountered in the field. In addition, national distributors and importers of vegetable seeds were interviewed at their offices in Accra by PDA staff. Scheduling these interviews proved to be challenging, and not all of the targeted importers ultimately granted an interview.

Data collectors were instructed to aim for a stratified sample, using a deliberately disproportionate allocation across seed types so that each seed type would be represented in sufficient numbers for meaningful analysis. Farmers using purchased OPV seed and F1 hybrid seed for their vegetables were each targeted to make up more than a quarter of the sample, and farmers using farmer-saved seed fewer than half. In practice, the enumerators found that, starting from random sampling, they more or less reached these proportions on their own. Purposive sampling to meet the quota was needed only in the Ashanti region; in the other twelve regions respondents were obtained through random sampling. As a result, the seed-type shares observed in those twelve regions can be read as approximating their true prevalence among vegetable farmers in Ghana, with only the Ashanti figures reflecting a deliberate over-representation of purchased OPV and hybrid users.

In total, the study draws on interviews with 409 vegetable farmers across thirteen regions and 53 agro-input shops across twelve regions, in all four vegetable production zones, complemented by the interviews held with 20 representatives of importers and wholesalers.

2 FARMER SURVEY

2.1 Introduction

This chapter presents the findings of a survey conducted among 409 vegetable farmers in Ghana. The survey builds on the Ghana Seed Sector Assessment carried out by Wageningen University & Research in 2024 (Bonnand et al., 2024). That assessment identified low farmer awareness, weak farmer financing and limited last-mile distribution as the main barriers holding back the uptake of improved varieties, in particular F1 hybrids. While the WUR study drew on desk research and stakeholder consultations, it did not capture farmer-level evidence on demand, willingness to pay or perceived economic returns. The present farmer survey is designed to fill that gap by providing quantitative evidence from the demand side of the seed system.

The survey covered farmers in thirteen regions across the Northern, Middle, South-Eastern and Western zones of Ghana. Data collectors were instructed to obtain a stratified sample with disproportionate allocation across the three main seed types in use: farmer-saved seed (less than 50% of the sample), purchased open-pollinated varieties (more than 25% of the sample) and F1 hybrid varieties (more than 25% of the sample). In practice, random sampling broadly reproduced these proportions in twelve of the thirteen regions, with purposive sampling applied only in the Ashanti region. Hence, the seed-type shares observed outside the Ashanti region can be read as broadly representative of the wider population in these regions. However, because Ashanti was the one purposively sampled region, the region-level results reported for Ashanti later in this report, including its seed-type mix, profit per acre and irrigation levels, are likely to be skewed towards higher-performing, hybrid-using farms, and should be compared with other regions only with that caution in mind.

The remainder of this chapter is structured as follows. Section 2.2 describes the demographics of the study group. Section 2.3 sets out the profile and business case of the farm, including profitability per acre by seed type, crop, region and gender. Section 2.4 examines access to seeds, and Section 2.5 farmers' perceptions of, and decision making around, hybrid seeds. Section 2.6 concludes with the use of seedlings.

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The present farmer survey is designed to fill that gap by providing quantitative evidence from the demand side of the seed system.

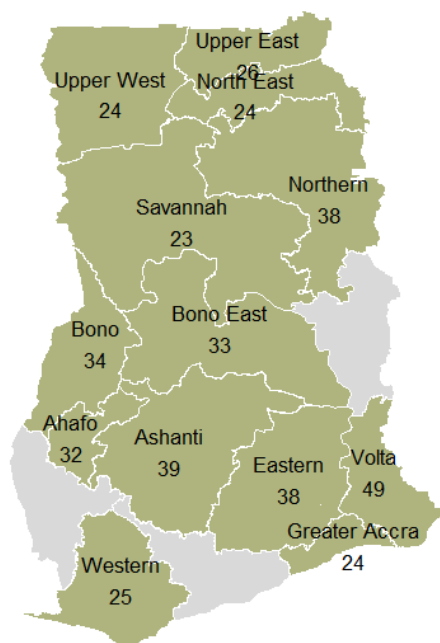
2.2 Demographics of the study group

The 409 farmers in the sample come from thirteen regions across the four agro-ecological zones of Ghana. Figure 2.1 shows the geographic spread of the sample and the number of respondents per region.

The 409 farmers in the sample come from thirteen regions across the four agro-ecological zones of Ghana

The sample is dominated by farm owners. 87% of respondents are the owner of the farm, 6% the owner's spouse, 3% employees, and the remaining 4% of-age children or other relatives of the owner. Decision making on seed purchases sits largely with the same person: 85% of respondents take the decision themselves and a further 11% take it after discussing with family members, while only 3% report that family members decide without them and 1% that the decision is dictated by an off-taker. Respondents are also physically active on their own farms, with 61% doing physical labour themselves, 37% supervising while also working physically, and only 2% acting purely as supervisors.

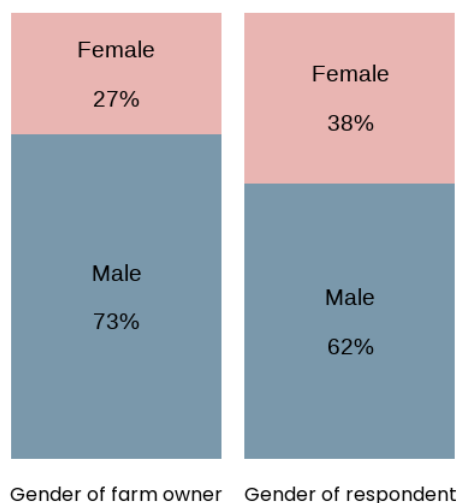
Figure 2.1 – Survey coverage, number of respondents per region



Of the 409 respondents, 73% are male-owned farms and 27% are female-owned (Figure 2.2). Throughout this report, female-owned farms are defined as farms where the female decides what

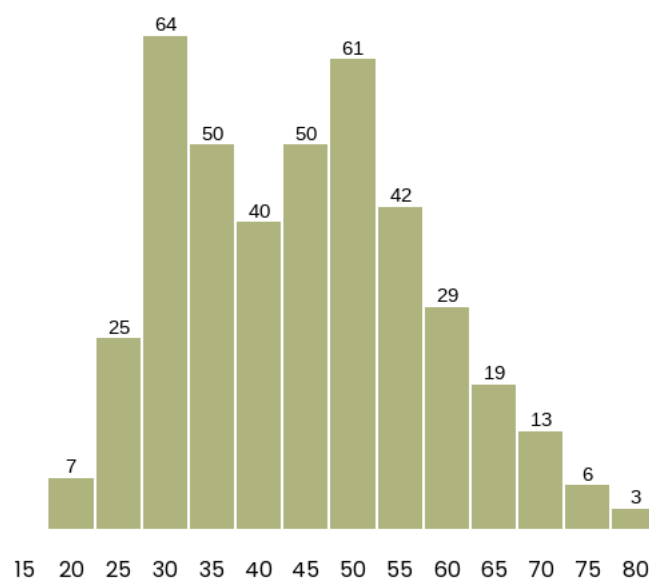
happens on the farm. It is not confirmed whether the female is also the owner of the farmland or the full owner of the proceeds of the farm.

Figure 2.2 – Gender of farm owner and gender of respondent, % of respondents



The age distribution of respondents is shown in Figure 2.3, with an average age of 45 years. Among the 362 respondents who are farm owners, the average is roughly the same at **46 years**. Within this group of owners, an interesting pattern emerges by seed type used on the main vegetable crop: **farmers using hybrid seeds are on average 41 years old, compared with 45 years for those using OPV seeds and 48 years for those using farmer-saved seeds**. This may suggest that younger farmers are somewhat more receptive to adopting new technologies, although the age differences between the groups are modest.

Figure 2.3 – Age of respondents (years), count of respondents



Average farm size is 5.1 acres and varies across regions, as shown in Figure 2.4. There is also a clear gender pattern: **male-owned farms average 5.7 acres against 3.4 acres for female-owned farms**, meaning women in the sample manage farms that are on average roughly 60% the size of those run by men. **Farmers using hybrid seeds for their main vegetable crop have on average larger farms than farmers using OPV or farmer saved seeds, with 5.7 acres versus 4.4 and 5.0 acres.** This effect is **maintained when looking only at the area under vegetable cultivation** (rather than the entire farm size), which is on average 2.6 acres for farmers using hybrid seeds, versus 1.9 acres for both farmers using OPV seeds and farmer saved seeds.

Figure 2.4 – Average farm size (acres), per region

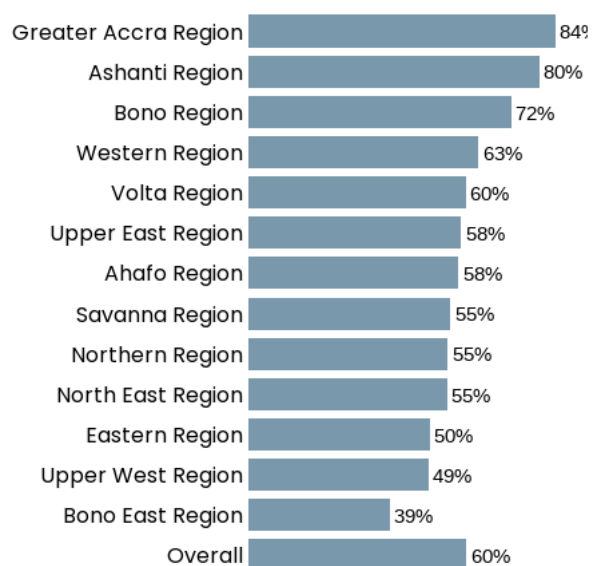
Ahafo Region 5.4	Northern Region 3.8	Savanna Region 3.3	Greater Accra Region 3.1
Bono East Region 8.4	Bono Region 4	Upper West Region 3.7	Upper East Region 3.5
Eastern Region 9.2	Ashanti Region 4.8	North East Region 4.4	Western Region 4.4
	Volta Region 5.2	Overall 5.1	

The average farm size used for vegetables is 2.1 acres, or 41% of the total land area in the sample. Figure 2.5 shows the share of total farm area allocated to vegetables, by region. These two figures (41% here and 60% in Figure 2.5) are calculated in different ways and answer slightly different questions. The 41% is effectively weighted by farm size, so larger farms carry more weight in the result. The 60% in Figure 2.5 first calculates the vegetable share for each individual farmer and then averages those shares, so every farmer counts equally regardless of how large their farm is. The fact that the two figures are quite different indicates that larger farms tend to devote a smaller proportion of their land to vegetables, while smaller farms often plant vegetables on most or all of their plot.

Larger farms tend to devote a smaller proportion of their land to vegetables, while smaller farms often plant vegetables on most or all of their plot.

For the average farmer, 60% of their farm area is devoted to vegetables. **Female-owned farms allocate a slightly higher share to vegetables (64%) than male-owned farms (58%),** suggesting that women in the sample are more specialised in vegetable production even though they operate smaller farms in absolute terms.

**Figure 2.5 – Farm size used for vegetables, per region,
% of total farm size per farm**



The crop mix grown by the sample is summarised in Figure 2.6 and detailed per region in Figure 2.7. Pepper, tomato, okra and garden eggs dominate, reflecting the broad commercial relevance of these crops in Ghanaian vegetable production. Note that in this report, 'pepper' refers to chili pepper, whereas 'capsicum' refers to bell pepper/sweet pepper. 'Other crops' were specified by the respondents as cauliflower (2 respondents) and beetroot (2 respondents).

Figure 2.6 – Vegetables grown, % of respondents

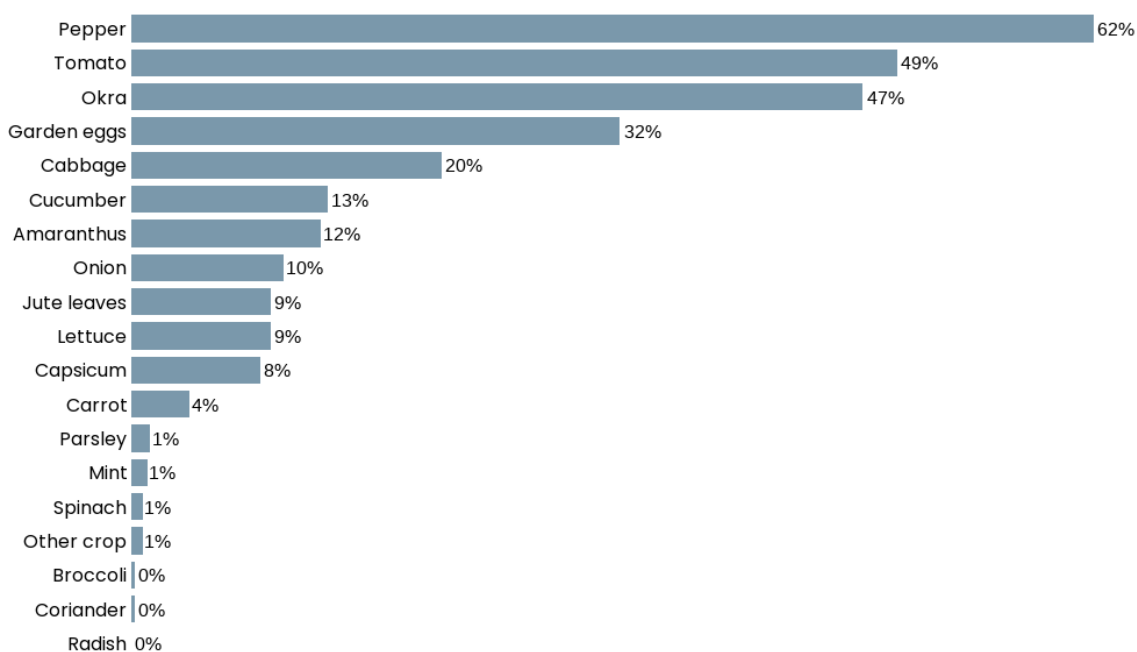
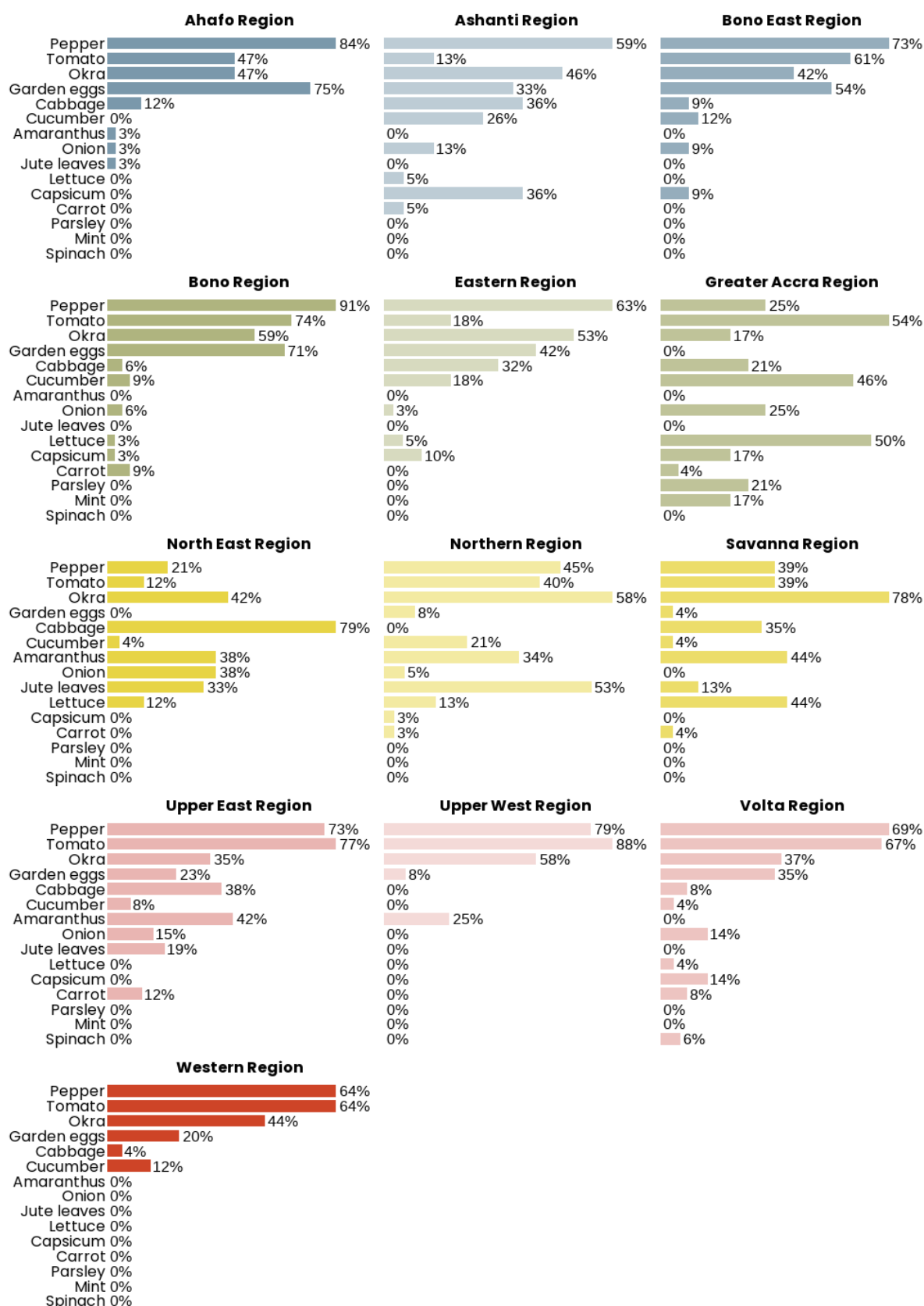


Figure 2.7 – Vegetables grown, per region, % of respondents

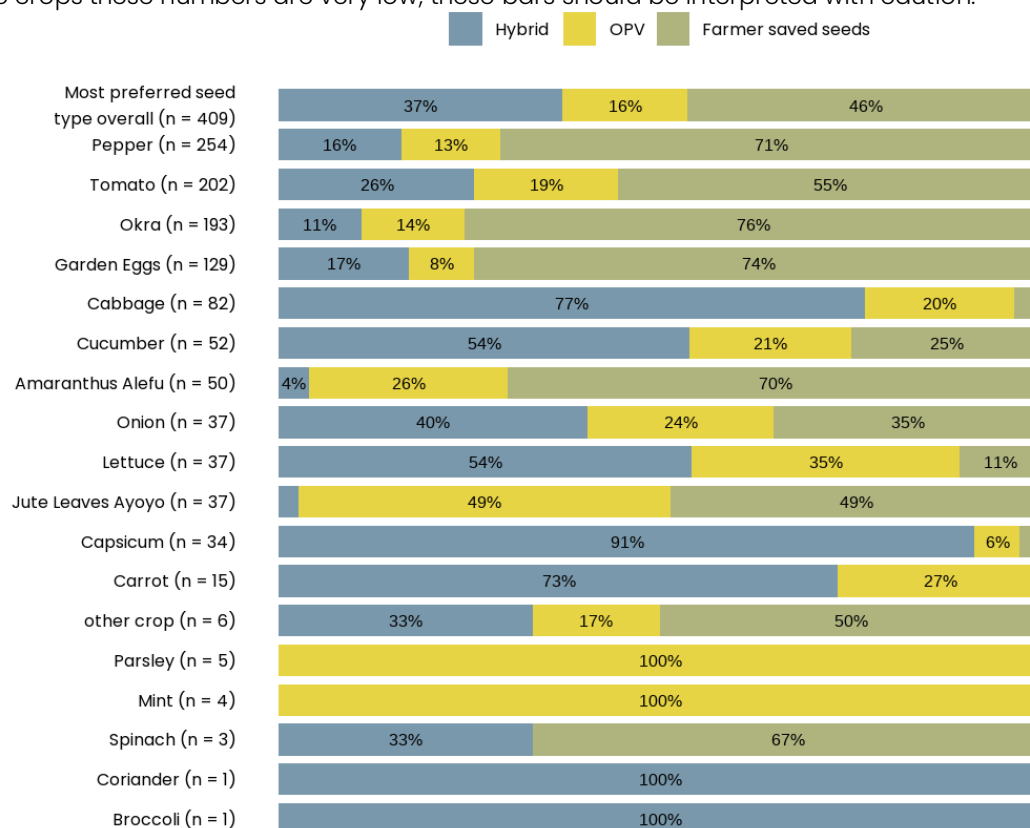


As becomes visible in figure 2.7, the crop mix differs substantially across regions. Pepper is the most widely grown crop in nearly every region, but the southern and Greater Accra regions stand out for a wider mix including cabbage, lettuce and other leafy crops, while the northern regions concentrate more on tomato, onion, jute leaves and amaranthus.

