



Access to Seeds
Index

Access to Seeds Index Report 2016

Advance copy

Bridging the gap between the
world's leading seed companies
and the smallholder farmer

February 2016

Foreword

A Promising First Impression

We are proud to present this first Access to Seeds Index, which provides a unique insight into how the seed industry is making quality seeds of improved varieties available to smallholder farmers. Smallholder farmers are considered key actors in tackling global food insecurity. But their productivity is currently limited, in part by insufficient access to quality seeds of improved varieties. With core strengths in breeding and delivery, seed companies are thus a critical part of the solution.

The Access to Seeds Index is not the first index to examine the ways in which an industry can help to solve a global challenge. It is, however, the first to assess regional companies alongside their global peers. By introducing a Regional Index, initially covering Eastern Africa, the Index shows that regional companies, too, play a distinctive and vital role in reaching smallholder farmers.

The Index aims to present an objective picture of what companies are doing today and where they can do more to achieve food security goals. The findings presented here are based on publically available information and data provided by companies upon engagement.

And these findings look promising. The Index encompasses four regions identified as having a food security challenge, smallholder farmer presence and agricultural potential: Latin America, Western Africa, Eastern Africa, and South and Southeast Asia. At the global level, the industry is connecting with almost every country in these regions, with the exception of Western Africa. In to Eastern Africa, regional companies are extending the global industry's reach, expanding the available portfolio and filling critical gaps. Overall, companies are taking a broad-access approach, which includes aspects such as affordability and capacity building. Even so, much more can be done. Companies that have made a clear commitment to smallholder farmers generally outperform those who serve smallholders on the side.

This publication marks the start of a next round of consultations with stakeholders. We welcome that AgriCord has agreed to contribute to three regional events in 2016 in which the findings will be discussed with smallholder farmers and farmers organizations.

As you read through this report, it will become apparent that there are plenty of opportunities for improvement and upscaling of promising projects, requiring action beyond the seed industry alone. Developing sustainable seed businesses and farming practices is dependent on an enabling environment. This is primarily the responsibility of governments. Here, complementary insights into the role of the public sector from the World Bank's Enabling Business of Agriculture monitor or Cornell University's TASAI Index can be brought to the table.

The Index methodology is the result of a thorough process of stakeholder consultation and expert review that started in 2012. Highlights were roundtable events at FAO's headquarters in Rome, with farmers in Addis Ababa and with the industry in Washington DC. I would like to thank the Dutch ambassadors at FAO, in Ethiopia and the USA for hosting these events as well as all the stakeholders and experts who contributed on these and other occasions. Special thanks go to the members of the Expert Review Committees for their strategic guidance.

I would also like to express my gratitude to the seed companies that participated in the consultation and data collection process. Many of the Index's indicators measure activities not regularly or only partially reported by companies, especially those that are not publicly listed. This required the gathering of additional data, which the large majority of companies – most notably 82% of the companies in the Regional Index for Eastern Africa – agreed to make available to us.

Finally, thanks go to our funders. The early support from the Dutch government has been decisive in developing this initiative. The Bill & Melinda Gates Foundation enabled us to broaden the scope with the Regional Index for Eastern Africa.

We look forward to discussing and refining future iterations of the Access to Seeds Index, in which we aim to include indexes for the other three regions and report on the progress made against the baseline established here.

Ido Verhagen
Executive Director
Access to Seeds Foundation





Saving or purchasing seeds

Marcelina Chauja sells quinoa seeds at the central market in Huancayo, Peru. It is generally assumed that smallholder farmers rely on seeds saved from year to year. Recent research focusing on sub-Saharan Africa has shown that this is not the case. A majority of smallholders purchase their seeds, mainly from local markets or fellow farmers. A relatively small proportion of transactions, 2.4% overall, involve 'certified seed' produced by private sector companies and sold through farm supply stores or agrodealers.¹

Acknowledgements

The 2016 Access to Seeds Index is made possible through the collaborative team efforts of several experts, authors, research, analysts and funders.* The Foundation is grateful for their contributions and expertise, and would like to offer thanks to those individuals who provided valuable feedback throughout the development of the 2016 Index.

Funders

The Netherlands Ministry of Economic Affairs
The Netherlands Ministry of Foreign Affairs
The Bill & Melinda Gates Foundation



Government of the Netherlands

BILL & MELINDA
GATES foundation

Supervisory Board Access to Seeds Foundation

Dennis Byron, Constantino Casasbuenas, Anil Jain,
Arnoud Kuijpers, Patricia Mbote, Wouter Scheepens,
Ann Tutwiler, Surinder K. Tikoo

Executive Board Access to Seeds Foundation

Ido Verhagen, Theo Quaijtaal

Expert Review Committee

Global Access to Seeds Index

Paula Bramel, Heleen van den Hombergh, Gigi Manicad,
Christoph Amberger, Michael Halewood, Ram Kaundinya,
Philip Kiriro, Thomas Osborn, David Spielman

Expert Review Committee

Regional Index for Eastern Africa

Dawit Alemu, Dominic Gitau, Flora Mpanju,
Essau Mwendo Phiri, Stephen Mugo,
John Kanyuthia Mutunga

The Access to Seeds Index

Research and Editorial Team

Ido Verhagen, Coosje Hoogendoorn,
Sanne Helderma, Wouter Kleijn,
Anke van Bruggen

Advisors

Wim Leereveld, Orlando de Ponti, Clemens Stolk

Regional Partner Eastern Africa

Cardno Emerging Markets, Nairobi office:

Joseph Ahenda, Ron Ashkin, Jedidah Wahinya,
Beatrice Kinyanjui, Shadrack Limbua, Juliah Mwashii,
Morris Mwendar, Rose Thuo

Data Collection and Scoring

Sustainalytics:

Kevin Ranney, Radoslav Georgiev, Lili R. Hocke,
Deniz Horzum, Cassie Reaburn, Megan Wallingford

* This acknowledgement is not intended to imply that the individuals and institutions mentioned above endorse the Access to Seeds Index, its final methodology, the analysis or results. Decisions regarding inclusion of all feedback were ultimately made by the Access to Seeds Foundation.

Access to Seeds Foundation

Mauritskade 63
1092 AD Amsterdam
The Netherlands

On behalf of the Access to Seeds Foundation,
please contact Ido Verhagen,
Executive Director
iverhagen@accesstoseeds.org
+31 8 53 03 29 32
www.accesstoseeds.org

Executive Summary

Many smallholder farmers yet to be reached, some seed companies showing leadership

A billion people go to bed hungry every day and two billion suffer from malnutrition. The global population is expected to grow by a further two billion in the coming decades, precisely in those regions that are currently considered food insecure. In these regions where agricultural systems are dominated by smallholder farmers, access to the key inputs to produce more and better food is often lacking.

Quality seeds of improved varieties have enabled farmers in advanced agricultural systems to triple their yields. What is the seed industry, strategically placed as it is at the start of the food value chain, doing to help smallholder farmers in food insecure regions to achieve similar results?

The Access to Seeds Index aims to shine a light on this question. It assesses and benchmarks leading global field crop and vegetable seed companies on their efforts to make their products available to smallholder farmers in four regions: Latin America, Western Africa, Eastern Africa, and South and Southeast Asia. A separate Regional Index has been compiled for Eastern Africa.



DuPont Pioneer leads the Global Index of Field Crop Seed Companies, its position primarily determined by its strong breeding program focusing on the regions where smallholder farmers are active.



East-West Seed outperforms its peers in the Global Index of Vegetable Seed Companies, due in large part to its smallholder-centric business model.



East-West Seed also leads the Regional Index for Eastern Africa, followed by a cluster of four companies that originate in the region, namely Victoria Seeds, East African Seed, Kenya Seed Company and NASECO.

The findings show that seed industry as a whole is active in all countries in the scope of the Index. This is with the exception of Western Africa, where there is a clear gap. However, country-level presence is no guarantee that the industry's products are actually accessible to smallholder farmers. This report identifies opportunities as well as good practices that can inspire seed companies and their partners to go the last mile – in every sense – to the farm gate.

Why an Access to Seeds Index?

Hunger is a daily reality for a billion people and two billion suffer from various forms of malnutrition. The global population is expected to grow by a further two billion in the coming decades, precisely in those regions that are currently considered food insecure.

The smartest way to tackle this pressing challenge is to enable farmers to produce more food. Agriculture in food insecure regions is dominated by small-scale agriculture or smallholder farmers, generally defined as farmers growing food on plots of land of around two hectares, equivalent to two or three football fields.

A good crop starts with quality seeds. Sufficient access to quality seeds of improved varieties is one of the many constraints smallholder farmers face. Improving access to seeds for smallholder farmers is thus an essential part of the solution to global food insecurity.

This is where the seed industry comes in. Improved varieties have enabled farmers in advanced agricultural systems to triple their yields. What is the seed industry doing to enable smallholder farmers in developing regions to achieve similar results?

The Access to Seeds Index aims to shine a light on this question. It assesses the leading global field crop and vegetable seed companies, which are generally at the forefront of research & development. But it also examines the regional industry, initially in Eastern Africa, which plays a crucial role in delivering the industry's products to the farm gate.

The Index seeks primarily to identify leadership and good practices, providing an evidence base for the discussion on where and how the seed industry can do more. Private sector engagement is at the heart of the Sustainable Development Goals, adopted by the United Nations in 2015. By creating a better understanding of the role of the seed industry, the Index aims to contribute to the achievement of these goals.



Access to Seeds
Index

How the Index's Findings are Presented

The Index's findings are presented at various levels.

- The overall rankings identify which companies demonstrate leadership across the board.
- The key findings at industry level provide insights into how the seed industry as a whole is targeting the four regions within the scope of the Index, as well as how the activities of global companies and regional companies complement each other.
- The key findings at measurement area level present good practices that were identified in each area for the Global and Regional Indexes, as well as which companies demonstrate leadership.
- Finally, the company scorecards provide further insights into the scores and operations of individual companies.

This executive summary provides an overview of the key findings (1) for the three rankings, (2) at industry level, at (3) measurement area level for the Global Index and (4) measurement area level for the Regional Index.

Methodology and Data Collection

The Access to Seeds Index is maintained by the Access to Seeds Foundation, an independent organization based in Amsterdam, the Netherlands. The Foundation is governed by a Supervisory Board made up of international experts with relevant experience in the fields of seeds, food and agriculture. It is funded by the Dutch Ministries of Economic and Foreign Affairs and the Bill & Melinda Gates Foundation.

The Index is a relative ranking, comparing companies with each other rather than against an absolute, ideal state. It focuses on seed companies with an integrated business model, covering the full seed value chain from R&D and production through marketing & sales. For benchmarking purposes, companies are grouped into separate rankings for (1) global field crop seed companies with seed revenues over \$1 billion, (2) global vegetable seed companies with seed revenues over \$100 million and (3) leading seed companies in a specific region.



The Index has identified four regions with (1) a food security challenge, (2) smallholder farmer presence and (3) agricultural potential: Latin America, Western Africa, Eastern Africa, and South and Southeast Asia. The Global Indexes assess company activities in all four regions. The Regional Index focuses initially on Eastern Africa, with the ambition to expand this to other regions in the future. Seven field crop seed companies and ten vegetable seed companies are included in the Global Indexes and a total of 17 companies in the Regional Index. Some companies appear in multiple Indexes. The focus of this first Index is on seeds for food crops. The scope could also be extended to other crops, such as fiber and oil crops, in subsequent Indexes.

The methodology is the result of an extensive process of stakeholder engagement and consultation that started in 2012. The stakeholders consulted were: smallholder farmers, the seed industry, governments, multilateral organizations, NGOs and academia. Guided by small-holder input, 'access to seeds' was translated into six dimensions which form the basis of the methodology: availability, affordability, suitability, capability, profitability and autonomy.

Indicators expressing what stakeholders expect from seed companies on each of these dimensions are grouped into seven measurement areas. Each measurement area is composed of indicators which assess (1) Commitment, (2) Performance, (3) Transparency and (4) Innovation. As the Index is a relative ranking, best-in-class performance on a specific indicator determines which company receives the highest score. The sum of the scores for these indicators make up the score for each measurement area. A company's overall score is the weighted sum of the scores for all indicators.

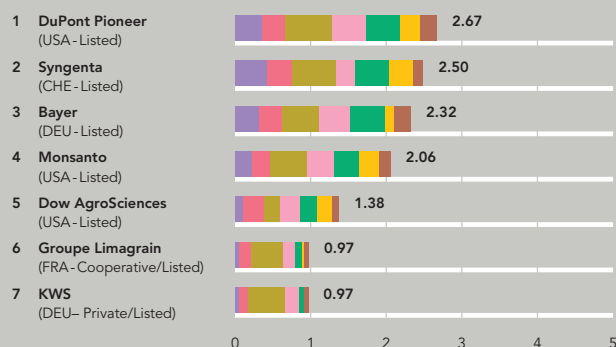
The methodology was reviewed by an Expert Review Committee, an independent, multi-stakeholder body composed of international experts from various relevant backgrounds. Based on their advice, the Supervisory Board approved the methodology. The methodology of the Regional Index for Eastern Africa was developed in partnership with Cardno Emerging Markets, based in Nairobi, Kenya.

The data collection and analysis were conducted by Sustainalytics, a leading global provider of environmental, social and governance (ESG) research, ratings and analytics. Companies were requested to fill out a questionnaire to supplement publicly available information. Seven of the 13 (54%) Global Index companies and 14 of the 17 (82%) Regional Index companies provided data for the analysis. As a result, the evaluation for a minority of the companies was based on publicly available information only. The full dataset used for the analysis was sent to each company individually for fact-checking purposes.

Overall Rankings



Global Index of Field Crop Seed Companies



DuPont Pioneer tops the Global Index of Field Crop Seed Companies, closely followed by Syngenta and Bayer CropScience. DuPont Pioneer clearly outperforms its peers in the measurement area Research & Development, thanks to its strong breeding program focusing on Index regions.

Syngenta achieves high scores in Governance & Strategy. This is due to commitments in its Good Growth Plan to make a measurable contribution by 2020, including reaching 20 million smallholder farmers in Index regions. It also leads in Capacity Building, largely due to the activities of the Syngenta Foundation. Bayer CropScience leads in Marketing & Sales, with good practices related to adoption strategies and after-sales support for smallholder farmers.

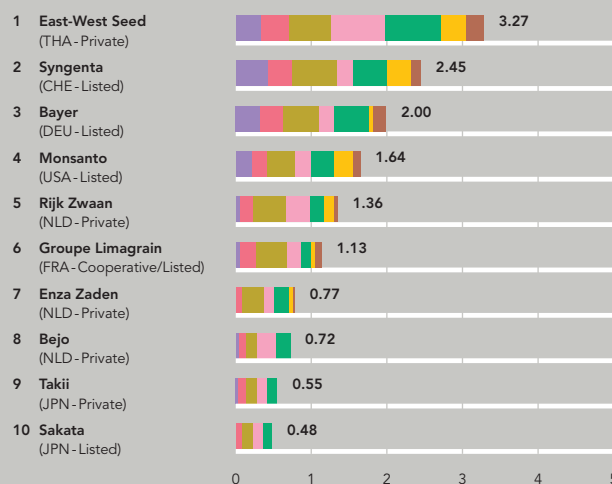
DuPont Pioneer and Bayer CropScience score best on Performance (programs and activities) indicators, whereas Syngenta's position is mainly determined by its high score on Transparency (disclosure) and Innovation (unique approaches in the industry) indicators.

These three companies lead in virtually all measurement areas, generally dividing the top positions between them. Monsanto, which ranks fourth overall, ranks second in Capacity Building and Local Seed Sector Advancement and third in Research & Development. KWS makes it into the top three in Genetic Resources & Intellectual Property, primarily thanks to its activities supporting the conservation and use of genetic resources in Index countries.

Overall, the ranking of global field crop seed companies reflects their commitment to work in the Index regions. The top four companies have business operations in the Index regions, whereas lower ranking companies, such as KWS and Dow AgroSciences, currently limit their contribution to smallholder farmer development to corporate social responsibility (CSR)-related projects.



Global Index of Vegetable Seed Companies



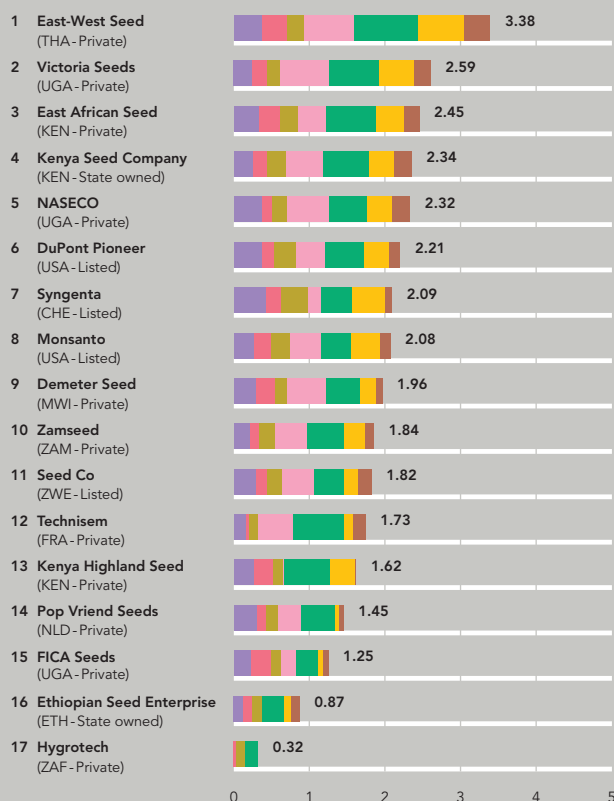
East-West Seed clearly outperforms its peers in the Global Index of Vegetable Seed Companies. Although it is the smallest in terms of seed revenues, the company demonstrates that size is not a determining factor in the Index. Its mission-driven smallholder-centric business model translates into high scores across all measurement areas, with the exception of Governance & Strategy.

Syngenta and Bayer CropScience rank second and third, respectively. Bayer CropScience is a steady top three performer but does not lead in specific areas. Syngenta scores highly in Governance & Strategy, due to the commitments articulated in its Good Growth Plan, and Capacity Building, thanks to the activities of the Syngenta Foundation.

The top three companies lead in all measurement areas, with the exception of Research & Development. Rijk Zwaan and Bejo take second and third place, respectively, in this area, reflecting their commitment to their core competency, breeding.



Regional Index for Eastern Africa



The Regional Index for Eastern Africa includes seed companies originating in the region, three listed multinational companies with a considerable presence in the region (DuPont Pioneer, Monsanto, Syngenta) and three private vegetable seed companies originating outside the region (East-West Seed, Technisem and Pop Vriend Seeds).

The Regional Index shows small differences between companies, with a gradual tailing-off of scores. This is with the exception of East-West Seed, whose performance significantly exceeds its peers. East-West Seed's position is underpinned by its smallholder-centric business model, which translates into consistently high scores in a number of measurement areas, including Marketing & Sales, Research & Development and Capacity Building.

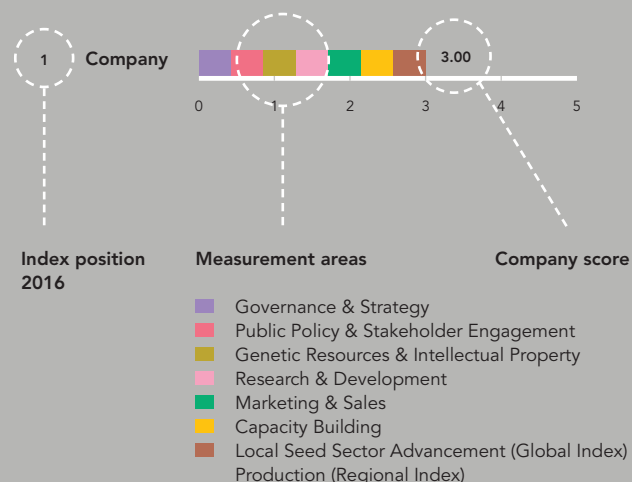
Behind East-West Seed, the top of the ranking is dominated by companies originating in Eastern Africa, namely Victoria Seeds, East African Seed, Kenya Seed Company and NASECO. Their comparatively strong overall performance is primarily driven by strengths in Marketing & Sales and Research & Development, most notably on Performance indicators rather than Commitment or Transparency. Generally speaking, the highest ranking companies have robust programs and activities related to access to seeds.

Despite an average performance overall, DuPont Pioneer, Syngenta and Monsanto excel in commitments in Governance & Strategy and Capacity Building, surpassing other Regional Index leaders. Since they are listed multinationals, it is likely that these companies face higher stakeholder expectations regarding accountability and responsibility. Commitment and Transparency thus make a greater contribution than other indicator categories to their overall score.

In this respect, a notable score is achieved by Ethiopian Seed Enterprise, which ranks fourth on Transparency after three listed, multinational companies. Although it is at the bottom of the overall ranking, Ethiopian Seed Enterprise outperforms the other companies originating in the region, largely due to the launch of its – by regional standards – advanced corporate website in early 2015.

Other companies in the Regional Index – Demeter Seed, Zamseed, Seed Co, Technisem, Kenya Highland Seed, Pop Vriend Seeds and FICA Seeds – demonstrate a comparatively weaker overall performance but show strengths in specific areas, typically Marketing & Sales and Research & Development.

How the Company Rankings Work

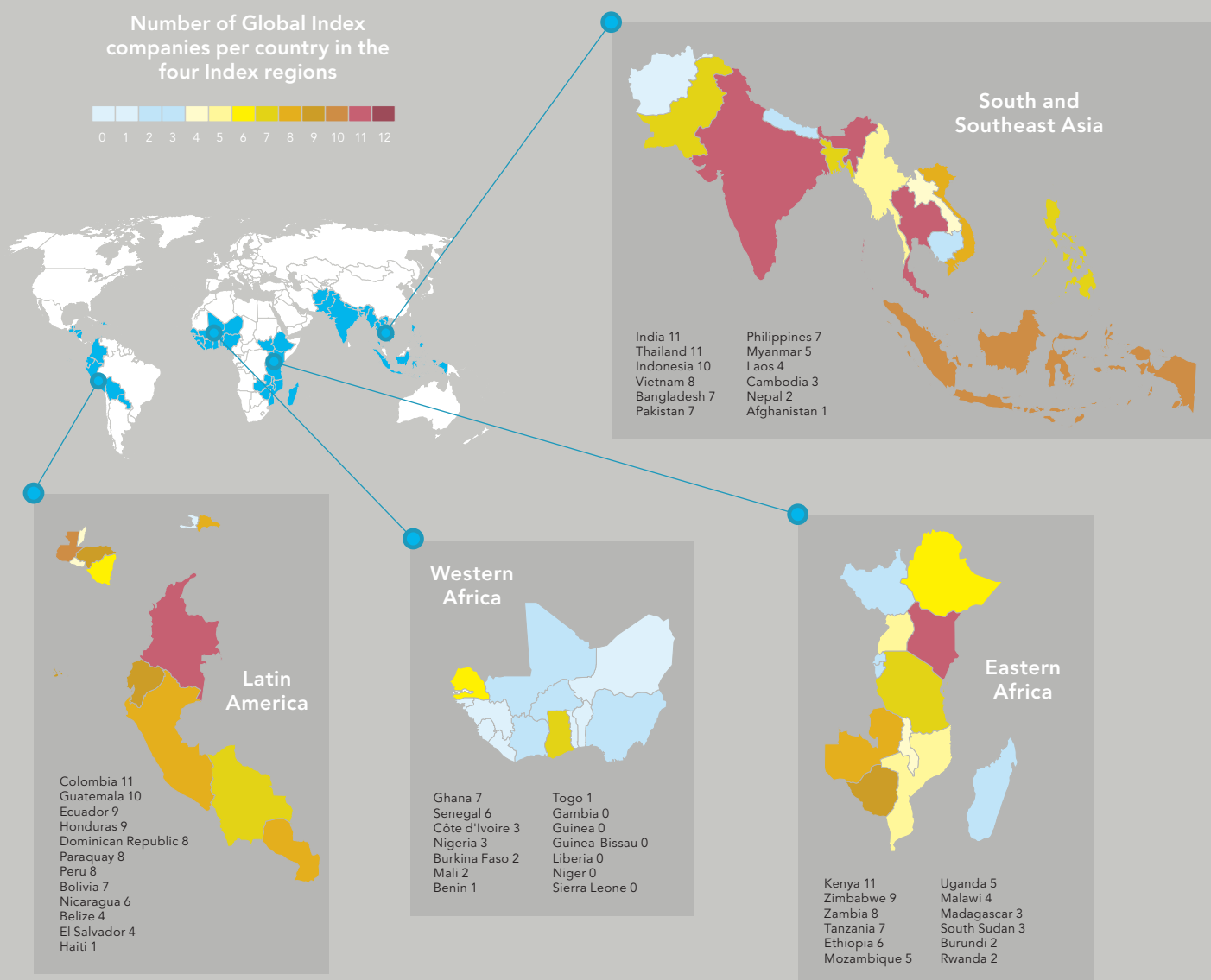


Key Findings – Industry Level

The Index has identified four regions with (1) a food security challenge, (2) smallholder farmer presence and (3) agricultural potential: Latin America, Western Africa, Eastern Africa, and South and Southeast Asia. It provides for the first time a comprehensive picture of what the industry is doing in these regions. The general assumption that emerged from preparatory stakeholder consultations was that the industry's commitment is limited to a few crops and countries, due to a lack of suitable genetic material for tropical zones and an inadequate enabling environment. Based on the Index's findings, this assumption deserves to be reexamined.

■ The global seed industry covers all Index regions, with the exception of Western Africa

The global-level assessment shows that global seed companies are active in all regions and cover almost every country in the scope of the Index. The exception is Western Africa, where six out of 14 countries are not reached. Countries with the highest concentration of global companies are Colombia, Kenya, India and Thailand. Companies with the largest footprint are Bejo, DuPont Pioneer and East-West Seed, with a presence in more than 30 countries across all Index regions. Companies also operate in fragile states such as Afghanistan, Haiti and South Sudan. However, country presence is no guarantee that seed industry products are actually accessible at the village level or in remote areas.



■ **Together, global and regional companies offer a broad portfolio of field crop seeds**

Global field crop seed companies tend to focus on major crops such as maize and rice in Index regions. Global companies generally do not have their full portfolio available in every country where they are present. The Regional Index shows that regional companies broaden the choice for smallholder farmers, both with regard to crops and suppliers. Regional companies have additional field crops such as dry beans, soybean, sorghum and wheat in their portfolio in all Regional Index countries. Both global and regional companies have breeding programs to bring new varieties to market in the near future.

■ **The seed industry has a broad portfolio of vegetable seeds available in Index regions, with breeding mainly carried out by global companies**

Global vegetable seed companies tend to have a broader portfolio available in Index countries than their global field crop seed peers. For some crops not in the portfolio of global companies, regional companies are filling the gaps. In Eastern Africa, there is a clear difference between the global companies and companies originating from the region. Most regional companies do not have a breeding or variety-testing program for vegetable seeds, with the exception of Kenya Seed Company, Victoria Seeds and a few others. This indicates that most regional companies rely on wholesalers. The main sources of newly bred vegetable varieties in Eastern Africa are likely to be global companies operating in the region such as East-West Seed, Pop Vriend Seeds and Technisem.

■ **Local crops are the domain of regional seed companies**

Local crops, also called 'neglected and underutilized crops', are typically the domain of regional companies. In Eastern Africa, local field crops such as cowpea or local vegetables such as amaranth and black nightshade are in the portfolio of multiple companies in nearly all Index countries. Global companies do not include local crops in their portfolio. Exceptions are East-West Seed and Technisem. As an illustration of their core mission to develop tropical vegetable seeds for smallholder farmers, these two are the only companies in the Regional Index that originate from outside the region but have breeding programs for local vegetable crops.

■ **Companies are active across multiple access dimensions relevant for smallholder farmers**

Guided by input from smallholder farmers, 'access to seeds' was translated into six dimensions: availability, affordability, suitability, capability, profitability and autonomy. The Index has identified good practices across most access dimensions. As an example, Victoria Seeds improves availability by using tuk-tuks as mobile seed shops to reach remote villages. Syngenta is addressing affordability by means of a smallholder crop insurance plan. Demeter Seed employs feedback mechanisms to inform its breeding program for seeds suitable for local preferences. Many companies are involved in capacity-building projects, as they understand increased capacity to be an essential step towards creating a sustainable future customer base. Although these initiatives are a promising start, there are opportunities to make them a structural element of smallholder-focused business models. Autonomy appears to be largely overlooked. This dimension relates to the freedom of farmers to choose between multiple suppliers and between the formal and informal seed system, as well as recognition of smallholder farmers as seed company partners along the seed value chain.

■ **Seed companies see smallholder farmers mainly as end-users**

Consultations with smallholder farmers also revealed that farmers see themselves not only as end-users but as partners in the seed value chain, e.g. seed producers or partners in the breeding process. With the exception of East-West Seed and Bayer CropScience, global seed companies appear to engage smallholder farmers in breeding and seed production only to a limited extent. In comparison, Uganda-based NASECO reports that more than 90% of its seed production is done by smallholder farmers and farmer cooperatives. Regional companies also engage smallholders more actively in their R&D processes, for example through participatory breeding or variety selection.

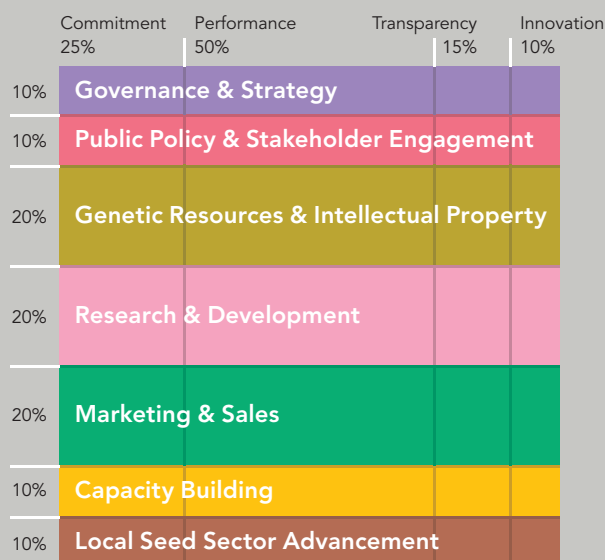
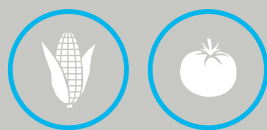
■ **Seed companies do not take a structural approach to addressing the needs of women farmers**

Approximately half of the smallholder farmer workforce is made up of women. Despite many policy debates underlining the need to pay dedicated attention to women farmers, only three Global Index companies have programs that explicitly focus on women farmers' input and training needs: Rijk Zwaan in Guatemala, Syngenta in Bangladesh and East-West Seed in Ethiopia, Myanmar and Vietnam. Among Regional Index companies, Seed Co has programs in Kenya; Victoria Seeds in Kenya and Uganda. Other companies make some effort to include women farmers in training, extension and demonstration activities, although women are not the main focus of these activities. No company takes a structural approach to addressing the needs of women farmers.

■ **Regional companies play a key role in access to seeds for smallholder farmers**

Regional companies go a step further in addressing the needs of smallholder farmers than their global peers. Smallholder farmers are the primary customer group for these companies. This underscores the importance of regional companies for reaching smallholders. Regional companies are active in domains generally neglected by global companies, notably breeding for local crops and marketing varieties from public research institutes. In addition, regional companies tend to address the different capacity levels of smallholder farmers more often by including open-pollinated varieties (OPVs) and different seed grades in their portfolio. Regional companies also demonstrate practices that go beyond their global peers in adoption strategies and inclusion of smallholder farmers in the seed value chain.

Key Insights on Measurement Areas – Global Indexes



The Access to Seeds Index evaluates company performance in seven measurement areas where stakeholders expect or desire company activity. For the Global Index, these seven areas are (1) Governance & Strategy, (2) Public Policy & Stakeholder Engagement, (3) Genetic Resources & Intellectual Property, (4) Research & Development, (5) Marketing & Sales, (6) Capacity Building and (7) Local Seed Sector Advancement. In each measurement area, companies are assessed with indicators in four categories: Commitment, Performance, Transparency and Innovation. A company's overall score is the weighted sum of its scores on all indicators. Following the advice of the Expert Review Committee, most weight is given to Performance indicators and measurement areas close to seed companies' core business, namely Genetic Resources & Intellectual Property, Research & Development and Marketing & Sales.

Most global companies have formulated a commitment, few with tangible targets

More than half of the global companies have formulated a commitment to smallholder farmers, although tangible targets are often lacking. Bayer CropScience has a formal commitment to provide food security solutions. Syngenta and Monsanto have targets to reach a certain number of smallholder farmers by 2020. East-West Seed provides tangible managerial incentives. The remaining companies disclose only informal commitments which are not part of a formal policy and thus have limited accountability.

Opportunities exist to increase engagement with stakeholders outside the seed sector

It is clear that smallholder development cannot be achieved by the seed industry alone. Most companies are actively involved in the sector's trade associations, but engagement with partners and initiatives outside the seed industry appears limited. Among field crop seed companies, Syngenta, DuPont Pioneer and Bayer CropScience are most active in international initiatives. Among vegetable seed companies, only East-West Seed demonstrates leadership, with active engagement both at the regional and global level.

Companies provide access to their genetic resources

Monsanto, DuPont Pioneer, Dow AgroSciences, Bayer CropScience and East-West Seed all collaborate with local partners to provide access to specific genetic material or biotechnology traits. This ranges from vegetable germplasm suitable for Africa to biotechnology traits for research on insect-resistant Bt cowpea and water-efficient maize. Four partnerships were identified in which companies have donated germplasm or participate in research for the development of genetically modified crop varieties, with a specific focus on developing traits that are also useful for smallholder farmers. Monsanto has donated germplasm to the Water Efficient Maize for Africa (WEMA) project and to the Bt Cowpea Partnership. DuPont Pioneer partners in the Africa Biofortified Sorghum (ABS) project, for which it has provided transgenic DNA constructs. Monsanto and Dow AgroSciences have contributed to the Virus Resistant Cassava for Africa (VIRCA) project. These partnerships have not yet resulted in commercially available genetically modified varieties in Index countries.

Support for local gene banks in Index countries is largely overlooked

Support for public gene banks, important for the conservation and use of region-specific crop diversity, is common among global seed companies but is generally limited to gene banks outside Index countries. Exceptions are KWS, which supports public gene banks in Peru and Ethiopia, and East-West Seed, which supports gene banks in Indonesia and Thailand.

■ Testing existing portfolios is more common than breeding for Index regions

Testing existing portfolios for suitability for Index regions can be regarded as low-hanging fruit, since breeding processes are multi-year activities. For example, Bayer CropScience performs variety trials in 11 Index countries around the world for two of the Index crops in its portfolio. DuPont Pioneer tests varieties of five of the seven Index crops in its portfolio in 11 countries in sub-Saharan Africa. Among the vegetable seed companies, East-West Seed and Enza Zaden have the most ambitious variety-testing programs, covering virtually all of the crops in their portfolio for at least one and up to four Index regions.

■ Breeding is also done in partnership; local feedback systems can be improved

East-West Seed and Rijk Zwaan demonstrate leadership in breeding through Afrisem, a collaborative breeding program that develops new varieties of local crops for the African market. Monsanto partners with AATF to develop water-efficient maize varieties, to be made available to smallholder farmers royalty-free. Syngenta is involved in a partnership with CIMMYT to develop wheat varieties suitable for smallholder farmers. The majority of global companies developing traits and varieties suitable for smallholder farmers do not provide evidence of systems to collect feedback from these farmers to inform their breeding processes. This raises questions about alignment of breeding efforts with the actual needs and preferences of smallholder farmers.