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A crop's seed economy is closely tied to whether commercial varieties exist and how widely they are available. Figure 2.8 shows the use of different seed types per crop, which previews a key theme of this report: hybrid seed is concentrated in a small group of high-value commercial crops, while leafy and traditional vegetables remain almost entirely in the farmer-saved seed system.

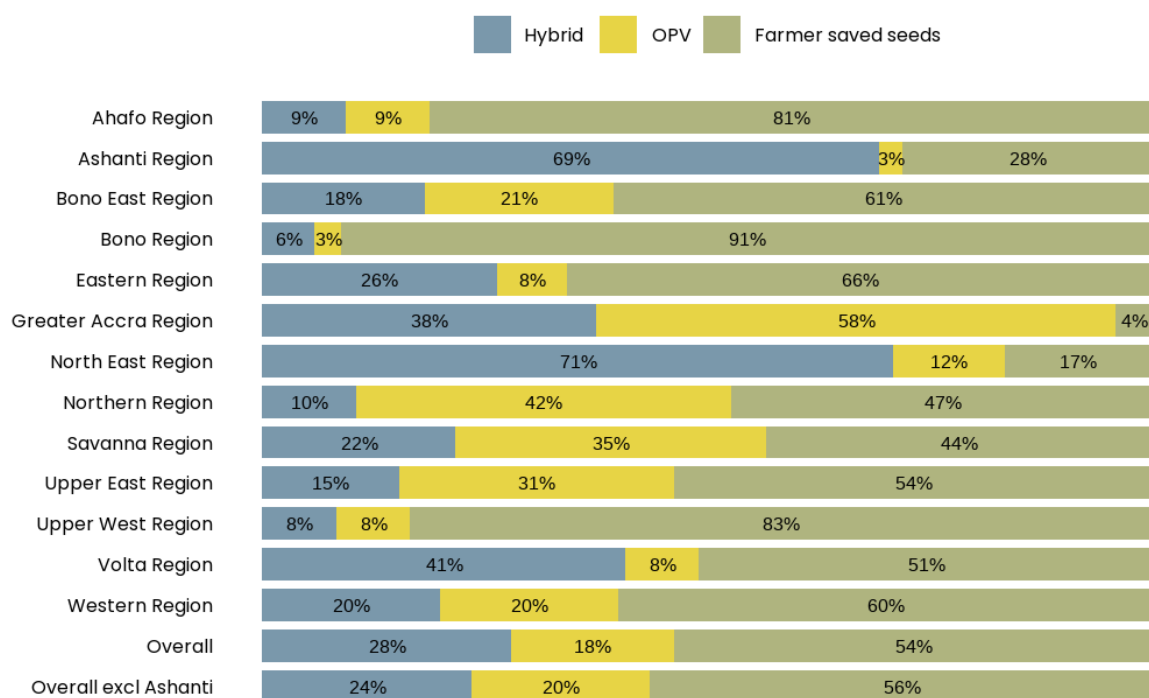
Figure 2.8 — Use of different types of seed, per crop, % of respondents who grow the indicated crop. Note: y-axis labels indicate the number of observations that contributed to the creation of the bar. For some crops these numbers are very low; these bars should be interpreted with caution.



Use of hybrid seed is sharply uneven by gender. Across the full sample, 47% of male-owned farms report using hybrid seed on at least one of their crops, against only 15% of female-owned farms. The gap narrows somewhat when the question is restricted to the main vegetable harvested last season: **35% of male-owned farms used hybrid seed on their main crop, against 10% of female-owned farms.**

The choice of seed type for the main vegetable crop also varies sharply by region, as shown in Figure 2.9. Because random sampling in twelve of the thirteen regions broadly reproduced the intended seed-type proportions on its own (see section 1.3), these overall shares can be read as approximating the true prevalence of each seed type among Ghanaian vegetable farmers, rather than as an artefact of the sampling design. As explained in section 1.3, purposive over-sampling of OPV and hybrid users was confined to the Ashanti region, where it was used to meet the seed-type quota. Hence the overall seed use excluding the Ashanti region approximates the actual seed use in Ghana, with 24% of farmers using hybrid seeds, 20% using OPV and 56% using farmer-saved seeds. For the same reason, the regional differences below can be read as genuine differences between regions, with only the figures for Ashanti, where purposive sampling was applied, warranting additional caution. Note that the overall analysis (including the Ashanti region) is also included in Figure 2.9 as it represents the sample composition (rather than the estimated population composition) on which the further analyses in this study are based.

Figure 2.9 – Use of different types of seed for the main vegetable crop, per region, % of respondents

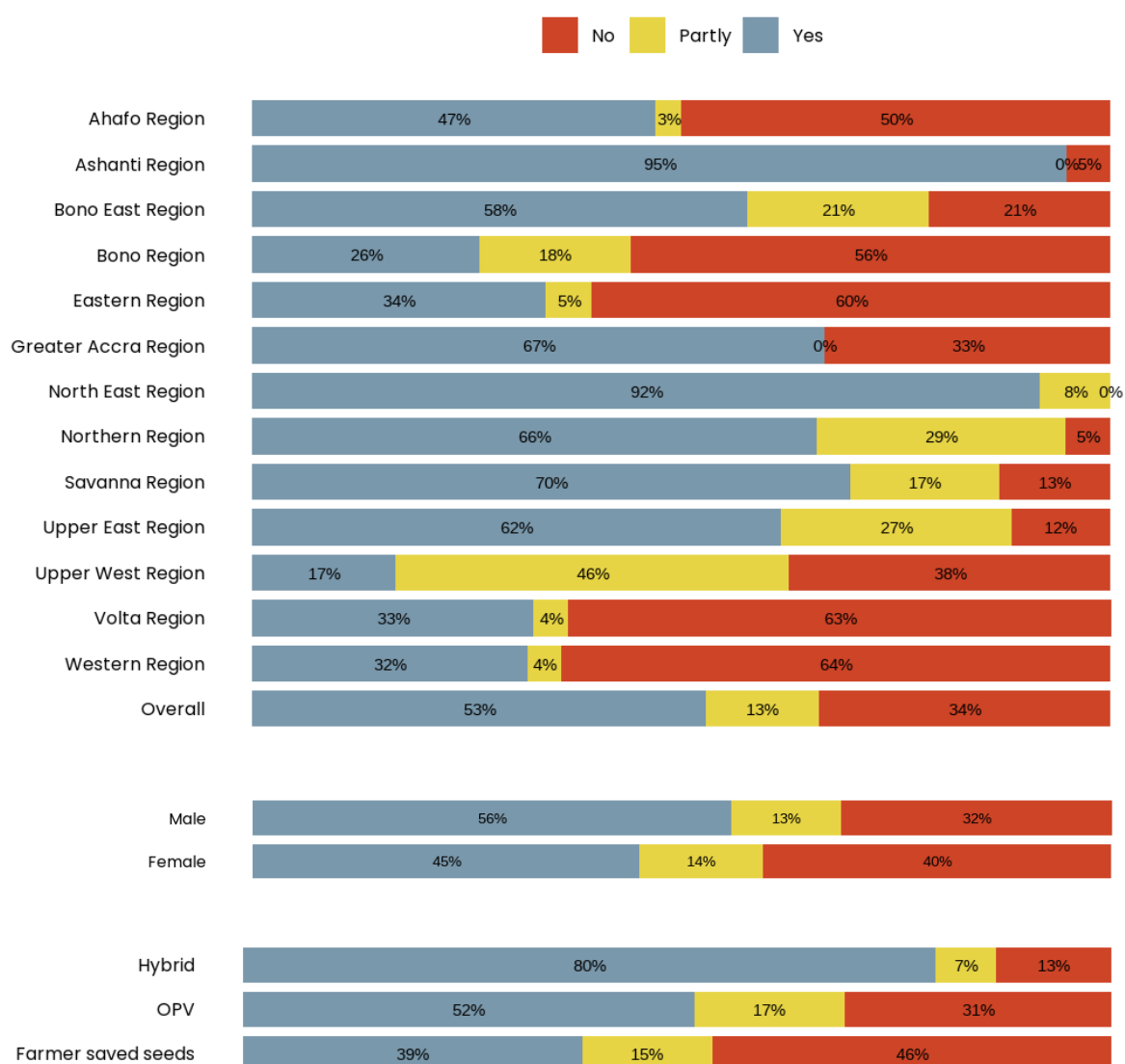


This regional pattern aligns closely with the profitability findings in section 2.3.5. The regions in which the highest number of farmers using hybrid seeds were interviewed, namely Greater Accra, Ashanti and North East, are also among those recording the highest median profit per acre on the main vegetable. The regions where farmer-saved seed dominates and hybrid use is marginal, such as Bono East and Northern, are the same regions sitting at the bottom of the profit distribution. This is consistent with the finding that hybrid seed is concentrated in the high-value commercial crops and

better-resourced regions (with wider crop mix and higher irrigation, see section 2.3.5), while leafy and traditional vegetables in the northern regions remain largely in the farmer-saved seed system.

Water access is a second structural feature shaping seed choice, since hybrid varieties typically require reliable moisture to deliver their yield potential. Figure 2.10 shows the share of respondents using irrigation on their farm, by region, by gender and by seed type.

**Figure 2.10 – Use of irrigation on the farm,
by region (a) / by gender (b) / by seed type (c), % of respondents**



Overall, just over half of respondents (53%) irrigate their farm fully, a further 13% irrigate partly and 34% do not irrigate at all (panel a). Access varies widely by region. It is near-universal in North East (92%), and high in Savanna (70%), Greater Accra (67%), Northern (66%) and Upper East (62%). At the other end, fully irrigated farms are the minority in Upper West (17%, though a further 46% irrigate partly), Bono (26%), Western (32%), Volta (33%) and Eastern (34%) regions. Note that sampling in Ashanti region was biased

towards farmers using hybrid seeds, which may have affected the high percentage of irrigation found in this region. This regional ranking broadly mirrors the seed-type and profitability patterns described above and in section 2.3.5, with the better-irrigated regions also tending to be those with higher hybrid adoption and higher profit per acre.

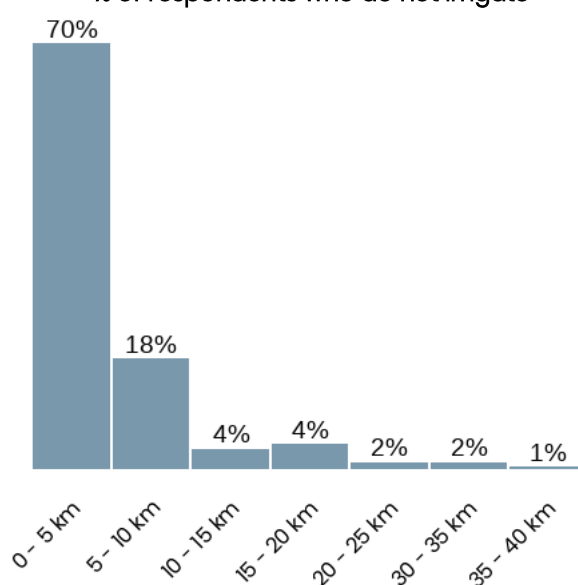
The link between irrigation and seed choice is clearest in panel (c) of figure 2.10. Among farmers using hybrid seed on their main crop, 80% irrigate fully and only 13% do not irrigate at all. This share falls to 52% fully irrigated among OPV users and to just 39% among farmers using saved seed, of whom almost half (46%) do not irrigate. This is consistent with the findings running through this report: hybrid varieties deliver their yield potential only with reliable water, so hybrid adoption and irrigation access tend to go together, while the rain-fed, farmer-saved seed system dominates where water access is limited.

Irrigation access also differs by gender. 56% of male-owned farms are fully irrigated and a further 13% partly irrigated, against 45% and 14% respectively for female-owned farms. Including partial irrigation, 69% of male-owned farms have some form of irrigation compared with 59% of female-owned farms, a ten-point gap that adds to the structural differences already noted around farm size and crop mix.

Two thirds of male-owned farms (67%) have some form of irrigation compared with 59% of female-owned farms

For farmers who do not irrigate, the distance to the nearest water source helps explain whether investment in irrigation is even feasible. Figure 2.11 shows that distribution, highly skewed towards relatively shorter distances.

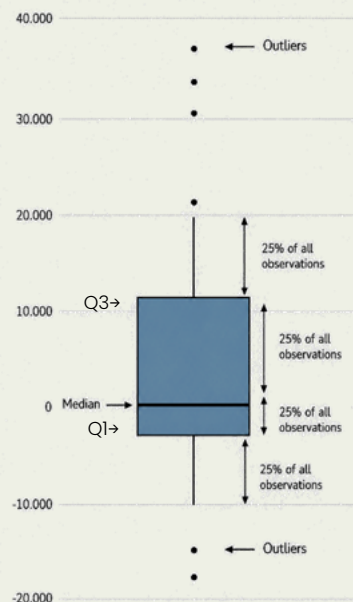
Figure 2.11 – Distance to the nearest water source (kilometres),
% of respondents who do not irrigate



2.3 Business case of the farm

The use of boxplots

A boxplot is a simple way to show how values are spread within a group. The line inside the box marks the median, which is the middle value, with half of the observations above it and half below. The box itself shows the middle 50% of observations, which is where the most typical values fall. The bottom edge of the box is the point below which a quarter of the observations sit, and the top edge is the point above which the highest quarter sits. The lines extending above and below the box, often called whiskers, show the broader range of values that are still considered typical. Dots beyond the whiskers are outliers, which are unusually high or low observations compared to the rest of the group. Outliers are not automatically errors; they may reflect exceptional cases or unusual circumstances, but they always deserve closer attention. In practical terms, a taller box or longer whiskers suggest more variation within the group, while a shorter box suggests more consistency. When comparing several boxplots with the same axis, higher boxes generally indicate higher typical values, while wider spreads indicate more variability.



2.3.1 Average profit per acre

Profit per acre was not asked of farmers directly. Instead, the survey asked each farmer a series of more concrete questions that a farmer would readily be able to answer about the main vegetable harvested last season: the area planted, how much was sold and in which unit, the price received, and the main costs incurred, such as those for seed, fertiliser, agro-chemicals, labour and transport to market. From these responses, the total income, total expenses and resulting profit for the crop were calculated, and this profit was then divided by the area planted with this vegetable to obtain a profit per acre for each farm in order to ensure comparability. This approach was chosen because farmers are generally able to recall what they sold and what they spent far more reliably than they can estimate a profit figure per acre, which is not a number most farmers keep track of themselves.

These profit-per-acre figures should nonetheless be read as indicative rather than precise. Income and costs were captured in the units farmers actually transact in (for example bags or other containers) together with the price received per unit, so they do not depend on produce being weighed. The area planted, however, is more uncertain: enumerators observed that the size of an acre varied by local convention rather than formal measurement. Because profit is expressed per acre, this variation in how land area is estimated carries a margin of error that the figures themselves cannot show.

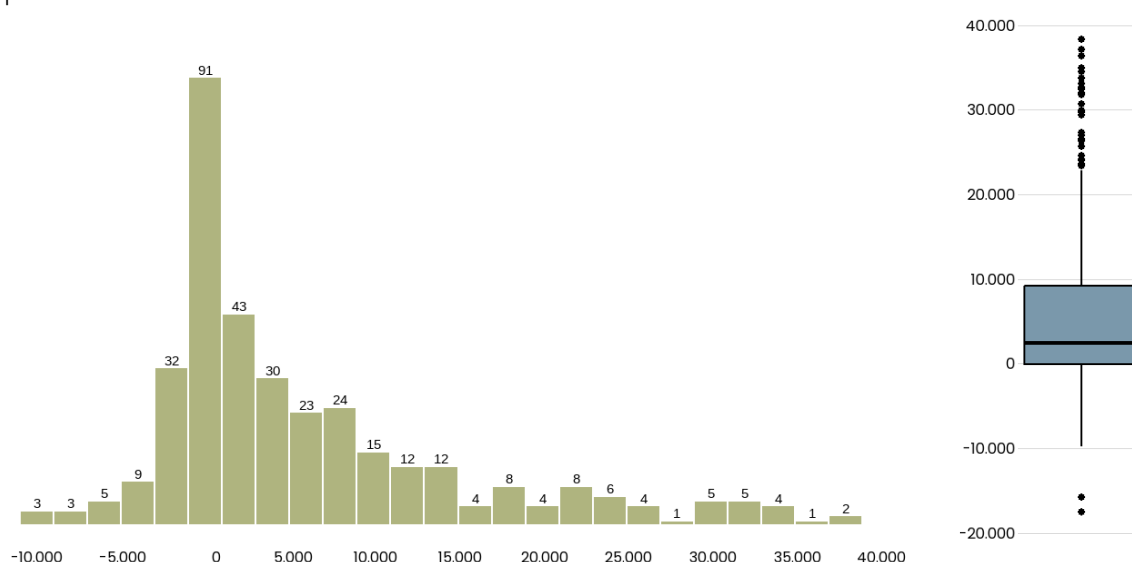
All profit per acre figures in this section are based on 356 of the 409 respondents. The remaining 53 farms reported profit values that were unusually high or low compared to the rest of the sample

(identified as outliers using the standard Tukey¹ interquartile range rule) and were excluded so that a few extreme cases would not distort the averages. From section 2.4 onwards, the analysis returns to the full sample of 409 respondents.