■ Global companies concentrate on marketing proprietary hybrid varieties

Collectively, global seed companies have established distribution channels in all Eastern African and a majority of Western African countries. In most cases, seeds are directly distributed by local subsidiaries or through third-party distributors. The actual reach within countries requires additional research. Only a few companies address different capacity levels among smallholder farmers. East-West Seed offers open-pollinated varieties (OPVs) alongside hybrids in its portfolio. Monsanto and DuPont Pioneer offer double-cross and three-way hybrids. These are higher yielding than OPVs but more affordable for smallholder farmers than advanced hybrids.

■ Activities in genetically modified seeds are limited in Index countries

Only in a limited number of Index countries is the cultivation of genetically modified varieties of Index crops authorized. Notably, cultivation of genetically modified maize and/or soybean is concentrated in Latin America (Bolivia, Colombia, Honduras and Paraguay) and South and Southeast Asia (Philippines, Thailand and Vietnam). Six Index companies (Bayer CropScience, Dow AgroSciences, DuPont Pioneer, Groupe Limagrain, Monsanto and Syngenta) have genetically modified varieties of maize and/or soybean in their portfolios. All companies are committed to ensuring and managing biosafety in Index countries in cases where they bring these varieties to the market.

■ Field days, demonstration plots and tailored packaging are common ways to promote adoption

The majority of companies have relevant programs encouraging the adoption of improved varieties. These include collaborations, like DuPont Pioneer's partnership with USAID and the Ethiopian government to organize demonstration plots in Ethiopia. East-West Seed shows leadership by adapting 95% of its packaging to the needs of smallholder farmers. Adaptations include small package sizes and information in local languages as well as pictograms for illiterate farmers. Bayer CropScience takes a different approach, combining several agricultural inputs in a so-called Much More Rice solutions box offered in Ghana, India and Vietnam.

■ Capacity building is largely on a project-by-project basis, rather than a structural activity

Two thirds of vegetable seed companies and all but one field crop seed company are engaged in building smallholder capacity in Index regions. East-West Seed stands out as the only company whose capacity-building programs cover almost 75% of the Index countries where it is active. For most other companies, capacity building takes place in collaborative projects aimed at a specific region or country, rather than being a structural element of a smallholder-focused business model. An example of a project involving several companies is the collaboration of Bayer CropScience, Monsanto, Syngenta and Seed Co with the Tanzanian government in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT).

■ Local seed sector advancement is limited

Although there are some strong examples of support for local research capacity and engagement with local seed enterprises, only Bayer CropScience has a formal commitment addressing its role in the development of formal seed sectors in Index countries. DuPont Pioneer is the only company to recognize the relevance of the informal seed sector in Index countries, but this recognition is limited and not part of a formal policy.

Key Insights on Measurement Areas – Regional Index for Eastern Africa



The seven measurement areas for the Regional Index for Eastern Africa are: (1) Governance & Strategy, (2) Public Policy & Stakeholder Engagement, (3) Genetic Resources & Intellectual Property, (4) Research & Development, (5) Marketing & Sales, (6) Capacity Building and (7) Production. In each measurement area, companies are assessed with indicators in four categories: Commitment, Performance, Transparency and Innovation. A company's overall score is the weighted sum of its scores on all indicators. Following the advice of the Expert Review Committee, most weight is given to Performance indicators and the measurement areas Research & Development and Marketing & Sales, which are expected to have the greatest impact on access to seeds.

Regional companies assign responsibility for smallholder farmers at executive level

With smallholder farmers representing the most important customer base in the region, it is hardly surprising that most regional companies assign responsibility for access to seeds for smallholder farmers at the executive level. Eleven out of 17 companies have implemented a management system with senior management oversight of access to seeds-related programs or activities and they track their progress.

Opportunities exist for regional companies to engage in global multi-stakeholder initiatives

Although most regional companies participate in national or regional industry associations, participation in global multi-stakeholder initiatives tends to be the domain of global companies. East African Seed, Kenya Seed Company and FICA Seeds are among the few companies giving the regional industry a voice at the global level.

Regional companies outperform their global peers in the conservation and use of genetic diversity

Whereas global companies have formal commitments in place, most actual activities for the conservation and use of genetic diversity are found among regional companies. East African Seed, Kenya Seed Company and Seed Co, among others, partner with multiple local seed banks and global research institutes. NASECO and Kenya Seed Company also donate their germplasm to public research partners.

Regional companies target local crops and use smallholder feedback to inform R&D decisions

In contrast to their global peers, regional companies include local crops such as amaranth and cowpea in their breeding programs. Local preferences are also taken into account. East African Seed, for instance, focuses its black nightshade breeding program on reducing bitterness. Multiple companies use farmer feedback mechanisms, such as Seed Co's on-farm visits and variety demonstrations, to inform their R&D decisions.

Regional Index companies demonstrate innovative practices in marketing & sales

Regional Index companies, as well as smallholder-focused global companies such as East-West Seed and Technisem, tend to be more active than their global peers in the development and deployment of marketing strategies tailored to the needs of smallholder farmers. Specifically, these companies are more likely than the large multinationals to make use of open-pollinated varieties (OPVs), different seed grades, localized seed packages and appropriate demonstration services. Technisem excels in providing adapted packaging at affordable prices to smallholder farmers in the region, while Victoria Seeds uses mobile seed shops (tuk-tuks) to reach farmers in remote areas. East-West Seed demonstrates leadership with its systems to gather, track and handle smallholder farmers' complaints.

Concluding Remarks

■ Capacity-building programs tend to focus on a few countries

Kenya, Tanzania and Uganda account for the majority of capacity-building initiatives in which seed companies are involved. Companies tend to focus their capacity-building efforts on only a few countries. In contrast, the company with the greatest capacity-building reach, Kenya Highland Seed, has activities in as many as eight countries. Often, companies partner with other organizations. NASECO's extension staff work with NGOs and private organizations to provide training; Victoria Seeds has established partnerships with local development organizations that seek to deliver extension services in Uganda. It is unclear whether company decisions or the availability of external partners limits the reach of capacity-building activities.

■ Regional companies involve smallholder farmers in seed production

Fourteen companies produce seeds in at least one Index country. Most seed production is concentrated in Tanzania and Uganda, followed by Ethiopia, Kenya and Zambia. With more than two thirds of the companies involving smallholder farmers in seed production, this is common practice. NASECO outperforms its peers, reporting that 90% of its production is carried out by smallholder farmers or farmer cooperatives. Behind it are East-West Seed (80%) and East African Seed (70%). Many companies report adherence to local labor laws, although only half disclose their social standards in seed production.

The Access to Seeds Index aims to highlight good practice and spark an increasingly evidence-based conversation about how the seed industry can best enable smallholder farmers to grow more and better food.

Yet it is clear that this conversation extends beyond the seed industry alone. It is essentially the role of governments to create the enabling environment in which markets can flourish. With seed companies covering all countries in the scope, excepting six countries in Western Africa, it would appear that market conditions in that region are a limiting factor. The seed industry, through its trade associations, could join forces with governments in Western Africa to improve the enabling environment.

For many of the global companies, working with smallholder farmers in Index regions is a relatively new part of their business. Despite broad country presence and crop portfolio availability, smallholder farmers still struggle to access the industry's products. Improving not only availability (distribution) and suitability (breeding) but also the other access dimensions of capability, profitability, affordability and autonomy will likely require partnerships.

As smallholder farmers themselves voiced during preparatory consultations for the Index, they see themselves not only as end-users of seeds but also as partners in breeding and production. As a whole, the practices identified tend to resemble a one-way delivery system. From both a commercial and agricultural productivity standpoint, it is thus worth exploring where and how smallholder farmers can act as dynamic, knowledgeable business partners of the seed industry rather than passive recipients.

Climate change is increasingly affecting agricultural production. This is particularly the case for smallholder agriculture, which is primarily rain-fed. Some seed companies have vowed to increase R&D spending on breeding for climate-resilient varieties. Company activity can also be detected in other areas, such as the conservation of genetic diversity or the provision of insurance against climate risks. As weather events become more extreme, and so too the damage they cause, the question of how the seed industry can increase its contribution is a priority topic on the future agenda.

Finally, it is important to note that the Index found only limited data on topics that have become increasingly important in international policy debates about the role of smallholder farmers, among them the role of women farmers, the need to inspire young generations to engage in agriculture and the relevance of informal seed systems. This disconnect between policy and practice will need to be addressed in the conversation this report hopes to ignite.

This first Access to Seeds Index is a baseline. It will be discussed with the seed industry and other stakeholders. Its methodology will, where necessary, be refined. However, the results of this report are intended to serve as a benchmark against which future efforts to bridge the gap between leading global and regional seed companies and smallholder farmers are measured.

Reaching the village level

David Oboth and Dickson Ogot look for a good place to set up the tuk-tuk mobile seed shop in Gulu, Uganda. Victoria Seeds improves accessibility by using mobile seed shops to reach markets in remote villages.



Table of Contents

Foreword

A Promising
First Impression

1

Executive Summary

Many smallholder farmers yet to be reached,
some seed companies showing leadership

5




Part I Introduction

21

Setting the Scene	22
Introduction to the Methodology	25
Methodology Overview	26

Part II The Rankings

30

	Global Access to Seeds Index Field Crop Seed Companies	32
	Global Access to Seeds Index Vegetable Seed Companies	32
	Regional Access to Seeds Index Eastern Africa	33
	A Closer Look at the Rankings	35

Part III Industry-level Key Findings

39

Key Finding 1	40
The global seed industry covers all Index regions; with a clear gap in Western Africa	
Key Finding 2	42
The seed industry brings a broad crop portfolio to Index regions	
Key Finding 3	44
The seed industry explores a broad approach to facilitating access to seeds for smallholder farmers	
Key Finding 4	46
Smallholder farmers are mainly seen as customers, not as partners in the seed value chain	
Key Finding 5	47
Regional companies play a key role in reaching smallholder farmers	

In this print-friendly version, blank pages from the hard copy have been omitted. The following page numbers are missing to align the numbering with the hard copy:
3, 17, 20, 29, 34, 37, 38, 49, 50, 62, 84, 97, 99,
129, 130, 132, 138, 168, 173, 175, 213, 221, 223.

Part IV

Global Access to Seeds Index

51

Introduction	51
A Governance & Strategy	53
Focus Areas	
1. Global Food and Nutrition Security	55
2. Access to Seeds for Smallholder Farmers	55
3. Governance and Accountability	56
B Public Policy & Stakeholder Engagement	57
Focus Areas	
1. Industry Engagement	59
2. Multi-stakeholder Initiatives	60
3. Lobbying and Public Policy Dialogue	60
C Genetic Resources & Intellectual Property	63
Focus Areas	
1. Conservation and Use of Crop and Genetic Diversity	66
2. Access to Genetic Resources	66
3. Intellectual Property Rights	67
D Research & Development	69
Focus Areas	
1. Improved Varieties for Smallholder Farmers	71
2. Specific Traits for Smallholder Farmers	72
3. Local Cooperation	73
E Marketing & Sales	75
Focus Areas	
1. Release of New Varieties	78
2. Quality of Varieties and Seeds	79
3. Packaging, Distribution and Affordability	80
4. Adoption Strategies and Access to Adjacent Technologies	81
5. After-sales Support	82
F Capacity Building	85
Focus Areas	
1. Capacity Building	88
2. Farmer Organizations	89
3. Access to Output Markets	89
G Local Seed Sector Advancement	91
Focus Areas	
1. Recognition of Local Seed Sectors	93
2. Advancing Local Seed Sectors	94
3. Local Seed Production	94
4. Supporting Certification and Registration Systems	95
5. Advancing Local Research Institutes	96

Company Scorecards

Global Access to Seeds Index

Bayer	102	KWS	116
Bejo	104	Monsanto	118
Dow AgroSciences	106	Rijk Zwaan	120
DuPont Pioneer	108	Sakata	122
East-West Seed	110	Syngenta	124
Enza Zaden	112	Takii	126
Groupe Limagrain	114		

Part V

Regional Access to Seeds Index for Eastern Africa

131

Introduction	131
Agriculture and the Seed Industry in Eastern Africa	133
A Governance & Strategy	135
Focus Area	
1. Access to Seeds for Smallholder Farmers	137
B Public Policy & Stakeholder Engagement	139
Focus Areas	
1. Industry Engagement	141
2. Multi-stakeholder Initiatives	142
3. Lobbying and Public Policy Dialogue	142
C Genetic Resources & Intellectual Property	143
Focus Areas	
1. Conservation and Use of Crop and Genetic Diversity	146
2. Access to Genetic Resources	147
3. Intellectual Property Rights	148
D Research & Development	149
Focus Areas	
1. Improved Varieties for Smallholder Farmers	151
2. Specific Traits for Smallholder Farmers	152
3. Local Cooperation	152
E Marketing & Sales	155
Focus Areas	
1. Release of New Varieties	157
2. Quality of Varieties and Seeds	158
3. Packaging, Distribution and Affordability	159
4. Adoption Strategies and Access to Adjacent Technologies	161
5. After-sales Support	161
F Capacity Building	163
Focus Areas	
1. Capacity Building	165
2. Farmer Organizations	167
3. Access to Output Markets	167
G Production	169
Focus Areas	
1. Local Seed Production	171
2. Maintenance Programs and Quality Management	172

Company Scorecards

Regional Access to Seeds Index for Eastern Africa

Demeter Seed	178	Monsanto	196
DuPont Pioneer	180	NASECO	198
East African Seed	182	Pop Vriend Seeds	200
East-West Seed	184	Seed Co	202
Ethiopian Seed Enterprise	186	Syngenta	204
FICA Seeds	188	Technisem	206
Hygrotech	190	Victoria Seeds	208
Kenya Highland Seed	192	Zamseed	210
Kenya Seed Company	194		

Limitations Overview	214
Definitions	216
References Cited in Definitions	218
Acronyms	219
Notes	220

Part I

Introduction

The Access to Seeds Index ranks the world's leading seed companies based on their efforts to improve access to seeds for smallholder farmers. By creating transparency around leadership and good practices, the Index provides an evidence base for the dialogue with the seed industry on its role and responsibility. As such, the Index aims to encourage the industry to step up its efforts in a way that is supported by society at large.

The Index methodology was developed following an extensive stakeholder consultation process that began in 2012. The methodology and indicators used for the assessment reflect what stakeholders expect from seed companies. As a relative ranking, the Index compares companies with each other rather than against an absolute, ideal state. Best-in-class performance on a specific indicator determines which company receives the highest score. Hence, leaders in the industry set and raise the bar.

Setting the Scene

Smallholder farmers represent an as yet untapped opportunity to intensify agricultural productivity and so meet future food demands. By improving the availability of quality seeds, the seed industry can play a major role in unlocking that potential. The Access to Seeds Index seeks to identify the extent to which seed companies are playing their part, while encouraging the industry to enhance its role and responsibility.

Global Food and Nutrition Security

Feeding the growing world population is one of the most pressing challenges of the 21st century. This is underlined by the second Sustainable Development Goal (SDG2): End hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Despite global gains in agricultural production, access to food remains unevenly distributed. As a result, 870 million people are still food insecure, with many more suffering from 'hidden hunger' caused by micronutrient or protein deficiencies. Most hungry people live in South and Southeast Asia, while sub-Saharan Africa has the highest prevalence of hunger. Some countries in Latin America are also considered food insecure.

Population growth and higher per capita consumption will have major implications for food demand in the next 35 years. The global population is projected to increase from today's 7 billion to more than 9 billion by 2050, with most of the additional 2 billion people living in precisely those regions that are currently considered food insecure. At the same time, 70% of the global population is projected to live in urban areas (87% in Latin America, 64% in Asia and 58% in Africa)². Consequently, an even larger number of people will depend on farmers to provide sufficient food.

Potential of Smallholder Farmers

Smallholder farmers already produce the bulk of food in the three regions mentioned above. They are responsible for 70% of Africa's food supply and an estimated 80% of the food consumed in Asia and sub-Saharan Africa combined. In Latin America, smallholders farm almost 35% of total cultivated land. Globally, there are approximately 2.5 billion people involved in full- or part-time smallholder agriculture, managing an estimated 500 million small farms. Approximately half of the agricultural workforce is made up of women. Helping smallholders to increase their production is thus critical to meet future food demands.

There is no universally accepted definition of a smallholder farmer. Land size is the criterion most commonly employed. For instance, the Food and Agriculture Organization of the United Nations (FAO) has adopted a two-hectare threshold as a broad measure of a small farm. Overall, smallholder farmers are characterized by marginalization, specifically in terms of access to resources, information, technology, capital and other assets. Nevertheless, the so-called 'green revolution', particularly in Asia, demonstrated that the potential of smallholder farming could be harnessed and realized. For example, Vietnam has gone from being a food-deficit country to a major food exporter, and it is now one of the largest rice exporters in the world. It has achieved this largely through the development of its smallholder farming sector and the wide adoption of a new generation of rice varieties.

Rural labor availability is under pressure as a result of migration and rising urban wages, while agricultural practices remain underdeveloped. As a result, food production is increasingly being carried out by a proportionally smaller group of farmers, working in harsh conditions and with low productivity. Furthermore, the agricultural labor force is aging. It is therefore imperative to entice young, dynamic men and women into agriculture by providing them with the means to become entrepreneurs who earn a decent income.

Importance of Access to Seeds

Whereas farmers traditionally selected and saved seeds from their own fields for the next season or relied on seeds supplied by their community (also called the 'informal seed sector'), in many parts of the world seed production has developed into a specialized task, one that is now carried out by both small and large, often R&D-intensive seed companies alongside public research institutes (also called the 'formal seed sector').

Access to the products of the formal seed sector by smallholder farmers is currently limited. Typically, these farmers rely for their supply of seeds on the informal seed sector. Although the varieties from the informal sector often have important traits or produce the crops that are preferred by local communities, low-tech multiplication and storage may result in limited seedling vigor and decreasing yields over the years. Tests comparing traditional and improved varieties of tomato seeds demonstrated that the application of better agricultural practices can double the yields of traditional varieties, whereas improved varieties in some cases quintupled yields³.

Quality seeds of improved varieties can not only help farmers to increase their yields. They are also critical for what is often described as sustainable intensification: combining higher yields with sustainable use of other agricultural inputs, such as water, fertilizers and crop protection products. Through plant breeding, varieties can be developed that are disease resistant, better adapted to low-input conditions or climate-change challenges such as drought. Plant breeding can also help to meet the challenge of hidden hunger, for instance biofortification that increases the nutritional value of crops. Similarly, breeding for extended shelf life can ensure better storability and transportability of crops.

Seeds are a key technology for agriculture. Seed quality, determined by genetic makeup (the variety) and the health and vigor of the seedling that emerges, plays a major role in determining crop yield and quality. The availability of quality seeds of improved varieties is thus essential to promoting smallholders as entrepreneurs. Interestingly, one of the six dimensions of access to seeds that emerged from the Roundtable Conference on the Access to Seeds Index, held in Addis Ababa in November 2013 and attended by smallholder farmers from around the world, was 'autonomy'. Smallholder farmers – as entrepreneurs – should at least have the choice to use seeds supplied by the formal seed sector or by the informal sector. It is likely that many farmers prefer a mixed model, in which they rely for some crops on informal systems but turn to the formal system for others. This is the basic thinking behind the 'integrated seed system development' model, which advocates the integration of both formal and informal seed systems and the participation of both public and private actors in the development of demand-driven seed chains for smallholder farmers.

A Role for the Seed Industry

In its report on the post-2015 development agenda, the UN High-level Panel pointed to the tripling of agricultural production in the industrialized world over the past 50 years, in large part thanks to the use of high-yielding varieties. International public research centers and national agricultural research institutes play an important role in the breeding and conservation and use of genetic resources, but delivery to farmers is generally not one of their core competencies. It is precisely this combination of breeding and delivery to which seed companies add value and which makes them crucial partners for farmers.

Seed companies can play a key role in developing suitable varieties and making quality seeds available to smallholder farmers, helping to transform agricultural systems and produce more in a sustainable way. The large number of smallholder farmers to be reached and their diverse needs and demands require market-based approaches. Throughout the industry, seed companies are stepping up their efforts – partly because they see a responsibility to do so and partly because they see new market opportunities and client groups emerging. Yet a challenge of this magnitude can clearly not be solved by the private sector alone. Governments are critical for creating the conditions for markets to flourish. Other actors, such as NGOs and farmer organizations, can join forces with seed companies to build capacity, enabling farmers to adopt new technologies.

Learning from these initiatives and gaining a better understanding both of the contribution companies are already making and the opportunities for them to do more, is at the heart of what the Access to Seeds Index sets out to do. As such, it aims to contribute to the approach set out by the Sustainable Development Goals, the cornerstones of which are engaging the private sector and forging new partnerships to achieve the goals. This is where the Index encourages an evidence-based dialogue with the industry by identifying leadership and best practices that have been developed and tested in the marketplace.

Market Consolidation in the Seed Industry

The seed industry originally consisted of small companies, often family businesses and cooperatives. Over the past decades, the seed sector has increasingly consolidated and now includes large multinational seed and chemical companies listed on the stock exchange. These companies have increased their role through acquisitions and ownership stakes.^{4 5}

This trend of market consolidation is manifesting itself in the first instance in global (agro-)chemical companies' acquisition of or growing stake in seed companies. Examples include DuPont's acquisition of Pioneer (in 1999), Monsanto's acquisition of De Ruiter Seeds (1998), Bayer CropScience's acquisition of Nunhems (2002) and Syngenta's acquisition of MayAgro (2013).

More recently, global seed companies have been buying (a stake in) local companies in non-OECD countries. In 2013, for instance, Groupe Limagrain obtained a 30% share in Seed Co,

which originates in Zimbabwe.⁶ That same year, DuPont Pioneer acquired the South African Pannar Seed.⁷ KWS acquired the Brazilian companies Semília Genética e Melhoramento and Delta Pesquisa e Sementes in 2012.⁸

There continues to be movement in the sector. After Syngenta rejected a bid from Monsanto in 2015,⁹ ChemChina offered to acquire the company in early 2016.¹⁰ Several other (potential) mergers and take-overs have been reported, among them the merger between The Dow Chemical Company and DuPont.¹¹

The impact of these developments on global and regional food and nutrition security as well as access to seeds is potentially significant. This is due to the seed industry's key role at the beginning of the global food value chain and the reliance of smallholder farmers, who are responsible for a large proportion of global food supply, on its inputs.

Index with a Regional and Global Scope

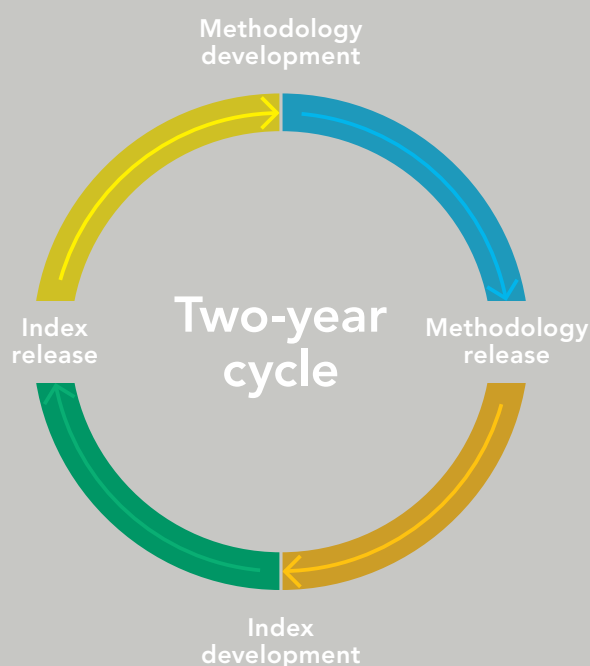
Although the ongoing consolidation of the seed industry at the global level would suggest otherwise, the industry is in fact highly diverse and locally driven. It can be described as a small group of global players, mainly originating in the USA, Europe and Japan, and a long tail of regional, national and niche players. Farming is ultimately a local business, and it will come as no surprise that this regional rootedness is reflected in the structure of the industry. The Access to Seeds Index follows a similar structure, with a Global Index that compares global seed companies and a Regional Index that ranks regional and national players.

Both global and regional players are well positioned to contribute to smallholder farmer development. Global companies have advanced R&D capacities, play a pivotal role in shaping the market and can use their geographic spread to transfer solutions that work in one region to other regions. The Index focuses on companies with an integrated seed business model, covering the full seed value chain, from R&D and production through distribution. As the business models of field crop and vegetable seed companies differ, two separate rankings were compiled.

Regional or national companies are particularly well placed to reach smallholder farmers, not only by introducing solutions that have proven to work elsewhere but also by responding to the needs and demands of smallholder farmers and articulating those to other players in the seed industry. The Regional Index currently covers Eastern Africa and will provide a template to roll out to other regions. The Regional Index focuses on regional companies as well as global companies with substantial activities in the region and national companies that are regarded as leading players in their home market.

Index Cycle

The Access to Seeds Index is published by the Access to Seeds Foundation, an independent organization based in Amsterdam, the Netherlands. By publishing the Index every two years, the Foundation seeks to create a platform around which stakeholders across the industry, farmer communities, governments, civil society and academia can coalesce to form a common view of how companies can make further progress. The Foundation is funded by the Dutch Ministries of Economic and Foreign Affairs and the Bill & Melinda Gates Foundation.



The Index methodology was developed in a thorough process of stakeholder consultations that began in 2012 and included two roundtable conferences with smallholder farmer representatives and the seed industry, respectively. The methodology, with its guiding principles, scope, measurement areas and indicators used for company assessment, is the product of these consultations. The methodology was reviewed by an Expert Review Committee and approved by the Supervisory Board of the Access to Seeds Foundation, both of which have an international and multi-stakeholder composition.

This first Access to Seeds Index provides a baseline measurement and marks the start of a new so-called index cycle, which will result in the publication of a second Access to Seeds Index in 2018. During the two-year cycle, the findings will be discussed with stakeholders in and around the seed industry and farmer communities, providing input for review and refinement of the methodology. This methodology will form the basis of the assessment for the second Access to Seed Index, and the cycle will begin again. As a result, each Index will reflect evolving priorities and enable progress to be monitored.

The Sustainable Development Goals

Partnering with the private sector is one of the cornerstones of the post-2015 development agenda. The adoption of the United Nations' Sustainable Development Goals (SDGs) in September 2015, illustrates the shift in the way the international community envisages addressing global challenges. The 17 universal goals, which in general seek to end poverty and hunger, improve health and education, protect and promote the sustainable use of ecosystems, combat climate change, and protect oceans and forests, encompass specific targets and indicators, not only to guide governments and development institutions but also to encourage the private sector and civil society to meet their responsibilities.

An evaluation of the SDGs' predecessors, the Millennium Development Goals (MDGs), specifically underlined the importance of improved crop varieties that have enabled farmers in advanced agricultural systems to triple their yields. Consequently, the seed industry is seen as a crucial partner in addressing global food security challenges. Besides SDG2, which sets out to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture, seed company activities may also affect other SDGs. These include SDG12, which focuses on ensuring sustainable consumption and production patterns; SDG13, which urges action to combat climate change and its impacts; and SDG15, which highlights the sustainable use of ecosystems.

Introduction to the Methodology

The methodology for the first Access to Seeds Index, laid out in the Methodology Report published in February 2015, is the result of extensive stakeholder engagement and expert review. The methodology consists of the following elements: guiding principles, research scope, measurement areas with indicators and scoring guidelines.

Guiding Principles

The Index is founded on the premise that smallholder farmers represent an underutilized opportunity to meet future food security challenges and that the seed industry can play a vital role in unlocking these farmers' potential.

Following input from stakeholders, the guiding principles acknowledge, among others, that although quality seeds of improved varieties are an essential input, farmer development is multifaceted and does not lie solely in the hands of the seed industry. The Index regards the seed industry as part of the solution and seeks to identify where and how seed companies can contribute.

Central to the guiding principles is the understanding that the Index attempts to incentivize the industry to develop inclusive business models suited to smallholder farmers, who see themselves as entrepreneurs. Although forms of strategic philanthropy can pave the way for new business models, the Index's focus is not on charity, donations or CSR projects with limited impact on business development. The principles also reflect that, from a smallholder's perspective, 'access to seeds' is not only about accessibility; it is also about availability, affordability, suitability, capability and autonomy.

Research Scope

To ensure a fair and meaningful analysis and comparison, the research scope delineates the areas that the Index takes into account.

The company scope ensures that the Index focuses its research on companies that can reasonably be considered peers. This is critical for an instrument that seeks to incentivize an industry through benchmarking. Therefore, only companies with an integrated seed business model (covering R&D, production and marketing) are included in the company scope. Separate global rankings are compiled for the leading field crop seed companies and leading vegetable seed companies, since the business models and sizes of each differ. A Regional Index for Eastern Africa has also been developed, with the potential for this to be rolled out to other regions.

The geographic scope and crop scope define the countries and crops for which the Index evaluates company activity. These scopes are also used for scaling to enable companies that are active in only a few countries or crops in the scope to be compared with companies that are active in a larger number of countries and/or crops. As such, companies with a small product portfolio or geographic footprint can make it to the top of the ranking. The geographic scope and crop scope are intended to enable a fair comparison between companies on what is currently in their portfolio, rather than evaluate them on product lines in which they are not currently active.

Measurement Areas and Indicators

The Index matches company performance with stakeholder expectations. Based on the results of the stakeholder engagement process, seven so-called measurement areas were identified where stakeholders expect or desire company activity. Indicators address specific topics within these measurement areas where stakeholders expect companies to act.

The indicators are a research tool, meant to identify whether there is an 'indication' of company activity in a certain area or on a certain topic. In other words, indicators are not guidelines or part of a code of conduct prescribing what companies should do. As an example, the indicator 'Developing improved varieties for local crops' (D.II.2: 'The company's breeding program includes the development of varieties of local crops appropriate to the local conditions and preferences of smallholder farmers in Index countries') seeks to identify whether the company has activities that fit this criterion. It is not intended to dictate company behavior. Ultimately, it is the best-in-class performance of an individual company on this indicator that receives the highest score.

The first Index provides a baseline measurement. Based on the insights generated by and lessons learned from the first Index, the methodology for the second Index will where necessary be refined. Indicators that identify substantial relevant company activity are likely to return in the second Index. Indicators that identify little relevant company activity are candidates for deletion if stakeholder dialogue finds that they reflect expectations that seed companies cannot reasonably meet. Alternatively, indicators may be candidates for revision if it becomes apparent that those expectations should be formulated in a way that better captures the role of the industry.

Scoring Guidelines

The Index is a relative ranking. It compares companies with each other rather than against an absolute, ideal state. The highest scores for each indicator reflect the degree to which a company meets stakeholder expectations. The best-in-class performance of a company on a certain indicator determines what receives the highest score. Additionally, companies do not receive negative scores on indicators, meaning that they can never score below zero. Preliminary scoring guidelines were developed based on stakeholder input as well as advice from the Expert Review Committee. Following completion of the data collection phase, the scoring guidelines were revised to better reflect current industry activities. The scoring guidelines were approved by the Supervisory Board of the Access to Seeds Foundation.

Methodology Overview

The Access to Seeds Index matches company performance with stakeholder expectations. These expectations are translated into indicators. As the Index is a relative ranking, the best-in-class performance on a specific indicator determines which company receives the highest score. Three different components make up the methodology: the guiding principles, the scope and the measurement areas with indicators.

Guiding Principles

Seeds are fundamental to agriculture. Yet it is clear that empowering smallholder farmers in developing countries entails more than simply making better seeds available to them. This is acknowledged in the Index's five guiding principles.

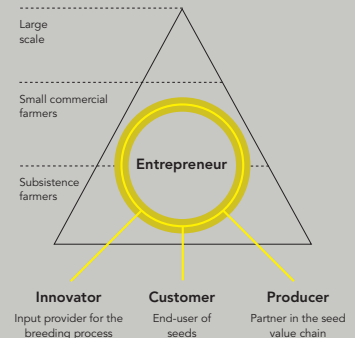
1.



Six Access Dimensions

The Index seeks to explore the possible contribution of seed companies to the six dimensions of access to seeds identified by stakeholders.

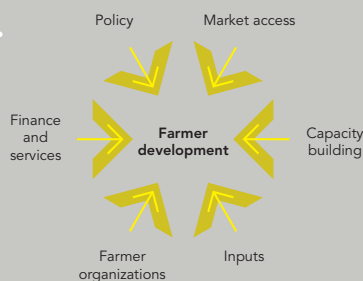
2.



Farmer as Entrepreneur

The Index focuses on sustainable business models and does not emphasize charity or donations.

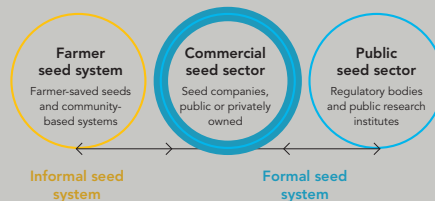
3.



Farmer Development

The Index examines if and how seed companies partner with others to contribute to six factors that are essential for farmer development.

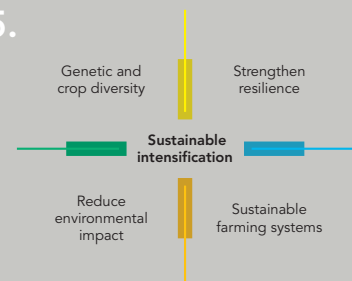
4.



Multiple Seed Systems

The Index's main focus is on the role of the commercial seed sector. It also considers interaction with other systems, such as breeding programs carried out by public research institutes and farmer-based seed systems.

5.



Sustainable Intensification

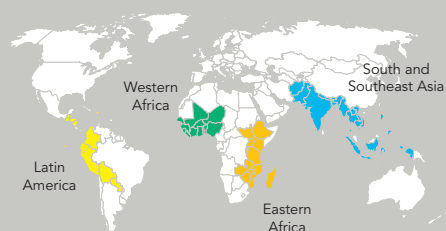
This principle acknowledges that increased smallholder farmer productivity has to be achieved using resources more efficiently and minimizing or reversing the negative impact on the environment.

Scope of the Index

Geographic Scope

Global seed companies are assessed on their activities in the Index's four target regions. The Regional Index focuses on leading companies in a specific region. The four regions were identified based on three criteria:

- Presence of smallholder farmers
- Food security challenge
- Agricultural potential



Company Scope

The Index focuses on leading seed companies with an integrated seed business model (R&D, production, distribution). Leadership is defined by seed revenues (global) or peer recognition (regional). For benchmarking purposes, three rankings have been developed for:

- Global field crop seed companies
- Global vegetable seed companies
- Regional seed companies in Eastern Africa

Field Crop Seed Companies

Global Index

- Bayer DEU
- Dow AgroSciences USA
- DuPont Pioneer USA
- Groupe Limagrain FRA
- KWS DEU
- Monsanto USA
- Syngenta CHE

Vegetable Seed Companies

Global Index

- Bayer DEU
- Bejo NLD
- East-West Seed THA
- Enza Zaden NLD
- Groupe Limagrain FRA
- Monsanto USA
- Rijk Zwaan NLD
- Sakata JPN
- Syngenta CHE
- Takii JPN

Seed Companies Regional

Index for Eastern Africa

- Demeter Seed MWI
- DuPont Pioneer
- (including Pannar) USA
- East African Seed KEN
- East-West Seed THA
- Ethiopian Seed Enterprise ETH
- FICA Seeds UGA
- Hygrotech ZAF
- Kenya Highland Seed KEN
- Kenya Seed Company KEN
- Monsanto (including National Seed Co. of Malawi) USA
- NASECO UGA
- Pop Vriend Seeds NLD
- Seed Co ZWE
- Syngenta (including MRI) CHE
- Technisem FRA
- Victoria Seeds UGA
- Zamseed ZAM

Crop Scope

The Index focuses on food crops. The scope encompasses both field crops and vegetable crops. The three crop lists are:

- Global field crops (major crops based on total area of cultivation)
- Global vegetable crops (major crops based on total area of cultivation)
- Local priority crops (as identified in stakeholder consultations)

Global Field Crops

- Barley
- Beans, dry
- Maize
- Millets:
 - Finger millet
 - Foxtail millet
 - Pearl millet
- Potato
- Rice, paddy
- Sorghum
- Soybean
- Wheat

Local Field Crops

- Chickpea
- Cowpea
- Lablab
- Pigeon pea
- Tef

Global Vegetable Crops

- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Chicory
- Chili pepper
- Cucumber
- Eggplant
- Garlic
- Gherkins
- Gourd
- Green bean
- Green pea
- Leek
- Lettuce
- Melon
- Okra
- Onion
- Pumpkin
- Spinach
- Squash
- Sweet pepper
- Tomato
- Turnip
- Watermelon

Local Vegetable Crops

- Amaranth
- Black nightshade
- Crotalaria
- Jew's mallow
- Spider plant

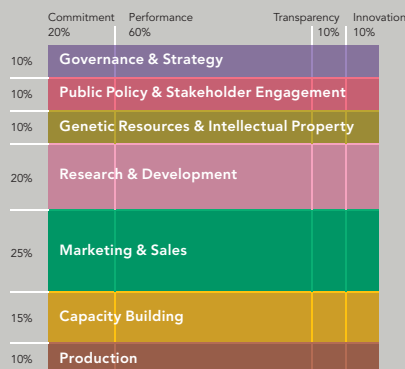
Measurement Areas

Companies are assessed and ranked using a weighted scorecard approach. In each measurement area, companies are assessed with indicators classified in four categories: Commitment, Performance, Transparency and Innovation.

Weighting & Scoring Global Index



Weighting & Scoring Regional Index



- Governance & Strategy**
Seeks to capture companies' overall commitment to global food and nutrition security and, more specifically, to smallholder farmer development.
- Public Policy & Stakeholder Engagement**
Seeks to capture how companies engage with policy-makers and other stakeholders to influence policies and markets in ways that benefit smallholder farmers.
- Genetic Resources & Intellectual Property**
Seeks to capture how companies handle genetic resources and IP in ways that support the opportunities for smallholder farmer development.
- Research & Development**
Seeks to capture how companies' R&D efforts contribute to developing varieties suitable for smallholder farmers.
- Marketing & Sales**
Assesses the way in which companies make quality seeds of improved varieties available and affordable to smallholder farmers.
- Capacity Building**
Seeks to capture how companies contribute to ensuring that smallholder farmers have the capacity to realize the full potential of quality seeds of improved varieties.
- Local Seed Sector Advancement (Global Index)**
Seeks to capture the extent to which seed companies are involved in advancing a professional seed sector on a local level.
- Production (Regional Index)**
Seeks to identify whether seed companies produce seeds locally and involve smallholder farmers in this process.

How the Index was Developed

During a comprehensive process of engagement and consultation, stakeholders provided input for the Index methodology. The methodology was subsequently reviewed and approved by the Supervisory Board. The first Index provides a baseline measurement. Based on the findings of and feedback on this Index, the methodology, described in detail in the Methodology Report published in March 2015, will be reviewed and where needed adjusted prior to the second edition.

1. Methodology Development

Stakeholder consultations

In a thorough two-year process of roundtable conferences, individual interviews and public feedback, stakeholders provided input for the methodology development.



Methodology review

The Expert Review Committee reviewed drafts of the methodology and provided advice on improvements and finalization.



Methodology approval

Based on stakeholder input and the advice of the Expert Review Committee, the Supervisory Board of the Access to Seeds Index approved the methodology.

2. Data Collection

Company training

Companies selected for the Index were offered training on data collection and provision.



Data provision

To complement information available from public sources, companies were invited to provide additional data through a questionnaire.



Data verification

The data applicable for analysis was selected and checked. The full dataset was sent back to all companies for fact-checking purposes.

3. Data Analysis

Weighting

The Expert Review Committee advised on the relative weights of measurement areas and indicator types. The weights were confirmed by the Supervisory Board.



Scoring

Scoring guidelines were developed for each indicator and refined based on the data to identify best-in-class performance. The final scoring guidelines were approved by the Supervisory Board.



Comparison

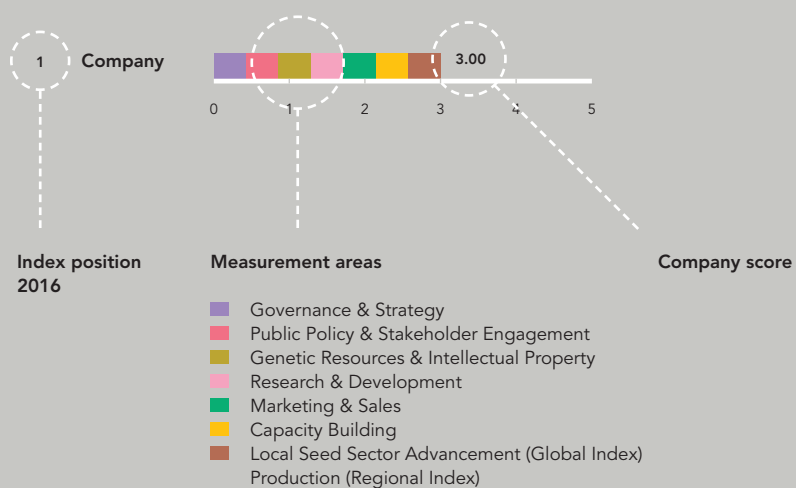
The Index is a relative ranking, comparing companies with each other rather than against an ideal state. Comparison identified leadership and best practices.



Local breeding

Local scientists Shakuntala and Pushpalata examine tomato crops in the greenhouse at East-West Seed's R&D center in Bangalore, India. Through plant breeding, varieties can be developed that are suitable for smallholder farmers: better adapted to low-input conditions or climate-change challenges such as drought. Breeding for extended shelf life can also ensure better storability and transportability of crops.

How the Company Rankings Work



Part II

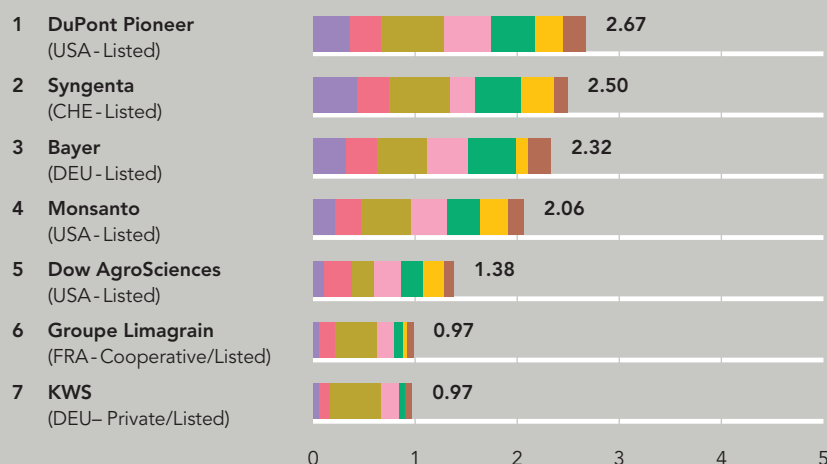
The Rankings

In order to compare companies that are similar in portfolio, scope or presence, the Access to Seeds Index is divided into three rankings: global field crop seed companies, global vegetable seed companies and regional seed companies in Eastern Africa. Based on their presence or portfolio, some companies appear on multiple lists. Companies are assessed and ranked using a weighted scorecard approach. There are a total of 73 indicators for the global companies and 62 indicators for the regional companies. A company's overall score is the weighted sum of its scores.

DuPont Pioneer tops the Global Index of Field Crop Seed Companies, closely followed by Syngenta and Bayer CropScience. East-West Seed clearly outperforms its peers in the Global Index of Vegetable Seed Companies, again followed by Syngenta and Bayer CropScience. East-West Seed also leads the Regional Index for Eastern Africa, followed by a cluster of four companies that originate in the region: Victoria Seeds, East African Seed, Kenya Seed Company and NASECO.



Global Index of Field Crop Seed Companies

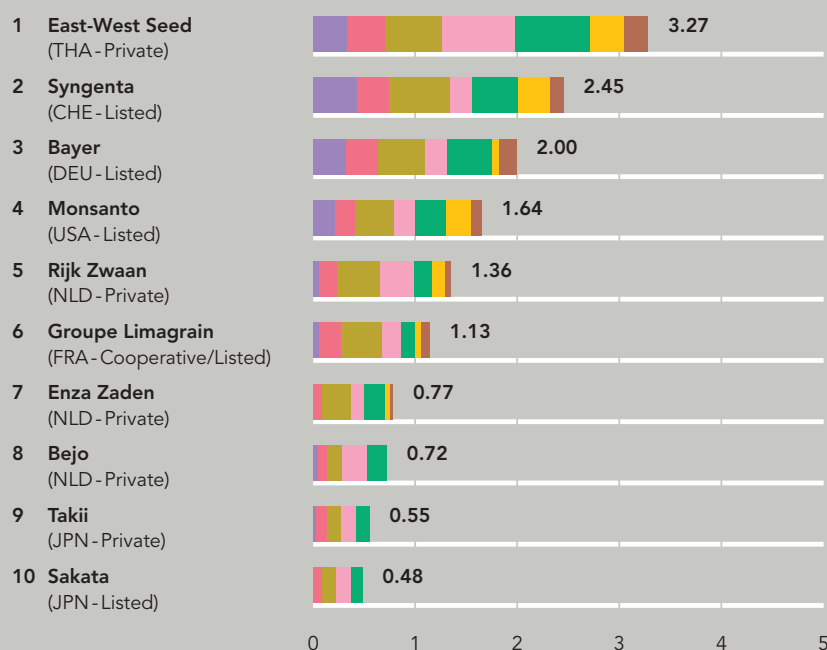


DuPont Pioneer tops the Global Index of Field Crop Seed Companies, its position the result of strong performance in measurement areas including Genetic Resources & Intellectual Property, Research & Development and Marketing & Sales. DuPont Pioneer is closely followed by Syngenta and Bayer CropScience. Syngenta's strengths lie in Genetic Resources & Intellectual Property, Marketing & Sales and Governance & Strategy; Bayer CropScience's strengths in Research & Development, Marketing & Sales and Local Seed Sector Advancement.

Interestingly, DuPont Pioneer and Bayer CropScience score best on Performance (programs and activities) indicators, whereas Syngenta's ranking is mainly determined by its high score on Transparency (disclosure) and Innovation (unique approaches in the industry) indicators. The three companies lead in virtually all measurement areas, generally dividing the top positions between them. Monsanto ranks fourth overall but ranks second in Capacity Building and Local Seed Sector Advancement and third in Research & Development. KWS makes it into the top three in Genetic Resources & Intellectual Property, largely thanks to its activities supporting the conservation and use of genetic resources in Index countries.



Global Index of Vegetable Seed Companies

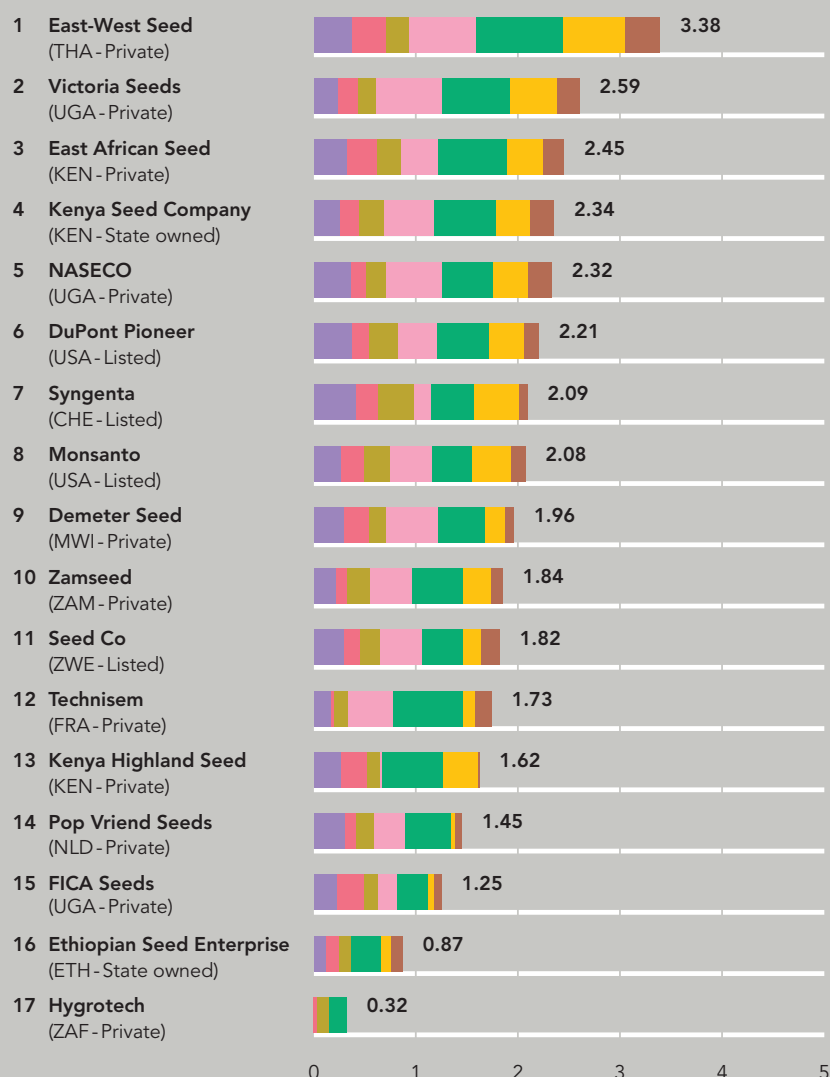


East-West Seed clearly outperforms its peers in the Global Index of Vegetable Seed Companies. Although it is the smallest in terms of seed revenue, the company demonstrates that size is not a determining factor in the Index. Rather, its mission-driven smallholder-centric business model translates into high scores across all measurement areas, with the exception of Governance & Strategy. Syngenta and Bayer CropScience rank second and third, respectively. Bayer CropScience is a steady top three performer but does not lead in specific areas. Syngenta scores highly in Governance & Strategy, due to the commitments articulated in its Good Growth Plan, and Capacity Building, thanks to the activities of the Syngenta Foundation.

East-West Seed lags on Transparency, its overall leading position mainly determined by its score on Performance indicators. Syngenta leads on Commitment and Transparency. The top three companies generally lead in all measurement areas, with the exception of Research & Development. Rijk Zwaan and Bejo take second and third place, respectively, in this area, reflecting their focus on their core competency, which is breeding. Companies at the lower end of the ranking disclose few relevant activities across all areas evaluated.



Regional Index for Eastern Africa



The Regional Index for Eastern Africa shows small differences between companies, with a gradual tailing-off of scores. This is with the exception of East-West Seed, whose performance significantly exceeds its peers. East-West Seed's position is underpinned by its smallholder-centric business model, which translates into consistently high scores in a number of measurement areas, including Marketing & Sales, Research & Development and Capacity Building.

Behind East-West Seed, the top of the ranking is dominated by companies based in Eastern Africa, namely Victoria Seeds, East African Seed, Kenya Seed Company and NASECO. Their comparatively strong overall performance is primarily the result of strengths in Marketing & Sales and Research & Development, most notably on Performance indicators rather than Commitment or Transparency. Generally speaking, the highest ranked companies have robust programs and activities related to access to seeds.

Despite an average performance overall, DuPont Pioneer, Syngenta and Monsanto excel in Commitment in the areas of Governance & Strategy and Capacity Building, surpassing other Regional Index leaders. Since they are multinationals, it is likely that they face higher stakeholder expectations regarding accountability and responsibility. Commitment and Transparency thus make a greater contribution than other indicator categories to their overall score.

Demeter Seed, Zamseed, Seed Co, Technisem, Kenya Highland Seed, Pop Vriend Seeds and FICA Seeds demonstrate a comparatively weaker overall performance but show strengths in specific areas, typically Marketing & Sales and Research & Development. Ethiopian Seed Enterprise and Hygrotech close out the ranking, mainly due to low levels of disclosure across all measurement areas.

Measurement Areas

- Governance & Strategy
- Public Policy & Stakeholder Engagement
- Genetic Resources & Intellectual Property
- Research & Development
- Marketing & Sales
- Capacity Building
- Local Seed Sector Advancement (Global Index)
- Production (Regional Index)

A Closer Look at the Rankings

The highest ranked companies in both Global Indexes lead in virtually all measurement areas. Additionally, sector innovations are found mainly among the leading companies. Leadership does not come from nowhere. The top three companies in both Global Indexes are also the companies with a broad commitment in place and tangible targets driving their activities.

Leaders lead in all areas

The leaders in the Global Index of Field Crop Companies are DuPont Pioneer, Syngenta and Bayer CropScience. Monsanto and KWS occasionally enter the top three. The leaders in the Global Index of Vegetable Seed Companies are East-West Seed, Syngenta and Bayer CropScience. Only in Research & Development does the top three have a different composition, with Rijk Zwaan and Bejo occupying second and third place, respectively.

These leadership patterns can be explained by the commitment articulated by individual companies. The companies that make it into the top three in both Global Indexes all have a formal policy articulating a broad role for the company in global food challenges, including tangible targets. In contrast to this broader commitment, companies such as Rijk Zwaan, Bejo and Enza Zaden primarily focus their contribution on a specific area: breeding. KWS and Dow AgroSciences, among others, limit their contributions to global food security challenges to CSR-related projects.

The Regional Index has a more variable set of companies among the leaders per measurement area. In some cases, companies that score below average overall still make it into the top three. Examples are Technisem, which ranks second in Marketing & Sales, and FICA Seeds, which ranks third in Public Policy & Stakeholder Engagement.

Although leading companies generally lead in all areas, these positive outliers in specific measurement areas demonstrate that interesting practices can be found across almost all companies in the Index.

Performance exceeds commitments; transparency can be improved

Each measurement area is assessed with indicators classified in four categories: Commitment, Performance, Transparency and Innovation. Leading companies, both in the Global and Regional Indexes, show commitment and performance related to improving access to seeds for smallholder farmers, with performance usually stronger than publicly disclosed commitments. This is especially true for smaller companies, which include many of the regional companies in the Regional Index.

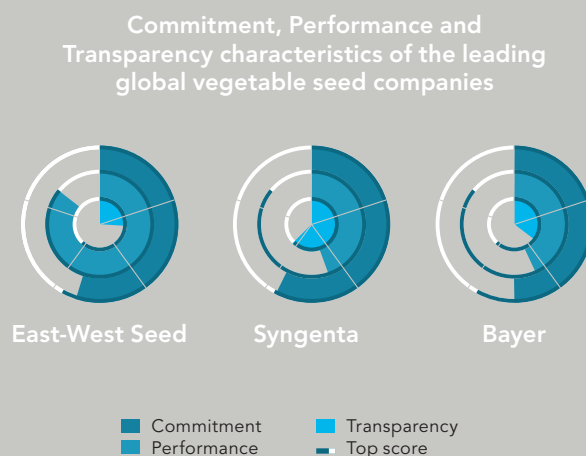
Relatively few companies publicly and regularly report on their activities. Lack of transparency in the seed industry can be explained to some extent by the fact that there are multiple private and two state-owned companies among the vegetable seed companies and in Eastern Africa. Private companies are not required to be as transparent about their business strategy and results as

listed companies. This is illustrated by the global field crop seed companies, all listed, the general level of public disclosure for which is higher than for companies in the other two Indexes.

A notable score is achieved by Ethiopian Seed Enterprise, which ranks fourth on Transparency, after three listed, multinational companies. Although it is at the bottom of the overall ranking, it outperforms the other companies originating in the region largely due to the launch of its – by regional standards – advanced website in early 2015.

Leadership is linked to different patterns of commitment, performance and transparency

Whereas the overall rankings and the rankings per measurement area show that the leading companies generally dominate both, an analysis of the four indicator categories reveals a different pattern. East-West Seed, leading both the Global Index of Vegetable Seed Companies and the Regional Index, is an example of a company that shows a clear commitment to access to seeds for smallholder farmers and scores particularly highly on Performance. However, its level of public disclosure is not as strong. In contrast, Syngenta, which ranks second in both Global Indexes, actively reports on its activities at the global level and scores well on Transparency, but ranks lower on Performance.



Sector innovations are found mainly among the leading companies

In addition to many good practices, a number of interesting innovative activities have emerged that could be important strategies and examples of change. The most innovative activities can be found in Research & Development and Marketing & Sales and generally among the leading companies, including Syngenta, East-West Seed, DuPont Pioneer and Victoria Seeds, and, to a lesser extent, Rijk Zwaan, Dow AgroSciences and Demeter Seed.

Syngenta and East-West Seed stand out in particular. Many of Syngenta's innovations are tied to work done by the Syngenta Foundation, which is proving to be an effective vehicle for developing and piloting innovative approaches for smallholder farmers in a relatively non-competitive environment. East-West Seed's innovative approaches are directly linked to its smallholder-centric business model.



Adoption strategies

Ethiopian farmer Gifty Jemal Hussein explains to President Obama how her life has improved since the use of quality seeds helped her to triple her yields. She participated in the Advanced Maize Seed Adoption Program (AMSAP), a collaboration between DuPont Pioneer, the Ethiopian government and USAID.

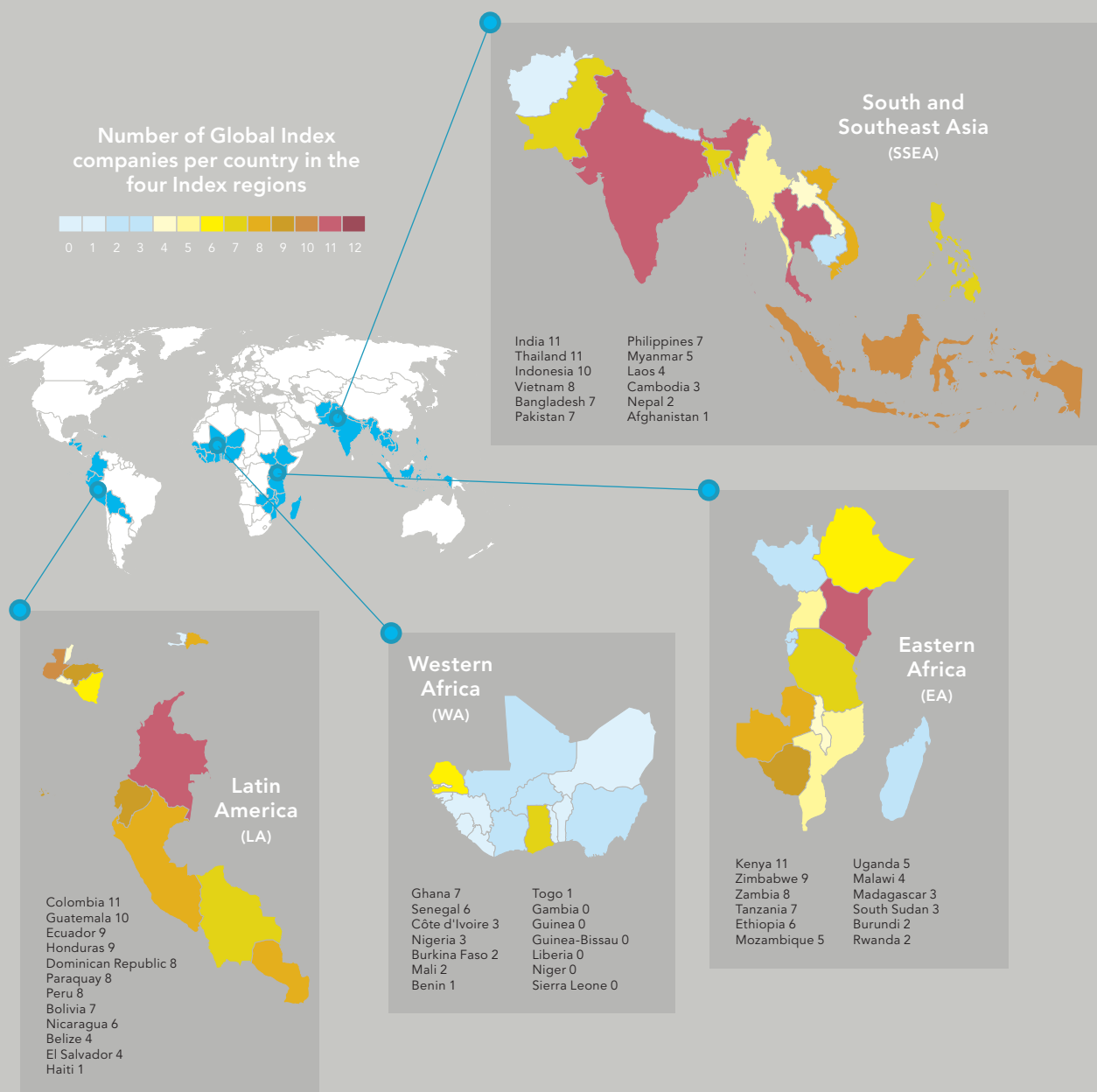
Part III

Industry-level Key Findings

The Index has identified four regions with (1) a food security challenge, (2) smallholder farmer presence and (3) agricultural potential, and provides for the first time a comprehensive picture of what the industry is doing in those regions. The general assumption that emerged from stakeholder consultations was that the industry's commitment is limited to a few crops and countries, due to a lack of suitable genetic material for tropical zones and an inadequate enabling environment. Based on the Index's findings, this assumption deserves to be reexamined. Global seed companies cover all Index regions and offer a broad portfolio. This is with the exception of Western Africa. Zooming in on Eastern Africa, a regional seed industry landscape becomes visible, with regional companies filling some vital gaps and going a step further than their global peers to address the needs of smallholder farmers.

Key Finding 1

The global seed industry covers all Index regions; with a clear gap in Western Africa



Access to the seed industry's products begins for smallholder farmers with seed companies being present in the countries where they farm. The Global Index shows that global companies are present in all Index regions. Only Western Africa lags significantly behind, with six out of 14 countries not served at all. The regional and global companies assessed for the Regional Index cover all Eastern African countries, with at least three companies per country.

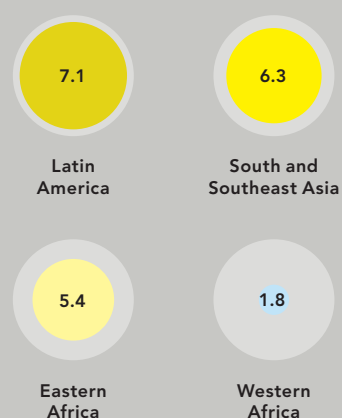
It is not a given that global seed companies enter the markets where smallholder farmers are active. Most companies originate in temperate climate zones and

their genetic material might not be suitable for tropical climate zones. An appropriate enabling environment (policy and regulations) is also required. Before varieties can be introduced into a market, they need to be tested and registered. Similarly, companies need protection of their intellectual property or measures against counterfeit seed. In many countries in the Index scope, there is room for improvement in this respect. Nevertheless, it is encouraging to note that all regions and almost all countries, with the exception of Western Africa, are covered by global seed companies. Clearly, companies see reasons and find ways to overcome the obstacles to market entry.

Global Index companies are active in all Index regions; Western Africa is covered least

A total of 13 global field crop and vegetable seed companies were assessed for the Global Index. Together, these companies are present in all four Index regions. Only Western Africa shows a clear gap, with Gambia, Guinea, Guinea-Bissau, Liberia, Niger and Sierra Leone not served by any global company in the scope. Most companies are present in Latin America, on average around seven per country, followed by South and Southeast Asia, with an average of six companies per country, and Eastern Africa, with an average of five companies per country. The lowest level of company activity is in Western Africa, with an average of around two companies per country. The countries with the widest spread of companies are Colombia, India, Kenya and Thailand, where 11 of the 13 Global Index companies are reportedly active. It is notable that companies also operate in fragile states, including Afghanistan, Haiti and South Sudan. Companies with a large footprint are Bejo, DuPont Pioneer and East-West Seed, which are present in 33, 30 and 30 countries respectively, across all Index regions. The most breeding and production locations are found in South and Southeast Asia and the fewest in Western Africa.

Average number of Global Index companies per country in the four Index regions

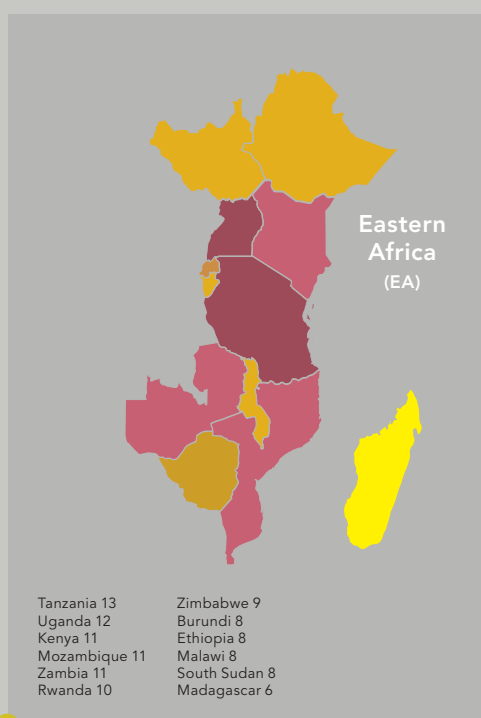


Regional Index companies extend the reach of the seed industry in Eastern Africa

A total of 17 companies were assessed for the Regional Index. Four Global Index companies are also included in the Regional Index: East-West Seed, DuPont Pioneer, Monsanto and Syngenta. The map shows that at least three companies are active in each of the countries in the Regional Index scope, namely DuPont Pioneer, Pop Vriend Seeds and Seed Co. Ethiopian Seed Enterprise only appears to be present in Ethiopia, its home base. The highest number of companies (13 out of 17) are active in Tanzania.

Companies that originate in the region are an essential part of the seed industry's reach as a whole and the opportunities for smallholders to choose between suppliers. This becomes clear when one looks at countries with only limited activity by Global Index companies. In Burundi and Rwanda only two Global Index companies are active, but this is complemented by an additional six and eight other companies, respectively, operating in the region.

Number of Regional Index companies per country in Eastern Africa



Key Finding 2

The seed industry brings a broad crop portfolio to Index regions

The seed industry's portfolio in Index countries is broader than generally assumed. In the dialogue on seed industry activities in Index countries, which took place during the development phase of the Index, an often-heard assumption was that seed companies mainly focus on major crops like maize and tomato. Smaller global crops, in terms of areas harvested, and so-called 'neglected and underutilized crops', which the Index refers to as 'local crops', were assumed to be largely ignored. Based on the findings of this first Index, these assumptions deserve to be reexamined.

Global field crop seed companies focus on major crops

The choice for smallholder farmers would be limited if they depended solely on the sales portfolios of global field crop seed companies. Most activities are found in maize and no global field crop companies sell foxtail and finger millet in any of the Index regions. DuPont Pioneer, for instance, has maize in its sales portfolio in all Index regions and in its breeding programs in all regions except Western Africa. Through its subsidiary, Pannar, it has a broader portfolio in Eastern Africa. Bayer CropScience focuses its field crop activities in Index countries on rice, with the addition of pearl millet in South and Southeast Asia and soybean in Latin America.

Regional companies broaden availability and choice in field crop seeds

Looking at Eastern Africa, it becomes clear that the regional industry plays a crucial role in broadening the regional availability of quality seeds of improved field crop varieties, and hence the choice for smallholder farmers between suppliers. Two companies, DuPont Pioneer and Seed Co, have dry beans, maize, soybean, sorghum and wheat in their portfolio in all Regional Index countries. Multiple companies also have barley, finger millet and rice in their portfolio, although these crops are not available in all countries. Only for two crops is company activity limited to one supplier in one country: foxtail millet (Kenya Seed Company in Kenya) and potato (Seed Co in Zimbabwe).

Both global and regional vegetable seed companies have a broad portfolio available in Index regions with breeding mainly carried out by global companies

The overall picture is somewhat different for vegetable seeds. Global seed companies as a group have a relatively broad portfolio of vegetable seeds available in Index regions, indicating that these companies are equipped with the genetic material appropriate for these regions. With only a few exceptions, such as green pea, garlic and turnip, global vegetable seed companies have breeding or testing programs for all crops and all regions.

Zooming in on Eastern Africa, it becomes clear that the portfolios of the regional seed companies offering vegetable seeds complement the portfolios of their global peers, with garlic, green pea and turnip also available but an absence of chicory. Although information at shop or village level is not available, the results indicate that at country level in many countries and crops – with the exception of Madagascar and South Sudan – farmers can choose between multiple suppliers.

It should be noted, however, that having multiple suppliers in the market does not automatically mean real choice for farmers. Most regional companies supplying vegetable seeds have a broad sales portfolio but no breeding program of their own, indicating that they rely on wholesale suppliers. If companies obtained their seeds from the same source, farmers would have the choice between different packages containing the same seeds. Exceptions are Kenya Seed Company, which has its own breeding programs for specific vegetable crops, and Victoria Seeds, which performs variety trials for vegetable crops for specific agroecological zones. In Eastern Africa, the main sources for newly bred vegetable seed varieties are currently global companies such as East-West Seed, Pop Vriend Seeds and Technisem.

Local crops are mainly the domain of regional companies

The so-called 'neglected and underutilized crops' are certainly not ignored by seed companies originating in Eastern Africa. Local vegetables such as amaranth, black nightshade, spider plant and Jew's mallow are in the portfolio of multiple companies in nearly all Regional Index countries. These companies have their own breeding programs for these crops as well. For local field crops, most company activity – both sales and breeding – is found in cowpea.

Global companies do not include local crops in their portfolio. Exceptions here are East-West Seed and Technisem. As an illustration of their core mission to develop tropical vegetable seeds for smallholder farmers, these two companies are the only global companies with breeding programs for local crops.

Global – Distribution

● Crop distributed by Global Index companies in region

Field Crops	LA	WA	EA	SSEA
Barley				
Beans, dry			●	
Finger millet				
Foxtail millet				
Maize	●	●	●	●
Pearl millet				●
Potato				
Rice, paddy		●	●	●
Sorghum			●	●
Soybean	●		●	
Wheat			●	

Vegetable Crops

Broccoli			●	●
Cabbage	●	●	●	●
Carrot	●	●	●	●
Cauliflower	●	●	●	●
Chicory				
Chili pepper	●		●	●
Cucumber	●	●	●	●
Eggplant	●	●	●	●
Garlic				
Gherkin	●			●
Gourd	●	●	●	●
Green bean	●			●
Green pea				
Leek				
Lettuce	●	●	●	●
Melon	●	●		●
Okra		●	●	●
Onion	●	●	●	●
Pumpkin	●	●	●	●
Spinach	●			
Squash				
Sweet pepper	●		●	●
Tomato	●	●	●	●
Turnip				
Watermelon	●	●	●	●

Regional – No. of Companies Known

● to distribute in Index countries
● to breed for the region

Field Crops	1	2	3	4	5	6	7	8	9	10
Barley	●	●	●	●	●					
Beans, dry	●	●	●	●	●	●	●	●	●	
Finger millet	●	●	●							
Foxtail millet	●									
Maize	●	●	●	●	●	●	●	●	●	●
Pearl millet	●	●	●							
Potato	●									
Rice, paddy	●	●	●	●	●	●	●	●	●	●
Sorghum	●	●	●	●	●	●	●	●	●	●
Soybean	●	●	●	●	●	●	●	●	●	●
Wheat	●	●	●	●	●					

Vegetable Crops

Broccoli	●	●	●	●	●	●	●	●	●	●
Cabbage	●	●	●	●	●	●	●	●	●	●
Carrot	●	●	●	●	●	●	●	●	●	●
Cauliflower	●	●	●	●	●	●	●	●	●	●
Chicory										
Chili pepper	●	●	●	●	●	●	●	●	●	●
Cucumber	●	●	●	●	●	●	●	●	●	●
Eggplant	●	●	●	●	●	●	●	●	●	●
Garlic	●	●								
Gherkin	●	●								
Gourd	●	●	●	●						
Green bean	●	●	●	●	●	●	●	●	●	●
Green pea	●	●	●	●	●					
Leek	●	●	●	●	●	●	●	●	●	●
Lettuce	●	●	●	●	●	●	●	●	●	●
Melon	●	●	●	●	●	●	●	●	●	●
Okra	●	●	●	●	●	●	●	●	●	●
Onion	●	●	●	●	●	●	●	●	●	●
Pumpkin	●	●	●	●	●	●	●	●	●	●
Spinach	●	●	●	●	●	●	●	●	●	●
Squash	●	●	●	●	●	●				
Sweet pepper	●	●	●	●	●	●	●	●	●	●
Tomato	●	●	●	●	●	●	●	●	●	●
Turnip	●	●	●	●						
Watermelon	●	●	●	●	●	●	●	●	●	●

Key Finding 3

The seed industry explores a broad approach to facilitating access to seeds for smallholder farmers

Can farmers easily obtain the seeds they need?