All profit per acre figures reported in this section relate to a single crop per farm: the main vegetable harvested by the respondent in the last season, defined as the crop accounting for the largest share of that farm's vegetable production. The seed type a farmer is classified under in the analysis that follows is therefore the seed type used for that main crop. A farmer counted here as a "farmer-saved seed" or "OPV" user may still use hybrid seed on smaller, secondary vegetables on the same farm, and the reverse is also possible. Comparisons between seed types in section 2.3.3 should be read with this in mind.

The median profit per acre on the main vegetable last season was around 2,400 GHS. The more typical half of farms earned between roughly minus 60 GHS and 9,200 GHS per acre, which already points to a very wide spread in returns.

Figure 2.12 — Profit per acre (GHS) achieved on the main vegetable harvested last season, count of respondents



Across the 356 farms in the cleaned sample, the median profit per acre on the main vegetable last season was around 2,400 GHS. The more typical half of farms (setting aside the lowest- and highest-earning quarters) earned between roughly minus 60 GHS and 9,200 GHS per acre, which already points

¹ The Tukey rule is a standard statistical method for spotting unusually high or low values. It flags any observation that lies more than 1.5 times the interquartile range (the spread of the middle 50% of values) below the 25th percentile or above the 75th percentile.

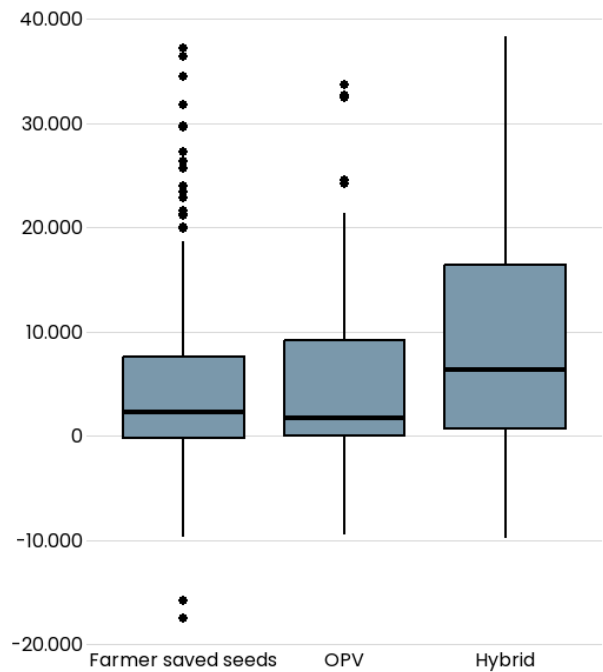
to a very wide spread in returns. The whiskers extend from a loss of close to 9,800 GHS per acre on the low end to a profit of nearly 22,900 GHS per acre on the high end, meaning that even within the typical range, some farms made losses while others earned almost ten times the median. A notable share of farms therefore did not break even on their main vegetable crop, while a roughly equal share generated returns well above the average. The sections that follow break this overall picture down by seed type (2.3.3), crop (2.3.4), region (2.3.5) and gender of the farm owner (2.3.6) to identify where the differences come from.

2.3.2 Trends per seed type used

The 356 farms in the cleaned sample were split into three seed-type groups: farmer-saved seed (59%), hybrid (22%) and OPV (19%). It should be noted that farmers do not always clearly distinguish between OPV and hybrid seed, so some misclassification between these two groups in the self-reported data will be present. The differences in profit per acre between these groups are striking. Hybrid users report a median profit of 6,350 GHS per acre, almost three times the 2,256 GHS reported by farmer-saved seed users and more than three times the 1,776 GHS reported by OPV users.

Hybrid users report a median profit of 6,350 GHS per acre, almost three times the 2,256 GHS reported by farmer-saved seed users and more than three times the 1,776 GHS reported by OPV users.

Figure 2.13 — Profit per acre (GHS) on the main vegetable harvested last season, by seed type used



The gap widens further at the upper end. The top quarter of hybrid users earned more than 16,400 GHS per acre, against roughly 7,600 GHS for farmer-saved seed users and 9,300 GHS for OPV users, and the best-performing hybrid farms reached close to 38,300 GHS per acre, almost double the upper whisker of either alternative. Downside outcomes, by contrast, look broadly similar across all three groups: a quarter of farms in each category earned little or nothing on their main vegetable, and the lower whiskers cluster around a loss of 9,500 to 9,800 GHS per acre.

In other words, hybrid seed does not appear to protect farmers against poor seasons (the floor is much the same as for other seed types), but it offers a meaningfully higher ceiling and a higher typical return when conditions allow it to perform. This is consistent with the access patterns shown in section 2.2: hybrid use is concentrated in higher-value commercial crops, and is most prevalent among farms that also have irrigation (a feature reported by two thirds of male-owned and three fifths of female-owned farms). This suggests the higher returns are not due to hybrid seed alone. They depend in part on the conditions that tend to come with it, such as irrigation and high-value crops.

Hybrid users combine higher profits with higher total costs pointing to a high-input, high-output system. Seed nonetheless accounts for a very similar share of total expenditure for OPV and hybrid farmers

Table 2.1 sets these profitability findings against what farmers actually spend. Seed costs rise sharply with seed type: hybrid users spend an average of 1,274 GHS per acre on seed, against 752 GHS for OPV users and just 230 GHS for those relying on farmer-saved seed. That hybrid users pay more for seed than OPV users is reassuring for the data: while it cannot be guaranteed that every farmer classified their own seed correctly as hybrid or OPV, the overall pattern makes sense, since hybrid seed is indeed more expensive than OPV. The table also shows that hybrid users combine higher profits with higher total costs (5,483 GHS per acre, against 3,368 GHS for OPV and 3,069 GHS for farmer-saved seed users), pointing to a high-input, high-output system. Seed nonetheless accounts for a very similar share of total expenditure for OPV and hybrid farmers, at 22.3% and 23.2% respectively. Finally, although many farmer-saved seed users spend nothing on seed because they save it themselves, the average is not zero: some buy farmer-saved seed from neighbours, on the local market or even at agro-input shops, and so still incur a modest cost.

Table 2.1: Average total and seed expenditure per acre, by seed type (GHS)

	Total expenses per acre (average, GHS)	Seed expenditure per acre (average, GHS)	Seed expenditure relative to total expenditure (%)
Farmer saved seed	3,069	230	7.5%
OPV	3,368	752	22.3%
Hybrid	5,483	1,274	23.2%

These cost differences also point to a financing hurdle: moving to hybrid seed requires roughly 5,483 GHS per acre upfront, against around 3,069 GHS for farmer-saved seed, which helps explain why cash-constrained farmers, including many women and smallholders, tend to stay with the cheaper farmer-saved system even when they would prefer improved seed.

2.3.3 Trends per crop

Profit per acre on the main vegetable harvested last season varies sharply by crop. Cabbage stands out at the top, with a median of 11,010 GHS per acre across 33 farms and a top quarter earning more than 21,000 GHS per acre. Lettuce shows a similar pattern. Tomato and onion also report relatively high typical returns (medians of 3,360 and 9,325 GHS per acre respectively), though the onion result rests on only 10 observations.

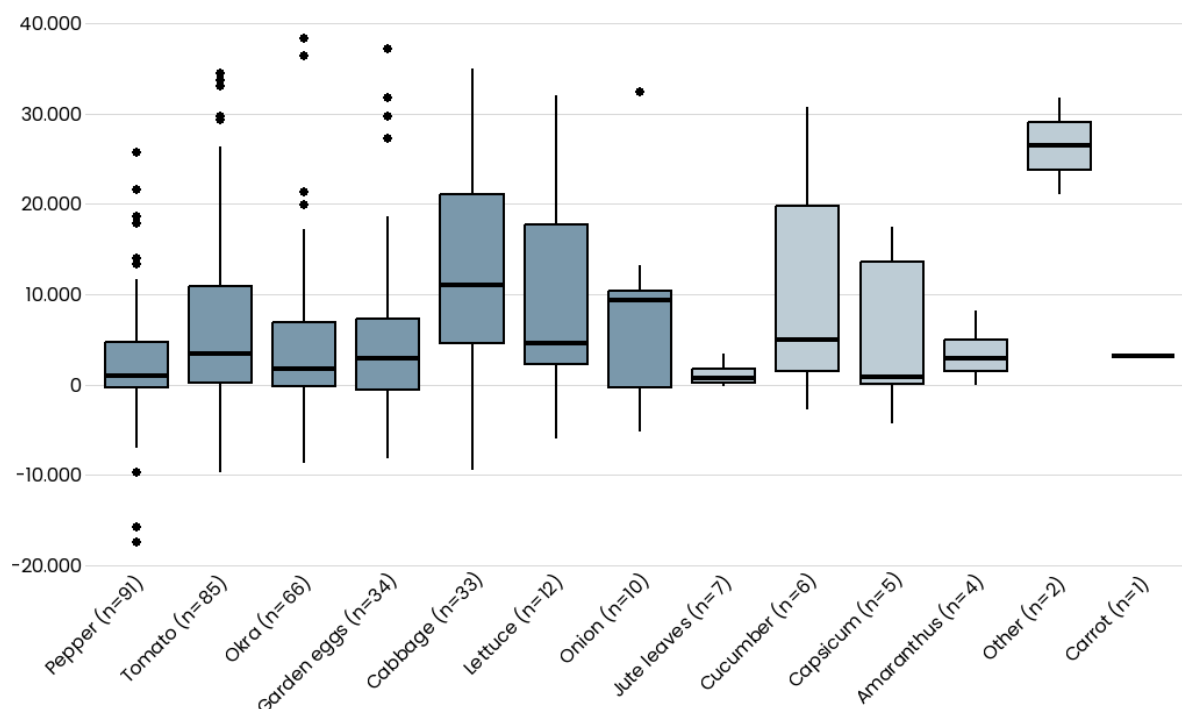
At the other end, pepper, okra and garden eggs, the most widely grown vegetables in the sample, deliver markedly lower typical profits. Pepper, the single most common main vegetable (91 farms), has a median of just 940 GHS per acre and the lowest whisker entirely below zero, meaning that more than a quarter of pepper-focused farms made a loss on their main crop. Okra (n=66) and garden eggs (n=34) sit in a similar range, with medians of 1,745 and 2,919 GHS per acre and lower whiskers extending to losses of around 8,000 to 8,700 GHS per acre.

Cabbage showed the highest profit margins, followed by unions, lettuce and tomatoes, whereas the profit margins for pepper, okra and garden eggs were among the lowest.

Two observations follow. First, the crops with the highest typical returns (cabbage, lettuce) overlap closely with the crops in section 2.2 where hybrid use is concentrated. In other words, the higher profit linked to hybrid seed is partly down to which crops those farmers grow. Hybrid users are concentrated in the most profitable crops, so the seed and the crop choice are difficult to disentangle. Second, the crops most widely grown by the sample, pepper and okra, are also among the least profitable per acre, which underlines the scope for value uplift if a portion of these farmers can shift to higher-margin vegetables or to improved seed for the same crop.

Results for jute leaves, cucumber, capsicum, amaranthus, other and carrot are based on fewer than 10 observations each and are not interpreted further; they are shown in light blue in the figure below.

Figure 2.14 — Total profit per acre (GHS), per main crop harvested last season. Note: x-axis labels indicate the number of observations that contributed to the creation of the boxplot. For some crops these numbers are very low; these boxplots are shown in light blue and should be interpreted with caution.



2.3.4 Trends per region

Profit per acre on the main vegetable also varies substantially across regions, with median returns spanning more than a tenfold range. Greater Accra Region records the highest typical profit at 9,150 GHS per acre (n=19), followed by North East Region (8,400 GHS, n=19), Ashanti Region (6,575 GHS, n=22) and Eastern Region (6,554 GHS, n=32). In these four regions, the top quarter of farms earned upwards of 12,000 to 18,700 GHS per acre, and the upper whiskers reach close to 25,000 to 35,000 GHS per acre. The Ashanti figure should be read with some caution: it was the one region where hybrid and OPV users were purposively over-sampled (see section 1.3), which is likely to raise its median profit relative to a fully random sample.

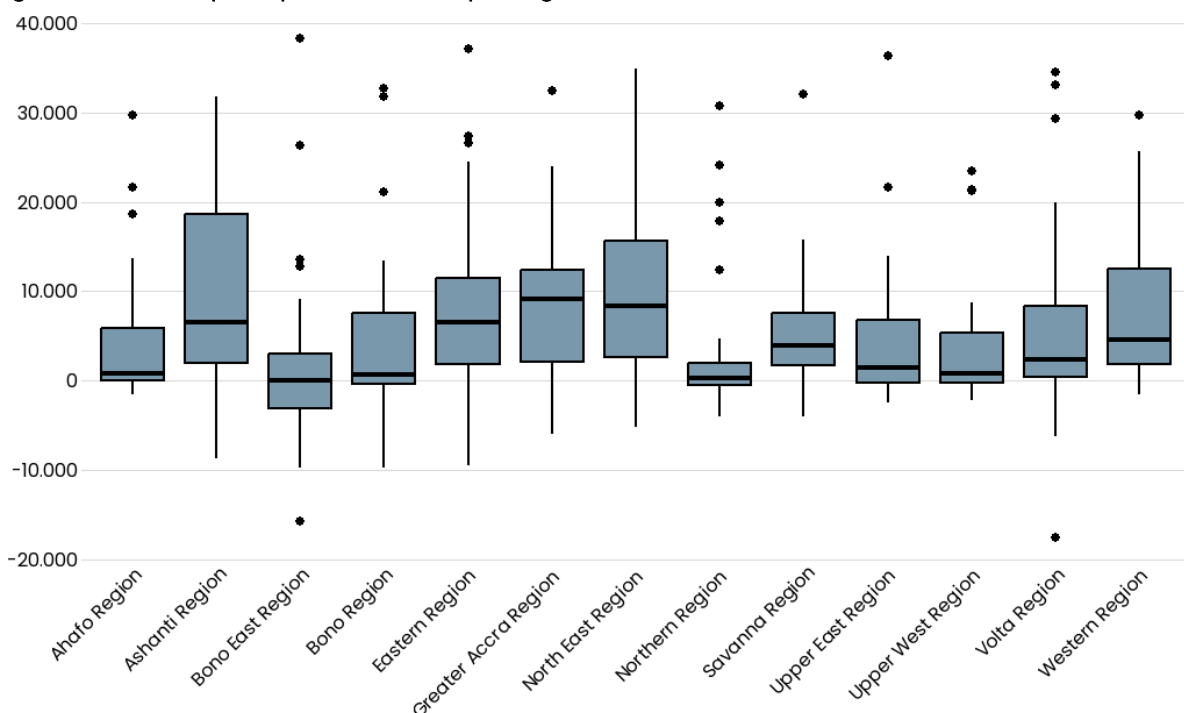
A middle group of regions, including Western, Ahafo, Savanna and Volta, posts medians in the 2,300 to 4,600 GHS per acre range, with Q1 values close to or just above zero. These regions show typical returns but with a meaningful share of farms earning little or making losses.

Greater Accra Region records the highest typical profit at 9,150 GHS per acre, followed by North East Region, Ashanti Region, and Eastern Region. At the bottom of the distribution sit Bono East Region, Northern Region and to a lesser extent Bono Region.

At the bottom of the distribution sit Bono East Region (median 56 GHS per acre, n=30), Northern Region (275 GHS, n=37) and to a lesser extent Bono Region (750 GHS, n=33). In Bono East and Northern, Q1 values are deeply negative (-3,200 and -420 GHS per acre respectively), meaning at least a quarter of farms in those regions made an outright loss on their main vegetable last season. Upper East and Upper West Region also report Q1 values below zero, though their medians sit somewhat higher at around 800 to 1,400 GHS per acre.

The regional pattern is consistent with the crop and seed-type findings in sections 2.3.3 and 2.3.4. The high-margin regions, in particular Greater Accra, Eastern and Ashanti, are also the regions identified in section 2.2 as having a wider crop mix that includes cabbage and higher levels of irrigation, both of which support hybrid seed use. The lower-margin Northern regions are more concentrated in okra, jute leaves and amaranthus, crops that remain largely in the farmer-saved seed system. The regional profitability therefore seems to be the outcome of the geography of access to commercial crops, the suitable climatological conditions to grow them, hybrid seed and irrigation. In the more profitable regions, this may set in motion a virtuous cycle: where profits are reinvested in better farm infrastructure and inputs, including hybrid seed, they can drive further gains over time.

Figure 2.15 — Total profit per acre (GHS), per region.



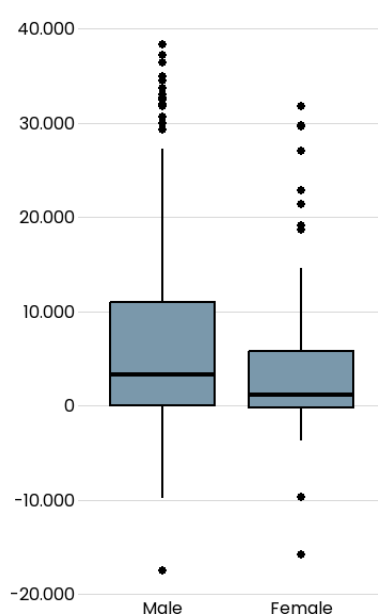
2.3.5 Trends per gender

The 356 farms in the cleaned sample split into 250 male-owned and 106 female-owned farms. Male-owned farms report a median profit of 3,348 GHS per acre, almost three times the 1,167 GHS reported on female-owned farms. The gap widens further up the distribution: the top quarter of male-owned farms earned more than 10,980 GHS per acre against 5,860 GHS for female-owned farms, and the upper whiskers reach 27,317 GHS and 14,600 GHS per acre respectively. At the lower end, both groups include farms making losses, but losses are deeper on male-owned farms, where the lower whisker reaches close to minus 9,800 GHS per acre against around minus 3,700 GHS on female-owned farms.

Male-owned farms report a median profit of 3,348 GHS per acre, almost three times the 1,167 GHS reported on female-owned farms.

This pattern should be read against the structural differences between the two groups already noted in section 2.2. Male-owned farms in the sample are on average noticeably larger than female-owned farms (5.7 versus 3.4 acres) and are more likely to be irrigated (67% versus 59% with some form of irrigation). The most direct contributor to the profit gap, however, is likely to be seed-type composition: 35% of male-owned farms used hybrid seed on their main vegetable last season, against only 10% of female-owned farms. Given that hybrid users earn a median of 6,350 GHS per acre against around 2,000 GHS for non-hybrid users (section 2.3.3), the lower take-up of hybrid seed among female-owned farms accounts mechanically for a sizeable share of the observed gender gap in profit per acre.