The coverage of most Index countries and Index crops, as discussed in the first two key findings, is an important prerequisite for availability. In terms of availability at country level, only for Western Africa was a clear gap identified. Across the industry, it seems to be common practice to make use of field days and demonstration plots to show the quality of the crops that can be produced with company seeds. Yet the question remains: how extensive is

companies' reach? Smallholder farmers appear to be specifically targeted through the distribution networks of agrodealers and seed company agents. Some companies disclose efforts to reach further, although it is not clear to what extent this has been achieved. An interesting example is the mobile seed shops (tuk-tuks) used by Victoria Seeds to reach smallholder farmers in remote areas in Eastern Africa.

Do farmers as users and producers have freedom of choice?

Not being dependent on one source for their supply of seeds is an important aspect of autonomy for smallholder farmers. The presence of multiple seed companies and crops in most Index countries indicates an increasing ability for smallholder farmers to choose between a wider range of suppliers from the formal seed system. At the same time, smallholder farmers will likely rely for some crops on the formal seed system and for others on the informal seed system. While nearly all companies respect the farmers' privilege of saving seeds for private, non-commercial use in Index countries, no evidence was found that companies support the informal seed system in Index countries. Furthermore, relatively few companies disclose evidence of working with farmer organizations and/or strengthening such organizations. Although in policy discussions the importance of an integrated seed systems approach, which takes into account the relevance of different seed systems for smallholder farmers as well as the interaction between seed systems, is gaining support, this line of thinking does not yet seem to have taken root in seed companies.

Access Dimensions

Access to seeds can be translated into six dimensions, as was concluded during the roundtable with smallholder farmers in Addis Ababa, Ethiopia (November 2013). Companies focus in particular on improving the availability and affordability of seeds, and – through capacity-building activities – on increasing the capabilities of smallholder farmers. While companies were found to breed for characteristics important for smallholder farmers, more can be done to guarantee suitability. This includes improving the availability not only of hybrid but also open-pollinated varieties (OPVs) as well as different seed quality grades, in order to provide smallholder farmers with more choice and autonomy in their business activities. Regional companies appear to have developed practices that go a step further than their global peers.

1.

Availability

6.

Autonomy

5.

Profitability

Can farmers build a profitable business?

More than half of the companies, both at the global and regional level, strengthen the capacity of smallholder farmers to operate effectively in output markets. Most notably, Global Index companies report on value chain projects. Among them is Bayer CropScience's Food Chain Partnership, which is active in more than 30 countries including Guatemala, India and Kenya. Within the partnership, Bayer CropScience acts as a facilitator to bring together the partners along the food value chain, including farmers, processors, exporters, retailers and consumers, to increase sustainable agriculture and the 'sustainable production of high-quality and affordable food'. Also in breeding programs, increased shelf life and transportability are breeding targets that increase opportunities for smallholder farmers to sell their produce on output markets. Rijk Zwaan's breeding program includes Caribbean melons, which were developed to have a longer shelf life. Similarly, shelf life and transportability are two of the main breeding objectives of East-West Seed.

Can farmers afford to use quality seeds of improved varieties?

Most companies provide seeds in suitable quantities for small plots. Smallholder farmers can also benefit increasingly from insurance products such as those facilitated by the Agriculture and Climate Risk Enterprise (ACRE), a spin-off company of the Syngenta Foundation which insures African smallholder farmers against calamities such as droughts. Several companies, particularly in Eastern Africa, promote policies such as government subsidies supportive of increasing access to quality seeds for smallholder farmers. Some regional companies also report cooperation with farmer organizations to facilitate joint purchasing.

2.

Affordability

3.

Suitability

Are seeds tailored to the needs of smallholder farmers?

Suitability can be increased by breeding for a specific region. As discussed in key finding #2, seed companies have established breeding programs for many of the global crops and, at the regional level, also for local crops. These programs take into account e.g. increased resistance to pests and diseases and tolerance to abiotic stresses. Regional companies NASECO and Demeter Seed report that they also take other traits, such as culinary preferences, which are relevant for the end-users of the crop into consideration. Demeter Seed, for example, selects maize varieties for flintiness, to ensure crop compatibility with smallholder farmer processing and consumption methods and cooking time. Another aspect of suitability is accounting for smallholders' different capacity levels. In Eastern Africa, in particular, practices were found of marketing specific-grade seeds, for example for hand planting, as well as selling open-pollinated varieties (OPVs) for crops for which hybrid varieties are readily available.

4.

Capability

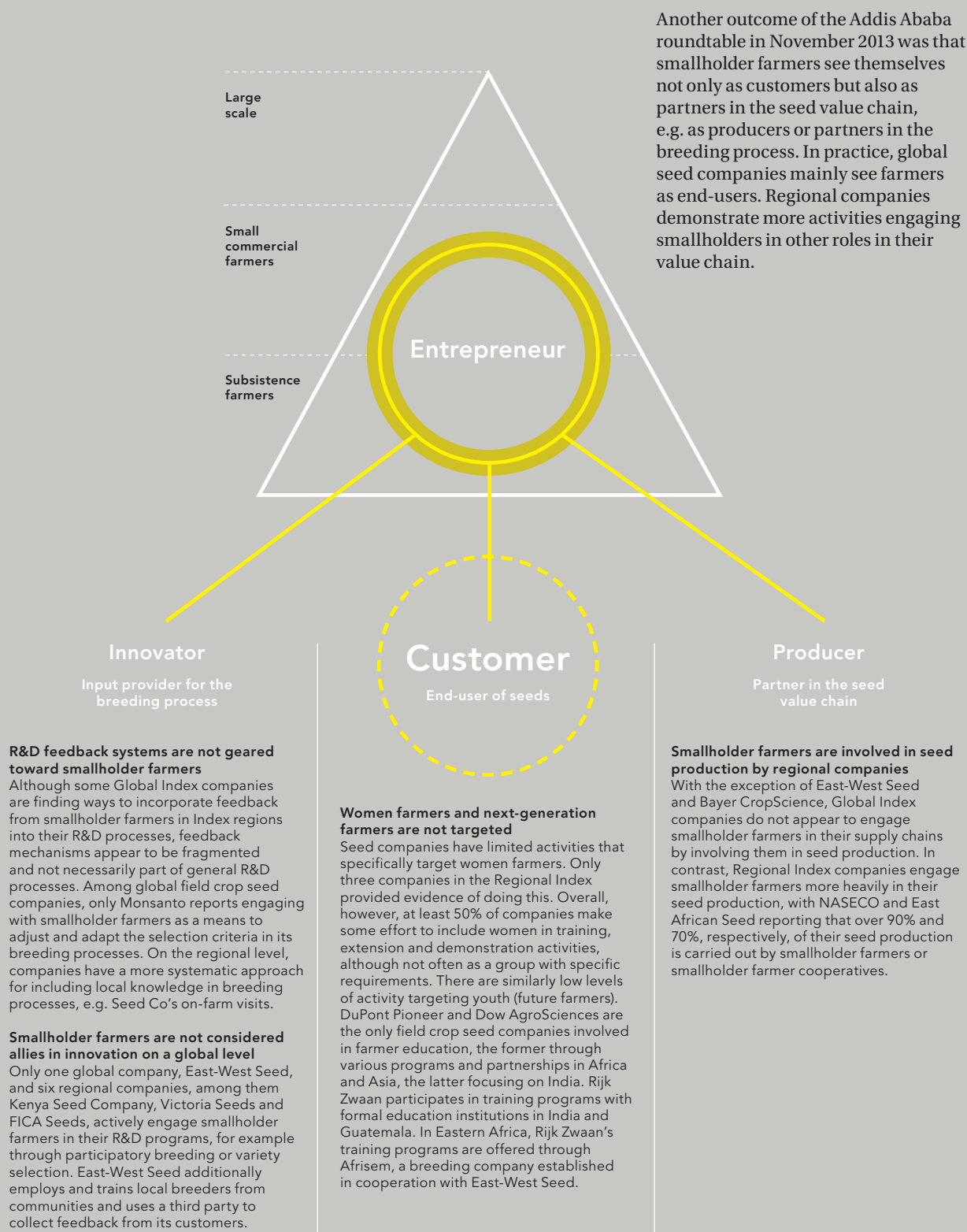
Do farmers have the capacity and enabling environment?

Leading companies actively invest in extension services for smallholder farmers and look for collaborations with the public sector to ensure farmers can benefit fully from improved varieties. The most common activities are those that provide agricultural advisory services to farmers, via collaborative programs with partners such as extension services, research stations and NGOs. Through these programs, companies support farmers on issues that span the entire scope of their operations, from seed selection, agronomic best practices and supporting technology to post-harvest processes, storage and marketing. East-West Seed helps key farmers to develop demonstration farms in more than 70% of the Index countries where it is active. These farmers demonstrate cultivation techniques to their neighbors, guided by dedicated

extension teams with no sales incentives, who visit weekly and advise on all aspects of crop production. Throughout the cropping cycle, these demonstration farms are used as a base for village training events. Towards the end of the cropping cycle, field days are organized to disseminate technical, financial and marketing information. Index companies also collaborate with research institutes, universities and NGOs in formal agricultural education and training. DuPont Pioneer, for instance, is involved in the Rice Farming education program, a Department of Agriculture initiative in India to provide training to rice farmers on sustainable farming methods; and the DuPont Pioneer Farming Academy, a partnership with local governments in the Philippines to establish a central facility to train rice and maize farmers on new technologies for hybrid rice and maize farming.

Key Finding 4

Smallholder farmers are mainly seen as customers, not as partners in the seed value chain



Key Finding 5

Regional companies play a key role in reaching smallholder farmers

Insights from the Regional Index suggest that regional companies play a key role in reaching smallholder farmers. Several regional companies outpace global players in Eastern Africa. Regional companies are active in local crops that are neglected by global companies. In their activities in Marketing & Sales and Capacity Building, regional companies also tend to go further.

Regional companies broaden the portfolio and reach of the seed industry

East-West Seed and regional companies Victoria Seeds, East African Seed, Kenya Seed Company and NASECO outperform their global peers in the Regional Index. Being based in a region where up to 80%¹² of all farmers are smallholders, regional companies regard smallholder farmers as their most important customer group. Regional companies outpace their global peers by including local tastes and culinary preferences in their R&D processes, among them cooking time by Demeter

Seed and reduced bitterness in black nightshade by East African Seed. These companies have a broader reach, finding ways to penetrate remote markets, for example by making use of tuk-tuks and mobile agents. Moreover, East-West Seed and Regional Index companies such as NASECO, East African Seed and Kenya Highland Seed include in their portfolios open-pollinated varieties (OPVs) and different grades of seeds to accommodate the differing capacity levels of smallholder farmers. Notably, global company Pop Vriend Seeds sells both hybrid and OPV varieties, e.g. for onion, in the region. Similarly, Regional Index companies include smallholder farmers – up to 90% by East-West Seed – in their value chains through seed production.

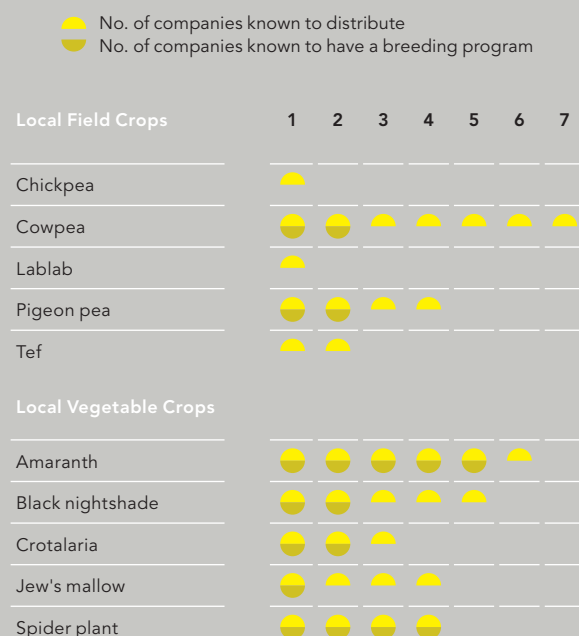
Local crops are the domain of regional companies

The majority of regional companies, complemented by smallholder-focused global companies East-West Seed and Technisem, breed and/or sell local crops. Breeding activities are largely embedded in general breeding programs for both field and vegetable crops, indicating a dedicated approach to the development and dissemination of improved varieties of local crops in Eastern Africa.

Regional companies are an outlet for varieties developed by research institutes

International and national research institutes often lack the mandate and marketing infrastructure to market varieties developed for the benefit of smallholder farmers. In contrast to global companies, regional companies commercialize seeds developed by international and national research institutes. Examples have been found for all Index field crops except millet, potato and barley, and several local vegetable crop varieties for marketing in Burundi, Kenya, Rwanda, Tanzania, Uganda and Zimbabwe. State-owned Kenya Seed Company has assisted research institutes in Burundi, Kenya and Rwanda in bringing different field crop varieties to market. Privately owned East African Seed markets varieties developed by research institutes, for instance different local vegetable varieties from AVRDC, the Asian Vegetable Research and Development Center (also known as the World Vegetable Center).

Local crop activities of Regional Index companies





Farmer education

Agriculture students learn various agricultural skills such as sowing turnip seeds at the Bayer Ramanaidu Vignana Jyothi School of Agriculture. The school was established in 2007 in the Medak district of Andhra Pradesh, India. The school offers two six-month training courses to teenagers, and seeks to encourage them to choose a future in agriculture in their home region rather than moving to the city.

Part IV

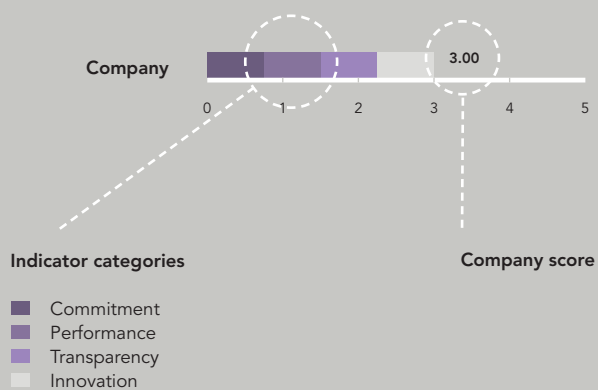
Global Access to Seeds Index

The Global Access to Seed Index assesses the efforts of the world's leading seed companies with an integrated business model to improve smallholder farmers' access to seeds. As the business models of field crop and vegetable seed companies differ, two separate lists were drawn up for the seven leading field crop companies (with estimated seed revenues over \$1 billion) and the ten leading vegetable seed companies (with seed revenues over \$100 million). Four companies that are active in both areas appear on both lists.

The Index uses a framework that is composed of seven measurement areas identified by stakeholders as those in which companies can play a positive role in increasing access to seeds for smallholder farmers. This section describes the way the leading global seed companies are doing business with smallholder farmers in each of the measurement areas.

In each measurement area, companies are assessed with indicators in four categories: Commitment, Performance, Transparency and Innovation. The contribution of each of these indicator categories is reflected in each company's score in that measurement area. The practices that received scores on the Innovation indicators (unique in the sector) are highlighted at the end of each measurement area chapter. As innovative practices could not always be identified, this indicator category may be missing from a company's score and some measurement areas.

How the Company Rankings Work per Measurement Area



Measurement Area

A

Governance & Strategy

This measurement area focuses on the integration of access to seeds issues into companies' core policies, strategies, governance structures and management systems. The objective of the measurement area is to capture companies' overall commitment to global food and nutrition security, and, more specifically, to smallholder farmer development. The Global Index seeks to understand the strategic reasoning behind companies' access to seeds initiatives, as they tend to be most effective and sustainable when developed as part of a clear corporate strategy.

Three Focus Areas

Global Food and Nutrition Security

Seed companies can contribute in many ways to the global food and nutrition security agenda and to sustainable intensification of agriculture, including outside the Index regions. The incorporation of global food and nutrition security issues into company policy shows the company's willingness to contribute to these issues. A clear strategy drives company actions and enables partners to engage with the company and stakeholders to hold the company to account.

Access to Seeds for Smallholder Farmers

Seed companies can contribute to smallholder farmer development by increasing smallholder farmers' access to knowledge, technologies, varieties and seeds, thereby enhancing their productivity in a sustainable way. A clear commitment and strategy to help improve the situation of smallholder farmers explains how companies can contribute based on their portfolios, assets and capabilities.

Governance and Accountability

Improving access to seeds requires governance structures that build accountability and incentivize companies to fulfil their commitments to food and nutrition security and to smallholder farmers. Assigning responsibility and accountability for access to seeds to the board or senior executives helps to ensure that such commitments are integrated into companies' corporate strategies. Clearly formulated goals and targets, supported by incentives to reward activities that promote access to seeds or global food and nutrition security more generally, can improve implementation and assessment.

Main Findings in Governance & Strategy

Global Index companies demonstrate awareness of their role in global food and nutrition security

Companies show awareness of their role in and opportunities to contribute to global food and nutrition security by disclosing details of their formal commitments. However, most companies' commitments are informal, limiting accountability.

Managerial incentives exist to improve access to seeds for smallholder farmers, but there is room for improvement

Syngenta and East-West Seed provide tangible managerial incentives, ensuring that access to seeds targets are included in daily and strategic business decisions. While other companies show awareness of their role in global food security, they rarely link this to improving access to seeds for smallholder farmers. This is also reflected in the lack of managerial incentives to pursue access to seeds-related goals. In general, field crop seed companies demonstrate stronger governance and accountability structures to pursue access to seed-related goals.

Definitions of smallholder farmers vary among Global Index companies

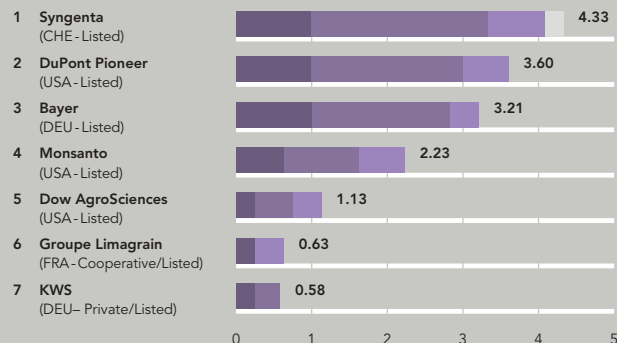
Despite the frequent use of the term 'smallholder farmers' by Global Index companies, less than half provided a definition or description of the smallholder farmers they target. The definitions provided vary between farmers with less than 0.25 hectares, less than two hectares and a more flexible FAO definition.

Transparency of the resources dedicated to access to seeds activities is limited

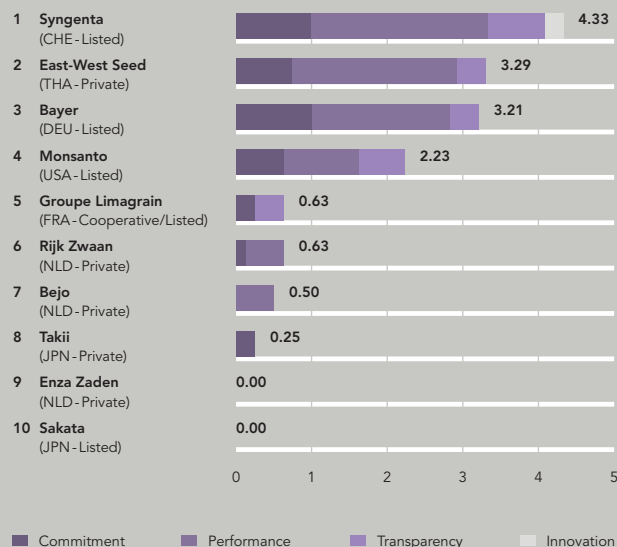
DuPont Pioneer and East-West Seed disclose a total aggregated amount of resources dedicated to access to seeds-related activities. While the majority of companies report activities to increase access to seeds for smallholder farmers and global food and nutrition security, transparency of the resources dedicated to these activities is limited.

How Companies Perform

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



Syngenta clearly leads both Indexes in this measurement area, followed by East-West Seed in the Global Index of Vegetable Seed Companies and DuPont Pioneer in the Global Index of Field Crop Seed Companies. Bayer CropScience is in third place in both Indexes.

Leading companies address the material issues across all categories and focus areas covered under Governance & Strategy. This is with the exception of DuPont Pioneer, which does not clearly link management incentives to the achievement of access to seeds-related goals.

The low-ranking companies in both Indexes disclose limited details on most issues addressed. These companies could improve their ranking by increasing their disclosure, and by strengthening and implementing their access to seeds-related commitments.

Focus Area 1: Global Food and Nutrition Security

Global Index companies are aware of their role in global food and nutrition security

All seven field crop seed companies and six out of ten vegetable seed companies disclose relevant commitments, indicating broad awareness of the sector's role in global food and nutrition security. However, only DuPont Pioneer and Bayer CropScience have formal commitments in place. DuPont Pioneer allocates 60% of its R&D budget to food security solutions. Bayer CropScience's commitment focuses on food security through innovation and partnerships targeting sustainable intensification of agriculture. The remaining companies disclose only informal commitments. These are not part of formal policy, endorsed by senior management, and thus have limited accountability. East-West Seed and Monsanto link their informal commitments to investments in R&D.

Overall, companies could improve accountability by formalizing their commitments and integrating these into official company documents such as policies approved at the senior management level. Formal commitments may include establishing and reporting on programs and targets, and assigning responsibility and accountability. As official company documents, these commitments are typically communicated to internal and external stakeholders.

Focus Area 2: Access to Seeds for Smallholder Farmers

Global Index companies are aware of access to seeds-related issues, but more tangible targets are needed

More than half of the companies are committed to sustainable intensification and improved access to seeds for smallholder farmers in Index countries. However, the majority of these commitments lack tangible targets.

Monsanto and Syngenta are the only companies to disclose relevant targets. In its Good Growth Plan, Syngenta commits to reach '20 million smallholder farmers and help them increase their productivity by 50%, while preserving the long-term potential of their land' by 2020. Monsanto commits 'to improve lives, including an additional 5 million people in resource-poor farm families, by 2020'. However, Monsanto does not provide a definition of smallholder farmers or resource-poor farm families.

Global Index companies have varying definitions of smallholder farmers

Four out of 13 companies have a definition or description of 'smallholder farmers', with Syngenta and Bayer CropScience sharing the definition of 'farmers with land smaller than two hectares'. DuPont Pioneer has adapted the flexible FAO definition, which takes into account the land cultivated, agroecological zone and country. East-West Seed provides the most precise definition of smallholder farmers as 'those with 0.25 hectares or smaller (or between 2,000-4,000m²)'. However, in references to its seed production supply chain, the company also describes smallholder farmers as producers with an average landholding size of 1.1 hectares.

Having no definition of smallholder farmers is a potential obstacle to providing a targeted response to their needs. Smallholder farmers are not a homogenous group and companies are thus encouraged to define as clearly as possible the smallholder farmers they intend to target with their programs and activities.

Transparency of Index companies' investments in access to seeds-related programs is limited

Bayer CropScience and DuPont Pioneer are most transparent about the resources dedicated to activities targeting smallholder farmers. Both companies have implemented a number of access to seeds projects in the Index countries where they are active. DuPont Pioneer, whose programs cover Ethiopia, Zambia, Ghana and India, has allocated a combined \$5 million to initiatives engaging smallholder farmers.

East-West Seed leads the Global Index of Vegetable Seed Companies on the transparency of the resources dedicated to activities targeting smallholder farmers. The company has programs in Myanmar, the Philippines, Thailand, Indonesia, Vietnam, India, Tanzania and Index countries in Western Africa, accounting for a combined \$1.6 million annually.

Focus Area 3: Governance and Accountability

Leading companies have established access to seeds governance and accountability systems

Six of the 13 global seed companies have established access to seeds governance and accountability systems. The purpose of these systems is to ensure the implementation of commitments and assessment of outcomes of access to seeds programs and activities.

Syngenta, East-West Seed and DuPont Pioneer lead the way by assigning direct responsibility for access to seeds programs, commitments and targets to company directors. Syngenta's executive committee oversees the development of its Good Growth Plan, which includes commitments and programs related to smallholder farmers. The committee also has the ultimate responsibility for delivering the commitments (see the Innovation Overview for further details).

Smallholder farmers are central to the way East-West Seed does business. The supervisory board is involved in shaping the company's access to seeds strategy and assessing its performance. One of the company's 2015 goals is 'to develop and improve knowledge-sharing programs for farmers, employees and dealers, aiming to improve the lives of millions of farmers'.

Dow AgroSciences, Bayer CropScience and Monsanto all integrate access to seeds governance and accountability into their sustainability objectives. However, these do not appear to be translated into specific access to seeds targets and strategies.

Syngenta and East-West Seed incentivize managers to achieve access to seeds-related targets and goals

Syngenta and East-West Seed disclose management incentives for access to seeds-related goals, with Syngenta in part linking its executives' compensation paid in company stocks (performance stock units) to the performance of its Good Growth Plan.

East-West Seed's access to seeds-related objectives are incorporated in executives' compensation and its performance management system, which includes all employees. One performance indicator for board members is the growth of the company's Value Packs program, which is tailored to the needs of smallholder farmers.

Among the other companies, however, there is little evidence of senior management incentives to ensure access to seeds goals are met. This may be seen as an indication that access to seeds issues are not highly prioritized.

Innovation Overview

Syngenta's Good Growth Plan

Syngenta's Good Growth Plan is considered innovative in the field of corporate commitments to access to seeds for its explicit focus on smallholder farmers, inclusion of the company's commitments and measurable targets up to 2020 and provision for regular progress reports. The plan aims to increase food security by achieving the following targets:

- Make crops more efficient: increase the average productivity of the world's major crops by 20% without using more land, water or inputs;
- Rescue more farmland: improve the fertility of 10 million hectares of farmland on the brink of degradation;
- Help biodiversity flourish: enhance biodiversity on 5 million hectares of farmland;
- Empower smallholders: reach 20 million smallholders and enable them to increase productivity by 50%.¹³

The Good Growth Plan has been endorsed by senior management, with Syngenta's executive committee directly involved in the development process and assigned 'ultimate responsibility for delivering the commitments'. The company's regional teams are responsible for implementing the activities on the ground.

Syngenta clearly indicates how the goals and targets will be measured, relying on 'internal and third-party data collection and validation as well as assessment by independent auditors'. In terms of data points, the company states that it measures its reach and smallholder crop productivity. For the former, it counts the number of smallholders reached directly through its fieldwork and indirectly through sales, while the latter is measured by (comparing) its 'smallholder reference farms' that use improved methods and 'smallholder benchmark' farms that use existing practices.

Progress towards each goal is reported annually, which increases transparency towards stakeholders and allows for follow-up on the company's activities.

Other Innovative Access to Seeds Strategies

Bayer CropScience

Bayer CropScience's commitment to global food security focuses on sustainable intensification and underlines the need for a holistic approach. The company has developed a five-point plan for what it calls a New Revolution in Agriculture, which can be achieved, among others, through leading innovation; enabling farmers big and small; and driving sustainable intensification of agriculture. The company's mission statement reads: 'Our goal is to develop products that not only benefit consumers and larger scale growers, but also help enhance the livelihoods of smallholder farmers and their communities.' In addition, the company intends to help address the impacts of climate change and vowed to increase R&D spending to around €850 million in 2015 to boost plant resistance to biotic and abiotic stresses.

Monsanto

Monsanto has made a commitment to sustainable agriculture that includes 'producing more', 'conserving more' and 'improving lives'. The company aims 'to improve lives, including an

additional 5 million people in resource-poor farm families by 2020', and to help farmers double yields for the Index crops maize and soybean. Despite the frequent use of 'smallholder farmers' in its communications, Monsanto does not provide an explicit definition of the term.

DuPont Pioneer

DuPont Pioneer has formally committed to strengthen global food security and publishes updates on the topic in both its annual and sustainability reports. In addition, the company has a website dedicated to its food security goals, where it states that 'over 60% of the company's research and development budget is earmarked for food security solutions'. In 2012, the company allocated \$10 billion in R&D to achieving its food security goals. DuPont Pioneer's sustainability strategy focuses on agricultural development with three goals: 1) Innovating to feed the world; 2) Engaging and educating youth; and 3) Improving the livelihoods of 3 million farmers and their rural communities. In this commitment, smallholder farmers are not addressed explicitly.

Measurement Area

B

Public Policy & Stakeholder Engagement

This measurement area seeks to capture how companies engage with policymakers and other stakeholders to influence national and international policies and markets in ways that can affect access to seeds for smallholder farmers. Companies can be actively involved in collaborative initiatives, international alliances or seed associations that play a role in seed sector development in Index regions.

Three Focus Areas

Industry Engagement

Companies are in a position to promote awareness of the role that the seed industry can play in smallholder farmer development through access to seeds. Through active membership in seed associations and industry organizations, including participation on boards, in relevant committees and working groups, seed companies can contribute to a greater understanding of the specific needs of smallholder farmers in Index countries and the opportunities to meet those needs.

Multi-stakeholder Initiatives

In order to contribute to global food security and improved access to seeds, it is important that seed companies engage and collaborate with stakeholders. These include universities, international research organizations, farmer organizations, local and international NGOs, and industry peers. Examples of such collaborations are the establishment of public-private partnerships or participation in international alliances.

Lobbying and Public Dialogue

Seed companies have a significant influence on public policy matters relevant to access to seeds. Many stakeholders stress that lobbying activities in Index countries should go through national trade associations. The policy positions that companies advocate through their lobbying activities, as well as their participation in trade associations, think tanks, interest groups or other organizations, are an important element of their contribution to global food security and access to seeds. It is crucial that companies are transparent about their lobbying activities, as well as their membership in and financial support for trade associations and other organizations advocating public policy positions that may impact access to seeds. Moreover, seed companies are in a position to engage actively in the public debate on global food security.

Main Findings in Public Policy & Stakeholder Engagement

Global Index companies engage in dialogue and multi-stakeholder initiatives at a global and regional level

The majority of companies in both Indexes collaborate in several multi-stakeholder initiatives, engage their senior executives in public and industry dialogue relating to access to seeds, and hold memberships in industry and trade organizations.

Opportunities exist to develop formal policies on industry engagement

Although a handful of companies have general statements, Syngenta is the only company with a formal policy governing its collaborations with stakeholders and engagement with the industry. Many companies have a formal policy regarding political involvement, but none of these policies describes company lobbying activities. These gaps provide an opportunity for companies to develop formal policies to guide their stakeholder and industry engagement activities.

Lobbying positions and financial support for industry organizations are not always transparent

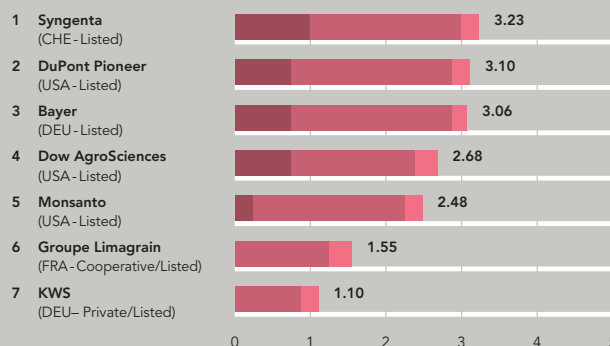
Companies have an opportunity to improve transparency regarding their lobbying positions and the financial support they provide to various organizations. Only one company, Bayer CropScience, discloses information on its lobbying positions. Moreover, East-West Seed is the only company to disclose fully its membership in and financial support for trade associations, think tanks, interest groups and other organizations.

Opportunities exist to advocate policies that benefit smallholder farmers

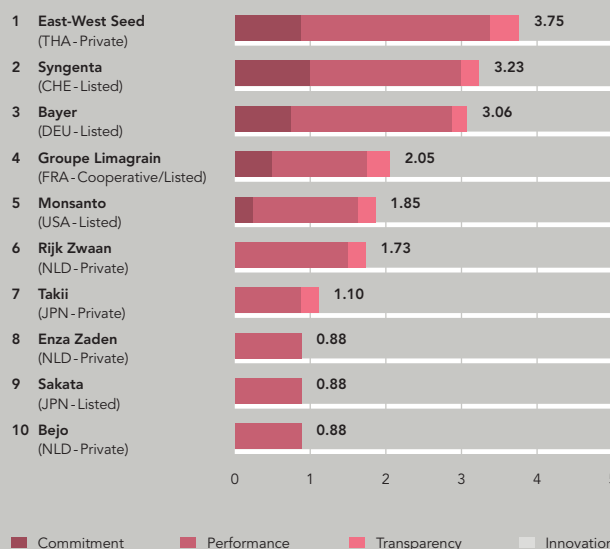
Companies can do more to leverage their influence to advocate policies that support the interests of smallholder farmers. Although the majority of companies follow local regulations and international standards on political advocacy, only one company, East-West Seed, demonstrates leadership by actively engaging in dialogue and supporting policies that benefit smallholder farmers.

How Companies Perform

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



East-West Seed leads the Global Index of Vegetable Seed Companies in this measurement area, followed by Syngenta. Syngenta, meanwhile, tops the Global Index of Field Crop Seed Companies, followed by DuPont Pioneer. Bayer CropScience occupies the third place in both the Indexes.

Clearly outperforming its peers in the Global Index of Vegetable Seed Companies, East-West Seed distinguishes itself in three ways: it actively engages in public policy advocacy by participating in dialogue and reporting developments on issues relevant to smallholder farmers (especially by providing marketing information and farmer education); it participates in several global and regional multi-stakeholder initiatives; and it publically discloses its membership in and financial support for various initiatives, associations and organizations.

The top three performers in both Indexes demonstrate leadership by advancing the interests of smallholder farmers through public policy advocacy, participating in and leading multi-stakeholder initiatives, and engaging in public and industry dialogue pertaining to access to seeds for smallholder farmers.

Every leading company has senior executives engaged in discourse with stakeholders and industry peers on key issues such as global food security and access to seeds. Furthermore, not only do these companies participate in multi-stakeholder initiatives related to improving access to seeds, they frequently assume founding or leadership positions in these initiatives.

Leading companies also report public policy advocacy activities that aim to support access to seeds for smallholder farmers, and their lobbying practices comply with local regulations and international standards regarding bribery and corruption. Nevertheless, there is room for improvement even among the leaders. Companies may consider strengthening their formal commitments and policies on engagement and political involvement, in particular disclosing the types of lobbying activities in which they are engaged and information on their lobbying positions.

The lowest scoring vegetable seed companies, which include Bejo, Sakata and Enza Zaden, disclose no information either on commitments or activities related to industry engagement, lobbying and public dialogue, or their engagement in multi-stakeholder initiatives. KWS and Groupe Limagrain are the lowest scoring field crop seed companies, with limited commitments in place and minimal engagement in relevant initiatives.

Across both Indexes, improving performance requires formalizing commitments pertaining to stakeholder and industry engagement, and political involvement; participating in dialogue, public policy advocacy and other initiatives aimed at improving access to seed for smallholder farmers; and publicly disclosing information on the aforementioned activities.

No innovative practices were identified for Public Policy & Stakeholder Engagement.

Senior executives engage in international global initiatives that seek to improve access to seeds for smallholder farmers

Several companies exhibit leadership in public and industry dialogue by engaging a number of senior executives in multiple initiatives. Six of the 13 companies have at least one senior executive engaged in dialogue with industry peers. The leaders in this measurement area outperform their peers by engaging regularly and at a senior executive level in a variety of global and regional initiatives. DuPont Pioneer's chief executive officer, for example, spoke at the 2015 Chicago Council on Global Affairs and Global Food Security Symposium, and its executive vice president moderated a workshop on agricultural partnerships at the World Economic Forum. Similarly, Rijk Zwaan's managing director chaired a discussion on genetic resources in developing countries in 2014, and one of its directors spoke at the Amsterdam Initiative against Malnutrition (AIM).

Global Index companies are active members of seed trade associations and other organizations

More than half of all companies disclose information on their memberships in industry and trade organizations, and/or support for other relevant interest groups. However, East-West Seed is the only company in either Index to be fully transparent in this area by disclosing, in addition to its memberships, the financial support it provides to these organizations.

The majority of companies are involved in multiple trade associations and/or other types of organizations such as the International Seed Federation and the African Seed Trade Association. Some companies are also members of other types of organizations. DuPont Pioneer, for example, is a member of the initiatives Field to Market, Global Harvest and New Visions for Africa.

Focus Area 2: Multi-stakeholder Initiatives

Global Index companies, especially field crop seed companies, actively engage in multi-stakeholder collaborations

Most Global Index companies engage and collaborate with stakeholders on initiatives that contribute to global food security and improved access to seeds. However, there is a significant difference between field crop and vegetable seed companies: three out of ten vegetable seed companies, namely Bejo, Enza Zaden and Takii, do not provide details of any participation in multi-stakeholder initiatives, compared to one field crop seed company, KWS.

Two companies, Bayer CropScience and East-West Seed, received high scores for demonstrating leadership in their engagement in multi-stakeholder initiatives. These companies not only participate in multiple initiatives but also participate in initiatives at both a regional and global level.

Bayer CropScience, for instance, is a founding member of the multi-stakeholder German Food Partnership, which aims to improve food security in developing and emerging markets. In addition, the company is a member of the Grow Africa partnership and the New Alliance for Food Security and Nutrition, both of which focus on Africa, and the World Economic Forum's New Vision for Agriculture, a global initiative.

Similarly, East-West Seed participates in regional initiatives, such as the Food Security and Agriculture Cluster Philippines, and global initiatives, such as the Global Crop Diversity Trust, which is also directly or indirectly supported by other seed companies. East-West Seed was also one of three partners to receive a grant for Seeds of Expertise for the Vegetable Industry of Africa (SEVIA), a Dutch government project aimed at contributing to food security and vegetable industry development in Africa. The other partners are Rijk Zwaan, a vegetable seed peer, and public partner Wageningen University & Research Center.

Opportunities exist to formalize commitments on multi-stakeholder engagement

Syngenta is the only company to articulate a formal commitment to multi-stakeholder engagement. However, while it commits in its Good Growth Plan to engage in dialogue and collaborative initiatives with relevant stakeholders, this commitment does not extend to lobbying in the interests of smallholder farmers.

Focus Area 3: Lobbying and Public Policy Dialogue

Policy statements governing lobbying and political activities are in place

Five out of seven field crop seed companies, compared to four out of ten vegetable seed companies, have formal policy statements governing lobbying and political activities. Three of these, Syngenta, Groupe Limagrain and Bayer CropScience, are in both Indexes.

Differences between the Indexes may in part reflect the size of the companies: field crop seed companies are typically large, listed companies, whereas vegetable seed companies – with the exception of those found in both Indexes – tend to be smaller, private firms that may not be subject to the same level of stakeholder scrutiny as their listed counterparts.

The vast majority of companies articulate their approach to lobbying and political activity in a business code of conduct or business code of ethics. Bayer CropScience, one of the leaders in this area, has a unique, stand-alone policy, the Code of Conduct for Responsible Lobbying, which outlines clear and binding rules for its involvement in political activities. Despite the prevalence of formal policy statements in this area, none of the policies describes the type of lobbying activities in which companies engage.

There is an opportunity to leverage Global Index companies' influence in public policy to benefit smallholder farmers

No evidence was found of companies lobbying against the interests of smallholder farmers in Index countries. However, only four companies actually engage in public policy advocacy that supports smallholder farmers. Of the few companies that engage in advocacy, East-West Seed outperforms its peers by participating in and leading multiple initiatives that target farmer development in key regions. For example, in 2014 the company published a paper entitled 'Opportunities for Myanmar's Vegetable Sector: Aligning Farmers to Changing Markets and the Role of the Seed Industry', with the aim of generating government and NGO interest in rural economic development through smallholder farmer vegetable production. To improve market access for farmers in Myanmar, the company also initiated a roundtable meeting in November 2014 on developing the country's vegetable sector (see box for further details).

Bayer CropScience, Syngenta and DuPont Pioneer also disclose activities in this area. The Syngenta Foundation, for example, is engaged in projects in Kenya and Tanzania that aim to improve smallholder farmers' access to 'high-quality seeds', and one of the principles for achieving this aim is 'to develop enabling seed policy environments'. However, Syngenta does not provide details on how the project will attain this objective. DuPont Pioneer engages in public policy through national and regional seed associations as well as global biotech and science organizations, though it is not clear how it uses this engagement to support the interests of smallholder farmers.

Facilitating Dialogue on Myanmar's Agriculture Sector

East-West Seed takes a multi-pronged approach to generating interest in Myanmar's agriculture sector. In 2014, the company published a paper entitled 'Opportunities for Myanmar's Vegetable Sector: Aligning Farmers to Changing Markets and the Role of the Seed Industry', which aimed to facilitate multi-stakeholder dialogue on economic development through smallholder vegetable production.

In September 2014, company representatives met with Myanmar's President Thein Sein to draw attention to its national approach to production and farmer extension, ensuring the accessibility of technologies for smallholder farmers and promoting the safe use of agrochemicals. The company also hosted the Grow Myanmar seminar, which highlighted the role of the private sector in improving the lives of smallholder farmers in Myanmar.

In November 2014, the company was one of the key organizers, alongside the Myanmar Ministry of Agriculture, the Dutch government and not-for-profit organization Mercy Corps, of the Roundtable Meeting on Developing the Vegetable Sector in Myanmar. The objective of the meeting was to discuss the importance of a clear market, higher farmer productivity and improved value chains in creating a strong business environment for the vegetable sector in Myanmar.

Source: East-West Seed Annual Report (2014)

Global Index companies respect local regulations and/or international standards

Across both Indexes, a limited number of cases involving alleged bribery, corruption or breaches of local regulations or international standards were found. In 2013, Monsanto was accused of using an indigenous species of eggplant to create a genetically modified version of the crop without getting prior approval. As a result, the Indian government sued the company for violating the national Biological Diversity Act. In 2012, Dow AgroSciences allegedly bribed an Indian official to have its products registered. Both cases still appear to be under investigation.

Measurement Area

C

Genetic Resources & Intellectual Property

Access to genetic resources is vital for seed companies and smallholder farmers to develop new varieties. At the same time, intellectual property (IP) protection enables companies to generate a return on R&D investment through licensing. IP protection can, however, have implications for established smallholder practices such as farm-saved seeds and the breeders' exemption. This measurement area therefore seeks to clarify and assess the positions of companies on these issues.

Three Focus Areas

Conservation and Use of Crop and Genetic Diversity

The growth of the formal seed sector can reduce local crop diversity currently conserved in situ by farmers and communities. Seed companies can help preserve local crop diversity and the informal seed system by supporting freely accessible public gene banks for ex situ conservation and community seed banks for in situ conservation. Additionally, companies can help preserve agricultural diversity, e.g. by engaging with local governments, supporting the Global Crop Diversity Trust and the International Treaty for Plant Genetic Resources for Food and Agriculture, and continuing to breed using local varieties from public and private gene banks.

Access to Genetic Resources

Access to genetic resources is important for breeding companies, public research institutes and smallholder farmers to develop varieties tailored to local conditions and crop preferences. Support for public gene banks and community seed banks, as well as access to company gene banks and commercial varieties for further breeding, can all facilitate the development of new varieties appropriate for smallholder farmers.

Intellectual Property Rights

The handling of intellectual property rights can significantly impact access to seeds for smallholder farmers. The long-established breeders' exemption makes commercial varieties available for further breeding; the farmers' privilege allows on-farm seed saving. This access may, however, be restricted by the use of contractual clauses and patents, not just on plant varieties but also on traits, methods and technologies. Conversely, specific licensing strategies can improve access to patented varieties, traits, methods and technologies for national agricultural research institutes and private plant breeders to develop new varieties appropriate to the needs of smallholder farmers.

Main Findings in Genetic Resources & Intellectual Property

More than half of Global Index companies undertake initiatives either to support the conservation and use of crop and genetic diversity or to improve access to genetic resources

While more than half of the seed companies support the conservation and use of crop and genetic diversity or access to genetic resources, company approaches differ. Support for public gene banks through financial or technical assistance is offered by seven companies. Four companies also provide access to their own genetic resources. One vegetable and three field crop seed companies have programs to encourage the conservation and use of a diverse set of crops and genetic resources in Index countries. Two field crop seed companies provide humanitarian royalty-free licensing. Finally, three seed companies disclose financial contributions to the Benefit-sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture.

Companies provide access to genetic resources for the development of improved varieties in Index countries

Monsanto, DuPont Pioneer, Bayer CropScience and East-West Seed all collaborate with local partners to provide access to specific germplasm or biotechnology traits. This ranges from vegetable germplasm suitable for Africa to germplasm and biotechnology traits for research on Bt cowpea and water-efficient maize. Providing access may help the industry better manage its relationships with local stakeholders and, by providing access to their genetic resources and biotechnology traits today, companies may help to create future demand for improved varieties.

Global Index companies collaborate with public gene banks

Companies typically bring financial or in-kind contributions, technical capacity and/or their own genetic resources to partnerships with public gene banks. One vegetable seed company and three field crop seed companies engage in such partnerships in Index countries. Some of these and several other companies partner with public gene banks outside Index countries, including US-based, Europe-based and international research institutes such as AVRDC or CIMMYT, whose mission is geared towards smallholder farmers. Opportunities exist to expand these activities across more seed companies, and across more Index countries in general.

Most Global Index companies respect the breeders' exemption and the practice of farm-saved seeds for smallholder farmers

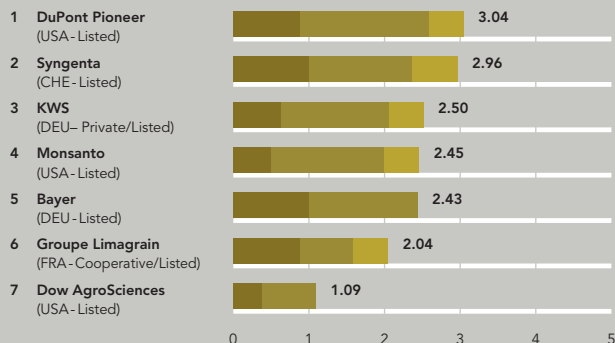
As companies own commercial varieties that could be useful for further breeding in Index countries, for instance by public research institutes, blocking the use of this material is considered detrimental to access to seeds for smallholder farmers. Similarly, as many smallholder farmers in Index countries are reliant on saved seeds, blocking the use of farm-saved seeds is considered bad practice. After examining external sources, the evidence suggests that companies do not block the use of their commercial varieties under plant variety protection (PVP) for further breeding or the practice of farm-saved seeds for non-commercial purposes by smallholder farmers in Index countries.

Opportunities exist to improve commitments to and transparency of genetic resources and intellectual property

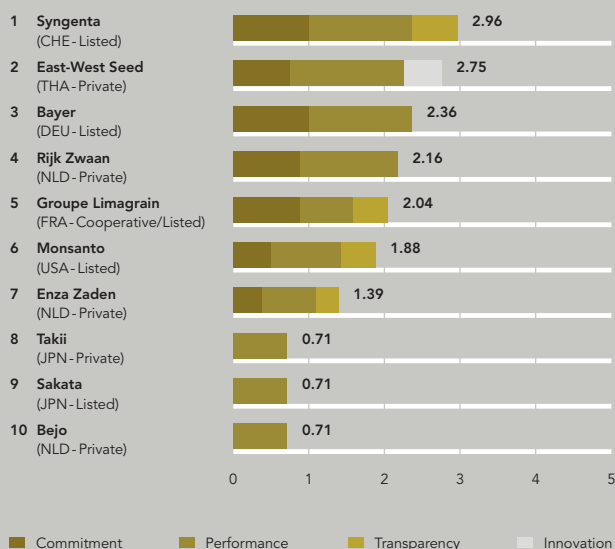
The level of transparency among the companies who disclose their position on genetic resources and intellectual property varies significantly, ranging from stand-alone policies and statements posted online to position documents made available to the Access to Seeds Index during the data collection process.

Disclosing a clear stance on these core areas of genetic resources is strongly encouraged, as it may help to facilitate a transparent dialogue between the industry and its stakeholders, including smallholder farmers, governments and NGOs. Companies are encouraged not to only endorse and make such commitments publicly available but also to ensure their appropriate scope, senior-level oversight and responsibility for implementation.

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



The leading companies in Genetic Resources & Intellectual Property are Syngenta (both Indexes), East-West Seed (vegetables) and DuPont Pioneer (field crops). Although the quality of their commitments differs, all three companies have commitments in this measurement area and put these into practice.

The companies in the middle of the rankings are characterized by strong performance in some areas but a lack of activities in others. Bayer CropScience (both Indexes), for instance, received full credit for its commitment to the conservation and use of crop and genetic diversity. Rijk Zwaan (vegetables) scores highly in access to company genetic resources and support for public gene banks but fails to attain similar scores in other areas. This can also be observed among field crop seed companies. KWS outperforms all its peers in its support for public gene banks but lacks activities in other areas and strong commitments to initiate them.

Takii, Sakata, Bejo (vegetables) and Dow AgroSciences (field crops) occupy the bottom of the rankings. These companies are characterized by vague, informal or non-existent commitments and low performance throughout the measurement area. The three vegetable seed companies provide no evidence of any commitment or activities to conserve and use a diverse set of crops and genetic resources, or any efforts to improve access to genetic resources for the benefit of smallholder farmers. Although Dow AgroSciences states that it recognizes the importance of biodiversity and supports the 'conservation of biological diversity and the sustainable use of biological resources', it does not specifically reference crop diversity. Furthermore, the company provides no evidence of undertaking any activities related to genetic resources and intellectual property.

Focus Area 1: Conservation and Use of Crop and Genetic Diversity

Support for public gene banks is common, but Index countries are largely overlooked

Seed companies can help to preserve local crop diversity by supporting public gene banks. This support can be focused on gene banks in Index countries or on those outside of Index countries that nevertheless conserve crop and genetic resources important for smallholder farmers in Index countries. Although most support is given to gene banks operating outside of Index countries, KWS and East-West Seed provide support in Index countries, namely Ethiopia and Peru, and Indonesia and Thailand, respectively.

The type of support differs, from financial donations and in-kind contributions to technical support aimed at the multiplication of relevant materials and the documentation of local genetic resources. Syngenta, DuPont Pioneer and Monsanto make donations to the Global Crop Diversity Trust (GCDT), either directly or through industry associations. As such, the International Seed Federation (ISF) is a donor of the GCDT. KWS provides financial support in Ethiopia and Peru, while Monsanto provides in-kind contributions in the USA and the Netherlands. Additionally, Bayer CropScience helps the International Rice Research Institute (IRRI), an international research and training organization, to expand its gene bank database, and assists the Asian Vegetable Research and Development Center (AVRDC), an international nonprofit institute for vegetable research and development, in maintaining and characterizing its ex situ collections. The company also has similar activities in a number of European countries and the USA. Finally, Rijk Zwaan partners with the Centre for Genetic Resources of the Netherlands, where the company is based, to multiply gene bank materials.

KWS and East-West Seed undertake similar training activities in Index countries. As part of a collaboration with the German government, KWS supports the maize and quinoa work of the public gene bank in Peru through trainings on the characterization and genotyping of accessions as well as the identification of duplicates. In Ethiopia, the company focuses its activities on barley and wheat. These activities include the provision of breeding material, laboratory equipment and instruments, training courses for breeders and financial support for field trials. In 2013 and 2014, East-West Seed assisted the Thailand-based public gene bank BIOTEC by multiplying tomato accessions, and provided technical and management support and access to its germplasm collection to Bogor Agricultural University in Indonesia.

Focus Area 2: Access to Genetic Resources

Companies provide access to their genetic resources for the benefit of smallholder farmers in Index countries

Access to the genetic resources held by seed companies is a topic of often heated debate. The industry argues that protecting genetic resources encourages investments in R&D and innovation. However, broad availability of genetic resources is essential for the development of improved crop varieties for smallholder farmers in Index countries. Within this context, it is notable that four seed companies, Bayer CropScience, DuPont Pioneer, East-West Seed and Monsanto, provide access to their genetic resources for the benefit of smallholder farmers.

These four leading companies work in partnership with other stakeholders to provide access to their genetic resources. The selected partners, which often have experience in research in Index regions, comprise national research institutes, local governments and development organizations that aim to develop new varieties of crops important in Index countries. As these partners do not always have the right set of genetic resources to achieve this aim, seed companies are a valuable and logical source.

Overall, access to genetic resources is more common for field crops and in sub-Saharan Africa. DuPont Pioneer provides transgenic DNA constructs to the African Biofortified Sorghum (ABS) initiative, which is expected to result in a public GM sorghum line, and is engaged in talks with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to provide free access to its millet germplasm. According to the company, this germplasm performs well under Indian conditions and could be extended to Africa.

Monsanto focuses on maize and cowpea in Africa. It has contributed germplasm and biotechnology traits for water-efficient maize, and donated intellectual property for cowpea. East-West Seed has contributed germplasm of local crops to Afrisem, a breeding company in which it partners with Rijk Zwaan in Tanzania.

Water Efficient Maize for Africa

In drought-prone Eastern Africa, Monsanto has donated maize varieties and two biotechnology traits from its global proprietary collection to the Water Efficient Maize for Africa (WEMA) partnership. Using this germplasm, WEMA has been able to breed improved maize varieties

with beneficial drought- and insect-tolerance characteristics. In 2014, the first WEMA maize hybrid varieties were released in Kenya, Tanzania and Uganda (see the Regional Index chapter on Genetic Resources & Intellectual Property for further details, p. 147).

Focus Area 3: Intellectual Property Rights

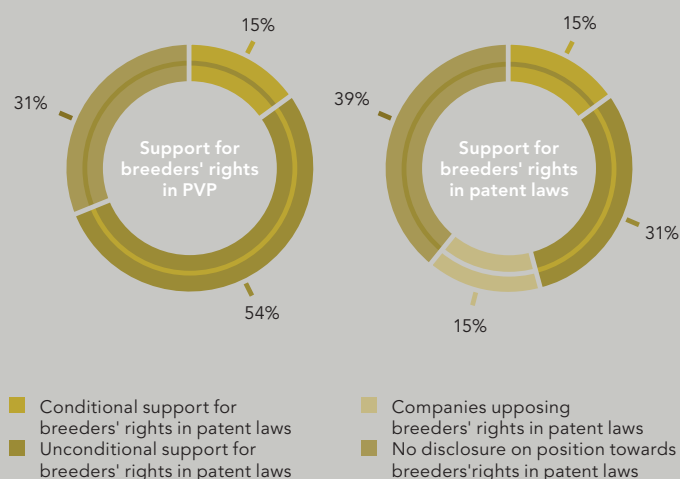
Most Global Index companies support both the breeders' exemption and the farmers' privilege

The long-established breeders' exemption in plant variety protection (PVP) laws, which makes commercial varieties available for further breeding, is high on the agenda of every seed company.

All nine companies who disclose details on the issue state that they support the breeders' exemption, though two provide it conditionally, arguing that the exemption should not conflict with their own internal product stewardship programs or with regulatory compliance. DuPont Pioneer highlights its involvement in international efforts to protect the breeders' exemption and notes that it has worked to stop other treaties or laws from limiting the exemption.

With regard to the breeders' exemption in patent law, two companies, Syngenta and DuPont Pioneer, argue that patent law should be kept separate from PVP laws, and that the licensing of patented traits should be supported instead.

More companies support the breeders' exemption in PVP than in patent laws



No company was found to use contracts or other mechanisms to discourage the use of farm-saved seeds. Several companies express support for the farmers' privilege, albeit conditionally.

All companies, with one exception, are found to support the farmers' privilege, albeit conditionally. Syngenta, for instance, states that it 'recognizes the right of farmers to practice [on-farm seed saving] but that it should not be allowed for high-value crops such as vegetables and flowers'. The company adds that it makes an exception for least-developed countries (LDCs), not enforcing its patents or technologies in seeds and biotechnology in these countries.

Some companies specify that the practice of seed saving should only be allowed for subsistence or non-commercial use by farmers. For example, Rijk Zwaan states that it 'considers the exchange or sales of farm-saved seeds for subsistence farming not as commercial use', and East-West Seed regards farm-saved seeds as an acceptable practice 'if it's for the farmers' own use only'.

Syngenta and KWS cite support for the Nagoya Protocol on Access and Benefit-sharing (Nagoya Protocol) in general, but voice concerns about the implementation of the Nagoya Protocol by certain countries, in particular in the European Union.

Some humanitarian licensing strategies found

One of a seed company's key assets is its intellectual property. As this can be important for smallholder farmers in Index countries, companies can use specific licensing strategies to improve access to patented technologies, varieties and traits. An example of such a strategy is 'humanitarian licensing', of which examples have been found for DuPont Pioneer and Monsanto.¹⁴

Few Global Index companies report commitments and activities related to patents and humanitarian licensing

Commitment not to enforce patents for smallholder farmers in Index countries	Development and use of provisions to categorize licensing practices	Use of royalty-free licensing in Index countries
<p>Syngenta is the only company with a formal commitment not to pursue or enforce patents and applications in seeds or biotechnology in least-developed countries for private use by subsistence farmers.</p>	<p>No company discloses provisions that enable the use of humanitarian licenses and that distinguish between companies and research institutes in Index countries.</p>	<p>DuPont Pioneer and Monsanto provide access to their germplasm through royalty-free licenses. Access is provided to partners for maize, sorghum and cowpea.</p>

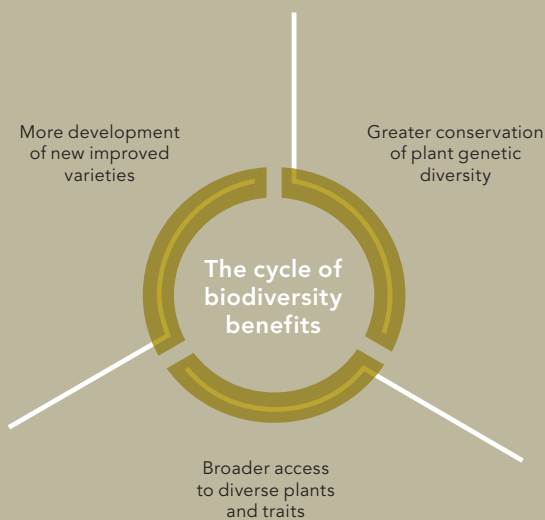
Only two Global Index companies disclose their position on the patenting of native traits

Although the patenting of native traits, which occur naturally in crop species and their wild relatives, is considered a key issue with regard to intellectual property protection, only two companies disclose their position. East-West Seed clearly opposes applications for such patents, stating that these traits already exist in nature, do not qualify as inventions and are a matter of 'mere discovery'. Bayer CropScience, meanwhile, supports the patenting of native traits if such inventions comply with 'the patentability criteria such as novelty, inventive step, industrial applicability and sufficiency of disclosure'. As no other companies formulate a position on the matter, there is much room for improvement across the seed industry as a whole.

Investing in biodiversity

Safeguarding genetic and crop diversity is important for meeting future food and nutrition security needs. Meanwhile, climate change is increasing the business case to do so. Perhaps the most striking example of this reality is the Svalbard Global Seed Vault, a large secure seed storage bank on a remote island in Norway. Here, varieties from all over the world are stored to protect genetic diversity and preserve crop wild relatives and varieties that may otherwise go extinct. With the loss of 75% of plant genetic diversity since the 1900s, the need to preserve and foster such diversity is evident, especially since old varieties and crop wild relatives may hold genetic traits such as resistance to heat, droughts, salinity, floods and pests. Such traits are not only central to the development of improved varieties by seed companies but are also necessary for agriculture in Index countries to adapt successfully to new growing conditions.

Seed companies can contribute to and benefit from safeguarding crop diversity on three reinforcing levels. Greater conservation of genetic diversity in the public domain means broader access to genetic resources for companies to select and integrate into their breeding programs. This broader access to plants and traits aids the development of improved crop varieties. Finally, the development of new varieties contributes to overall plant genetic diversity available for future R&D (e.g. through the breeders' exemption and research projects).



Seed companies are helping to safeguard crop diversity by collecting and conserving varieties in their own company gene banks and supporting public gene banks. Going beyond this status quo, East-West Seed has taken a leading role in the conservation and use of genetic diversity by establishing a new gene bank in Indonesia, which is unique in the industry. In collaboration with Bogor Agricultural University in Western Java, the company aims to preserve local horticultural germplasm grown by smallholder farmers. The company states that it will facilitate access to this germplasm by making it a 'public genetic resource and open bank' in the future.

Measurement Area

D

Research & Development

This measurement area focuses on companies' research & development efforts, especially activities that consider local conditions in Index regions and the key crops for farmers in those regions. These activities include adapting global crops for local use and breeding programs aimed at improving e.g. the yield, pest and disease resistance and climate resilience of local crops. Additional activities, such as cooperation with local and/or public research institutes for the development of new varieties, evaluation of the needs of local farmers and consumers, and the development of appropriate seed treatment and other technologies, are also considered.

Three Focus Areas

Improved Varieties for Smallholder Farmers

Plant-breeding activities tailored to the needs and preferences of smallholder farmers in Index regions demonstrate companies' commitment to the development of improved varieties. By conducting variety trials and on-farm demonstrations, companies can test varieties in their existing portfolio for suitability in Index regions. They can also contribute to the availability of improved varieties in Index regions through dedicated breeding programs or targeted approaches in their general breeding programs focusing on both global and local crops.

Specific Traits for Smallholder Farmers

Dedicated programs to develop specific traits such as tolerance to abiotic stresses like heat, drought, flooding and salinization and resistance to pests and diseases, can significantly improve crop yield and performance. Such traits can subsequently be used in breeding programs with local varieties for Index countries. Similarly, the development of improved varieties with specific traits that increase the nutritional value of crops can contribute greatly to food and nutrition security.

Local Cooperation

Specific needs, preferences and knowledge can be incorporated into companies' breeding programs by involving local farmers, consumers and other stakeholders in the variety selection through variety trials and demonstrations. Cooperation with local research institutes and farmer organizations can also be of tremendous value. In some cases, local research institutes may already have developed germplasm that is available for use in breeding programs.

Main Findings in Research & Development

There is evidence of variety testing targeting smallholder farmers

A significant number of companies engage in testing existing varieties or developing improved varieties for smallholder farmers. However, few have formal commitments guiding these activities for researching and developing traits and varieties suitable for smallholder farmers.

Few Global Index companies breed local crops

Only four out of 13 companies are involved in R&D activities dedicated to local crops, but there is some evidence of relevant R&D collaborations in this area. Examples include Rijk Zwaan and East-West Seed's Afrisem breeding activities, and Dow AgroSciences and Monsanto's cassava project with the Donald Danforth Plant Science Center (see the Innovation Overview for further details).

Field crop R&D efforts are dominated by research collaborations and partnerships

Six out of seven field crop seed companies are involved in collaborative research to develop improved varieties of global and local Index crops. The collaborations aim to create synergies in companies' efforts, with international research institutes such as CIMMYT and the Donald Danforth Plant Science Center serving as partners for a number of the relevant collaborations.

Global Index companies engage in developing traits potentially suitable for smallholder farmers

The majority of companies disclose breeding activities for traits, such as drought and flood tolerance, which may be suitable for smallholder farmers in Index countries. However, most companies do not clearly identify the link to the needs of smallholder farmers. This may indicate a gap, since the agricultural practices of smallholder farmers, such as no or lower use of fertilizers, are often different from those of large- or medium-sized farmers.

R&D activities lack transparency

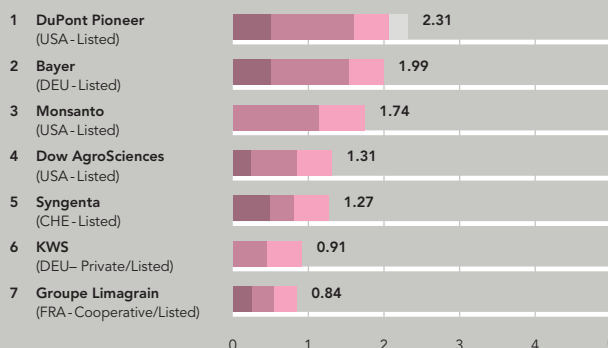
Overall, companies are not fully transparent about their R&D activities. However, most companies disclose details about their R&D partnerships and collaborative research.

Opportunities exist to improve local feedback systems for traits and varieties suitable for smallholder farmers

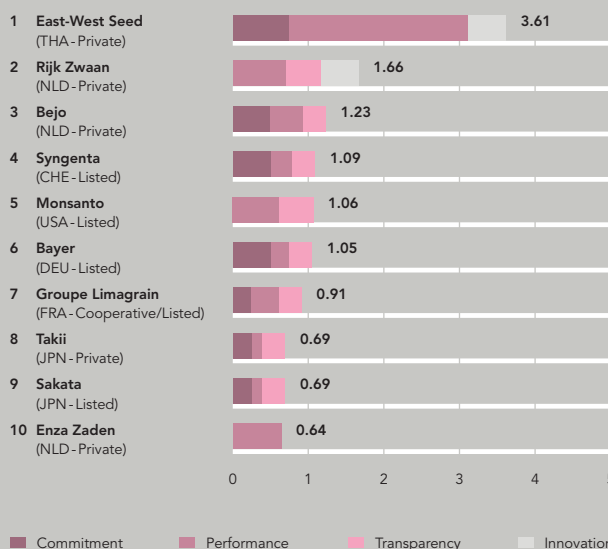
The majority of companies that disclose efforts to develop traits and varieties suitable for smallholder farmers do not provide evidence of systems to collect feedback on the needs of smallholder farmers and other actors in the value chains in Index countries. The lack of such systems may lead to the misalignment of efforts and needs.

How Companies Perform

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



East-West Seed leads the ranking, thanks to strong performance across the measurement area. The company's business model explicitly focuses on smallholder farmers, directly linking R&D efforts to the needs of these farmers. Other companies at the upper end of the ranking, including Rijk Zwaan and Bejo, also have R&D programs dedicated to the needs of smallholder farmers. Generally, however, performance in this measurement area is low, indicating room for improvement.

DuPont Pioneer outperforms its field crop seed peers, largely due to its commitment to develop traits suitable for smallholder farmers and its variety testing activities. Bayer CropScience has committed to develop improved varieties for smallholder farmers and to breed for specific traits suitable for smallholder farmers. It is also involved in collaborative research activities. Monsanto lacks commitments but has embedded local feedback systems.

Companies that rank low in the Indexes include KWS, Groupe Limagrain, Sakata and Takii. While Enza Zaden demonstrates weak performance or discloses no information in most R&D focus areas, the company scores well in testing its existing portfolio and developing traits and varieties suitable for smallholder farmers. Low-scoring companies communicate little on how their R&D activities address the specific needs of smallholder farmers.

Focus Area 1: Improved Varieties for Smallholder Farmers

There is evidence of commitments to develop improved varieties for smallholder farmers

Eight companies have commitments to develop improved varieties for smallholder farmers. However, Syngenta is the only company with a formal commitment (in its Good Growth Plan) to develop new smallholder solutions in its R&D portfolio. Syngenta states that by employing its technologies and integrated strategy, it will 'not only focus on the world's 8 million large-scale farmers, but also on the 450 million smallholder farmers, whose productivity often lags behind their developed market counterparts'.

Most Global Index companies develop and test suitable varieties

Nine companies disclose activities related to developing varieties suitable for smallholder farmers or in testing their existing portfolio for smallholder farmers.

Bayer CropScience and DuPont Pioneer have strong activities related to testing their field crop portfolio and developing global field crop varieties for smallholder farmers. Bayer CropScience performs variety trials in 11 Index countries around the world for two of the four Index field crops in which it is engaged, whereas DuPont Pioneer tests varieties of five out of the seven Index field crops in its portfolio in 11 Index countries in Africa.

In comparison, vegetable seed companies carry out testing for smallholder farmers in the majority of the Index countries where they are active. East-West Seed and Enza Zaden's R&D activities cover all of the companies' global vegetable crops and all of the Index regions where they operate. Syngenta performs variety trials of its existing vegetable portfolio through a partnership with Fair Planet, a nonprofit organization in Ethiopia with which other Index companies also collaborate.

Partnerships spur the development of varieties suitable for smallholder farmers

Monsanto and Syngenta are also involved in developing global field crops for smallholder farmers through partnerships. Monsanto does this through Water Efficient Maize for Africa (WEMA), a public/private partnership led by the Kenya-based African Agricultural Technology Foundation (AATF) to develop water-efficient maize and make resulting varieties available royalty-free to smallholder farmers. Syngenta develops wheat varieties suitable for smallholder farmers in partnership with the International Maize and Wheat Improvement Center (commonly known by its Spanish acronym CIMMYT).

The only R&D activity found for local field crops is conducted by Dow AgroSciences and Monsanto in partnership with the Donald Danforth Plant Science Center on improved cassava varieties. These varieties reduce the impact of cassava mosaic disease (CMD) and cassava brown streak disease (CBSD), although neither company markets cassava. The two companies with R&D activities for local vegetable crops, Rijk Zwaan and East-West Seed, collaborate in Afrisem, an Africa-focused company that breeds hot pepper, African eggplant and African kale, among others. East-West Seed appears to have the most (eight) local crops in its breeding programs, including coriander and palak for the Asian market.

Opportunities exist to improve transparency around R&D resources

At present, companies do not report transparently on their allocation of funding for R&D of varieties suitable for smallholder farmers. East-West Seed is the only company which, on engagement, provided detailed information about the resources it dedicates to R&D for smallholder farmers, the lion's share of which is used to develop varieties suitable for smallholder farmers in Index countries, as these farmers account for 95% of the company's customers. More transparency may enhance understanding of the industry's R&D efforts to address the needs of smallholder farmers in Index countries.

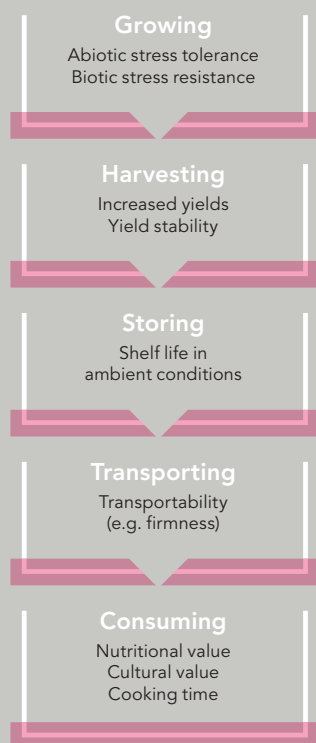
Focus Area 2: Specific Traits for Smallholder Farmers

There is evidence of commitment to develop suitable traits
DuPont Pioneer has a formal commitment to develop traits suitable for smallholder farmers. Although it does not reference smallholder farmers specifically, the company has allocated \$10 billion to R&D as part of its Food Security Goals and is working on innovative developments to increase food production, enhance nutritional value, improve agricultural sustainability, boost food safety, extend food freshness and reduce waste. Overall, less than 50% of companies are committed to developing traits suitable for smallholder farmers.