Figure 2.16 — Total profit per acre (GHS), per gender of the ownership of the farm



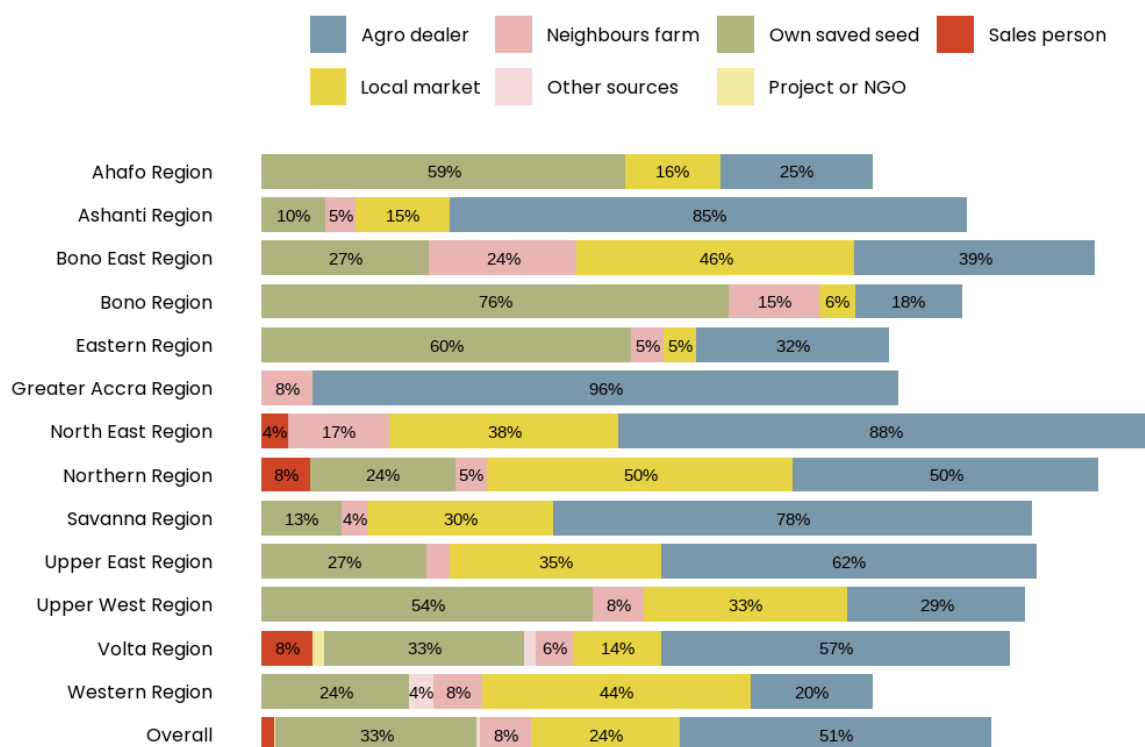
Field observations point to why the lower hybrid take-up among women persists. Enumerators reported that women farmers, typically cultivating small plots, relied heavily on farmer-saved seed because it was affordable, familiar and easily accessible, and that although some expressed interest in hybrid and OPV seed, the higher cost limited adoption. Women therefore often obtained seed from neighbours or local markets, valuing its predictability and lower financial risk. This suggests the gender gap is not mainly about awareness or preference. Cost and access to improved seed matter just as much, if not more.

2.4 Access to seeds

This section examines where farmers source their seed, how far they travel to reach their preferred outlet, what types of seed are stocked there, and what farmers do when their seed of choice is unavailable. Together, these factors provide a picture of the practical reach of the formal seed system into the farms in the sample and of the points at which it breaks down. Many respondents source seed from more than one channel in a season, so the channel shares reported below are not mutually exclusive and add up to more than 100%.

The channel mix differs sharply by region, as figure 2.17 below shows.

Figure 2.17 – Source of buying seeds, by region, % of respondents

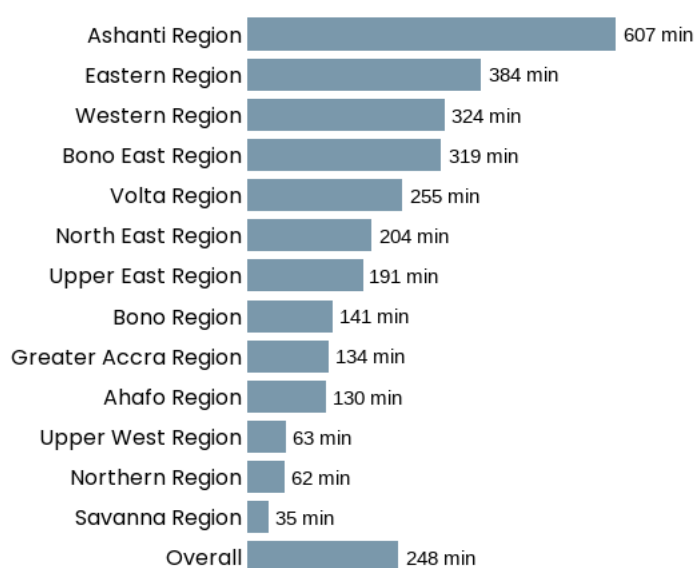


The graph shows that agro-input dealers are the leading source of seed overall (51% of respondents), but reliance on them is heavily concentrated in a few regions: farmers in Greater Accra (96%), North East (88%), Ashanti (85%) and Savanna (78%) source overwhelmingly from dealers, whereas own-saved seed still dominates in Bono (76%), Eastern (60%) and Ahafo (59%), and local markets are the

leading channel in Northern (50%), Bono East (46%) and Western (44%). Three of the four regions most reliant on agro-input dealers, namely Greater Accra, North East and Ashanti, are also the regions with the highest median profit per acre and the crop mix and irrigation that support hybrid use (section 2.3.4). This overlap suggests that a strong dealer presence, higher hybrid uptake and higher returns tend to cluster together, which makes these regions a natural focus for marketing and distribution efforts. The pattern is indicative rather than conclusive given the relatively small regional sample sizes.

Travel times to the agro-input dealer are substantial. On average, a round trip to the dealer takes just over four hours (248 minutes), considerably longer than the 100 to 138 minutes typical for a neighbour's farm or local market. This partly reflects geography: as the chart below shows, travel times vary considerably by region.

Figure 2.18 — Average time of a round trip to the agro-input dealer (minutes), by region



Nearly half (43%) of respondents who bought from an agro-input dealer bypassed the nearest one to reach their preferred dealer, meaning that choice of dealer, not simple proximity, drives where many farmers buy. The reasons given in an open question for preferring a particular dealer span quality, availability, price and service factors, and were most commonly cited as follows:

- | | |
|---|----|
| 1. Quality seeds / trusted seed quality | 41 |
| 2. Availability of preferred seed, brand or variety | 28 |
| 3. Affordable prices | 16 |
| 4. Higher yields / better performance | 13 |
| 5. Good customer relationship, trust or reliability | 11 |
| 6. Convenient location / accessibility | 9 |
| 7. One-stop shop / broad product range | 5 |
| 8. Credit offered | 4 |
| 9. Advice, technical knowledge or customer service | 4 |
| 10. Produce marketing linkages (dealer buys farmer's produce) | 3 |

Stocking of hybrid seed by agro-input dealers appears to be widespread. 80% of respondents indicated that their dealer sells hybrid seed, 18% did not know whether the dealer stocks it, and only 2% believed the dealer does not. Of those who knew their dealer stocks hybrid seed, 64% reported that the dealer had actively tried to sell it to them. Taken together, this suggests that on the supply side, dealer availability of hybrid seed is not the binding constraint on uptake (a point that section 2.5 returns to when examining farmer-side reasons for non-use).

Stocking of hybrid seed by agro-input dealers appears to be widespread. 80% of respondents indicated that their dealer sells hybrid seed, 18% did not know whether the dealer stocks it, and only 2% believed the dealer does not.

But stocking and reliable availability are not the same thing. Farmer-saved seed users effectively never face a stockout, because they grow their own seed. Among purchased seed users, however, roughly one in six **farmers preferring hybrid (17%) or OPV (18%) reports that their seed of choice is not always available.**

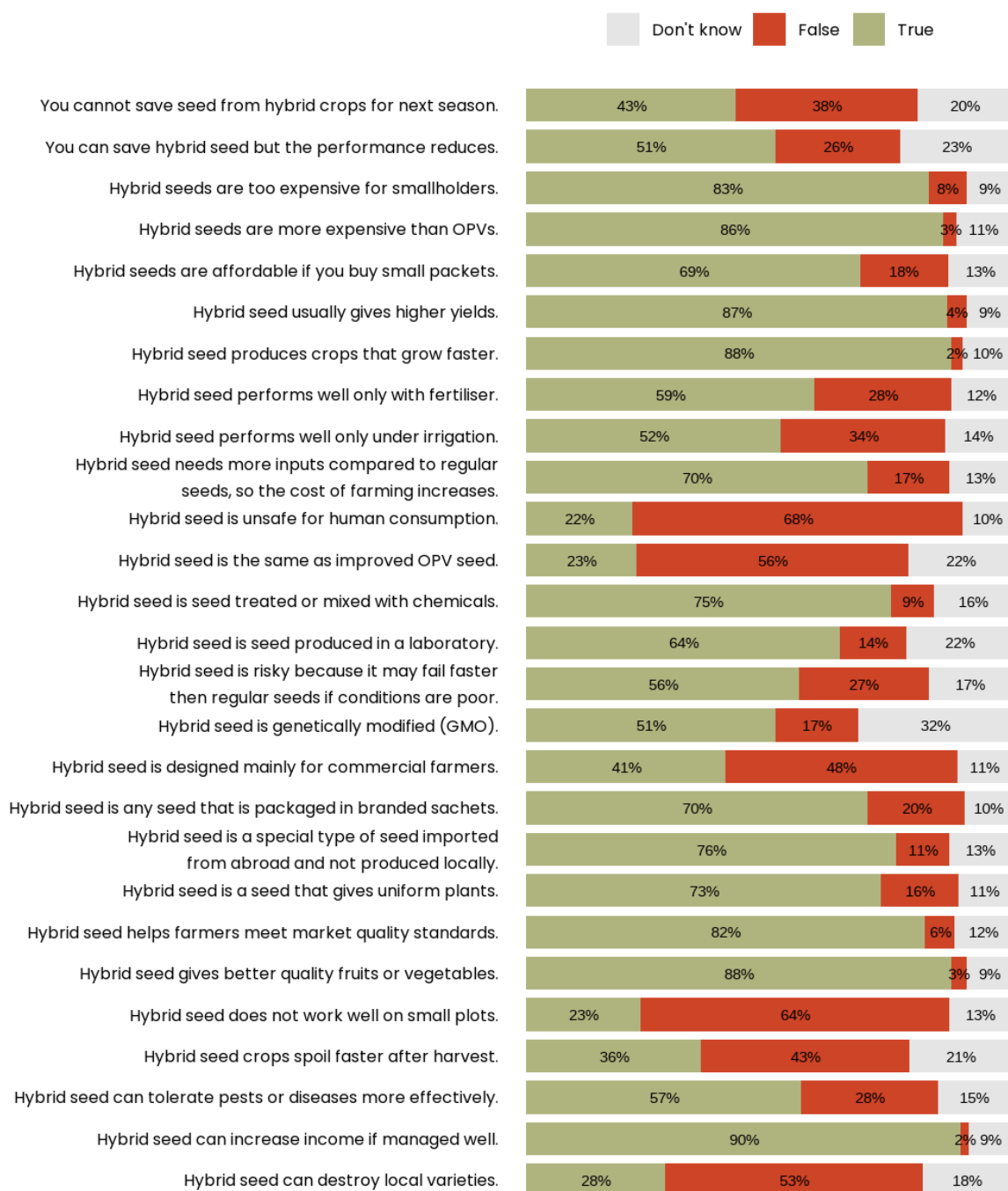
When their preferred seed is unavailable, farmers report what they typically do in its place. Respondents could select more than one strategy, so the figures below sum to more than 100%. The pattern is telling: **79% of affected farmers fall back to farmer-saved seed, 40% switch to OPV, and 8% miss the planting season altogether.** Strikingly, none reports switching up to hybrid seed when their preferred option is unavailable. Stockouts therefore tend to push farmers toward lower-input alternatives rather than higher-input ones, which means that even short-term supply gaps in OPV or hybrid channels can translate into a step backwards in seed-system adoption.

2.5 Perception and decision making around hybrid seeds

This section turns from how farmers access seed to how they think about hybrid seed in particular: who has heard of it, who uses it, how they perceive it, and what drives the decision to adopt or not.

Awareness of hybrid seed is far from universal in the sample. 63% of all 409 respondents say they have heard of hybrid seed, leaving more than a third who have not. Use is correspondingly more limited: 39% of all respondents report having used hybrid seed on at least one of their crops in the last harvest season. This is a broader measure than the 28% shown earlier in Figure 2.9, which counts only hybrid use on the main crop. The share rises from 28% to 39% because some farmers reserve the more expensive hybrid seed for a single high-value vegetable rather than using it on their main crop. Taken together, these figures imply that around six in ten hybrid-aware farmers had actually tried it. The perception data below cover only the 63% of respondents who have heard of hybrid seed.

Figure 2.19 — Farmers' perceptions and beliefs regarding hybrid seeds, % of hybrid-aware respondents



The pattern in the chart cuts in three directions at once. On the positive side, a clear majority of hybrid-aware farmers accept the headline value proposition: they believe hybrid seed can raise income (90%) and deliver better-quality produce (88%). On the cautionary side, many of those farmers rightfully attach important conditions to that belief, agreeing that hybrid is more risky (56%) as it only performs under irrigation (52%) or with adequate fertiliser (59%). And on the misconception side, the chart shows that even among the aware group, basic facts about hybrid seed are not settled: substantial shares confuse hybrid with OPV or with GMO varieties (51%), and a meaningful minority still associate hybrid seed with risks to human health (22%). With respect to costing, the large majority finds that hybrid is too

expensive for smallholders (83%), but that it would be affordable in small packets (69%). This further suggests conditional belief and a price/packaging challenge rather than a pure willingness-to-pay one.

22% of hybrid-aware farmers believe hybrid seed is unsafe for human consumption, and 51% believe it is genetically modified.

90% of hybrid-aware farmers believe hybrid seed can increase income if managed well, and 88% believe it gives better quality produce.

These three layers, conviction on upside, conditional belief, misinformation, together explain why the dominant reason for non-use is information rather than rejection of the product. Field observations by the enumerators put this in context, and suggest the true level of accurate awareness may be even lower than the survey figures imply. Enumerators noted that many farmers treat any branded, sealed or packaged seed as “hybrid”, in several cases presenting empty containers from a previous season as evidence of hybrid use even though the labels identified the contents as OPV. Reported awareness of hybrid seed therefore often reflects exposure to packaged seed rather than an accurate understanding of what distinguishes hybrid, OPV and farmer-saved seed.

Of the 61% of respondents who did not use hybrid seed on any crop in the last harvest season, the reasons given for non-use are dominated by information rather than by negative experience. More than **two thirds (68%) said they do not know enough about hybrid seed, and a further 20% would like to use it but cannot afford to. Only around one in eight non-users (6% who believe hybrids do not perform well, plus 6% who do not trust them as not natural) gave a reason rooted in scepticism about the product itself.** Combined with the supply-side finding in section 2.4 that 80% of dealers stock hybrid seed, this points to awareness, financing and confidence, not stocking, as the binding constraints on uptake.

Field observations help explain where the confidence gap comes from. Enumerators reported that some farmers had saved and replanted seed harvested from hybrid (F1) crops and then experienced poor germination, lower yields and inconsistent fruit quality, which they attributed to the hybrid seed itself rather than to the loss of vigour that occurs when F1 seed is replanted. This points to a misunderstanding of how hybrid seed works rather than a genuine performance problem, and suggests that part of the distrust recorded above could be addressed through practical guidance on buying fresh seed each season rather than saving it.

Of the 62% of respondents who did not use hybrid seed on any crop in the last harvest season, the reasons given for non-use are dominated by information rather than by negative experience.

Despite not using hybrid seed themselves, 39% of these non-users believe it is more profitable than the alternatives. Among that group, 78% say they would be willing to take a loan to buy hybrid seed. Less expected, among non-users who do not believe hybrid seed is more profitable, still 44% say they would be willing to take a loan to buy it. Put simply, willingness to take a loan for hybrid seed runs ahead of belief in it. Even many farmers who are not convinced hybrid is more profitable would still borrow to try it, which suggests that offering finance, not just making the case for hybrid, could drive adoption. The combination of the 20% who said they could not afford hybrid and these loan-willingness figures points to a financing-led adoption channel, where access to credit, rather than first changing the farmer's belief about hybrid profitability, may be enough to move a meaningful portion of the non-user group.

Returning to the 39% of respondents who did use hybrid seed in the last harvest season for at least one crop, the survey asked how they learned to use it. Respondents could select more than one source, so the figure below sums to more than 100%. The figure shows that three quarters of farmers received no formal training on the use of hybrid seeds. This study did not assess whether that lack of training affects how effectively the seed is used.

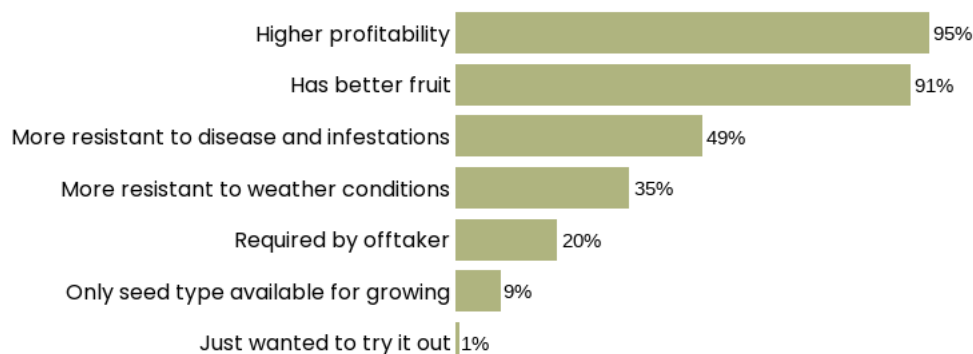
Figure 2.20 — Knowledge gained about the use of hybrid seeds, % of hybrid-using respondents



The reasons hybrid users gave for choosing hybrid seed are shown in the figure 2.21 below. Respondents could again select more than one reason. Satisfaction among hybrid users is near-universal: **99% said they would use hybrid seed again next season, and 98% would recommend it to other farmers.**

Satisfaction among hybrid users is near-universal: 99% said they would use hybrid seed again next season, and 98% would recommend it to other farmers.