Global Index companies breed for traits relevant for smallholder farmers

Despite the lack of formal commitments, nine companies are involved in breeding for traits suitable for smallholder farmers. DuPont Pioneer, East-West Seed, Groupe Limagrain through its daughter company Hazera and Monsanto have breeding programs for traits that are especially useful for smallholder farmers. However, most companies do not link these breeding efforts specifically to the needs of smallholder farmers. This explicit link is important for companies who target markets dominated by smallholder farmers, due to the differing growing conditions of smallholder farmers. For example, water and fertilizer availability and affordability can be restricted, increasing the importance of abiotic stress tolerance.

Importance of specific traits in different parts of the production and consumption chain for smallholder farmers

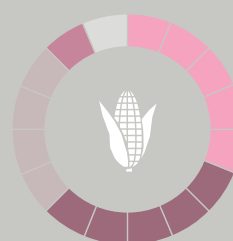


Breeding efforts focus on resistance to pests and diseases, abiotic stress tolerance and increased yield

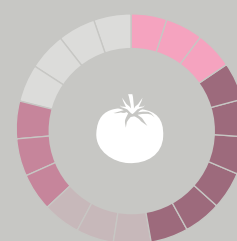
Overall, field and vegetable crop breeding efforts focus on pest and disease resistance and abiotic stress tolerance and increased yield. Abiotic stresses include heat, drought, flooding and salinization. In general, biotic stress resistance is the most chosen trait for breeding activities among vegetable seed companies. For field crop seed companies, abiotic stress tolerance is as popular as biotic stress resistance. Field crop seed companies generally have a limited focus on improved nutritional value and local preferences. Among these companies, increased nutritional value and local preferences are only addressed by DuPont Pioneer. In contrast, the same number of vegetable seed companies pursue these traits as pursue increased yield and abiotic stress tolerance. Local preferences, including increased shelf life, cooking time and transportability, are even more prominent in the breeding programs of vegetable seed companies than increased yield and abiotic stress tolerance.

For example, East-West Seed breeds for unique traits including shelf life, transportability and higher levels of saponins, an anti-diabetic in bitter melon varieties. This targets the growing number of people in Index countries affected by diabetes. DuPont Pioneer reports breeding activities in Vietnam for salt water-tolerant hybrid rice, a nutritious and easily digestible sorghum variety and improved maize varieties that are better at capturing fertilizer. Both these sorghum and maize varieties are developed using genetic modification.

Number of Global Index companies breeding traits useful for smallholder farmers



Field crop seed companies



Vegetable seed companies

- Tolerance to abiotic stress
- Resistance to pests and diseases
- Increased yield
- Improved nutritional value
- Local preferences

Number of field crop seed companies assessed = 6

Number of vegetable seed companies assessed = 9

Focus Area 3: Local Cooperation

The development of Index field crops is fueled by collaborative research

Six out of seven field crop seed companies are involved in collaborative research targeted at Index countries, often with local public or private partners. Collaborations range from Bayer CropScience's Memorandum of Understanding with PhilRice in the Philippines to collaborations by DuPont Pioneer, Monsanto and Dow AgroSciences with a broader focus on Africa. KWS and Syngenta target specific countries in Africa.

Syngenta collaborates with HarvestPlus, part of the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), to develop new varieties of millet in India, maize in Zambia and new varieties of the local crops sweet potato in Mozambique and Uganda and cassava in Nigeria. Although not a collaboration with a local partner, Syngenta has also worked with the University of Bern in Switzerland to develop new varieties of the local crop tef for the Ethiopian market.

In contrast to the field crop seed companies, East-West Seed is the only vegetable seed company involved in collaborative research in Index countries. This is done with local public and private partners such as the Asian Vegetable Research and Development Center (AVRDC), universities in India, Indonesia, the Philippines and Thailand, and the Thai National Science and Technology Development Agency (NSTDA). The company engages 'farmer cooperators' to test new varieties in their fields before commercialization.

Local needs and R&D efforts may be prone to misalignment

Although most companies engage in partnerships to tailor R&D efforts for the Index regions, only a few report formal feedback programs. East-West Seed's feedback program is a joint information-gathering effort between the company's product development staff, marketing & sales and R&D teams. This information is then passed on to the Product Advancement Committees in each unit. The feedback program includes regular visits to farmers' fields and focus group discussions.

Bejo has implemented a formal program for Bejo Sheetal, its joint venture with Indian peer Sheetal Hybrid Seeds Pvt. Ltd., in which breeders directly collect feedback from trials at farmers' fields or from local organizations. Among field crop seed companies, only Monsanto appears to have a feedback system, but the scope of the system remains unclear.

Overall, companies that consider smallholder farmers a distinct market segment could capitalize on the opportunities to collect feedback on farmers' specific needs and use this to shape R&D efforts for Index countries. Companies could collect such information by assessing the preferences of local consumers, traders and smallholder farmers.

Cooperating for Cassava

Dow AgroSciences and Monsanto are both involved in research on cassava, a globally important food security crop. Cassava serves as a primary source of calories for more than 250 million people living in sub-Saharan Africa, who eat it as often as two-three times a day. It grows well in poor soils with little rainfall.

Cassava is propagated by cuttings not by seed, and hence does not feature prominently in the product portfolios of seed companies. A major problem in cassava growing in Africa is virus diseases, in particular cassava mosaic disease (CMD) and cassava brown streak disease (CBSD). Several distinct varieties of the CMD virus exist, leading to malformation of leaves and reduced or no tuber production. CBSD is especially prevalent in Eastern Africa, causing necrotic areas within the tuber as well as a general reduction of root size. Lesions in roots may result in post-harvest spoilage.

Both Dow AgroSciences and Monsanto have contributed to developing virus-resistant varieties in cooperation with the Donald Danforth Plant Science Center as part of the Virus Resistant Cassava for Africa (VIRCA) project.¹⁵ The Monsanto Fund has 'contributed nearly \$13 million' to the collaboration, and Dow AgroSciences is training and working with visiting scientists from African nations to introduce a DNA regulatory element into the cassava plant to block viral replication. Other partners are the National Crops Resources Research Institute in Namulonge, Uganda, the Kenya Agricultural and Livestock Research Organization in Nairobi, Kenya, and the International Institute for Tropical Agriculture (IITA) from its hub at BeCa/ILRI in Nairobi.

Afrisem: local crop development

Afrisem was established by Rijk Zwaan, in collaboration with East-West Seed, in Tanzania in 2008. Through this company, the two competitors joined forces to develop local crops and varieties that are suitable for the African market. Afrisem's focus is on developing affordable quality seed and improved varieties of local crops, among them African eggplant and African kale. Traits include increased yield, improved shelf life, disease resistance and leaf characteristics.

Innovative approaches to nutrition security

The importance of the nutritional value of varieties has been highlighted by major international development institutions, including the World Bank¹⁶ and FAO, especially for regions with low food security and limited food options for the local population. Within the last few years, several projects have focused on increased vitamin and micronutrient content. The increase of these elements in crops commonly used in traditional and daily cuisine can reduce malnutrition and nutrition-related diseases without changing cultural habits.

The African Biofortified Sorghum (ABS) Initiative, of which DuPont Pioneer is a member, was established in 2005. As the name suggests, this public-private partnership focuses on Africa and on sorghum, which is an affordable staple food for more than 300 million people across the continent. As the crop lacks most essential nutrients, the initiative develops improved sorghum varieties with increased pro-vitamin A, zinc and iron content, and aims to build production and distribution capability to get biofortified sorghum seed to farmers. The results of the partnership have so far been promising as higher levels of pro-vitamin A have been achieved, reaching 100% of the daily vitamin A requirement in children, and stability of pro-vitamin A during grain storage has improved.

East-West Seed is conducting exploratory research into developing bitter melon varieties with higher levels of saponins, an anti-diabetic. This development speaks to a different aspect of traits, namely targeting prevalent diseases in Index countries with improved food. The World Health Organization has raised concerns about the likely two-fold increase of diabetes in developing countries in the next 30 years.¹⁷ Potentially affecting up to 284 million in 2030, the increase is being driven by higher concentrations of dietary fat and sugar. More readily available anti-diabetics could help in the management of the disease, especially important given the lack of access to conventional treatment in developing countries (for example, Index country Guinea¹⁸).

Measurement Area

E

Marketing & Sales

This measurement area assesses the ways in which companies make quality seeds of improved varieties available and affordable to smallholder farmers and promote adoption. This could include tailored packaging and trusted distribution networks. Promotion of new varieties can be done through demonstrations and on-farm trials, helping to raise awareness among smallholder farmers of advancements in breeding and the use of other inputs. Other relevant practices are similar to those used in developed countries, including professional testing of varieties before release, quality assurance and after-sales support systems.

Five Focus Areas

Release of New Varieties

New varieties are most beneficial when tailored to the needs of smallholder farmers in Index countries. These varieties may be the result of companies' global breeding programs or varieties that were developed by companies' local breeding programs or local research institutes. Smallholder farmers often use open-pollinated varieties (OPVs), from which they can save seeds for their own use in the next growing season. This seed-saving system is not technically possible with F1 hybrids, which are the commercial standard for many crops because in general they produce better yields. The indicators consider how companies deal with this issue and whether they accommodate the differing capacity levels of smallholder farmers.

Quality of Varieties and Seeds

Most Index countries have legislation and regulations regarding quality control and the testing of new varieties and seed lots, but the capacity of the national institution to implement the regulations is weak or in some cases nonexistent. It is the role of seed companies to ensure that only varieties suited to local conditions are released into the market, and that the seeds of these varieties meet certain minimum standards. This can be done through professional variety testing and adherence to internationally adopted quality control protocols and codes, e.g. on biosafety. Seed quality should also be maintained throughout the distribution channel.

Packaging, Distribution and Affordability

When entering a new market, an existing distribution network can be used or new distribution channels created. This is of particular relevance when trying to reach smallholder farmers in remote regions. Depending on the local situation, it may be necessary to target specific groups such as women and young farmers, who play a significant role in agriculture and increasing agricultural productivity. Distribution channels must be robust and reliable in order to minimize the sale of counterfeit seeds. Training distributors in inventory management and taking responsibility for the distribution channel can help to prevent misuse. The packaging should include clear instructions and warnings in the local language as well as pictograms. Finally, smallholder farmers generally require smaller quantities of seeds and a pricing strategy adapted to their local situation. Affordability can also be improved when breeding companies partner with other organizations to introduce finance or insurance services.

Adoption Strategies and Access to Adjacent Technologies

A promotional strategy, including field days and initiatives targeting lead farmers, which improves local knowledge about different varieties and their potential should be implemented. During demonstrations and on-farm trials, the use of adjacent technologies such as agrochemicals, fertilizers and irrigation can be introduced. Since some of the companies in the scope are also leading suppliers of agrochemicals, these companies should ensure that only registered pesticides are promoted and protocols on pesticide safety are followed.

After-sales Support

In order to ensure that the varieties and seeds they produce meet local needs and demands, companies should have customer feedback and grievance mechanisms in place. This feedback can serve as an important part of the learning process for breeders.

Global Index companies reach all Index regions, but gaps exist in Western Africa

Collectively, companies have established distribution channels in all countries in three Index regions. In Western Africa, however, companies are present in only eight out of 14 Index countries, with no coverage at all in Gambia, Guinea, Guinea-Bissau, Liberia, Niger and Sierra Leone.

In most cases, seeds are distributed directly by local subsidiaries or through third-party distributors. Latin America and South and Southeast Asia have the most developed distribution networks, with an average of seven and six companies, respectively, found to be distributing seeds. In Eastern Africa, an average of five companies are active per country. The industry has not yet developed Western Africa's distribution channels to the same extent, with an average of less than two companies in eight out of 14 countries. The highest concentrations are in Ghana (seven companies) and Senegal (six companies). This indicates both a current gap and a future opportunity for the industry to reach smallholder farmers in this region. It is notable that companies also have some degree of activity in fragile states, for example Afghanistan, Haiti and South Sudan.

Most of the Index crops are available in Index regions, but there is room for improvement

In general, only limited information is publicly available about the countries where crops are marketed. Hence, the data collected is likely to be an underestimation of the extent to which improved seed of global crops are made available by global Index companies in Index countries. Nevertheless, the data gathered shows that seven of the 11 global field crops are available in Index regions, with maize (in all four regions) and rice (in three regions) most widely available. Global vegetable crops are also marketed extensively, with 19 of the 25 crops distributed in Index regions. Eleven vegetable crops are distributed in all Index regions. Opportunities exist for barley, finger millet, foxtail millet and potato (field crops), and chicory, garlic, green pea, leek, squash and turnip (vegetables), for which no reliable distribution data for any of the Index regions was found.

Quality management is a top priority for seed companies

Almost all companies address the issue of seed quality management in informal statements or as part of company policies, though in significantly different ways. Where no formal commitment exists, companies could improve their performance by introducing company-wide policies and standards on seed quality, seed health, testing, registration and certification. Such policies would bolster a company's commitment to maintain consistently high quality across Index countries. Many companies have systems in place to ensure that quality standards are maintained, although often it is not clear whether these are aligned with the standards of the International Seed Testing Association (ISTA), the Inter-national Organization for Standardization (ISO) or equivalent third-party organizations.

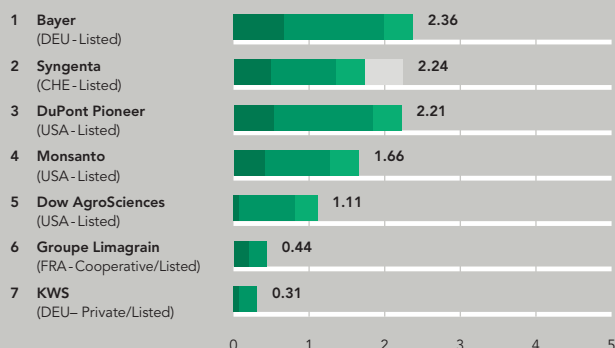
Global Index companies use field days and demonstration plots to raise adoption rates among smallholder farmers

To encourage the adoption of improved varieties by smallholder farmers, most companies organize field days or have demonstration plots. These provide a form of capacity building and demonstrate the potential impact of companies' products on productivity, potentially making the process of switching to new varieties more attractive to smallholder farmers.

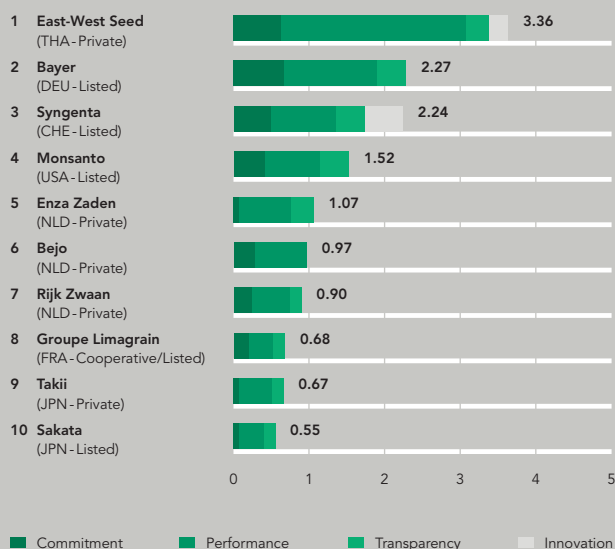
Global Index companies concentrate efforts on marketing proprietary hybrid varieties

Only a few companies offer open-pollinated varieties (OPVs) alongside hybrid varieties and market varieties developed by international or national research institutes. This appears to be an underutilized opportunity.

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



East-West Seed leads the Global Index of Vegetable Seed Companies by a strong margin. It is followed by Bayer CropScience and Syngenta, which both also perform well in the Global Index of Field Crop Seed Companies. DuPont Pioneer completes the top three in the Global Index of Field Crop Seed Companies.

East-West Seed's high ranking is based on its strong performance throughout the focus areas. Besides offering improved varieties to smallholder farmers for all of its Index crops, East-West Seed is the only vegetable seed company that markets varieties developed by public research institutes. Furthermore, it differentiates between segments of smallholder farmer customers and offers these customers tailored products: open-pollinated varieties (OPVs) in all Index countries where it is active and different seed grades, such as both uncoated and coated seeds, to account for different farmer requirements and budgets.

The other top-three companies also have extensive marketing activities in Index countries. Bayer CropScience, which trails East-West Seed in the Global Index of Vegetable Seed Companies but outperforms its peers in the Global Index of Field Crop Seed Companies, leads in its approach to seed quality management and performs well above average in most of the other focus areas. DuPont Pioneer very actively markets varieties to smallholder farmers in the Index countries where it operates. Syngenta's highly innovative smallholder insurance initiative promotes the adoption of improved varieties, setting the company apart from its peers (see the Innovation Overview for further details).

Behind the leading companies is a group of five companies with more variable scores. For example, Enza Zaden and Bejo, ranking fifth and sixth respectively in the Global Index of Vegetable Seed Companies, both have extensive distribution channels in Index countries but provide no evidence of activities that accommodate the differing capacity levels of smallholder farmers or improve the affordability of seeds for these farmers. At the bottom of the rankings are Groupe Limagrain, Takii, Sakata and KWS. These companies disclose no evidence of making quality seeds of improved varieties available and affordable to smallholder farmers and do not appear to promote adoption.

Focus Area 1: Release of New Varieties

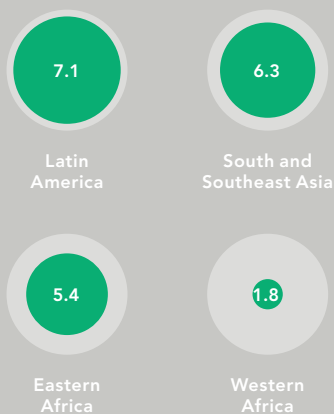
Companies market improved varieties of at least 26 Index crops in at least 44 Index countries

Companies are active throughout Index regions and already market a variety of Index crops. The evidence gathered for this first Index shows that companies market improved varieties in 44 out of 50 Index countries. Improved varieties of at least one Index crop are available in all Index countries in South and Southeast Asia, Eastern Africa and Latin America. Western Africa is considerably less well covered, with no marketing activities currently found in Gambia, Guinea, Guinea-Bissau, Liberia, Niger and Sierra Leone.

On average, most companies are present in Latin America (seven per country), followed by South and Southeast Asia (six per country) and Eastern Africa (five per country). The lowest level of company activity appears to be in Western Africa, with an average of less than two companies per country. This indicates that Western Africa is still a blank on the marketing map of global seed companies.

Within these 44 Index countries, companies market improved varieties for the vast majority of Index crops: 26 out of 36. Global vegetable seed companies market improved varieties of 19 out of 25 (76%) Index crops. The vegetable crops marketed in all four Index regions are cabbage, carrot, cauliflower, cucumber, eggplant, gourd, lettuce, onion, pumpkin, tomato and watermelon. In contrast, no evidence was found that companies market chicory, garlic, green pea, leek, squash or turnip in any Index region. Among global field crop seed companies, maize was found to be most widely marketed and opportunities remain in barley, finger millet, foxtail millet and potato.

Average number of Global Index companies per Index country in the four Index regions



Global Centers and Global Companies

The Consultative Group for International Agricultural Research (CGIAR), a network of 15 international agricultural research centers, developed 57 rice, 70 maize and more than 100 wheat varieties in 2014 alone. These were released in all Index regions, with a strong focus on Western Africa (16 varieties) and Eastern Africa (43 varieties).¹⁹ National research organizations are typically the first to distribute these

varieties. Global Index companies are increasingly collaborating with CGIAR centers, including CIMMYT, IRRI, ICRISAT and IITA, on research projects. Closer collaboration with these centers and national research organizations beyond the research phase could help to ensure that CGIAR varieties reach smallholder farmers, if companies opened up their own marketing and distribution channels.

Global Index companies do not appear to market varieties developed by research institutes

Partnerships throughout the seed value chain are common, but there is limited evidence of collaborations in which companies market varieties developed by national or international research institutes. While research institutes often have the R&D expertise to develop varieties suitable for smallholder farmers, they lack the marketing and distribution networks of seed companies and are usually dependent on public distribution channels. Using existing company distribution networks in Index countries to market these varieties could potentially help to raise the adoption rate of improved varieties and increase company revenues without incurring extra R&D costs.

Three Global Index companies account for the differing capacity levels of smallholder farmers in their marketing strategy

Only East-West Seed, Monsanto and DuPont Pioneer appear to adapt their seeds to the differing capacity levels of smallholder farmers. Such adaptations are considered best practice, as they take into consideration the different stages of farmer development, from subsistence smallholder farming to commercial smallholder farming, and the related transition from the informal to the formal seed sector.

East-West Seed addresses these capacity differences by offering open-pollinated varieties (OPVs) as well as hybrids for crops in its portfolio. It also markets different seed grades of its varieties. These include seeds with and without a coating or encrusting – the treated, more expensive type being more suitable for (semi-) commercial smallholder farmers.

Monsanto and DuPont Pioneer also offer different seed grades. Monsanto states that it offers three-way and double-cross maize hybrids. These do not have the same level of hybrid vigor as single crosses but provide higher yields than OPVs in more 'resource-constrained countries'.

Focus Area 2: Quality of Varieties and Seeds

Global Index companies are committed to seed quality and safety

The issue of seed quality and safety is high on the industry's agenda: all companies except Groupe Limagrain have formal or informal commitments regarding the quality and safety of varieties and seeds. Some companies have formalized these commitments in policies or code of conducts, while others' commitments are informal. The commitments vary in content and focus, usually relating to testing, registration and certification; the approval and registration of new varieties in countries that lack relevant protocols and codes; testing seed quality (i.e. germination, purity, uniformity) and seed health (i.e. absence of pathogens); and, in the case of genetically modified varieties, ensuring biosafety in Index countries.

Frequency of seed quality and safety policies

Focus of policy	Number of companies
1. Policy for testing, registration and certification when launching new varieties in Index countries	6
2. Protocols and codes on the approval and registration of new varieties in Index countries that lack these protocols and codes	2
3. Policy for testing seed quality when entering Index countries that lack relevant protocols and codes	9
4. Policy for ensuring biosafety in Index countries (only for the 6 companies that market GM varieties)	5

Most companies have internal seed quality management systems (QMS), usually in line with and/or certified by ISTA or ISO 9000 but sometimes of a more proprietary nature. These are applied to test seed quality when entering Index countries that lack relevant protocols and codes, independent of the country of seed destination.

All companies that market GM seeds confirm adherence to biosafety regulations for GM varieties, with five of the six having publicly disclosed policies on ensuring and managing biosafety in Index countries. Syngenta states that 'new GM seed products are only placed on the market after the safety assessments have been reviewed and approved by the appropriate regulatory authorities in that particular country'. DuPont Pioneer takes a more societal approach by committing to 'carefully consider the wishes of society, protection of the environment, need for increased productivity and general improvement in the quality of life as [it] develop[s] biotechnology products'. Only in a limited number of Index countries is the cultivation of genetically modified (GM) varieties of Index crops authorized. Notably, cultivation of GM maize and/or soybean is concentrated in Latin America (Bolivia, Colombia, Honduras and Paraguay) and South and Southeast Asia (Philippines, Thailand and Vietnam).

There is no evidence of misleading marketing practices in Index countries

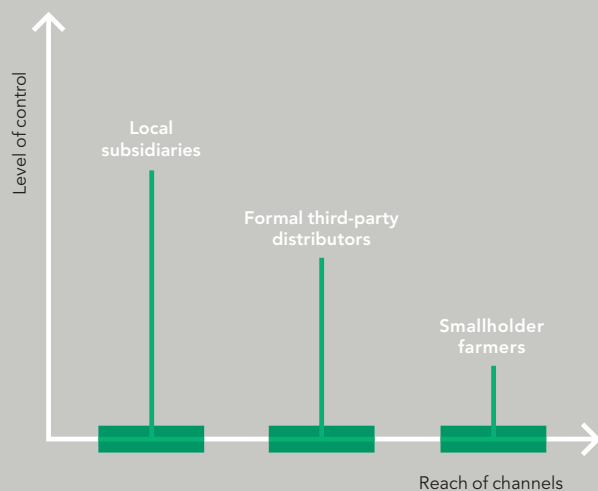
Analysis of third-party sources showed that no company is engaged in misleading marketing practices in Index countries. The Index also assessed cases in which companies settled lawsuits or were found to be in breach in courts outside of Index countries, as these could be indicative of a company's marketing practices in general. Two cases were found involving Monsanto. In Brazil in 2012, a court ruled that Monsanto's commercials for modified soybean lacked the scientific evidence to support the claimed environmental benefits of the crop. In South Africa, authorities ordered the company to withdraw a commercial for GM crops on similar grounds in 2014.

Focus Area 3: Packaging, Distribution and Affordability

Global Index companies adopt different types of distribution strategies to market their seeds

Companies have established distribution channels in almost all Index countries and tend to use three approaches for seed distribution. These are distinguished by the level of company control and the reach of marketing channels. First, companies can establish and use local subsidiaries to market their products, thus maintaining strong control over their sales practices. However, reach will also be limited to the number of subsidiaries a company has. For example, Rijk Zwaan organizes its sales in Index regions directly through its subsidiaries in Guatemala, India and Tanzania.

Global Index companies can tap into three distribution channels



A second approach is to use local third-party distributors to market seeds. This is the most popular approach and balances control with reach. Here, companies need to formulate policies and control the activities of third-party sales agents to ensure quality and good marketing practices. Enza Zaden, for instance, markets its seeds independently using third-party distributors, who have sales responsibility for a specific area in a country or region.

The third approach is to cooperate with smallholder farmers to distribute seeds. Although the potential reach is large, maintaining a high level of control is challenging. DuPont Pioneer uses smallholder farmers to market some products in remote areas and employs a 'village-level system' to market others.

In practice, most companies use a mix of the three approaches depending on the country specifics and local farmers' needs. East-West Seed uses both local subsidiaries and third-party distributors to market its seeds, employing around 250 direct accounts or distributors in Index countries that 'supply seeds to dealers and sub-dealers in small towns and villages'.

Six out of 13 Global Index companies are involved in activities to improve affordability

Almost half of the companies are involved in programs to make seeds more affordable to smallholder farmers in Index countries. Companies generally take four approaches to improve the affordability of their seeds for smallholder farmers. On the one hand are approaches that aim to improve affordability on the product side as well as drive down prices or increase economies of scale. Here, companies adopt tailored cost models that enable cost reduction, utilize tiered pricing to differentiate between customer segments or support collective buying to achieve economies of scale. On the other hand are approaches that aim to improve affordability on the customer side. These focus on customers' income or the risks they incur when investing in new varieties. Here, approaches seek to improve access to credit and insurance.

Global Index companies improve affordability on the product and customer side



Most companies concentrate their efforts on one of these approaches and the geographical scope of programs remains limited. East-West Seed, however, leads in this area by combining two approaches and implementing these in all of the Index countries where it is active.

Three companies employ differential pricing strategies: Bayer CropScience, Monsanto and East-West Seed. The latter's Value Pack program extends to all Index countries where it is active and enables smallholder farmers to obtain a certain quantity of seeds for the cheapest price.

Another popular approach is microfinance, with examples from Dow AgroSciences, Monsanto and DuPont Pioneer. Dow AgroSciences, for instance, has collaborated with the Grameen Foundation and Bankers without Borders in Kenya to develop a banking application that 'allows farmers to take out loans on the value of their crops in hopes of receiving a better harvest profit'.

Focus Area 4: Adoption Strategies and Access to Adjacent Technologies

The Agriculture and Climate Risk Enterprise (ACRE) is worthy of note. ACRE, majority owned by the Syngenta Foundation, uses automated weather stations and mobile payments to facilitate insurance for farmers against drought and excess rain. In 2014, an estimated 230,000 farmers were insured in Kenya, Tanzania and Rwanda through products designed by ACRE²⁰ (see the Innovation Overview for further details).

Four Global Index companies adapt their packages to meet smallholder farmer needs

Smallholder farmers' often limited capacity levels and landholdings mean they can have different needs when it comes to seed package sizes and product information. In light of these needs, four companies, East-West Seed, Bayer CropScience, Syngenta and DuPont Pioneer, have adopted strategies that focus primarily on package sizes.

East-West Seed's program has the largest smallholder farmer reach, with 95% of its packages adapted to the needs of smallholder farmers. The company offers 'small-pouch packages' as part of its Value Packs program and includes information in local languages and pictograms for illiterate farmers.

In terms of seed package size, differences exist between field crop and vegetable seed companies but typically range from packages sufficient for plots of less than one acre (0.4ha) up to two hectares. DuPont Pioneer offers the smallest field crop packages, suitable for 1/7th of an acre, or about 55m².

Bayer CropScience takes an alternative approach, combining several agricultural inputs in its so-called Much More Rice (MMR) solutions box. In Ghana, the company offers the box with adapted inputs to correspond with one acre (0.4ha) of farmland, in Vietnam and India for 1 hectare.

Global Index companies use field days to promote the adoption of improved varieties by smallholder farmers

Nine companies have relevant programs to encourage smallholder farmers' adoption of improved varieties. Several of these programs involve field days, which span one or several days when smallholder farmers can see how using improved varieties, quality seed and often other agricultural practices can improve yields. Demonstration plots, which can viewed throughout the farming season, are also used for a similar purpose.

When organizing collaborative field days and demonstration plots, companies may choose to partner with peers, the public sector and NGOs. For example, DuPont Pioneer works with USAID and the Ethiopian government to organize demonstration plots in the country.

Global Index companies improve access to inputs other than seeds to boost smallholder farmer productivity

Access to agricultural inputs other than seeds – agrochemicals, fertilizer, irrigation and mechanization – is a next step to boosting smallholder farmer productivity. Examples of such practices have been found for Bejo, East-West Seed, Bayer CropScience and Syngenta.

Bayer CropScience and Syngenta (suppliers of seeds and agrochemicals) provide examples of combined sales of a range of agricultural inputs to smallholder farmers in Index countries. Both companies have programs that focus on agrochemical capacity building. Bayer CropScience's Food Chain Partnerships in India, Kenya and Thailand train farmers to increase crop production and improve safe use of agrochemicals. In Kenya, the company provides tomato seeds and inputs for integrated pest management in appropriate packs. Syngenta focuses on safe crop protection in Bangladesh through training programs, and educates farmers in Vietnam on responsible production methods that include agrochemicals. The Syngenta Foundation encourages smallholder cooperatives in Bangladesh and India to benefit from economies of scale when acquiring inputs. Although improving access to other inputs is beneficial to smallholder farmer development, farmers' autonomy might be jeopardized if they are contractually obliged to buy e.g. agrochemicals from the same company they buy seeds from. Examples of such practices have not been found in relation to smallholder farmers in Index countries.

Specialized seed companies, such as Bejo and East-West Seed, also integrate inputs other than seeds into their marketing strategies. During the period of analysis for this Index, Bejo hosted field days in Mali and Senegal where it showed smallholders how small sowing machines and other machinery can increase yields. In Cambodia and Myanmar, East-West Seed provided advice on the proper use and disposal of agrochemical packaging materials. It also imported plastic mulch to conserve water, prevent weeds and improve crop quality, and low-cost net houses that create consistent conditions for crops (see the Innovation Overview for further details).

Focus Area 5: After-sales Support

Few Global Index companies have feedback channels for smallholder farmers

Only four companies appear to collect, process and respond to feedback and complaints from smallholder farmers in Index countries. Companies use both digital and physical channels to do so, in either a systematic or a more ad-hoc manner.

Global Index companies collect, process and respond to feedback from smallholder farmers



Companies with digital channels have phone lines or websites that farmers, including smallholders, can use to send feedback or submit complaints regarding products. DuPont Pioneer, for instance, displays phone numbers on all of its seed packages. Other companies use physical channels such as field days, employee contact or distributors.

East-West Seed follows best practice, commissioning a third-party surveyor to collect ‘independent and unbiased feedback’ from smallholder farmers on its varieties and overall company performance. Additionally, it displays leadership by implementing a formal complaint-handling system (CHS), which registers complaints and forwards them to the respective departments.

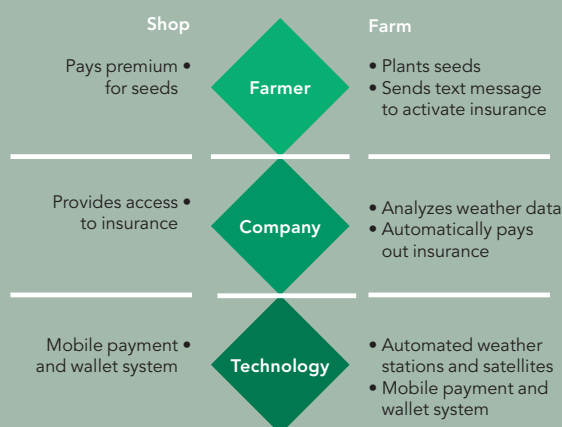
Syngenta improves access to insurance for smallholder farmers

Affordability is one of the six dimensions of access to seeds and specifically addresses the affordability of quality seeds of improved varieties. The ability of smallholder farmers to purchase these seeds is not only dependent on the market price itself but also on access to financial and insurance products. The seed industry provides access to credit in the form of microfinance, several examples of which can be found among Index companies. Under such schemes, smallholder farmers typically gain access to credit to buy inputs or invest in their farm.

Syngenta has established a program offering smallholder farmers insurance against drought and excess rain. By doing so, the company is able to reduce the risks faced by smallholder farmers who buy improved seeds and operate in unstable climatic zones.

As part of the program, Syngenta includes scratch cards with codes in its seed bags, which are sold for a premium. This premium gives farmers access to the insurance. Farmers activate the insurance by sending a text message with the code on the scratch card and receive a two-week replanting guarantee. During the two-week period, automated weather stations and satellites track the weather in that farmer's area. If the collected weather data exceeds a certain threshold of historical data, such as a specific percentage of rainfall below the average, the insurance is paid out automatically.

Syngenta's approach to improve access to insurance



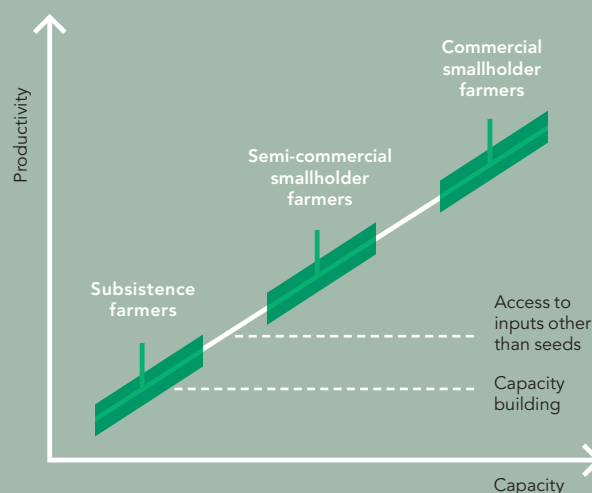
The program was established in 2009 by the Syngenta Foundation and spun off into the Agriculture and Climate Risk Enterprise (ACRE) in 2014.²¹ The majority of shares in the company are still held by the Syngenta Foundation. Since its inception in Kenya, the program has been expanded to Rwanda and Tanzania, reaching around 230,000 farmers in the three countries by the end of 2014. The Index crops eligible for insurance are maize, beans, wheat, sorghum and potatoes. In 2013, ACRE services insured a total of \$12.3 million and paid out \$370,405 or around 3% of the total insurance portfolio.²²

East-West Seed shows leadership in increasing access to inputs other than seeds

Quality inputs play a key role in increasing smallholder farmer productivity. Four types of physical input can have a particularly strong impact on yield growth: seeds, agrochemicals, irrigation and mechanization. East-West Seed stands out for its innovative approach to ensuring that inputs other than seeds are available to smallholder farmers in Index countries. While most companies include aspects of other inputs in capacity-building programs, East-West Seed imports inputs itself to kick start market growth. The company reasons that seeds alone are not enough and that the adoption of other agricultural inputs can, in time, increase its market for quality seeds.

Companies can support smallholder farmers' transition towards commercial farming by offering inputs other than seeds and training smallholder farmers on how to capitalize on them.