Figure 2.21 — Reasons for using hybrid seeds, % of hybrid-using respondents



Asked what advice they would give a fellow farmer considering hybrid seed, the following points were most commonly mentioned:

- | | | |
|----|---|----|
| 1. | Quality seeds, good seeds, best seeds, viable seeds, fewer seedling problems, reliable seed performance | 49 |
| 2. | Preferred seed available, specific variety or brand available, hybrid seed available, always in stock, getting what they want | 40 |
| 3. | Cheaper price, affordable price, reasonable price, lower cost, buying on credit, avoiding unaffordable hybrid seed | 20 |
| 4. | Trusted dealer, good working relationship, customer service, advice, dealer knowledge, responsiveness to complaints | 17 |
| 5. | Higher yields, bigger fruits, better crop output, seeds growing well on the farm | 14 |
| 6. | One-stop shop, larger market, easier location, delivery/order convenience | 9 |

Farmers were asked which factors they consider in their choice of seeds. The answers they provided are shown in Figure 2.22 below.

The "not influenced by anything" response should be treated with caution: 67% of the farmers who selected it also selected at least one other influencing factor, indicating that, in practice, they were influenced by something after all.

Only 13 respondents reported being influenced by social media. Within that small group, 69% use Facebook and 46% use TikTok, while none use Instagram, Twitter or LinkedIn. WhatsApp is widely available (used by exactly 50% of all respondents), but the survey responses suggest it is not a meaningful channel for seed-choice decisions in this sample.

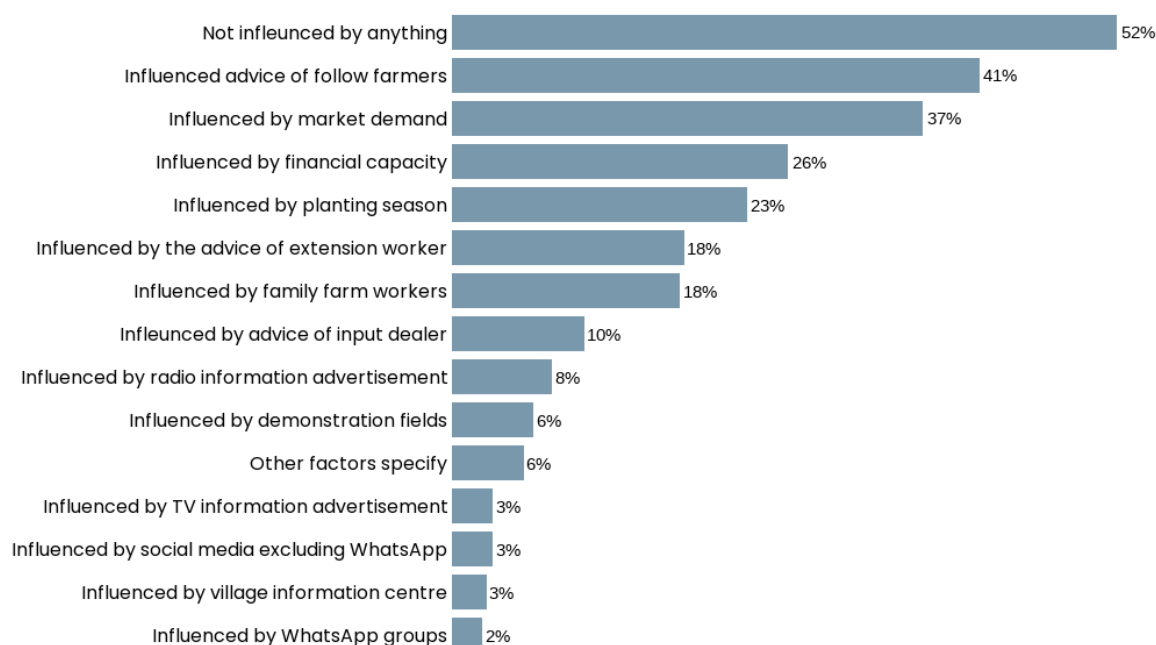
These patterns are consistent with recent research on media use among rural farmers in Ghana. A large survey of 1,565 smallholders in Northern Ghana found that farmers interact with information services mainly through phone calls (96%), peer farmers and field agents (around 88% each) and radio (41%), while social media accounted for just 1.2% of interactions; smartphone ownership was low (17%,

against 92% for basic feature phones) and only 13% had internet access.² In the Bono East Region, a study among 1219 farmers showed high use of radio (93%), television (90%) and mobile phones (81%), whereas smartphone and social media applications such as Facebook, WhatsApp and Twitter are used by only 6% of the study group.³ Radio in particular is repeatedly identified as the most popular and trusted source of agricultural information in rural northern communities, valued for its low cost and local-language programming; in one Tamale-area study about 70% of residents described themselves as habitual listeners who treat radio as a major source of information, although listenership skews towards men.⁴

The near-absence of social media influence in our own sample (13 of 409 respondents, around 3%) therefore fits this broader picture: for reaching vegetable farmers, radio together with peer and in-person channels is likely to be considerably more effective than social media. It is worth noting that our survey asked farmers what factors they consider in their seed choice, not which channels they generally use. This largely explains why radio featured less prominently here than in the studies above. If rural communities listen to radio as much as those studies suggest, the real influence of radio may be considerably greater than our respondents' answers imply.

Demonstration fields, a promotional method commonly used by seed companies, were cited as an influence by only 6% of respondents. It is unclear whether this reflects limited exposure (most farmers may never have had the chance to visit one) or whether those who did visit were simply claiming not to be influenced by it.

Figure 222 – Factors that influence farmers' seed choice, % of respondents



² Abdulai, A.R., Tetteh-Quarshie, P., Duncan, E. & Fraser, E. (2023). Is agricultural digitization a reality among smallholder farmers in Africa?

Unpacking farmers' lived realities of engagement with digital tools and services in rural Northern Ghana. *Agriculture & Food Security*, 12(11).

³ Myth or reality? The Digitalization of Climate-Smart Agriculture (DCSA) practices in smallholding agriculture in the Bono East Region of Ghana. *Environmental Development* (2023).

⁴ Audience listenership of FM radio: A case study of rural development in Northern Ghana. *Cogent Arts & Humanities*, 10(1), 2184750 (2023).

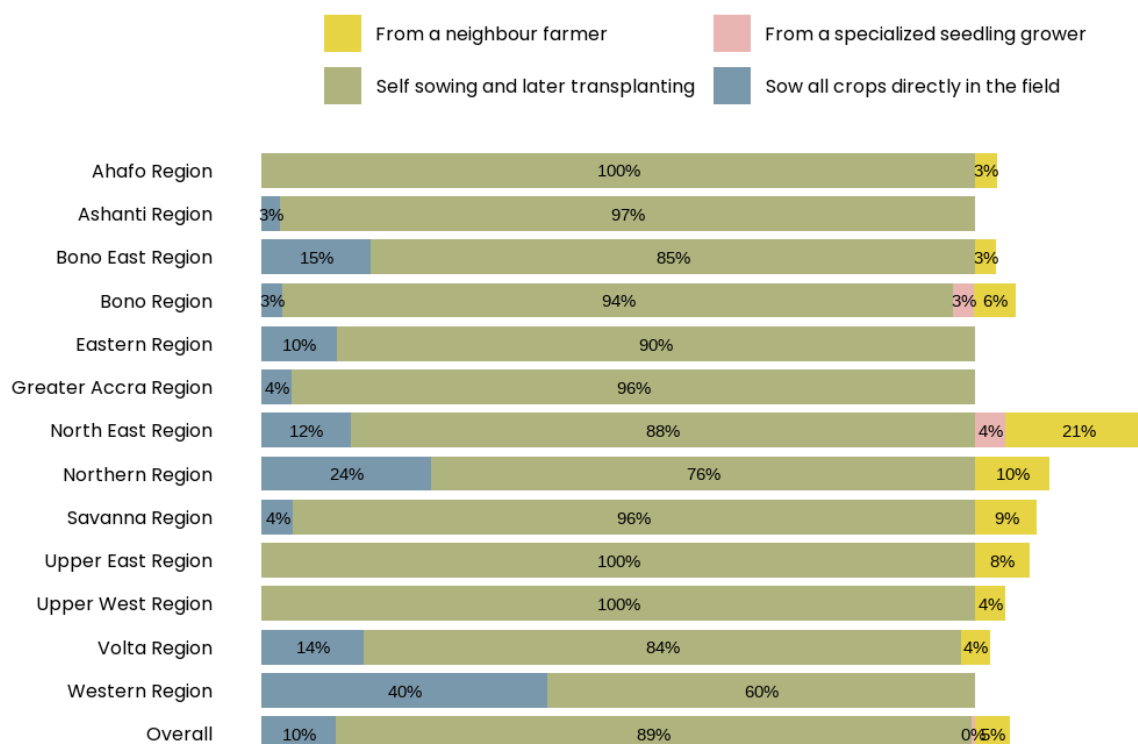
Only 3% of the respondents reported being influenced by social media, compared to 8% self-reportedly being influenced by radio and 6% being influenced by demonstration fields.

2.6 Seedlings

Many vegetable crops can be sown either directly in the field, or first raised as seedlings, and then transplanted. The latter route gives farmers more control over germination conditions and early-stage protection, but it also adds a labour and management step. This section first looks at how farmers obtain seedlings, then at the self-reported performance of farm-raised seedlings, and finally at whether farmers would be willing to source seedlings commercially if they moved to hybrid seed, including the prices they would pay.

The use of seedlings, and the way they are obtained, varies across regions. The figure below shows for each region the share of farmers who do not work with seedlings at all, who raise their own seedlings on the farm, and who source seedlings externally from a neighbour, a nursery, or another supplier.

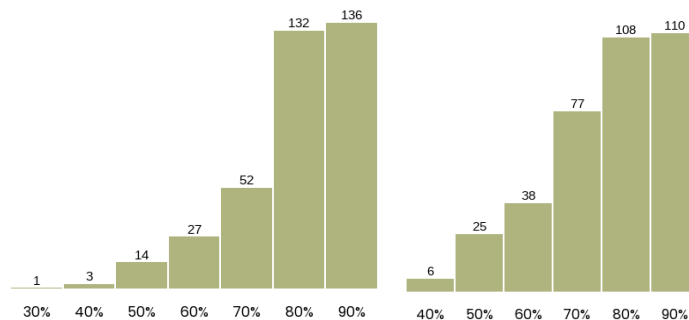
Figure 2.23 — Source of seedlings, by region, % of respondents



On average, 89% of farmers raised their own seedlings, 6% bought them from a neighbor, 10% sowed directly, and <1% bought seedlings from a professional seedling raiser.

Farmers who raise their own seedlings report broadly positive results, with an average germination rate of 79% and a post-transplant survival rate of 76%. As these are self-reported figures from farmers without a reference benchmark, they are best read as an indicator of farmer satisfaction with own-raised seedlings rather than as an absolute performance measure. Combined with the cost of buying seedlings externally, this likely contributes to the fact that the majority of farmers continue to raise seedlings themselves where they use seedlings at all.

Figure 2.24 — Percentage of seeds claimed to germinate (a) and percentage of seeds claimed to survive transplantation (b), count of respondents



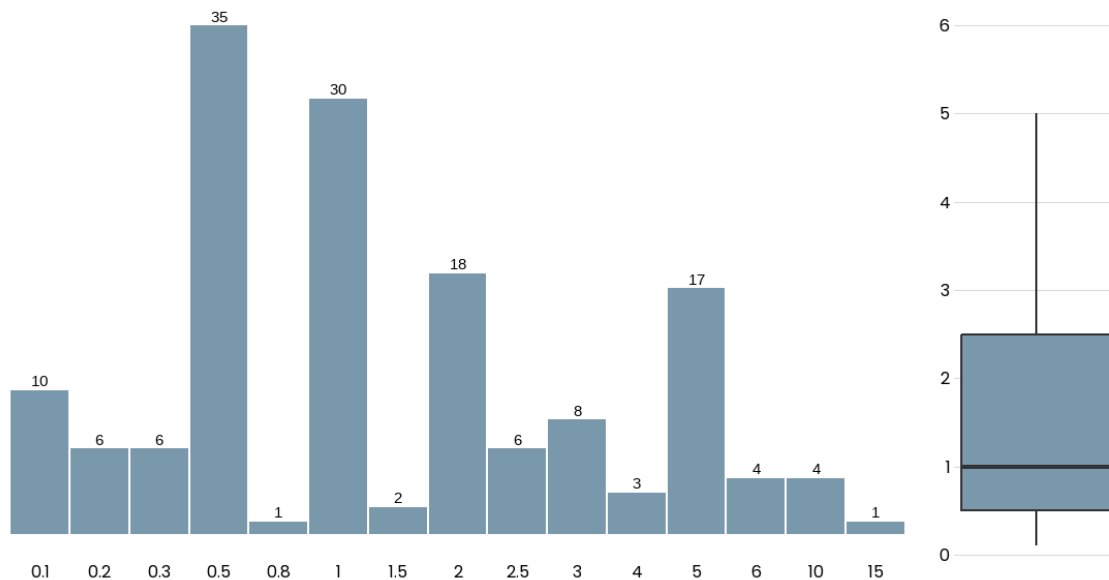
Field observations add texture to this reluctance. Beyond cost, enumerators reported that farmers feared externally sourced seedlings could introduce pests, worms, nematodes or diseases onto their farms, and believed that raising their own seedlings helped preserve the fruit qualities preferred by local buyers and kept crop characteristics consistent. At the same time, some farmers showed growing willingness to buy professionally raised seedlings when these were healthy, uniform, accessible and reasonably priced, viewing them as a way to improve yields and save labour. This conditional openness mirrors the willingness-to-pay pattern reported below.

Respondents were also asked how they would prefer to source their seedlings in a scenario where they were buying the more expensive hybrid seed. Of the 39% of respondents who already use hybrid seed for at least one vegetable, 43% said they would want to buy seedlings from a professional producer, as did 34% of those not yet using hybrid seed. In total, 152 respondents expressed interest in professionally raised seedlings under this scenario, while the remainder preferred to keep raising their own. The price these 152 farmers would be willing to pay per seedling is shown below.

From the farmers currently using hybrid seeds for at least one crop, 43% said they would want to buy seedlings from a professional producer

Willingness to pay for a professional seedling is modest and tightly compressed at the lower end. After removing outliers, the median price these 152 farmers would pay is 1 GHS per seedling. A quarter of them would pay no more than 0.5 GHS, half would pay no more than 1 GHS, and three quarters would pay no more than 2.5 GHS. Only the top quarter would pay between 2.5 and 5 GHS.

Figure 2.25 — Price willing to pay per seedling (GHS), count of respondents



3 AGRO-INPUT DEALER SURVEY

3.1 Introduction

This chapter presents the findings of a survey conducted among 53 agro-input dealers across Ghana. Agro-input dealers, the shops through which farmers buy most of their purchased seed, are a critical link between seed importers and distributors on the one hand and vegetable farmers on the other, and their stocking choices and advice shape which varieties ultimately reach the field.

The Ghana Seed Sector Assessment carried out by Wageningen University & Research (Bonnand et al., 2024) described agro-dealers as the main retail outlet for imported certified seed, while noting that the same shops also sell uncertified, often only labelled, seed from Ghanaian companies and farmer seed producers. For this uncertified seed, quality assurance rests on trust and on the dealer knowing the source rather than on formal certification. The assessment found that the sale of uncertified and sometimes poor-quality seed alongside certified seed creates distrust in commercial channels. That assessment, however, was carried out at sector level through desk research and stakeholder consultations, and did not survey agro-input dealers directly. The current survey is designed to fill that gap by providing dealer-level evidence on what shops stock, how they source and sell seed, how they relate to distributors, and how they view the market for hybrid seed and seedlings.

The present survey is designed to provide dealer-level evidence on what shops stock, how they source and sell seed, how they relate to distributors, and how they view the market for hybrid seed and seedlings.

The remainder of this chapter is structured as follows. Section 3.2 describes the demographics of the study group. Section 3.3 sets out the vegetable seed sales profile of the shops, and section 3.4 examines the sales of different vegetable seed brands and the dealers' relationships with their distributors. Section 3.5 looks at how dealers inform themselves and their current knowledge of Dutch vegetable seed brands. Section 3.6 presents the challenges they face in stocking and selling vegetable seeds, and section 3.7 concludes with dealers' perceptions of the market for seedlings.

3.2 Demographics of the study group

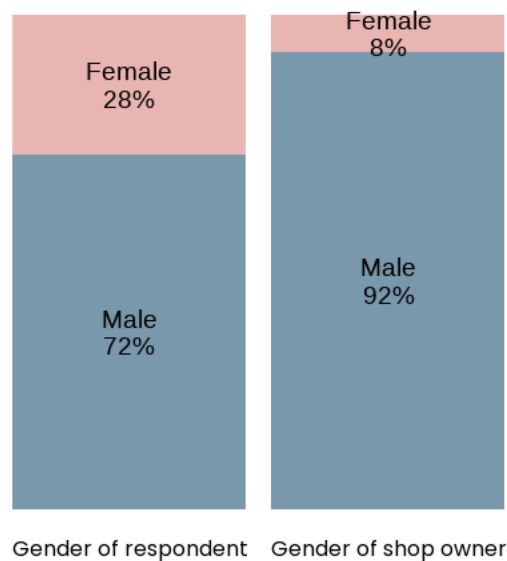
A total of 53 agro-input shops across 12 regions were interviewed. Figure 3.1 shows the geographic spread of the sample and the number of respondents per region. Coverage is widest in Ahafo (9 shops), Bono East (7) and Volta (6), while most other regions are represented by only one to five shops. Because of these small regional numbers, regional analysis is not meaningful for this dataset, and the dealer results are therefore discussed at the level of the full sample.

Figure 3.1 – Survey coverage, number of respondents per region



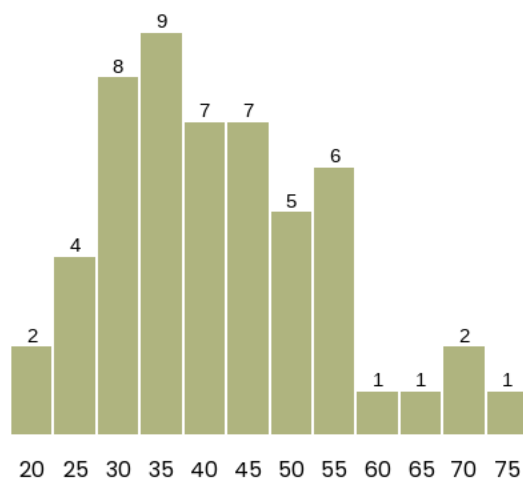
62% of the respondents were the owner of the shop, 23% an employee, and the remaining 15% either the spouse, of-age child or another relative of the owner. The gender profile differs markedly between ownership and the people actually interviewed (Figure 3.2). Shop ownership is strongly male-dominated, with 92% of shops owned by men and only 8% by women. Among respondents the share of women is considerably higher, at 28% against 72% men, reflecting that women appear more often as employees or relatives staffing the shop than as its owner.

Figure 3.2 – Gender of shop owner and gender of respondent, % of respondents



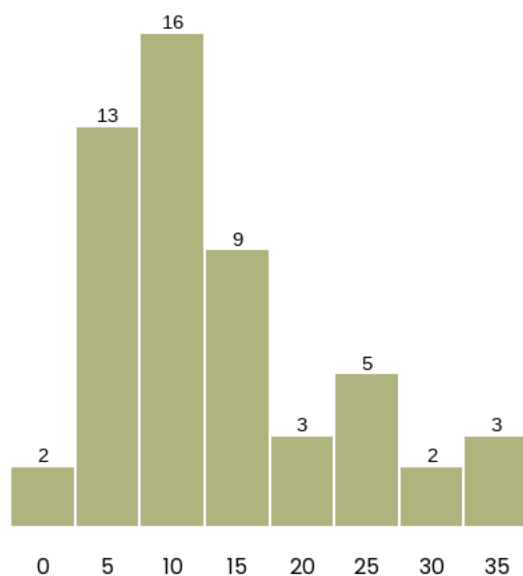
The average age of respondents is 42 years. At 45 years, the average age of the farmers surveyed (see section 2.2) is only slightly higher, so the two groups have a broadly comparable age profile, capturing both well-established and younger shop operators.

Figure 3.3 – Age of respondents (years), count of respondents



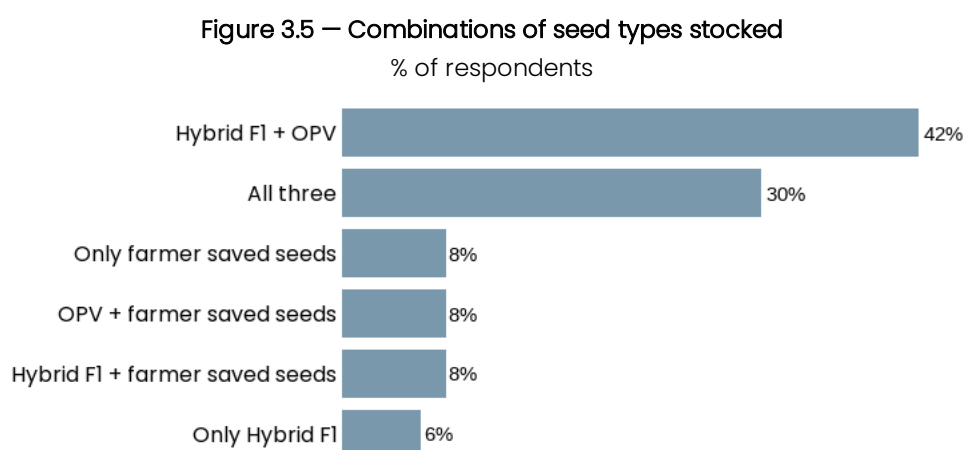
The shops had been in operation for an average of 13 years. Figure 3.4 shows the distribution of the number of years in operation. Most shops are relatively well-established, with the bulk of the sample having traded for between 5 and 15 years and a peak around 10 years, while a smaller group of long-standing shops has been in business for 25 years or more. Very few shops are recent entrants, suggesting that the agro-input retail sector in the sample is mature and characterised by businesses with substantial trading experience.

Figure 3.4 – Years in operation, count of shops



3.3 Vegetable seeds sales profile of the shops

Most shops stock a combination of seed types rather than a single type. Figure 3.5 shows the combinations of seed types stocked across the sample. The most common profile is stocking both hybrid F1 and OPV seed (42% of shops), followed by shops that stock all three types (30%), while only a small minority stock a single type, such as hybrid F1 only (6%) or only farmer-saved seed (8%). Overall, 85% of the interviewed shops stocked hybrid seeds, 79% stocked OPV seeds and 53% stocked local farmer-saved seeds.

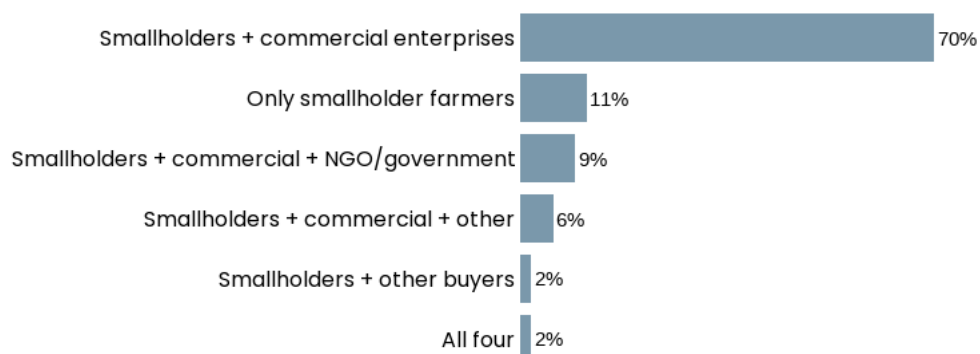


Overall, 85% of the interviewed shops stocked hybrid seeds, 79% stocked OPV seeds and 53% stocked local farmer-saved seeds. Shops reported that, on average, their sales consisted of 27% farmer-saved seed, 37% OPV and 36% hybrid.

When asked to estimate the relative sales volumes of the three seed types, shops reported that, on average, their sales consisted of 27% farmer-saved seed, 37% OPV and 36% hybrid. These shares are an average across the 53 shops and are not weighted by each shop's total sales volume, which was not collected. The actual volume shares across the market as a whole may therefore differ, for example if shops selling mainly hybrid seed have much higher total sales than those selling mainly farmer-saved seed.

Shops serve a mix of buyer types, as shown in Figure 3.6. By far the most common combination is selling to both smallholders and larger commercial farming enterprises (70% of shops), while 11% sell to smallholders only and the remaining shops add NGOs, government or other buyers to that base. Smallholders are therefore a universal customer group, with commercial enterprises the dominant second segment.

Figure 3.6: Buyer types served, % of respondents



Overall, all of the shops (100%) sold to smallholders, 87% to larger farming enterprises, 11% to development projects, NGOs or government, and 9% to other buyers. Other buyers included schools (mentioned by three shops), home gardens (mentioned once) and a hospital (mentioned once).

Measured by volume, average sales across the 53 shops went 64% to smallholders, 33% to larger farming enterprises, 1% to public organisations and 2% to other buyers. As with the seed-type split above, these shares are an average across the 53 shops and are not weighted by each shop's total sales volume, which was not collected. The actual volume shares across the market as a whole may therefore differ, for example if shops selling mainly to commercial enterprises have much higher total sales than those selling mainly to smallholders.

On payment terms, 87% of the shops require payment on purchase, while the remaining 13% offer trusted customers the option to buy on credit.

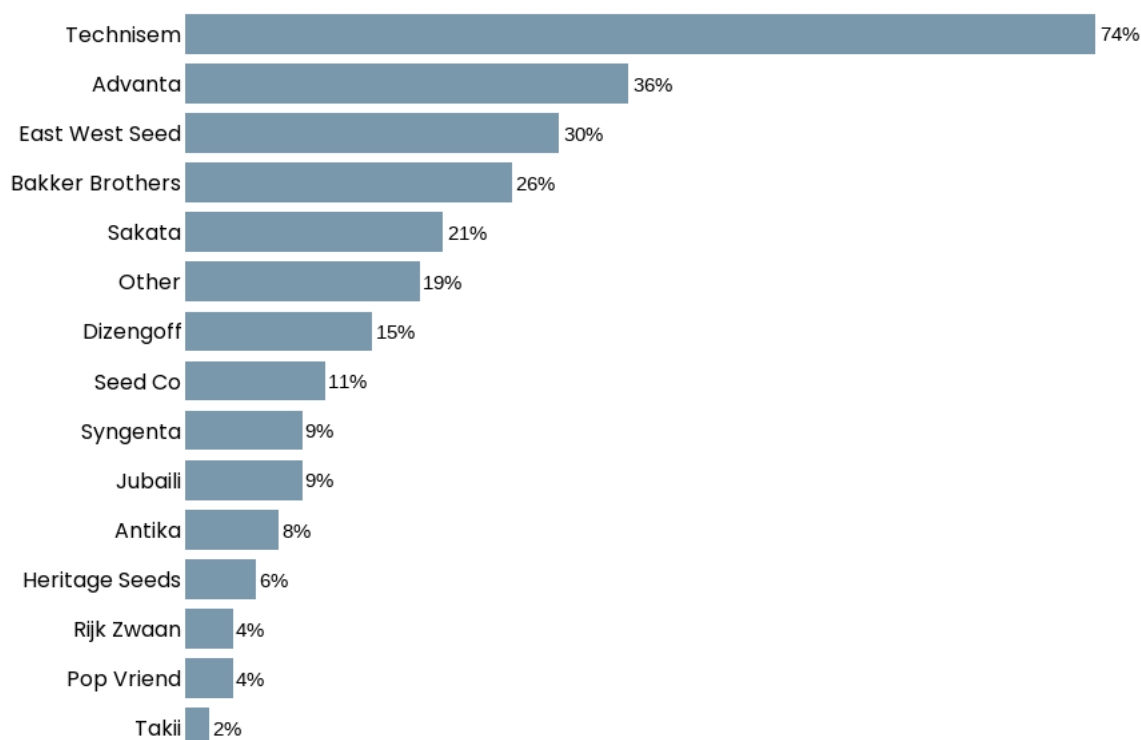
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3.4 Sales of different vegetable seed brands

Shops were asked which seed brands they stock. The results are shown in Figure 3.7. The name mentioned by far the most often is Technisem, stocked by 74% of shops, well ahead of any other brand. It is followed by Advanta (36%), East West Seed (30%) and Bakker Brothers (26%). A middle group is made up of Sakata (21%), Other (19%), Dizengoff (15%), Seed Co (11%), Syngenta (9%), Jubaili (9%) and Antika (8%), while Heritage Seeds (6%), Rijk Zwaan (4%), Pop Vriend (4%) and Takii (2%) are each named

by only a few shops. Several companies, including EasiSeeds and Enza Zaden are not stocked by any of the shops in the sample. Note that while some shops reported to stock 'Pop Vriend' seeds, this company is currently rebranded into KWS vegetables.

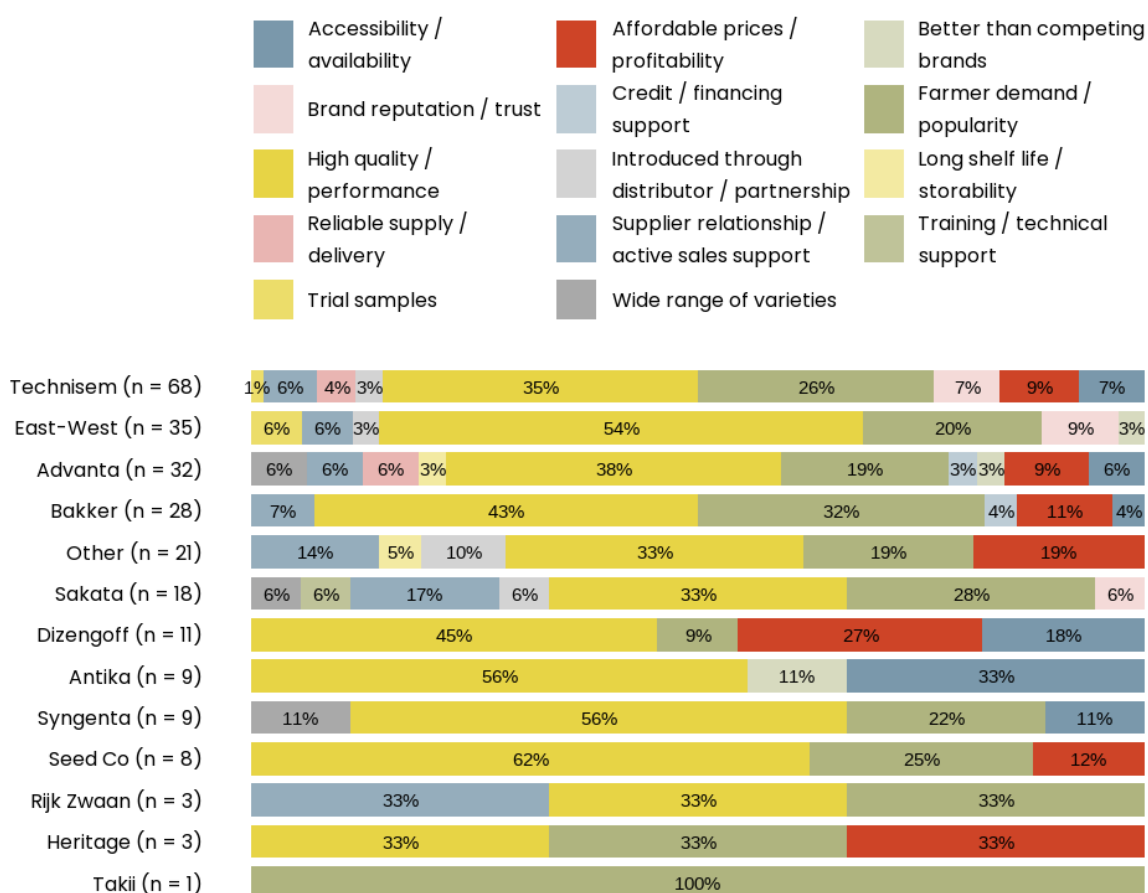
Figure 3.7: Seed brands stocked, % of respondents



For each brand a shop stocked, an open follow-up question asked why the agro-input dealer chose to stock it. The answers were grouped into a set of recurring reasons, which are shown per brand in Figure 3.8. Because the question was open, dealers could give more than one reason for a brand, so the figures show each reason as a share of all reasons mentioned for that brand rather than as a share of agro-input dealers. The label next to each brand gives the number of reasons on which its bar is based; brands supported by more responses, such as Technisem and East-West Seed, give a more reliable picture than those mentioned only a handful of times.

Across almost all brands, two reasons dominate: the perceived high quality and performance of the seed, and farmer demand or popularity. The price or profitability for the shop owner to sell a certain seed, and the relationship with the supplier are mentioned regularly but account for smaller shares, while reliability of supply, brand reputation and trial samples feature only occasionally.

Figure 3.8 – Reasons for stocking a seed brand, by seed brand, % of total number of reasons given across the respondents.



For each seed brand named, shops were asked how they receive the seeds, how they pay, how they would characterise their relationship with the distributor of that seed brand, and whether they receive training on seed use. The results are summarised by distributor in Figure 3.9.

Across almost all seed brands, the dominant way of receiving seeds is to place an order and have it sent to the shop (86%), while only a minority collect the seeds themselves from a distribution centre. Payment arrangements are more varied: paying on placing the order (59%) is most common, and paying on receipt (16%), buy on credit and pay gradually when selling (17%), and paying within a set term (8%) make up the rest of the overall sample. Relationships are reported as overwhelmingly smooth, with most brands scoring close to 100% on the statement that shops always get the seeds when they need them, and only small shares reporting difficulties in accessing seed on time. Training on seed use is the most uneven dimension: for some brands, such as Heritage Seeds and Antika, all of the shops that buy them report receiving training, whereas for others a majority report receiving none, most notably Syngenta (60% no) and the 'other' category (53% no).

Figure 3.9 – Seed receipt, payment, distributor relationship and training, by seed brand, % of respondents buying that brand



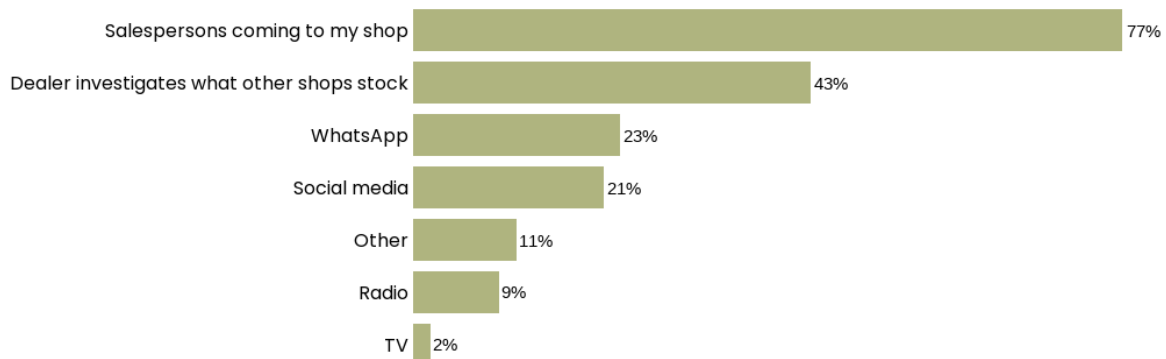
These per-brand figures should be read with caution, as several brands are named by only a handful of shops, so a single response can shift a brand's percentages substantially. They are best understood as broad indications rather than precise measurements.

Across almost all seed brands, the dominant way of receiving seeds is to place an order and have it sent to the shop. Relationships are reported as overwhelmingly smooth, with most brands scoring close to 100% on the statement that shops always get the seeds when they need them. Training on seed use is the most uneven dimension across different brands.

3.5 Ways of being informed

Shops keep up to date with the vegetable seed market through a range of channels. Figure 3.10 shows the share of shops that use each channel. By far the most important is sales people visiting the shop, mentioned by 77% of respondents, followed by the shop actively checking what other shops stock (43%). Digital and broadcast channels play a smaller role: WhatsApp (23%) and social media more broadly (21%) are used by around one in five shops, while radio (9%) and television (2%) are marginal. This underlines that the market is still largely informed through direct, in-person contact rather than media.

Figure 3.10 – Channels through which shop owners receive market information, % of respondents



Respondents who selected 'Other' specified that they receive information through experienced farmers (n = 4) or through organisations, such as the Green House Farmers Association (n = 2).

Among the 11 shops that inform themselves through social media, Facebook is the most used platform (64%), followed by TikTok (46%) and Instagram (18%); LinkedIn was used by a single respondent (9%) and none used Twitter. More broadly, WhatsApp is near-universal among the shops: 91% of respondents use it generally, even though only 23% indicate that they rely on it specifically as a channel for market information.