East-West Seed stimulates farmer development by improving access to inputs other than seeds



In Cambodia and Myanmar, East-West Seed has imported plastic mulch with a number of benefits for farmers such as water conservation, weed prevention and improved crop quality; low-cost net houses that create consistent conditions for crops; and some other basic inputs.

As smallholder farmers in these countries often lack the capacities to implement these inputs, East-West Seed also focuses on capacity building. The company promotes a 'peer-learning approach', in which 'key farmers' who display profitable and sustainable cultivation techniques receive assistance to teach neighboring farmers similar techniques. East-West Seed's extension workers provide support by training key farmers every week on all aspects of crop production from land preparation to harvest. The company also uses demonstration farms and organizes village training events to show smallholder farmers how to use agricultural inputs and raise productivity. Furthermore, the company advises smallholder farmers on how to collaborate and buy these inputs in bulk at a reduced price.

Measurement Area

F

Capacity Building

This measurement area focuses on the ways in which seed companies invest in local capacity building to ensure that farmers have the right knowledge and tools to realize the full potential of quality seeds of improved varieties. Offering or participating in extension services and agronomic training and education such as field schools can help achieve this goal. This area presents many opportunities for public-private partnerships.

Three Focus Areas

Capacity Building

Activities that build the capacity of smallholder farmers and farmer cooperatives include extension services, training and educational programs. The development of such activities and programs shows the willingness of companies to invest in the capacities of smallholder farmers and to help improve the yield and performance of local crops. Extension services can be offered by companies themselves or in partnership with local organizations. Training and educational programs for smallholders, such as field schools and field days, can be organized for specific target groups including women, young farmers or community trainers. Seed companies can connect different programs and topics so that technical expertise and adjacent technologies are included in extension services. (Mobile) ICT applications that provide agronomic support and advice to farmers deserve a special mention.

Farmer Organizations

Farmer organizations can help smallholders to acquire skills, access financial and agricultural inputs such as credit, seeds and fertilizers, and process and market their products more effectively through the development of linkages to output markets.

Access to Output Markets

Most farmers grow crops not only for their own use but also for commercial sale. Breeding companies can help farmers to increase the profitability of their business by linking them to output markets and assisting in the development of a local or regional market. Additionally, companies can partner with other organizations to offer farmers training on post-harvest handling and product hygiene.

Capacity building's niche and rationale

The typically limited education of smallholder farmers in Index countries means that they often need additional customer and after-sales support to be able to benefit from improved seeds. Rather than providing this in the form of small-scale charitable projects, targeted and strategic capacity building that lies somewhere between customer support and charity is most likely to contribute to the further development of smallholder farmers as valued customers for seed companies. A range of efforts by Index companies were found and underline the serious interest of the seed industry in this market segment. Nevertheless, gray areas between capacity building, customer support and charitable projects exist and a more strategic approach is recommended for most companies.

Approaches to building smallholder farmers' capacities vary but often include other partners

Two thirds of vegetable seed companies and all but one field crop seed company are engaged in building smallholder farmers' capacity in Index regions, offering support and training services to farmers directly as well as through partner organizations. Most activities are carried out collaboratively and employ a broad array of strategies and approaches. Multi-stakeholder initiatives often include capacity building as an element of the overarching program goals.

Many capacity-building programs are in place but their extent is unclear

Overall, companies are active in training and educating smallholder farmers, though few companies disclose formal commitments to invest in local capacity or ensure that smallholders have the right tools and knowledge to improve their capabilities. While the industry acknowledges its role in addressing the capacity needs of smallholder farmers, a large number of companies do not publicly disclose the extent of their contributions or the scope of their programs.

Few Global Index companies disclose contributions to formal agricultural education programs

Only four companies disclose support for formal training for smallholder farmers, either as an internal program or in partnership with universities, colleges, local agricultural schools, municipal governments or NGOs.

Global Index companies use a variety of ICT in programs to help build smallholder capacity

Companies use a wide array of software to advance agricultural advisory services. Although the current reach of ICT programs is somewhat limited, they have the potential to play a larger role in the future. Specifically, ICT networks are expanding to more remote areas and more smallholder farmers are becoming virtually connected, increasing the opportunities for companies to implement these services on a broad scale.

Opportunities exist to expand capacity building for women farmers

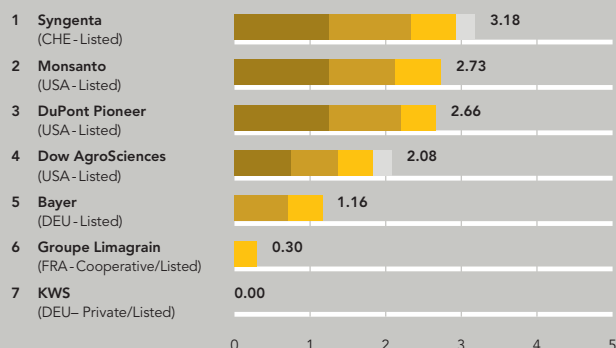
Overall, the industry is not proactive in developing capacity-building strategies that address the needs of women farmers. Only three companies have capacity-building activities specifically targeting women farmers.

Companies are aware of the benefits of supporting improved access to output markets

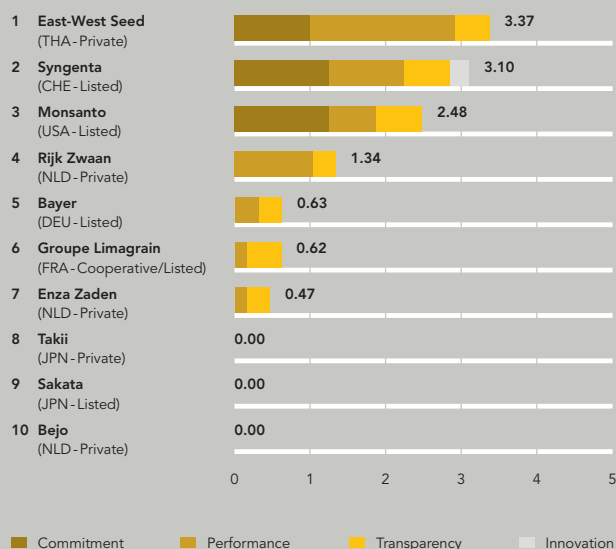
Six out of the 13 companies have adopted programs or activities that support smallholders' access to output markets. Companies typically provide market access assistance in the form of post-harvest solutions such as communal storage facilities; procurement such as guarantees for crop sales; and partnerships with downstream value chain players and other stakeholders.

How Companies Perform

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



In the Global Index of Field Crop Seed Companies, Syngenta leads the capacity-building ranking, followed by Monsanto and DuPont Pioneer. In the Global Index of Vegetable Seed Companies, East-West Seed ranks first, followed by Syngenta and Monsanto. The two companies listed in both Indexes have broader capacity-building programs targeting field crops than vegetable crops.

In the Global Index of Vegetable Seed Companies, the performance gap between the leading three companies and those that follow is relatively large.

East-West Seed, Syngenta, Monsanto, Bayer CropScience, DuPont Pioneer and Dow AgroSciences have formal commitments to help smallholder farmers increase their productivity and income, and all publicly disclose an extensive list of relevant capacity-building initiatives covering at least a third of the Index countries where they are active. In terms of transparency, most companies publicly report some details of their capacity-building initiatives, but Syngenta and Monsanto have the highest levels of disclosure.

East-West Seed stands out as the only company whose capacity-building programs cover almost 75% of the Index countries where it is active. It is actively engaged in providing advisory services and contributing to organizations or cooperatives that seek to improve agricultural practices and improve access to output markets.

Companies in the middle of both rankings disclose some information regarding capacity-building programs. However, their reporting lacks detail about the nature or geographic scope of their programs. These companies include Rijk Zwaan, Bayer CropScience, Groupe Limagrain and Enza Zaden.

An additional four companies, Takii, Sakata, Bejo and KWS, do not score any points in this measurement area as they disclose no evidence of capacity-building activities. While KWS discloses very limited information on involvement in training and education in Index countries, there is no evidence of a direct link with smallholder farmers.

Ample opportunities exist for Index companies to leverage their internal resources and know-how to assist farmer development, and hence contribute to strengthening their client base among smallholder farmers.

Focus Area 1: Capacity Building

Capacity-building programs exist, though formal commitments are limited

Three companies, Syngenta, Monsanto and DuPont Pioneer, have formal commitments to help smallholder farmers increase their productivity and income in a sustainable way. These commitments are part of a broader agenda to support global food security. Although not included in a formal commitment, East-West Seed is the only company to state that its strategic initiatives include knowledge transfer focused on smallholder farmers.

Global Index companies provide capacity-building services to smallholder farmers to a varying extent and often in partnerships

Overall, companies actively contribute to capacity-building initiatives that promote the adoption of hybrid seeds, provide training on agricultural best practices (including integrated advice on other inputs) and facilitate technology transfer. Almost three quarters of companies across both Indexes are involved in some form of capacity building, with activities reported in more than half of the Index countries. Yet opportunities remain for many of the companies to engage with smallholder farmers and increase the reach of existing programs.

The Southern Agricultural Growth Corridor of Tanzania (SAGCOT) is an example of a strong public-private partnership involving three Global Index companies, namely Bayer CropScience, Monsanto and Syngenta. These companies, along with other private sector actors, development partners, research organizations and local farmer organizations, support the Tanzanian government in providing access to improved seeds and fertilizers, training, microfinance, irrigation and machinery to smallholder farmers in the region.

Integrated extension services and beyond

Ten of the 13 companies specify their advisory service activities, disclosing whether they provide the services themselves or in partnership with other organizations or industry peers. Integrating adjacent inputs in these advisory services is more common for field crops than for vegetables. A large number of reported capacity-building initiatives include a crop-protection element, including pest and disease control (three companies), soil health management (two companies), fertilizer management (two companies) or water conservation (one company).

Some initiatives go further. An example of an innovative collaborative effort that targets the capacity building of a special group of smallholder farmers is Dow AgroSciences' partnership with the Academic Model for the Prevention and Treatment of HIV (AMPATH). As part of this partnership, Dow AgroSciences sends employees on six-month assignments to Kenya, providing support for the organization's food security program, working to increase understanding of local practices and disseminating knowledge of modern agricultural technology and processes to farmers in communities with a high incidence of HIV (see the Innovation Overview for further details).

Opportunities exist to improve formal training programs and farmer education

A number of companies contribute to education and training programs related to access to seeds for young, next-generation farmers in Index countries. However, only a few companies disclose contributions to formal training for smallholder farmers, either as an internal program or in partnership with universities, colleges,

local agricultural schools, municipal governments or NGOs.

East-West Seed has set up a scholarship program for post-high school degrees in agriculture in the Philippines and, as part of a loyalty program, the company funds the secondary education of children of its seed-producing farmers. In Ethiopia, Ghana, Kenya and Tanzania, DuPont Pioneer's collaboration with the 4-H Council trains young Africans in agricultural development issues, leadership, organizational skills and partnership building.

ICT programs take a variety of forms and could be scaled up

Information and communication technology (ICT) advancement initiatives vary significantly between the two Indexes. Five out of seven field crop seed companies, compared with only three out of ten vegetable seed companies, two of which are in both Indexes, are involved in ICT programs to facilitate smallholders' capacity building and informed decision-making. These programs support an array of activities, including financing, insurance, sales, agricultural advisory services, agronomy practices and market linkages.

Monsanto Farm AgVisory Services (MFAS) is a hotline that connects farmers in India with advisors who offer insights on seed selection, land preparation and weather for five Index crops. DuPont Pioneer has partnered with ICT solutions provider RML Information Services to reach rural smallholders in India. Farmers are provided with unique Pioneer RML cards, activated via a cellphone, which enable users to receive SMS updates in local languages on a variety of agriculture-related topics, including agronomy, price trends and weather updates. Since its launch in May 2011, this service has reached half a million farmers.

As the reach of technology continues to expand, vegetable seed companies in particular are encouraged to leverage ICT as a tool for building capacity and sharing knowledge with smallholders, and to move from pilot projects to mainstream services in more countries.

Capacity-building programs for women farmers are in place but could be expanded

Few companies address the specific capacity-building needs of women farmers. There is evidence that companies include women in their general training programs. However, only three out of the 13 companies have programs that include a specific focus on educating and training women farmers.

Rijk Zwaan supports the horticultural college in Chimaltenango, Guatemala, which provides courses for local growers on vegetable cultivation, marketing and organization, with an emphasis on women and women farmers. East-West Seed has a program in place that focuses specifically on educating and training women farmers, stating that consideration of women's role in agriculture contributed to the development of its training curriculum. The company supports the empowerment of women in Ethiopia, Myanmar and Vietnam by providing them with affordable seeds, entrepreneurial training and marketing opportunities. Syngenta has a program that focuses specifically on educating and training female farmers in Bangladesh. Although there are other examples of companies providing training for women in Index countries, the focus varies from nutrition, hygiene and food safety to agricultural research and development, rather than farming practices, suggesting that these activities are of a different nature and not specifically aimed at seed customer capacity building.

Focus Area 2: Farmer Organizations

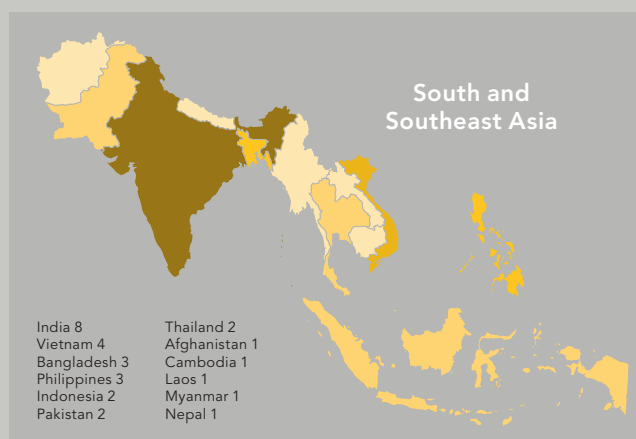
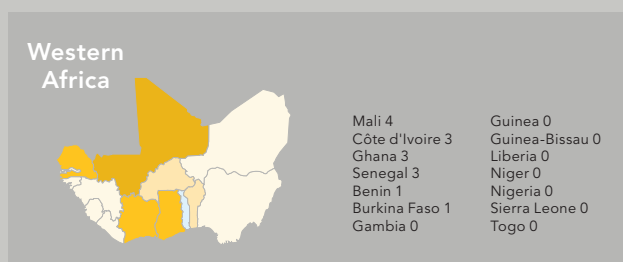
Opportunities exist to increase disclosure on support for farmer organizations

Across the two Indexes, only four of the 13 companies report some form of support for farmer organizations or cooperatives, and the scope of this support is often unclear.

Through 2SCALE, a Dutch-funded project, East-West Seed and Rijk Zwaan work with farmers and small-scale entrepreneurs in a variety of partnerships across nine African countries to build networks that connect farmers, buyers and intermediaries, thereby enabling them to create and grow new businesses. East-West Seed also collaborates with Mercy Corps, a not-for-profit organization working to support sustainable agricultural solutions. The company assists the organization in its efforts to establish farmer groups in Myanmar, stating that its primary interest is creating an environment that facilitates knowledge transfer. Syngenta supports activities strengthening farmer organizations in Mali, among others (see the Innovation Overview for further details).

Companies may consider investing more in the development of farmer organizations, since these can act as intermediaries between seed companies and the world's 500 million smallholder farmers.

Number of Global Index companies with capacity-building activities in Index countries



Focus Area 3: Access to Output Markets

Global Index companies are aware of the benefits of supporting improved access to output markets

Six of the 13 companies have programs or activities that support smallholders' access to output markets, including marketing training and general downstream linkages. Many of these activities are carried out in the context of larger partnership programs, whose objectives often include support for the entire value chain.

Monsanto's involvement in the World Economic Forum Partnership for Indonesia Sustainable Agriculture is an example of farmers being provided with post-harvest assistance and guaranteed maize grain procurement; East-West Seed's Resilience and Livelihood project in Indonesia is a collaboration with Dutch development organization Cordaid, which seeks to support activities with the potential for change 'via technical, market access, horizontal and vertical connectivity of value chain actors, access to information and value added along value chain'; and Bayer CropScience's Food Chain Partnership, active in more than 30 countries including Guatemala, India and Kenya, targets sustainable agriculture across the food value chain. The company acts as a facilitator to bring together the partners along the food value chain, including farmers, processors, exporters, retailers and consumers, with the common goal of 'sustainable production of high-quality and affordable food'. Farmers are able to benefit not only from advisory services on the optimal use of products and application technology, but also from increased access to markets with actors further along the value chain.

DuPont Pioneer and Syngenta demonstrate strong leadership in this area. Both companies report activities that enable the development of the downstream value chain as well as improved post-harvest storage.

Dow AgroSciences supports vulnerable smallholder farmers in Kenya

Dow AgroSciences has joined forces with the Academic Model for the Prevention and Treatment of HIV (AMPATH), a multi-partner initiative that includes the Kenyan government. AMPATH brings together a network of North American academic medical centers and Moi University and Hospital in Kenya to service more than 160,000 HIV-positive people at over 500 clinical sites in Kenya. As part of AMPATH's Food Security program, Dow AgroSciences sends employees to Kenya for 4-6-month periods to assist in agricultural training efforts that support self-empowerment, food security and sustainability. Targeting smallholders farmers in Kenya, the company helps these farmers to produce food for HIV patients and their communities, providing guidance on best practices in farming, harvesting and storing produce.

Syngenta's post-harvest storage project in Mali

Syngenta's PRECAD project in Mali addresses post-harvest storage by facilitating the construction of communal facilities to store surplus millet and sorghum and sharing the costs with local smallholders, with the objective of improving livelihoods and food security. Farmers are now better able to store crops at the end of the harvest season, when prices are lowest, and sell them through national farmer associations when prices increase. While Syngenta's activities in Mali are presently reduced due to security issues, the project is part of a long-term collaboration between the Syngenta Foundation and local stakeholders aimed at helping farmers to professionalize and achieve higher yields and income.²³

Measurement Area

G

Local Seed Sector Advancement

This measurement area seeks to capture the extent to which seed companies are involved in advancing a professional seed sector on a local level. Companies can contribute to the development of the technical capacity of national agricultural research institutes and training in specific areas for the national seed certification agency. In addition, seed companies have extensive skills and experience in research, seed production and value chains that can be very useful for building a national seed industry. Sharing these skills can be important for developing national seed associations and seed companies, and for the emergence of farmers as local seed suppliers.

Five Focus Areas

Recognition of Local Seed Sectors

Local and informal seed sectors play a vital role in Index countries as they provide a significant share of the seeds used by smallholder farmers. Recognition of this role reflects the commitment to the food security of smallholder farmers who continue to rely on informal seed sectors for a large number of crops.

Advancing Local Seed Sectors

Seed companies can have a beneficial impact on the development of local formal seed sectors by introducing new technologies and expertise as well as actively participating in national and regional seed trade associations. Seed companies can also operate through and help strengthen the national seed association or assist in establishing one if it does not already exist.

Local Seed Production

Seed companies can encourage local seed production in Index countries by enabling smallholder farmers to produce seeds under fair conditions. Working with local seed growers generates incomes and contributes to capacity building. The construction of local production facilities can also create employment opportunities and encourage knowledge transfer. Through partnerships with local seed companies, these facilities can access advanced technologies and expertise.

Supporting Certification and Registration Systems

Seed production registration and certification systems are often weak or underdeveloped in Index countries. Seed companies can help to develop these systems by offering technical training, thereby sharing knowledge of and experience with registration systems in other countries.

Advancing Local Research Institutes

Seed companies can enhance local research capacity in seed sectors in Index countries by providing local organizations with resources or knowledge. Partnering with local institutions such as national agricultural research institutes and universities to establish R&D-focused activities can achieve this. Another possibility is to improve variety testing by training stakeholders, including public breeding institutions and other governmental agencies. Training local employees in breeding techniques and variety testing can indirectly influence the advancement of local research institutes and breeding companies through knowledge transfer.

Main Findings in Local Seed Sector Advancement

Global Index companies produce seeds in Index countries, though opportunities exist to involve smallholder farmers

Eleven companies produce seeds in Index countries, but only two companies indicate that they involve smallholder farmers in seed production. Smallholder farmers can support companies in the production process in two ways: as a link in the company's seed multiplication chain and/or as a knowledge base to provide insight into local preferences and needs for the breeding process.

Global Index companies use a range of quality management systems in seed production

More than half of the companies report the use of a quality management system (QMS), and for four companies it was established that this QMS is used for seed production in Index countries and meets high standards.

Opportunities exist to improve social standards in local seed production

Companies can improve sector transparency by reporting on the details of monitoring activities and the results of production facility audits related to social standards, including child labor, forced labor, health & safety, living conditions and minimum wages. Although six companies implement some level of social standards in their seed production activities in Index countries, details of the nature of monitoring practices and outcomes are scarce.

A third of the companies proactively advance local research capacity

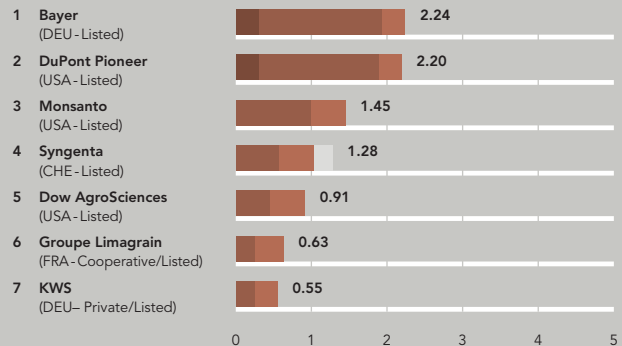
Five companies are advancing local research capacity by setting up research hubs, offering scholarships and internships to local scientists and/or joint trials with local research organizations.

Global Index companies do not formally recognize the role of informal seed sectors nor commit to advance local seed sectors

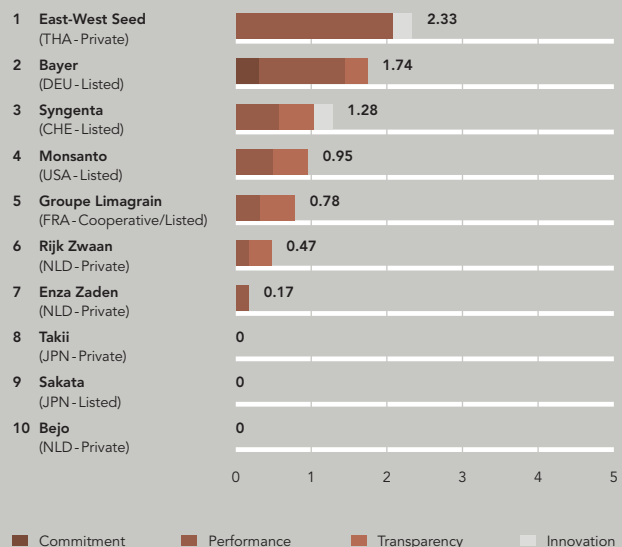
None of the companies has a formal policy or statement recognizing the role the informal seed sector can play in addressing food and nutrition security nor a formal commitment to develop the formal seed sector in Index countries.

How Companies Perform

Global Index – Field Crop Seed Companies



Global Index – Vegetable Seed Companies



Commitment Performance Transparency Innovation

Focus Area 1: Recognition of Local Seed Sectors

East-West Seed, Bayer CropScience and DuPont Pioneer lead the rankings in this measurement area. The first two companies involve local smallholder farmers in their production activities. All three provide quality assurance in seed production and address local research capacity needs. In the Global Index of Field Crop Seed Companies, Bayer CropScience and DuPont Pioneer occupy first and second place, respectively, while East-West Seed and Bayer CropScience are in first and second place, respectively, in the Global Index of Vegetable Seed Companies.

East-West Seed outperforms its peers in a number of areas, including involving smallholder farmers in the value chain and addressing the seed production training and education needs of smallholder farmers in Index countries. The company's strong performance in this measurement area is in line with its business model, which specifically targets smallholder farmers. Bayer CropScience also demonstrates leadership by involving smallholders in seed production.

DuPont Pioneer, another multinational well positioned to address the development of local seed sectors, has expanded its presence in Eastern Africa following the acquisition of South African seed company Pannar in 2013. DuPont Pioneer has committed to bring technological innovation to agriculture in Africa and is investing significant resources in developing research capabilities at its South African research center.

Field crop seed companies generally perform better than their vegetable seed peers, with smaller performance gaps between companies. In contrast, performance between vegetable seed companies varies greatly, with three companies (Takii, Sakata and Bejo) receiving no scores at all in this measurement area.

Companies in both Indexes could improve their ranking by recognizing the role of informal seed systems in Index countries, and working to develop a formal system that can co-exist alongside farmer-saved seed practices and community-based seed production systems. In addition, companies are encouraged to increase and/or give clear insight into the involvement of smallholder farmers in seed production in Index countries.

There is a lack recognition of the role of informal seed sectors

No company discloses a formal policy recognizing informal seed systems. DuPont Pioneer is the only company to address the issue, stating that 'select attributes of the informal seed system are important'. However, the statement is not part of a formal policy. In many Index countries, farm-saved seeds or seeds bought from local markets account for the majority of the seeds used by smallholder farmers. These systems are an important source of genetic diversity and may be the only source of preferred local varieties. Overall, opportunities exist for companies to formally recognize and commit to the co-existence of formal and informal seed systems in Index countries and regions.

Focus Area 2: Advancing Local Seed Sectors

Opportunities remain to improve performance around and commitments to advancing local seed sectors

Bayer CropScience is the only company to address the development of formal seed sectors in Index countries, saying in a statement that its commitment is demonstrated by its participation in national and regional seed associations. Syngenta, through the Syngenta Foundation, supports Seeds2B, a project in sub-Saharan Africa that aims to accelerate seed sector development.

Leading companies East-West Seed and DuPont Pioneer both engage with local seed enterprises, are members of local and regional seed associations, and support education and training of local plant breeders. East-West Seed reports that it is not only a member of local associations but a number of its employees are also active on the boards and in the committees and working groups of these associations. The company has also established breeding stations in six Index countries, where all of its breeders are local smallholders who have received on-the-job training from foreign breeders. DuPont Pioneer aims to advance plant breeding science and complement students' academic training by facilitating greater collaboration with the public sector. To date, India is the only Index country where such partnerships with local universities have been established.

Focus Area 3: Local Seed Production

Global Index companies engage in seed production activities in Index countries, but few companies involve smallholder farmers

Eleven out of 13 companies disclose seed production activities in Index regions. Much of the existing production activity is concentrated in South and Southeast Asia.

East-West Seed and Bayer CropScience are the only companies to provide evidence of proactively involving smallholder farmers in the value chain. East-West Seed states that 90% of the 16,000 farmers it employed to produce seed in 2014 were smallholders with an average farm size of 1.1 hectares. In India, Bayer CropScience involves some 40,000 local farmers in its rice seed production.

Overall, companies are encouraged to report on the share of smallholder farmers' contribution to the total seed production in Index regions, and to consider conducting impact assessments of seed production activities on smallholder farmers and further refining their engagement in seed production based on the assessment results.

Social standards in seed production are in place, though it is unclear how compliance is monitored

Six companies were found to implement social standards in their seed production activities in Index regions. Bayer CropScience and Monsanto apply the most complete and formal set of social standards. Bayer CropScience's Supplier Code of Conduct, which applies to all of its suppliers, addresses occupational health & safety standards, human rights, child and forced labor, living conditions and minimum wages. However, the company does not report on its monitoring activities or the results of audits across production facilities in Index regions. Monsanto has a Human Rights Policy, guided by the Universal Declaration of Human Rights and the International Labour Organization's Declaration on Fundamental Principles and Rights at Work. The policy encompasses nine social elements including child labor, forced labor, safety and compensation, and is embedded in the company's Supplier Code of Conduct. In addition, the company states that it works to identify and do business with partners who aspire to ethical standards consistent with this policy, indicating that there is some form of monitoring system for suppliers.

The remaining four companies provide fewer details on how they address social risks associated with their production operations in Index regions. The issue is receiving increasing attention in Index regions. Due, however, to the typically less stringent legal and enforcement frameworks in countries, it is often up to corporations themselves to proactively ensure that international labor laws are respected. Companies are therefore encouraged to disclose their social standards as well as related monitoring and auditing activities.

Focus Area 4: Supporting Certification and Registration Systems

Global Index companies use a range of quality management systems in seed production

More than half of the companies report the use of a quality management system (QMS), and for four companies it was established that this QMS is used for seed production in Index countries and meets high standards.

Bayer CropScience and DuPont Pioneer report most extensively on their quality management in seed production practices, showing that their seed production operations in Index countries are covered by ISO 9000 quality management certifications or equivalents, with documented seed purity, germination and quality. East-West Seed uses its own dedicated quality system. Groupe Limagrain's certifications appear not to cover the entire scope of its production operations. Three other companies report a QMS, but it is unclear how this is implemented in seed production in Index countries.

East-West Seed and DuPont Pioneer demonstrate leadership in their efforts to support seed production certification and registration systems

East-West Seed engages governmental and regulatory bodies in seed movement and phytosanitary issues. In Thailand, for example, East-West Seed offers training courses in seed testing to government officers and provides feedback on new regulations. The company helps to improve registration and certification institutions in markets where it has a strong presence, including Thailand, Vietnam, Tanzania, Philippines, India and Indonesia.

DuPont Pioneer engages with industry associations to encourage improved legislation, registration, certification and phytosanitary law. For example, under the African Seed Trade Association (AFSTA), company representatives seek to promote awareness and understanding of critical issues facing the industry such as the maize lethal necrosis (MLN) virus. The company states that in countries in which it does not market GM products, it has been involved directly in providing training and creating awareness of biosafety issues, specifically in Eastern Africa, Burkina Faso and Nigeria.

DuPont Pioneer and East-West Seed outperform their field crop and vegetable seed peers, respectively, in their efforts to improve certification and registration systems. Bayer CropScience and Dow AgroSciences also display strong practices in this area. Dow AgroSciences works with governments to support the development of laws, regulations, standards, practices and procedures 'that safeguard the community, workplace and environment', but does not provide details regarding the regional scope of its activities or how it engages governments.

Focus Area 5: Advancing Local Research Institutes

Strong examples exist of support for local research capacity

Five companies support the advancement of local research capacity in Index countries. DuPont Pioneer, KWS and Bayer CropScience all support local institutes in some way in a small number of Index countries. DuPont Pioneer stands out for its African Research Technology Hub.

African Research Technology Hub

In 2013, DuPont Pioneer established the African Research Technology Hub, based in South Africa. The center is designed to advance DuPont Pioneer's efforts in the area of seed product development throughout the African continent as well as help local farmers address key agronomic challenges, including pest and disease pressure, climate volatility and nutrient-depleted soils. Notably, the

facility includes Africa's first private insectary to raise and house insects that pose challenges to local crop production. DuPont Pioneer describes the insectary as 'critical to the development of traits and solutions to combat yield-robbing pests'. The company has committed to invest a total of \$5.8 million in the center by 2017.

Monsanto offers internships in countries across three Index regions. Its Beachell-Borlaug International Scholarship Program provides fellowships to individuals seeking doctorate degrees in rice or wheat plant breeding.

East-West Seed supports internship programs in Index countries as well as variety testing of AVRDC varieties in India, the Philippines and Thailand. In Thailand, East-West Seed has also participated in multi-locational variety testing of varieties from the public and private sector.

G

Innovation Overview

East-West Seed supports local seed enterprises in Index countries

East-West Seed's efforts to address education and training needs in Index countries have a strong effect on local seed sector advancement.

East-West Seed provides training and guidance to local seed companies that distribute its brands in Pakistan, Uganda and Zimbabwe. East-West Seed is a founding member of the Asia and Pacific Seed Association (APSA) and the Thai Seed Trade Association (THASTA). Also in Asia, the company is an active member of the Vietnam Seed Trade Association, the Philippine Seed Industry Association, the National Seed Association of India and the Maha Seedsmen Association (India). In Africa, it participates in the Tanzania Seed Trade Association (TASTA) and the African Seed Trade Association (ASTA).

In addition, the company states that its breeders were originally local smallholders. It has established breeding stations in six Index countries. Local staff were identified and later trained on the job by foreign breeders from the Netherlands or other countries. In collaboration with the University of California, Davis, the company has also established the East-West Academy, which offers a three-year curriculum for agriculture students.

The Syngenta Foundation advances local seed sectors in Africa

Initiated by the Syngenta Foundation, Seeds2B seeks to contribute to seed systems development and the improvement of the local seed sector, working at multiple levels in the value chain to support access to improved varieties that meet local needs, and facilitating technology transfer and capacity building in local seed production. Seeds2B Connect coordinates and connects a wide range of public and private breeders (both African and non-African) with local seed producers and distributors, with the aim of increasing access, improving distribution channels and facilitating local seed production. In 2015, it was active in Kenya, Malawi, Mali, Senegal and Zimbabwe.

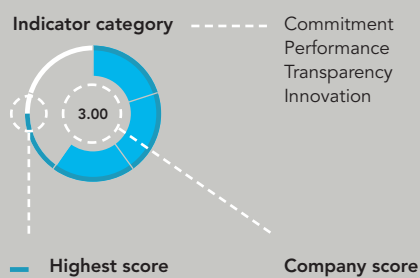
Seeds2B works with seed companies to determine candidates for adaptation trials in the local markets, assessing performance based on yields and other market traits. It then conducts marketing trials to create awareness and demand for successful varieties.



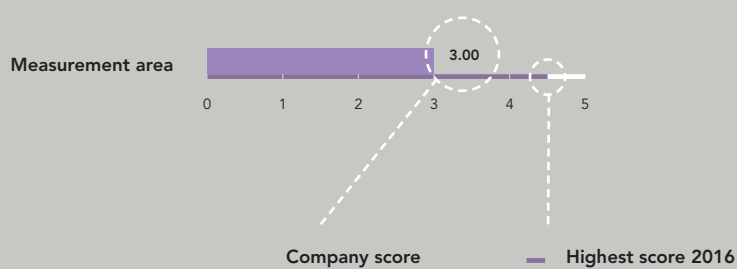
Seed insurance

Joseph Mukopi uses his cell phone to check the weather in Kikwameti village, Kenya. The Agriculture and Climate Risk Enterprise (ACRE), majority owned by the Syngenta Foundation, facilitates access to insurance products that protect smallholder farmers against risks such as drought and excess rain. Automated weather stations monitor daily rainfall and any payouts are made directly to the farmer's mobile wallet. In 2014, an estimated 230,000 farmers were insured in Kenya, Tanzania and Rwanda through products designed by ACRE.

How the Company Scores and Rankings Work: per Indicator Category



per Measurement Area



Global Access to Seeds Index – Company Scorecards

Company scorecards present the individual scores of the Global Index companies. The scores of companies that appear in both the Global Index of Field Crop Seed Companies and the Global Index of Vegetable Seed Companies are featured on one scorecard. A scorecard reflects a company's overall ranking as well as its ranking per measurement area and indicator category (Commitment, Performance, Transparency and Innovation). It also offers insights into practices that are considered leading in the industry, areas for improvement and notable findings. An overview is provided of a company's operations in the Index regions and its crop portfolio, where available.