3.6 Challenges with stocking and selling vegetable seeds

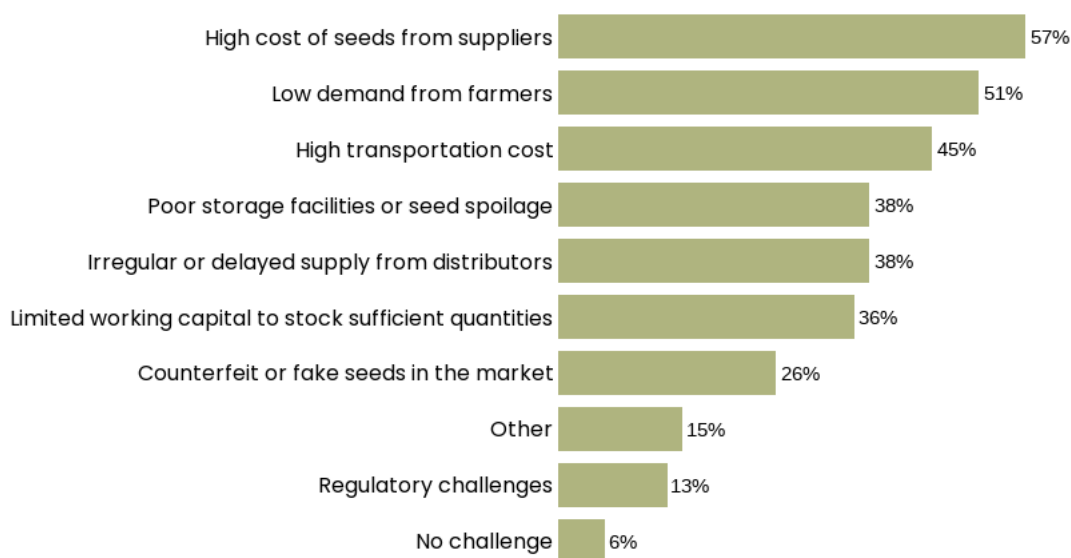
To understand the constraints shops face in their day-to-day business, dealers were asked which challenges they encounter in stocking and selling vegetable seeds. Respondents could name more

than one challenge, and the results are shown in Figure 3.11. The challenge mentioned most often is the high cost of seeds from suppliers, reported by 57% of shops, closely followed by low demand from farmers (51%) and high transportation costs (45%). Poor storage facilities or seed spoilage and irregular or delayed supply from distributors are each mentioned by 38% of shops, and limited working capital to stock sufficient quantities by 36%. Counterfeit or fake seeds in the market are a concern for 26% of shops, while other issues (15%) and regulatory challenges (13%) are less commonly cited. Only 6% of shops report facing no challenges at all.

The challenge mentioned most often is the high cost of seeds from suppliers, reported by 57% of shops, closely followed by low demand from farmers (51%) and high transportation costs (45%).

The picture that emerges is dominated by cost and demand. Three of the most frequently cited challenges (high seed cost, high transportation cost and limited working capital) are financial in nature, while weak and uncertain demand from farmers compounds the pressure on shops. Together with the concerns around seed spoilage, unreliable supply and counterfeit seed, this points to a retail environment in which thin margins and constrained working capital leave little room to absorb shocks.

Figure 3.11 – Challenges with stocking and selling vegetable seeds, % of respondents



Field observations show how this caution plays out specifically for hybrid seed. Enumerators found that some smaller shops, in communities such as Dumesua, Pramso and Krom Adwafo, did not stock hybrid seed at all because farmer demand was too low, with one shop owner noting that a sample of F1 seed supplied by a major seed company had remained unsold for nearly a year. Demand was also reported to be strongly seasonal, rising during the rainy planting season and falling sharply in the dry season, which makes shops wary of tying up limited working capital in hybrid stock that may not move. This helps explain why low farmer demand (51%) ranks alongside cost as a leading challenge.

3.7 Perception on the market for seedlings

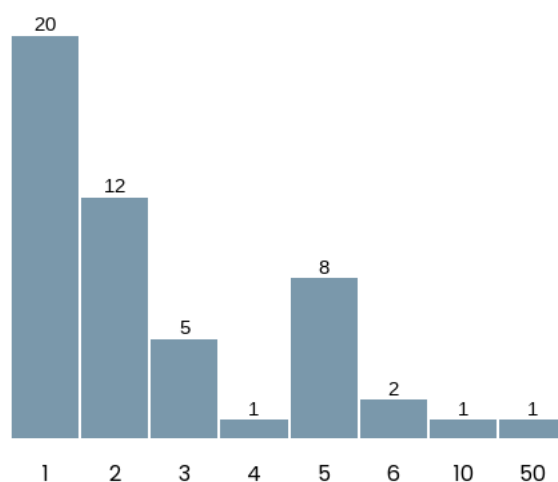
Agro-input dealers were asked whether they see any demand for professionally raised seedlings. Perceived demand is modest: 47% of dealers thought there was no demand at all and a further 45% thought there was only little demand, while just 8% saw a lot of demand.

Agro-input dealers perceived demand for professionally raised seedlings modest: 47% of dealers thought there was no demand at all and a further 45% thought there was only little demand, while just 8% saw a lot of demand.

Despite this, a quarter of dealers (25%) indicated that they might be interested in selling professionally raised seedlings alongside their seeds, suggesting some latent willingness to enter the business even where current demand is seen as limited.

Dealers were also asked what they thought a single seedling should sell for. The distribution of their answers is shown in Figure 3.12. The most common answer was 1 GHS (20 respondents), followed by 2 GHS (12 respondents), with a smaller cluster around 5 GHS and a few outliers naming prices as high as 10 or 50 GHS. The median price dealers thought a seedling should sell for was 2 GHS, which is significantly higher than the price farmers themselves indicated they would be willing to pay which had a median of 1 GHS.

Figure 3.12 – Price a seedling should sell for (GHS), count of respondents



4 SEED IMPORTER SURVEY

4.1 Introduction

This chapter presents the findings of a survey conducted among 11 seed importing companies and 9 local or regional distributors/wholesalers in Ghana. Importers and distributors sit at the top of the vegetable seed supply chain: they bring seed into the country and distribute it to the network of agro-input dealers from which farmers ultimately buy. Their sourcing, distribution and marketing choices therefore shape which varieties reach the field.

The Ghana Seed Sector Assessment carried out by Wageningen University & Research (Bonnand et al., 2024) identified limited last-mile distribution as one of the main barriers holding back the uptake of improved varieties, but examined the sector at a high level, rather than surveying importers and distributors directly. The present survey is designed to fill that gap by providing evidence from the supply side on how seed is imported, stored, distributed and marketed, and on how these businesses view the market for hybrid seed and seedlings.

The remainder of this chapter is structured as follows. Section 4.2 describes the demographics of the study group. Section 4.3 sets out the challenges these businesses face in the seed business, and section 4.4 examines the distribution system through which they supply agro-input dealers. Section 4.5 concludes with their perceptions of the market for seedlings.

4.2 Demographics of the study group

The study group comprised two types of business: seed importers and seed distributors. Importers have a direct relationship with the seed brands and bring seed into the country, but also distribute it themselves. Distributors, as the term is used in this chapter, do not import; they buy seed in bulk from importers and sell it on at wholesale to agro-input dealers, who in turn retail it to farmers. Both importers and distributors may in some cases also sell directly to farmers, but their defining characteristic is that they supply agro-input dealers.

Eleven importing companies were interviewed at 14 locations in total, as some operate several regional offices (2 for Jubaili, 3 for Agriseed Ltd). A further 9 distributors were interviewed. A full overview of the businesses and the brands they represent is given in Annex I.

Seeds account for a widely varying share of total turnover in both groups, from 6% to 100%, averaging 61% for importers and 46% for distributors. Hybrid seed makes up an average of 58% of the seed sold across both groups, again ranging widely (5% to 100%).

Storage practices differ between the two groups. The table below shows the storage methods reported by importers and distributors. Most likely distributors stock much smaller quantities of seed, which can be contained in a refrigerator, likely explaining the higher percentage in this category.

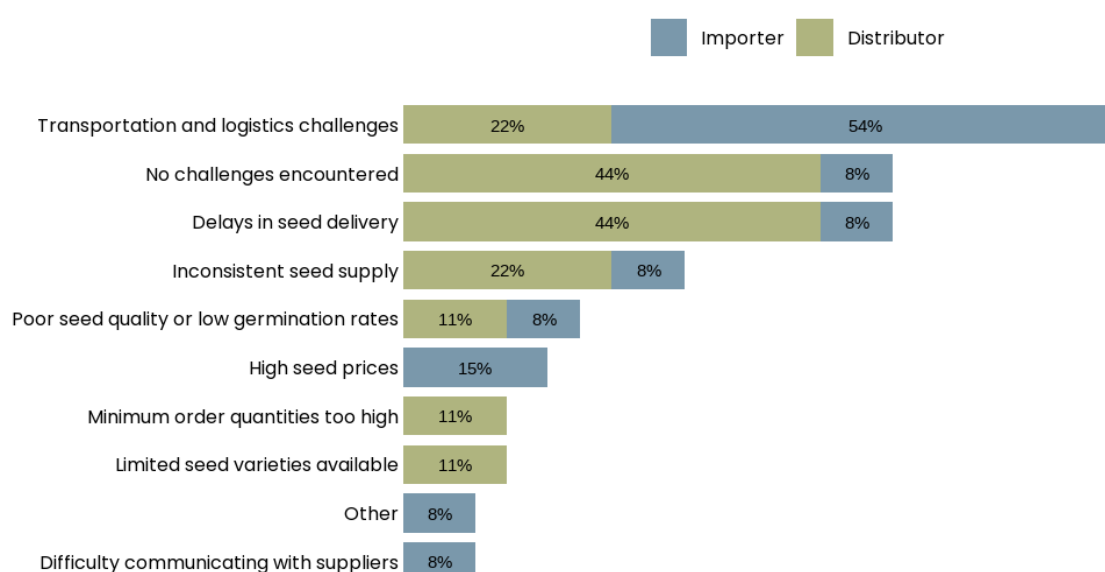
Table 4.1 — Storage methods for vegetable seeds, by type of business, % of respondents

Storage of vegetable seeds	Importer	Distributor
Air-conditioned room (16–20°C)	72	22
Ambient temperature	14	22
Refrigerator/cold room (<10°C)	14	56

4.3 Challenges in seed business

Figure 4.1 shows the challenges respondents encountered with the supplier of their seed. Note that respondents could select more than one challenge and therefore the sum of percentages will exceed 100%. Transportation and logistics challenges are by far the most common, cited by 54% of importers and 22% of distributors, while nearly half of the distributors (44%) reported delays in seed delivery. A further challenge mentioned under 'Other' (n=1) was that the seed brand owner also supplied the same seed to competing importers.

Figure 4.1 — Challenges experienced with the seed supplier, by type of business, % of respondents



Respondents described the supplier-related challenges in their own words. The following are a selection of representative answers rather than a complete overview. One distributor explained:

“ Sometimes when I buy from them and the demand is high in the system, the suppliers run out of stock and the few seeds in the system are being hoarded and sold at higher prices which delays the seed delivery process.

Importers, in turn, pointed to the cost and logistics of bringing seed into the country:

“ Import tariffs, quotas, and compliance requirements increase expenses, which are often passed on to consumers.

“ When the goods come to the ports, the clearing of the goods takes a long time. It delays.

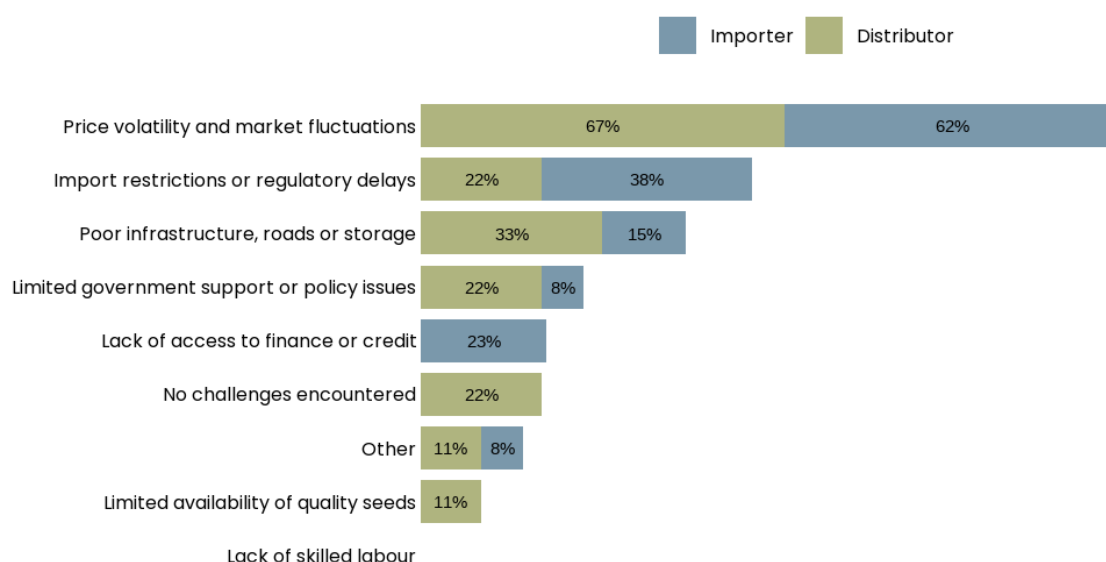
“ We face a lot of transportation challenges, especially due to bad roads. In our current shipment we have lost all the seed going to our outlets in the northern region, due to bad roads, and since seeds need to be stored at the right temperature all the seeds had to be discarded.

Beyond the supplier relationship, respondents were asked about general challenges affecting their seed business, shown in Figure 4.2. Price volatility and market fluctuations (e.g. demand, seasonality) dominate, cited by 62% of importers and 67% of distributors, followed by import restrictions or regulatory delays and poor infrastructure.

Taken together, the two figures point to a common theme: importers are most affected by challenges at the border and in the supply chain (import costs, customs clearing, transport and logistics), while distributors are more exposed to downstream conditions such as price fluctuations of the vegetable seeds and storage. Access to finance and unstable prices are concerns shared across both groups.

Price volatility and market fluctuations are a dominant sector challenge affecting international vegetable seed business, cited by 62% of importers and 67% of distributors

Figure 4.2 – General seed-sector challenges affecting the business, by type of business, % of respondents



Field observations from the distributor interviews reinforce two of these themes. Enumerators noted that storage facilities are often not suited to the temperature, moisture and ventilation control that preserves seed viability. As such, seed quality can decline in store, an observation consistent with the storage practices reported in section 4.2. They also found that distributors deliberately import only

limited quantities, because farmer demand is low and erratic, partly because farmers lose confidence in a variety after a single poor harvest. In turn, this caution creates occasional seed shortages when demand suddenly peaks at the start of the planting season.

Respondents also illustrated these broader sector challenges through their own experiences. Again, the quotes below are a selection of representative answers. Importers highlighted finance, import costs and price instability:

“ There’s limited credit for distributors, because the financial institutions see our business as risky.

“ High import cost and the way the seeds are handled by the custom officers affect the quality and the price of the seeds. There are some seeds that the government does not allow us to import, but which are available in our neighbouring countries with good quality.

“ There are high import charges and inconsistent processes in clearing the vegetable seeds.

“ We find it hard to set stable prices, when market prices keep changing.

“ High inflation and fluctuating interest rates negatively affect the vegetable business.

Distributors, meanwhile, emphasised storage losses and price volatility in the market:

“ Because of lack of good storage facilities, coupled with the weather conditions in the North, quality seeds mostly lose their viability after buying, which mostly leads to poor yields.

“ Within a short period, we experience price fluctuation in the market. When the prices keep fluctuating, it affects business as the demand of farmers is what drives the patronage of agro shops.

“ Recently, a supplier of ours reduced the price of their products, which affected our business, as we had stocked a lot but had to reduce the price to meet the current market price.

4.4 Distribution system

Both importers and distributors have several outlets or warehouses of their own. These serve clients directly but also act as central distribution points from which seeds are sent to a network of agro-input dealers. **Wholesalers own 6 outlets or warehouses on average and importers own 10. From these, each company supplies between 10 and 100 agro-input dealers, with an average of 50.**

Companies reach their dealers in different ways: 5 (25%) own cars that they use to deliver to shops, 4 (20%, all of them importers) require agro-input dealers to collect orders from their warehouses, and 11 **(55%) send seeds by public transport to dealers who have ordered.** All companies report that they can fulfil orders within 1 to 3 days.

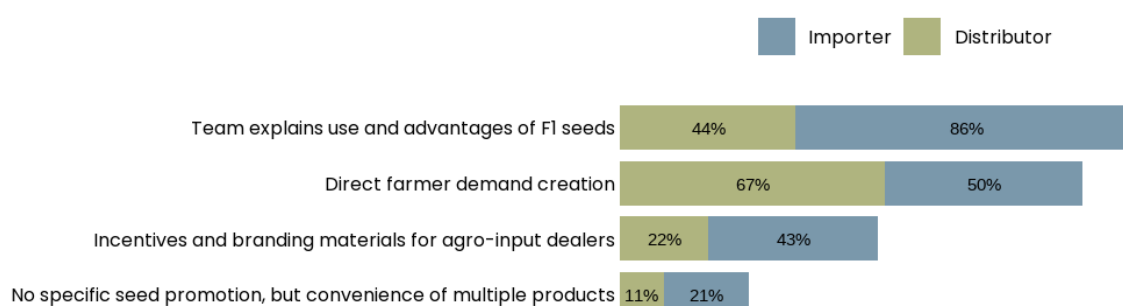
Payment terms vary: 13 companies **(65%) require shops to pay when placing their order**, 5 (25%) allow a payment term after the order is placed (for example 30 days), and only 2 (10%) are able to sell on credit to agro-input dealers.

Nine companies (45%, 4 distributors and 5 importers) reported using accounting software or tailor-made software, in most cases supplemented by Excel and paper-based records for some tasks. The remaining companies relied solely on Excel, supported by paper-based records for some tasks.

Companies use a range of marketing and sales approaches to convince agro-input dealers to buy from them, shown in Figure 4.3. The most common among importers is having a team explain the use and advantages of F1 hybrid seeds (86%), while distributors most often rely on direct farmer demand creation (67%).

Companies use a range of marketing and sales approaches to convince agro-input dealers to buy from them. The most common among importers is having a team explain the use and advantages of F1 hybrid seeds (86%), while distributors most often rely on direct farmer demand creation (67%).

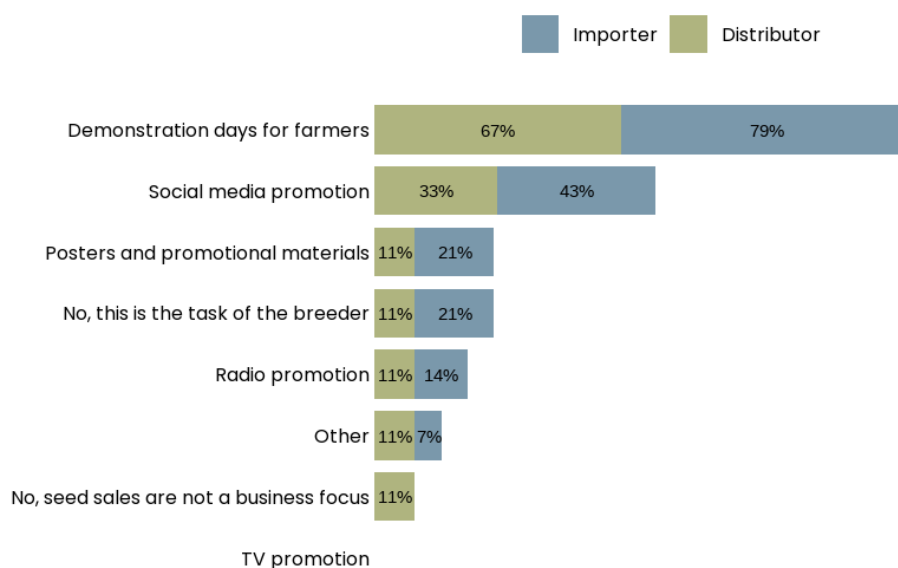
Figure 4.3 — Marketing and sales approaches used to convince agro-input dealers, by type of business, % of respondents



Companies also promote directly to farmers, as shown in Figure 4.4. Demonstration days for farmers are the leading approach for both groups (79% of importers and 67% of distributors), followed by social media promotion. Under 'Other', respondents specified the use of Community Information Centres.

Social media is one of the approaches used to promote directly to farmers. Of the 8 companies that use social media, 6 use Facebook, 3 use Twitter, and 2 each use Instagram and TikTok, while 1 uses LinkedIn. In addition, 6 use WhatsApp groups to share information.

Figure 4.4 — Marketing and sales approaches used to promote among farmers, by type of business, % of respondents



4.5 Perception on the market for seedlings

39% of the respondents would be interested in venturing into selling seedlings, whereby they would also see themselves as the producers of the seedlings rather than only the distributor. Field observations support this interest: enumerators reported that many distributors are already familiar with the seedling business and see it as a potentially lucrative way to diversify, drawing on their existing position in the seed value chain. They also recognise, however, that succeeding in it would require proper infrastructure, technical expertise and consistent quality control to meet farmers' expectations and build trust.

39% of the respondents would be interested in venturing into selling seedlings.

A selection of representative answers from those who were interested illustrates their reasoning:

“I'm familiar with the seedling business and it's becoming increasingly important in vegetable production. It makes sense for farmers to buy hybrid seedlings.

“It will help the farmers use less time in farming because they will not spend much time nursing their seeds and later transplanting, also, I will supply them with quality seedlings and finally, it will increase my income.

“We serve customers based on their needs. Once they are interested, we serve those needs

Among those who were not interested, representative answers included the following:

“It will not sell, most farmers have a local mentality and it is difficult to satisfy them. They prefer the farm saved seeds to their OPV and hybrid so the market for seed is even difficult to make returns on take less of seedlings they will not patronize it.

“ The company does not want to shift from its focus on importation and distribution of vegetable seeds.

“No, we are not into seedling business. For the farmers, I know they prefer to buy the seeds and do their own nursery than buy the seedlings. So I don't know if they would be interested in buying hybrid seedlings.

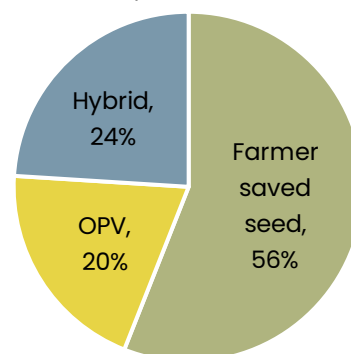
5 CONCLUSIONS

This study aims to understand demand, distribution and supply in Ghana's vegetable seed system, drawing on three separate surveys: 409 vegetable farmers, 53 agro-input shops, and 20 seed importers and distributors. The preceding chapters presented the findings of each survey. This chapter draws those threads together, and sets out what the findings mean for the target audience of the study.

5.1 Findings on the Ghana seeds sector that inform the Ghana Seed Partnership

Before turning to the specifics, a few features of the sector stand out. Vegetable growing in Ghana is overwhelmingly a smallholder activity, and for most growers a commercial one. The typical grower is an owner-operator, on average 45 years old. Hybrid-seed users are on average younger: 41 years versus 48 years for farmers using farmer saved seeds. Around a quarter of farms (27%) in the sample are female-owned. Holdings are averaging 5.1 acres with 2.1 acres under vegetables, and smaller farms tend to devote a larger part of their farm to vegetables. Male-owned farms are on average larger (5.7 acres) than female-owned ones (3.4 acres). Just over half of farms (53%) are fully irrigated, a share that rises to 80% among farmers using hybrid seed.

Figure 5.1. Type of seed used for the main crop.



Farmers draw on three types of seed. Farmer-saved seed is used by around 56% of farmers on their *main crop*, against 20% for purchased open-pollinated varieties (OPV) and 24% for F1 hybrids. More broadly, 35% of farmers used hybrid seed on at least one of their crops, and 63% of all respondents had heard of hybrid seed.

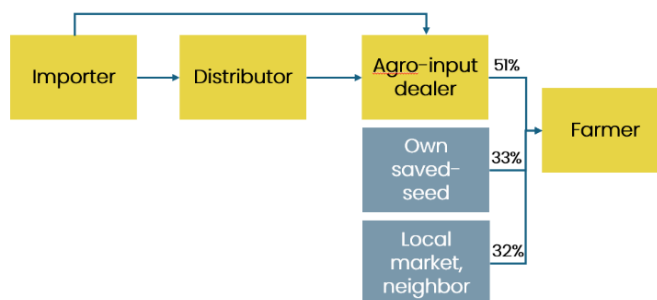
Access to improved seed is markedly unequal, most visibly by gender. Across the sample, 47% of male-owned farms use hybrid seed on at least one crop, against only 15% of female-owned farms (35% versus 10% on the main crop). Field observations suggest this gap is driven less by awareness or preference than by cost and access: women, who typically farm smaller plots, lean on farmer-saved seed because it is affordable, familiar and easy to obtain.

Vegetable seed enters the Ghanaian market through importers, who hold the relationship with the international seed brands. From there it reaches farmers along two routes. Importers supply some agro-input dealers directly, and they also sell to 'distributors' who act as regional wholesalers and in turn supply agro-input dealers. The agro-input dealer is the common point at which 51% of the farmers in the sample buy their seed.

Moving seed through the chain relies heavily on public infrastructure. From their distribution centres, importers and distributors reach agro-input dealers mostly by public transport (used by 55% of the companies) or their own vehicles, while a minority does not deliver seeds. Agro-input dealers in turn sell 64% of their vegetable seeds to smallholders and 33% to larger farming enterprises. Credit is thin

along the chain: between 10% to 17% of agro-input dealers obtain their seed on credit from suppliers, and just 13% of shops in turn extend credit to farmers, with the large majority requiring payment on purchase. This limited use of trade credit constrains how much stock dealers can carry and how flexibly farmers can buy.

Figure 5.2. Flow diagram of Ghanaian seed-supply system.



Challenges recur at every step. The cost of seed, high transportation costs and poor road conditions are raised as main challenges throughout the chain, from importers losing entire shipments on bad roads to dealers citing high supplier prices and transport costs. Inadequate storage is a further common problem at both distribution and agro-input dealer level, where seed that is not kept at the right temperature and humidity, quickly loses its viability. On top of these logistical constraints, 51% of agro-input dealers point to low farmer demand as a major challenge, while 38% of importers cite regulatory hurdles, such as import restrictions and customs delays.

Reliability of supply is a further concern. While 80% of farmers report that their agro-input dealer stocks hybrid seed, roughly one in six of those who prefer hybrid (17%) or OPV (18%) say it is not consistently available. When their preferred seed is out of stock, 79% of affected farmers fall back to farmer-saved seed. This suggests that strengthening the dependability of the distribution chain matters as much as stimulating demand.

5.2 Conclusions for international seed companies

For international seed companies that market hybrid varieties, the demand fundamentals in Ghana are encouraging. 90% of hybrid seed-aware farmers believe that hybrid seed can raise their incomes, and the survey data supports this: hybrid users report markedly higher profits per acre than those relying on OPV or farmer-saved seed, a median of 6,350 GHS per acre against 2,256 GHS for farmer-saved users and 1,776 GHS for OPV users. The upside is also substantial. The top quarter of hybrid users earned more than 16,400 GHS per acre, and the best-performing farms reached close to 38,300 GHS, well above the best results for OPV or farmer-saved seed. Downside outcomes, by contrast, are broadly similar across all three seed types. In each category, approximately a quarter of the farmers turning a loss on their farming enterprise. Hybrid seed therefore raises the ceiling without lowering the floor, an argument that should resonate with risk-conscious farmers.

Farmers are also realistic about the conditions hybrids require, recognising that they perform best with good management, irrigation and fertiliser. The data confirm this: hybrid seed is taken up mainly by farmers who have been able to make those investments. 80% of the farmers using hybrid seed for their main crop have irrigation, versus 39% of the farmers using farmer saved seeds. Adoption is concentrated in higher-value niche crops such as cabbage (70% grown with hybrid seeds), while the more common crops as also shown in figure 5.1, (i.e. pepper, tomato, okra and garden eggs) remain dominated by farmer-saved seed (i.e. 71%, 55%, 76% and 74% respectively). The crops most widely grown, pepper and okra, are also among the ones with the lowest margin.

Importantly, and despite some lingering misconceptions, farmers hold an overall positive perception of hybrid seed and report positive experiences with it. Among the 63% of the respondents who are aware of hybrid seed, 90% believes it can raise income, improve quality (88%), yield (87%) and grows faster (88%). Satisfaction among those who have used it is near-universal: 99% say they would plant it again and 98% that they would recommend it to other farmers.

The route to those farmers runs only partly through formal trade. Agro-input dealers play a limited but still significant role: only 51% of farmers buy their seed at agro-input shops, and even within those shops farmer-saved seed still accounts for around 27% of sales. Farmers are discerning about where they buy: 43% bypass the nearest agro-input dealer to reach a preferred one instead. This suggest that agro-input dealers, and the brands behind them, that build a reputation for quality and reliability have a market advantage.

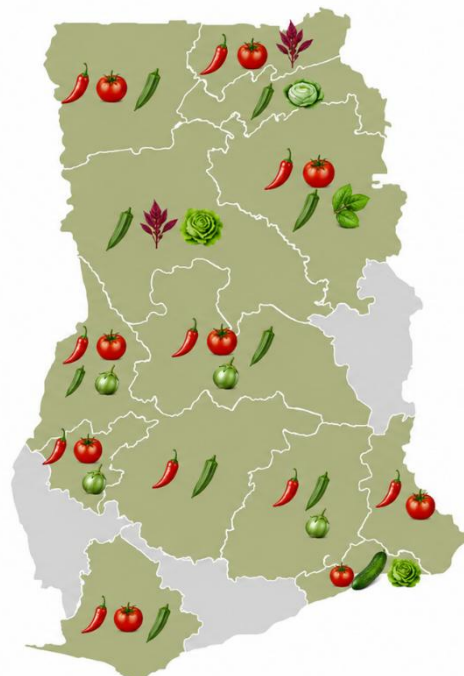
Among brands, Technisem is by far the most widely stocked, named by 74% of shops, followed by Advanta (36%) and East-West Seed (30%). Dealers cite the quality of the seed as the most important reason to stock a particular brand, ahead of farmer demand. Support to dealers varies widely between brands, however, from extensive training on seed use to none at all, which suggest room for new entrants to differentiate through agronomic support and training.

For an international company entering through a partnership with an importer, the implication is consistent across study findings: there is a genuine, data-backed market for hybrid seed, but it is built on quality, agronomic performance and the trust of discerning farmers and dealers, rather than on price or breadth of distribution alone.

5.3 Conclusions for a potential marketing campaign on hybrid varieties

Within the vegetable seed distribution structure, importers and distributors currently work to move their brands in two reinforcing ways. They first make sure their seed is stocked, through direct interaction with agro-input dealers (86% of importers, 44% of distributors), and then work to create demand among farmers to move those stocks (62% of distributors, 50% of importers). The primary tool for demand creation is the demonstration field, where farmers can see the performance of a variety for themselves. Social media plays a supporting role, mainly at dealer level, as 21% of agro-input dealers indicate to receive information through social media, versus 3% of farmers. Although 50% of the farmers and 91% of the agro-input dealers uses WhatsApp, only 3% of the farmers and 23% of agro-input dealers indicate that they use this channel to inform themselves about seed use.

Figure 5.3 Pictorial of crops grown per region. Including all crops grown by >40% of the respondents in certain region.



The choice of channel matters because of how farmers actually form their views. Farmers report that they are influenced above all by fellow farmers (41%), with demonstration fields (6%), radio (8%) and social media (3%) each playing a relatively small role by comparison. This points strongly towards a farmer-centred campaign that mobilises peer influence. Timing the campaign to the planting season, and linking the message to genuine market demand for the resulting produce, will further strengthen its relevance.

A potential marketing campaign will need to confront a set of misconceptions that hold farmers back. Among the most important is the perceived 'unnaturalness' of hybrid seed, including beliefs that it is unsuitable for human consumption (22%), that it is created in a laboratory (64%), or that it is genetically modified (51%). Alongside correcting these misunderstandings, farmers need practical support to reduce both the perceived and the actual risk of using hybrid seed, so that the higher up-front investment feels safe enough to take on. Addressing perception and risk together, through trusted peers, is likely to be more persuasive than messaging on yield and income claims alone.

A marketing campaign should concentrate where hybrids visibly pay off: higher-value crops such as cabbage and the better-irrigated regions where farmers achieve higher profits. Here farmers can maintain hybrid seeds under the right conditions, and can most readily see the upside of improved seed.

5.4 Conclusions for seedling businesses

At present, less than 1% of the farmers surveyed buy in their seedlings (0.49%): 89% raise their own, 10% sow directly in the field and 6% obtain seedlings from a neighbour (a farmer may use several sources). Farmers are generally satisfied with the results of raising their own seedlings, which goes some way to explaining why the practice is so widespread. There is, however, a latent market. Among the farmers who already use hybrid seed for at least one vegetable, 43% said they would be willing to buy seedlings from a professional producer. Those farmers that are not open to using professionally raised seedlings, cite the fear of pest and disease infestation that externally sourced seedlings may bring to their farm.

On the supply side, perceptions are more cautious. Agro-input dealers regard demand for professionally raised seedlings as modest: 47% saw no demand at all and a further 45% saw only little demand, while just 8% reported strong demand. Despite this, a quarter of dealers (25%) indicated that they might be interested in selling professionally raised seedlings alongside their seeds, and appetite is higher further up the chain, where 39% of importers and distributors said they would consider venturing into seedlings. Pricing is the gap to bridge: farmers are willing to pay around 1 GHS per seedling, whereas agro-input dealers believe they would need to sell at roughly 2 GHS.

Overall, demand for professionally raised seedlings is not universal, but it is sufficient to build a business case on. The opportunity is concentrated among commercial, hybrid-using farmers rather than the smallholder majority. A workable model will need to close the gap between what farmers are willing to pay and what suppliers consider viable, for example by focusing on the high-value crops where the economics of bought-in seedlings are most compelling.

ANNEX I: LIST OF IMPORTER AND DISTRIBUTION COMPANIES INTERVIEWED

Name company	District	Region	Person interviewed	Website	Seed brands represented
Importers					
Jubaili Agrotec Ghana	Tamale	Northern Region	Sale manager	Jubaili Agrotec Ghana	Jubaili (own produced), Seminis (Bayer)
Jubaili Agrotec Ghana	Atwima Kwanwoma	Ashanti Region	Agronomist	Jubaili Agrotec Ghana	Jubaili (own produced), Seminis (Bayer)
Agriseed Ltd	Ho Municipal	Volta Region	Sales Manager	Agriseed Ltd Facebook	Seed Co, Syngenta Group, Technisem
Agriseed Ltd	Tamale Central	Northern Region	Sales Manager	Agriseed Ltd Facebook	Seed Co, Syngenta Group, Technisem
Agriseed Ltd	Korle-Klottey Municipality	Greater Accra Region	Marketing Manager	Agriseed Ltd Facebook	Seed Co, Syngenta Group, Technisem
Dizengof Ghana Limited	Accra Metropolitan Assembly	Greater Accra Region	Seed Business Manager	Seeds - Dizengoff Ghana	Hazera, Vokkal Seeds
Demeter Ghana Ltd.	Accra Metropolitan Assembly	Greater Accra Region	Head of Agronomy and Sales	Demeter Ghana Limited - Helping Ghana Grow	Bakker Brothers, Hazera
Qualiseed Limited	Adentan Municipality	Greater Accra Region	Chief Executive Officer	Qualiseed Facebook	Advanta, Bakker Brothers, Sakata, Seed Co, Technisem
Exotic Hybrid Seeds	Adentan Municipality	Greater Accra Region	Sales Manager		Exotic Hybrid Seeds
RMG Ghana Limited	Airport Residential	Greater Accra Region	Corporate Sales Manager	RMG Concept Group: Overview LinkedIn	Aptiva, Kysar
Holland Greentech	Ayawaso West Municipality	Greater Accra Region	Regional Director	Home Holland Greentech main	Rijk Zwaan
Meridian Seeds and Nursery Ltd	Ayawaso West Municipal	Greater Accra Region	Operations Manager	meridianseedsggh.com	East-West Seed, Takii, Technisem, Kalash, GSN Seeds, Suba Seeds
Callighana	Ayawaso West Municipal	Greater Accra Region	Manager Director	Callighana Facebook	Advanta, Bejo

Name company	District	Region	Person interviewed	Website	Seed brands represented
Miqdadi Limited	La Dade Kotopon	Greater Accra Region	Sales manager	Agrimatco Ltd	Bayer, Enza Zaden, Syngenta

Distributors or Local/regional wholesalers					
Hadiola Agro-Chemicals Company Limited	Kumbugu	Northern Region	Director	-	Advanta, Bakker Brothers, East-West Seed, Heritage Seeds, Syngenta Group
WAAF Agro Limited	Techiman Municipal	Bono East Region	Manager	WAAF Agro Limited – Built with SitePad	Sakata, Solevo
Antika Company Ltd	Wa Municipal	Upper West Region	Accountant	About Us – Antika	Antika Company, CSIR-Crop Research Institute, East-West Seed, Heritage Seeds, NAFASO, Rijk Zwaan, Seed Co, Syngenta Group, Technisem
18th April Co. Ltd	Wa Municipal	Upper West Region	Managing Director	18th April Co. Facebook	Bakker Brothers, East-West Seed, Technisem
B. Kaakyire Agro Chemicals Ltd	Kumasi Metropolitan	Ashanti Region	Sales Executive	Home – B. Kaakyire Agro Chemicals Ltd	Advanta, Bakker Brothers, East-West Seed, Sakata, Technisem, Kalash
Dapsy Agro Products	Kumasi Metropolitan	Ashanti Region	Manager	-	Advanta, Bakker Brothers, Bayer, East-West Seed, Sakata, Syngenta Group, Technisem, Solevo, TopHarvest
Dad Agro Farms	Kumasi Metropolitan	Ashanti Region	Chief Executive Officer	-	Advanta, Technisem
Agri Commercial Services Limited	Wenchi Municipality	Bono Region	Managing Director	-	GreenField, own produced seeds
Greenfield Agricultural Services	Kwadaso Municipal	Ashanti Region	Chief Executive Officer	Greenfield	Technisem