Bayer

Access to Seeds
Index

Corporate Data
Headquarters: Monheim am Rhein, Germany
Ownership type: Listed
Group revenue (CropScience 2014): EUR 9,494,000,000

Bayer CropScience AG (Bayer CropScience) is active in the seeds, crop protection and non-agricultural pest control segments. It offers seeds and traits for cotton, vegetables and field crops through its operations in Europe, North America, Latin America, Africa, Asia Pacific and the Middle East. Crop-breeding and seed activities were added in 2002, following the acquisition of Aventis CropScience AG.*

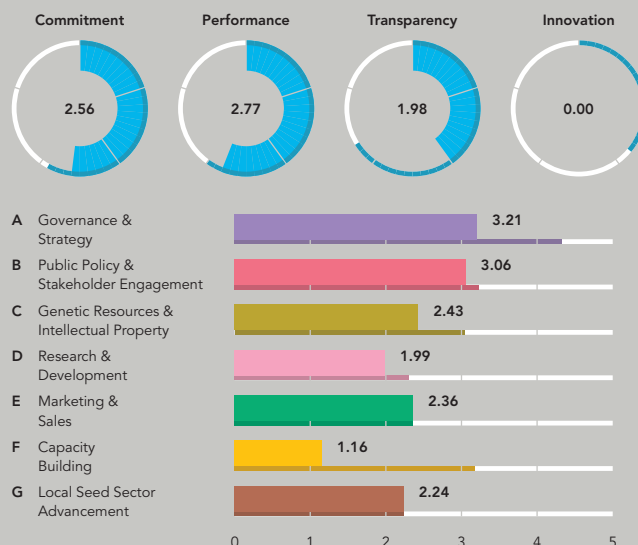
3

rank out of 7
score 2.32

Global Index – Field Crop Seed Companies

As one of the best performers, ranking third out of seven field crop seed companies, Bayer CropScience exhibits multiple strengths in improving access to seeds for smallholder farmers. It articulates a commitment to global food security, a specific commitment

to smallholder farmer development and senior-level responsibility for the implementation of these commitments. It contributes actively to public gene banks and outperforms its peers on the development of the local seed sector.



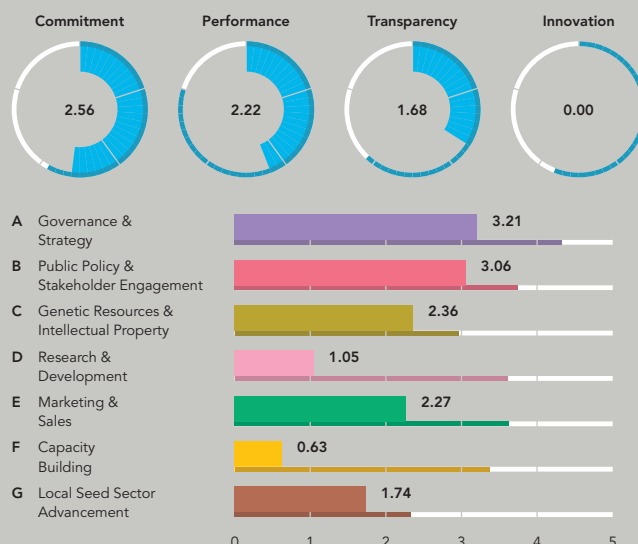
3

rank out of 10
score 2.00

Global Index – Vegetable Seed Companies

Bayer CropScience ranks third out of ten vegetable seed companies, displaying a number of strengths in improving access to seeds for smallholder farmers. It is a member of several multi-stakeholder initiatives that focus on increasing food security

and addressing constraints to agriculture-led growth for smallholder farmers in Asia and Africa. It has established long-term partnerships with public gene banks for the conservation, characterization and maintenance of vegetable germplasm.



Leading Practices

■ Bayer CropScience discloses a commitment to global food security, a specific commitment to smallholder farmer development and assigns responsibility to its CEO and executives for the implementation of these commitments.

■ The company is a member of several multi-stakeholder initiatives, such as the German Food Partnership (GFP) and the New Alliance for Food Security and Nutrition, which aim to increase food security in developing markets and address constraints to agriculture-led growth for smallholder farmers.

■ The company's vegetable seed segment has long-term partnerships with public gene banks, including AVRDC in Taiwan, CGN in the Netherlands, HRI in the UK, INRA in France and USDA/ARS in the USA, which it supports in the

maintenance and characterization of ex situ collections. It has also provided financial support for collection missions, for example for spinach and bean germplasm. The company's field crop seed segment has a long-term partnership with the International Rice Research Institute (IRRI), which has a large rice gene bank.

■ As part of its Much More Rice (MMR) program, the company offers an MMR solutions box. This combines MRR products in one box in quantities sufficient to farm one hectare of land in Vietnam and India and one acre in Ghana.

■ The company performs variety trials for Index field crops in 11 of the 23 Index countries where it is active, incorporating local knowledge and feedback into its breeding programs.

Areas for Improvement

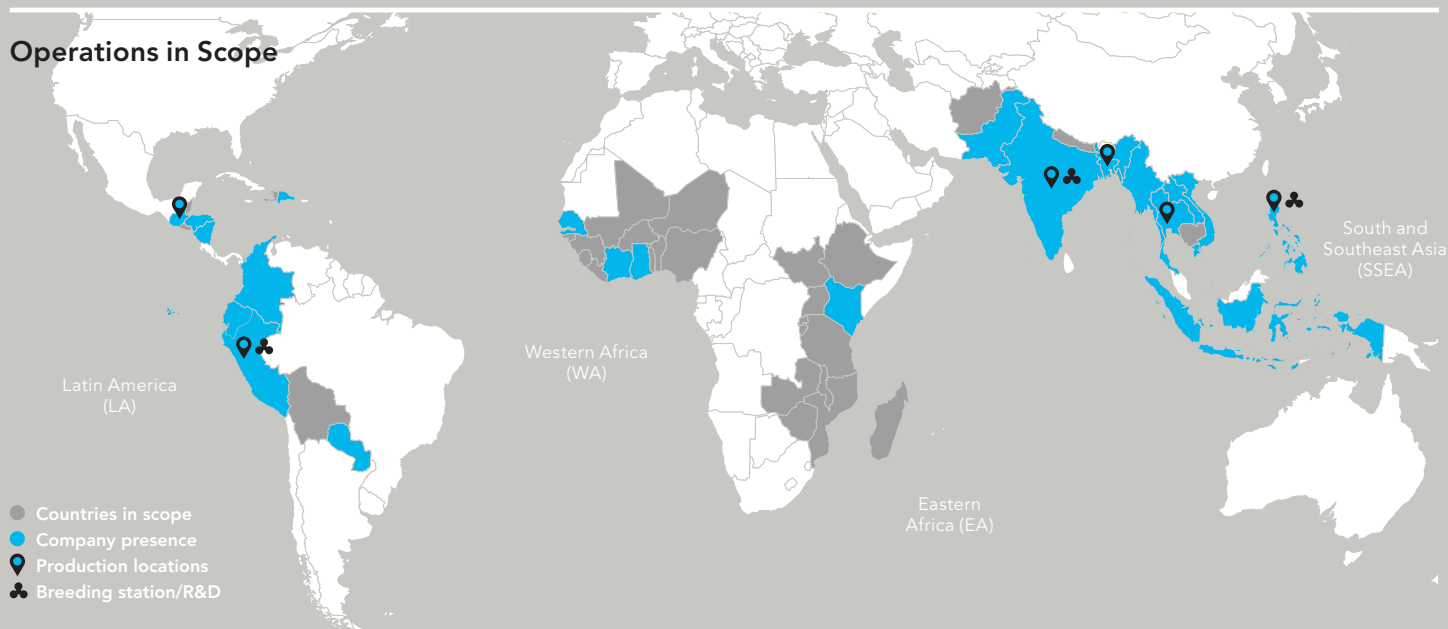
■ Bayer CropScience has a general statement addressing the development of the local seed sector, but it could consider articulating a formal commitment.

■ The company has established distribution channels in 21 Index countries, spread over all regions, with emphasis on Latin America and South and Southeast Asia. It is encouraged to expand distribution to other Index countries in which it has operations and to remote areas.

■ The company co-founded the Asian-German Better Rice Initiative (AGBRI), which provides smallholder farmers with education and advisory services, management skills and agricultural know-how, and access to modern technologies. These activities cover Indonesia, the Philippines, Thailand and Vietnam, but the company is encouraged to disclose information on the number of smallholder farmers reached.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Index Field Crops in Portfolio

	Sales				Breeding Focus			
	LA	WA	EA	SSEA	LA	WA	EA	SSEA
Pearl millet				●				●
Rice, paddy		●	●	●	●	●	●	●
Soybean	●				●			
Wheat								

Index Vegetable Crops in Portfolio

	Sales				Breeding Focus			
	LA	WA	EA	SSEA	LA	WA	EA	SSEA
Cabbage	●			●	●			●
Carrot	●			●	●			●
Cauliflower				●				
Chili pepper				●	●			●
Cucumber	●			●	●			●
Eggplant				●				
Gherkin	●			●	●			●
Gourd				●				●
Green bean	●							
Leek								●
Lettuce	●				●			●
Melon	●	●		●	●			●
Okra				●	●	●		●
Onion	●	●		●	●			●
Spinach	●							
Sweet pepper	●			●	●			●
Tomato	●			●	●			●
Watermelon	●	●		●	●			●

Notable Findings

■ Bayer CropScience's Code of Conduct for Responsible Lobbying sets out clear and binding rules for involvement in political matters. The Bayer CropScience Public and Governmental Affairs Committee is responsible for strategic planning of political involvement. The company states that it is logged in every transparency register set up by governments, regardless of voluntary or mandatory requirements.

■ The company supports the International Union for the Protection of New Varieties of Plants (UPOV) as well as the patenting of varieties. It also supports the patenting of inventions related to native traits, provided that such inventions comply with patentability criteria such as novelty, inventive step, industrial applicability and sufficiency of disclosure. Similarly, it supports the breeders' exemption in plant variety protection (PVP) laws, provided this does not negatively affect the company's stewardship and regulatory compliance obligations. The company mainly supplies F1 hybrids in Index countries, making farm-saved seeds an unattractive option for farmers.

■ The company uses biotechnology in plant development and specifies that tools such as marker-assisted breeding and genetic modification can be used to make plants more resistant to pests and environmental stress conditions. It develops hybrid rice varieties that are better able to withstand diseases, insect pests, prolonged submergence and high salt-water conditions, thus accounting for biotic and abiotic stress. The company has early stage research transgenic rice and soybean in its portfolio and markets one GM soybean product in Paraguay.

■ The company states that up to 40,000 local farmers in India are involved in rice seed production on its behalf.

■ The Bayer Code of Conduct commits the company to responsible marketing & sales. To ensure quality and safety, the international FAO Code of Conduct and regulatory standards for biotechnology products of OECD countries apply.

■ The Bayer Supplier Code of Conduct sets forth the company's sustainability principles, including fair labor conditions in the production of seeds in Index countries. The code requires suppliers to observe occupational health & safety rules, respect human rights and not to employ child labor in any form. It also addresses forced labor, living conditions and minimum wages.

■ Bayer CropScience has launched initiatives under its Food Chain Partnership in Guatemala, India and Kenya to develop value chains and work on integrated crop solutions.



Bejo

Access to Seeds
Index

Corporate Data

Headquarters: Warmenhuizen, the Netherlands
Ownership type: Private
Group revenue (2014): USD 190,572,540

Bejo Zaden B.V. (Bejo) is a vegetable seed company. Its most established markets are Western and Eastern Europe and North, Middle and South America, but it is also developing markets in Asia and Africa. Bejo was founded in 1978 and is family-owned.

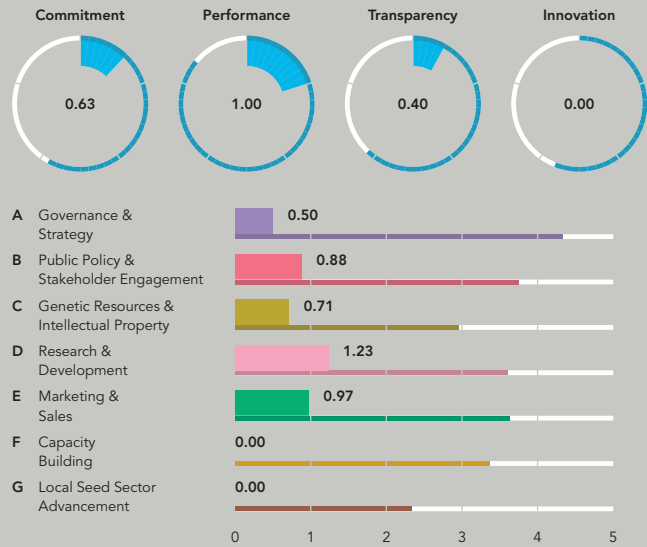
8

rank out of 10
score 0.72

Global Index – Vegetable Seed Companies

Ranking eighth in the Global Index of Vegetable Seed Companies, Bejo's below-average performance is characterized by a lack of transparency and commitments related to access to seeds. Despite overall weak performance, the

company has tailored some of its Research & Development activities to address the needs of smallholder farmers and improve access to seeds. Given its extensive vegetable crop portfolio and broad Index country presence, it has a clear opportunity to do more.



Leading Practices

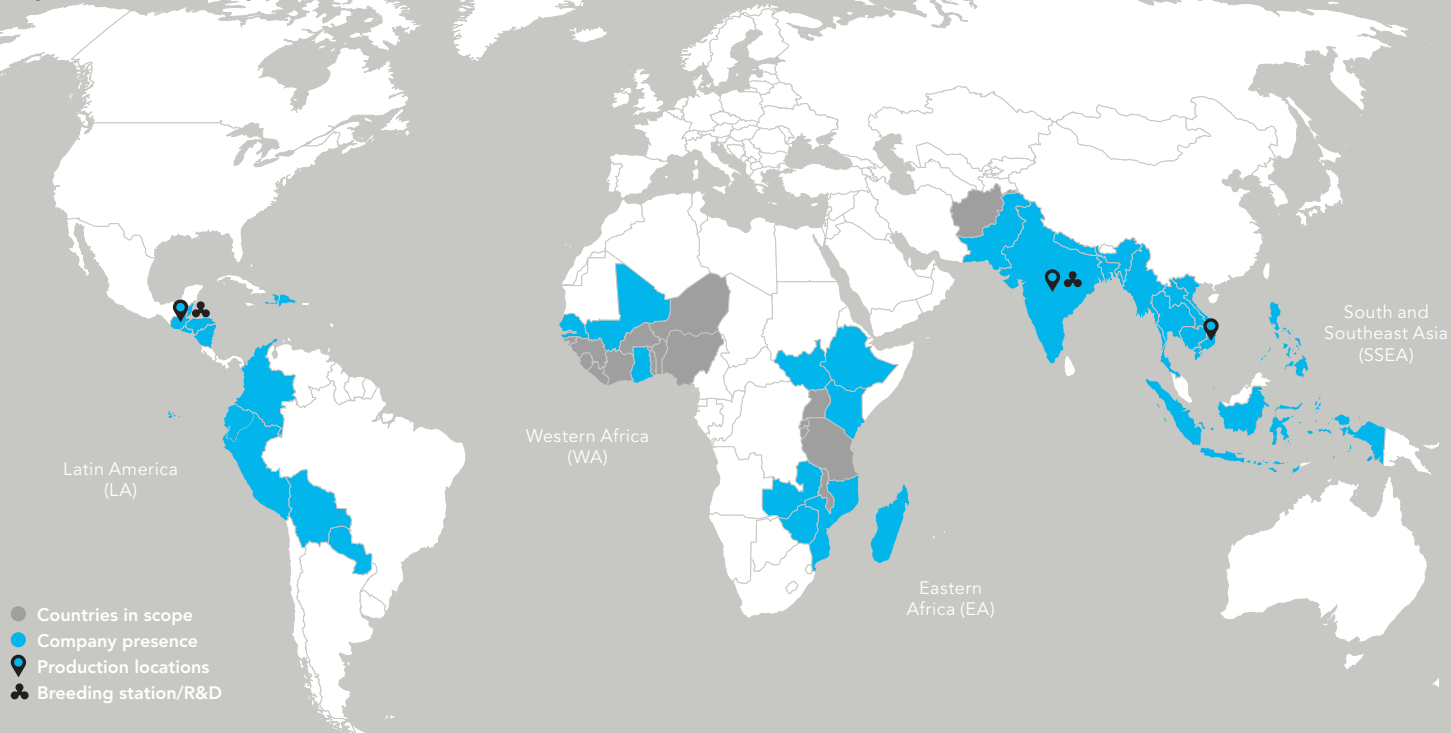
■ Bejo has a robust distribution network with channels in 33 Index countries. Through its Indian subsidiary, it has established a dealer network across India and the South Asian Association for Regional Cooperation (SAARC) countries. It has also developed a local dealer network in other countries where it operates, with the exception of Cambodia, Laos and Myanmar. It aims to reach remote areas by working with dealers and seed shops that directly serve local growers.

Areas for Improvement

■ Bejo scores highly in R&D relevant to Index countries but lowly in Marketing & Sales. It would be logical to match these R&D investments with an equal effort in Marketing & Sales.

■ The company could also consider increasing the overall transparency of its commitments and programs related to access to seeds and addressing smallholder farmer needs across Index countries.

Operations in Scope



Index Vegetable Crops in Portfolio

Broccoli
Cabbage
Carrot
Cauliflower
Chicory
Chili pepper
Cucumber
Eggplant
Gherkin
Gourd
Leek
Okra
Onion
Spinach
Sweet pepper
Tomato
Turnip

Notable Findings

■ Bejo has implemented training schemes to educate smallholder farmers on the sustainable use of agricultural inputs. It has also developed programs to promote the adoption of suitable varieties in select countries. In Mali, for example, it has hosted demonstrations on the use of sowing machinery for improving farming practices, while in Guatemala it organizes annual field days where it provides crop, cropping and variety information.



Access to Seeds
Index

Dow AgroSciences

Corporate Data

Headquarters: Indianapolis, Indiana, USA
Ownership type: Listed
Group revenue (2014): USD 729,000,0000

Dow AgroSciences LLC (Dow AgroSciences) markets crop protection products and seeds for a broad spectrum of crops, including maize, soybean, cotton and forage. The company began in the 1950s as the agricultural unit of The Dow Chemical Company. As a joint venture of The Dow Chemical Company and Eli Lilly & Co., it was known as DowElanco from 1989 onwards. In 1997, The Dow Chemical Company acquired 100% ownership.*

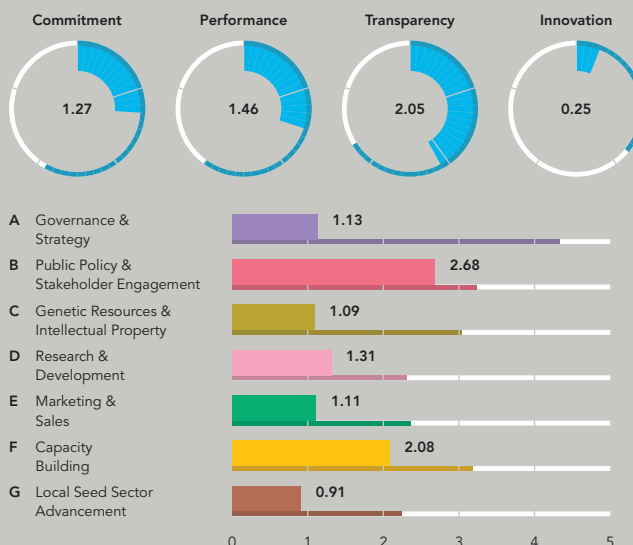
5

rank out of 7
score 1.38

Global Index – Field Crop Seed Companies

Dow AgroSciences ranks in the lower range of the Global Index of Field Crop Seed Companies. It has clear approaches to Public Policy & Stakeholder Engagement and existing breeding programs for resistance to pests and diseases, abiotic stress tolerance and

yield, although it is not clear to what extent these programs specifically target the development of varieties suitable for Index countries and smallholder farmers. Seed sales were found only in Latin American Index countries. Given the indications of research and capacity-building activities relevant for improved access to seeds for smallholder farmers in other regions, the company is encouraged to develop its seed business serving smallholder farmers on a more global scale.



Leading Practices

■ Dow AgroSciences contributes biotechnological tools to work coordinated by the Donald Danforth Plant Science Center (USA) to develop virus-resistant varieties of cassava for Africa. Cassava is an important food security crop in sub-Saharan Africa, and the Donald Danforth Plant Science Center collaborates with African partners to improve and eventually deploy cassava varieties with the potential to significantly reduce yield losses due to viruses. Peer company Monsanto is also involved in this multi-stakeholder program.

Areas for Improvement

■ As part of its sustainability reporting, Dow AgroSciences is encouraged to articulate more clearly specific targets to improve access to seeds for smallholder farmers, supported by incentives to reward activities, and to document implementation and assessment.

■ Dow AgroSciences has a breeding program for a number of specific traits that may significantly improve crop yield and performance for smallholder farmers. The company is encouraged to clarify whether the research scope applies to varieties that are being developed for Index countries.

■ The company could expand its initial capacity-building and value chain support activities in Kenya to help more smallholder farmers in Index countries to develop the skills to benefit fully from quality seeds.

Operations in Scope



Index Field Crops in Portfolio

Barley	
Beans, dry	
Maize	
Sorghum	
Soybean	
Wheat	

Notable Findings

■ Although not involved in seed sales in Eastern Africa, Dow AgroSciences has collaborated with the Grameen Foundation's Bankers without Borders to develop an e-warehouse program supporting access to finance and markets for urban smallholder farmers in Kenya. The program aims to help farmers store and manage their crops properly, link to a financial institution to obtain a partial advance against the value of their stored crops and connect with markets for final sale.

■ The company also collaborates with AMPATH (Academic Model for the Prevention and Treatment of HIV), a multi-partner initiative that includes the Kenyan and US governments. AMPATH brings together a network of North American and Kenyan medical schools led by Indiana University to service more than 160,000 HIV-positive people. As part of AMPATH's Food Security program, Dow AgroSciences sends employees to Kenya for 4-6-month periods to assist in agricultural training efforts. In addition, the company participates in the Wheat Initiative, another multi-stakeholder initiative involving countries, private companies and the international research organizations CIMMYT and ICARDA, aimed at coordinating global wheat research to improve wheat productivity, quality and sustainable production around the world.

■ The Dow Chemical Company's Code of Ethics, which is applicable to Dow AgroSciences, demonstrates a commitment to respect human rights, including standards on child labor, forced labor and health & safety.



Access to Seeds
Index

DuPont Pioneer

Corporate Data

Headquarters: Johnston, Iowa, USA

Ownership type: Listed

Group revenue (agriculture segment) (2014): USD 11,304,000,000

Pioneer Hi-Bred International, Inc. was established in the USA in 1926 and later renamed Pioneer. After its acquisition by E.I. du Pont de Nemours and Company (commonly referred to as DuPont) in 1999, it became known as DuPont Pioneer. The company supplies a diverse range of field crop seeds alongside crop protection products.*

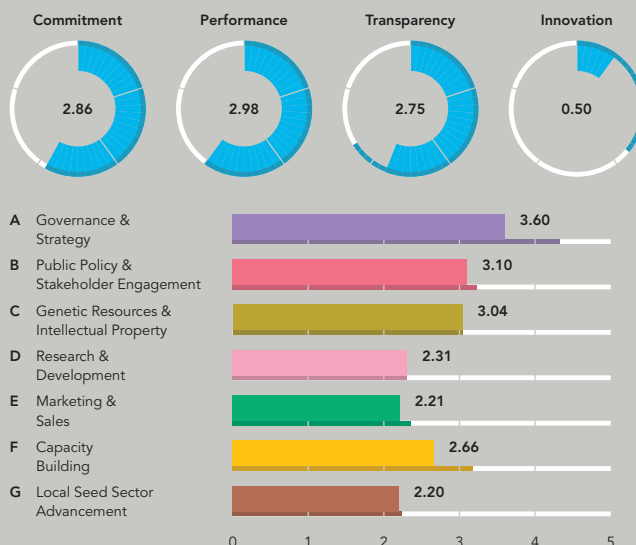
1

rank out of 7
score 2.67

Global Index – Field Crop Seed Companies

DuPont Pioneer leads the Global Index of Field Crop Seed Companies, thanks to relatively high scores in Genetic Resources & Intellectual Property and Research & Development. The company also performs well in Governance & Strategy, disclosing formal

commitments related to access to seeds that are integrated into its overall strategy. The company scores consistently well in the categories Commitment, Performance and Transparency, and demonstrates innovation in its breeding programs. While strong programs are in place across all measurement areas, the company has opportunities to improve in Marketing & Sales and Capacity Building.



Leading Practices

■ One of DuPont Pioneer's Global Food Security Goals is to improve agricultural development worldwide. The company states that it focuses on 'enabling farmers to be more productive, not only through the provision of improved seeds but also by developing stronger food value chains in collaboration with partners in support of rural agricultural communities worldwide'. Moreover, the company is committed to increasing the productivity and incomes of smallholder farmers in an environmentally sustainable way, with the goal of improving the livelihoods of 3 million smallholder farmers and their rural communities by 2020.

■ DuPont Pioneer has an extensive distribution network which covers the majority of Index countries, marketing its products both directly and through dealers to reach remote areas. The company indicates that over half of the Index crops in its portfolio are available in almost every Index country.

■ The company partners with local universities and many of the CGIAR centers (CIMMYT, IRRI, ICRISAT, CIAT) in its research efforts. It reports more than 500 R&D collaborations, which include material transfer agreements, intellectual property considerations and royalty stipulations.

■ The company provides transgenic DNA constructs, currently for testing purposes only, to the African Biofortified Sorghum (ABS) project, which aims to combat human micronutrient deficiencies by developing nutrition-enhanced sorghum. In addition, the company has donated its intellectual property to the Improved Maize for African Soils (IMAS) partnership, the resulting inbreds and hybrids of which will be made available royalty-free to national programs and smallholder farmers.

■ DuPont Pioneer strongly supports the breeders' exemption in plant variety protection (PVP) laws and has worked to stop treaties or laws from limiting the exemption. The company does not support a breeders' exemption in patent law. However, it states that it supports the entire system of relevant international treaties, naming the four separate treaties wherein inventors, breeders, farmers and societal rights are balanced and protected.

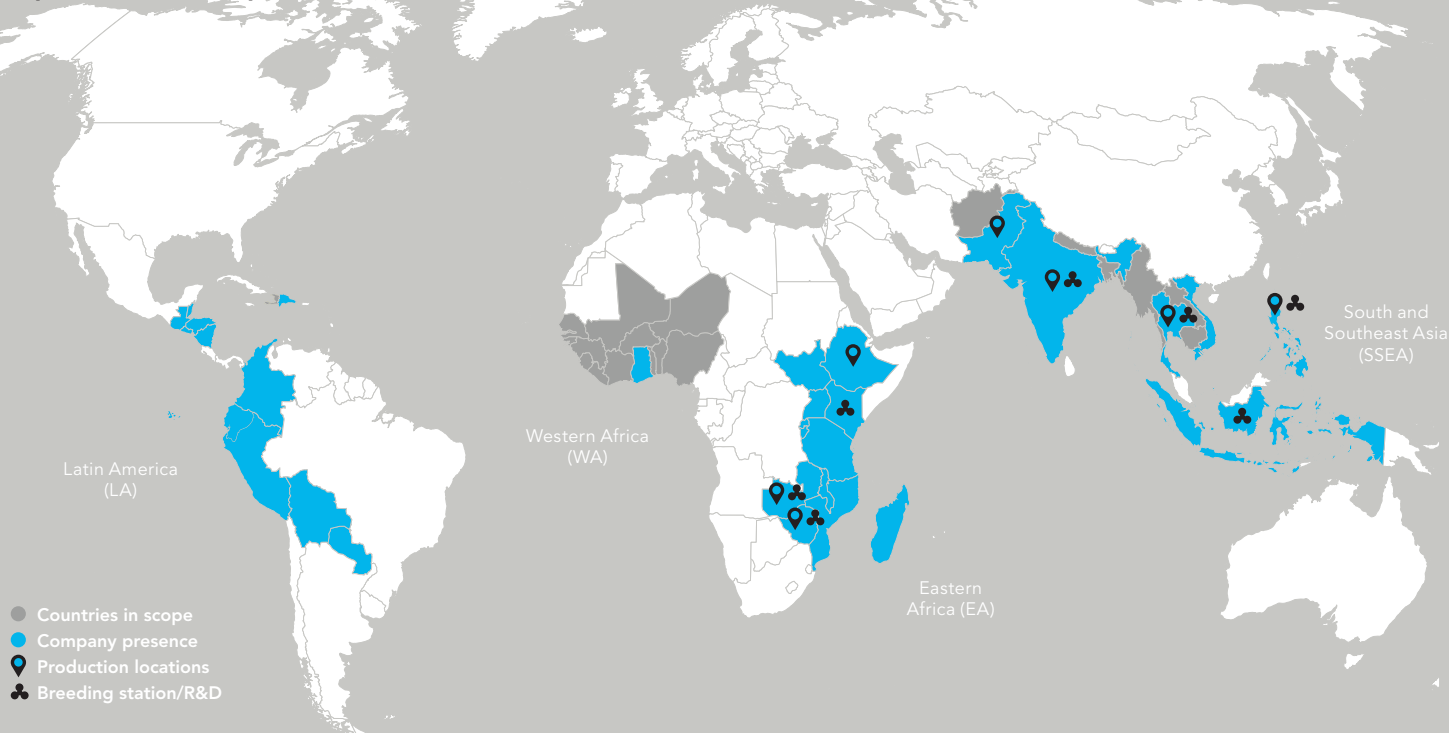
■ The company has a Biodiversity Principles position statement. This includes a commitment to conserve and protect natural resource biodiversity; consider the concerns of local communities in the selection, design, production and introduction of products; and publicly advocate these positions.

Areas for Improvement

■ As a subsidiary of a large agrochemical company, DuPont Pioneer could strengthen its efforts to ensure that smallholder farmers in Index countries have access to the necessary agricultural inputs other than seeds. It could consider activities to facilitate capacity building around the appropriate and sustainable use of these inputs.

■ DuPont Pioneer discloses some aspects of its position on the protection of its intellectual property (IP), namely the use of biotechnology to protect the value of its traits and IP without interfering with the practice of farm-saved seeds. The company is encouraged to disclose a more comprehensive formal position on the patenting of native traits and the licensing of patented traits.

Operations in Scope



Index Field Crops in Portfolio

	Sales				Breeding Focus			
	LA	WA	EA	SSEA	LA	WA	EA	SSEA
Beans, dry			●					
Maize	●	●	●	●	⌘		⌘	⌘
Pearl millet				●				⌘
Rice, paddy								⌘
Sorghum			●	●	⌘			
Soybean			●					
Wheat			●					

Notable Findings

■ DuPont Pioneer participates in a number of global policy debates and other collaborative initiatives. Since 2010, it has convened a multi-stakeholder Advisory Committee on Agricultural Innovation and Productivity, which has been tasked with exploring the global issues affecting food and nutrition security. It has contributed to the New Alliance for Food Security and Nutrition, a collaboration with USAID that aims to reduce global hunger by enabling smallholder farmers' access to agricultural innovations. In addition, it has sponsored the Global Food Security Index, a worldwide perspective on food insecurity compiled by the Economist Intelligence Unit.

■ The company accommodates the differing capacity levels of smallholder farmers by offering different grades of seeds and selling seed in appropriately sized packages.

■ The company is involved in the R&D of specific traits tailored to the needs of smallholder farmers, including resistance and tolerance to biotic and abiotic stresses, higher nutritional values and increased yields. It also reports activities to develop salt water-tolerant hybrid rice, a nutritious and easily digestible sorghum variety, and improved maize varieties that are better at capturing fertilizer, thereby increasing yield. The company also refers to culinary preferences.

■ The company's research and production activities are certified to ISO standards, with documented seed purity, germination and quality. Seed quality is monitored throughout the distribution network. Seed packages are designed to protect seeds during transport and storage, agreements with distributors prohibit sales of seeds beyond their shelf life and a variety of measures are reportedly in place to prevent the sale of counterfeit seeds.

■ DuPont Pioneer is the only Global Index company that recognizes the importance of the informal seed system.



Access to Seeds
Index

East-West Seed

Corporate Data

Headquarters: Nonthaburi, Thailand
Ownership type: Private
Group revenue (2014): USD 136,272,641

East-West Seed Company Ltd. (East-West Seed) is a vegetable seed company that originally focused on breeding and marketing varieties in Asia. It was founded in the Philippines in 1982 but moved its headquarters to Thailand shortly afterwards. More recently, the company has expanded its operations to other tropical and sub-tropical parts of the world. The company is family-owned.

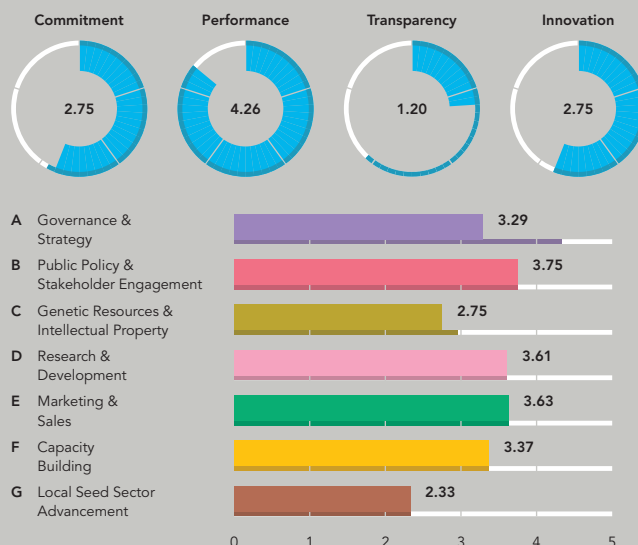
1

rank out of 10
score 3.27

Global Index – Vegetable Seed Companies

Topping the Global Index of Vegetable Seed Companies, East-West Seed's ranking is driven by strong performance across all measurement areas, with programs and initiatives supporting access to seed for smallholder farmers and the commitments and policies to

back them up. The company performs particularly well in Marketing & Sales and Research & Development. It has an extensive distribution network, and develops packaging and labeling that addresses smallholder farmers' needs. Its quality management system includes a system for collecting and handling feedback and grievances from smallholder farmers. Due to the nature of its business model, in which smallholder farmers are the primary customers, the company has developed a robust governance & strategy system around access to seeds. It prioritizes the needs of smallholder farmers in the development of both local and global crops. Finally, the company leads in innovation in several areas.



Leading Practices

■ East-West Seed has extensive programs and activities that support smallholder farmers throughout its value chain. It outperforms its peers in all measurement areas except Governance & Strategy and Genetic Resources & Intellectual Property. It also outperforms its peers in the categories Performance and Innovation.

■ The company demonstrates a strong commitment to access to seeds for smallholder farmers and discloses a supporting strategy. In its mission statement, the company articulates the importance of farmers and how it intends to serve them in a manner that 'improves their livelihoods and income'. It is also committed to employing a variety of tools and methods to fulfill this mission such as developing local breeding, extension and marketing capabilities. The company considers 90% of its customer base to be smallholder farmers.

■ East-West Seed has a strong governance system in place to support its access to seeds commitments and strategy. Supervision is in the hands of the supervisory board and management board. The company also sets targets to measure its progress and to integrate these targets across the business, engaging all of its core business units. Company goals are translated into management goals, which are monitored via an online performance management system.

■ The company demonstrates leadership in public policy advocacy, participating in multi-stakeholder initiatives and engaging in public and industry dialogue that supports smallholder farmers and access to seeds. It discloses several initiatives covering many Index countries and involves senior leadership in some of these initiatives.

■ The company has a comprehensive R&D program that prioritizes the needs of smallholder farmers. It carries out R&D for all Global Index vegetable crops in its portfolio as well as seven local crops in sub-Saharan Africa and Asia. It leads the way in breeding crops that are tailored to smallholder farmers' needs, with priority breeding objectives of disease and insect resistance, heat tolerance, off-season adaptation, improved transportability, shelf life and higher yields.

■ The company's collaboration with Rijk Zwaan in the Afrisem breeding program is innovative due both to the focus on local crop development for Eastern Africa and the fact that two competitors are working on this development together.

■ The company considers the needs of smallholder farmers throughout its marketing & sales activities, including package sizes, distribution channels, promotion of agricultural inputs and after-sales support.

■ Local smallholder farmers are involved in the company's production activities, with 90% of farmers participating in seed production being smallholders.

Areas for Improvement

■ Despite its strong performance, East-West Seed discloses a limited amount of information publicly, providing most information only on engagement. The company can improve its Transparency score by disclosing more information publicly, especially on its governance and accountability, marketing & sales, local seed sector advancement and R&D activities.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D

Latin America (LA)

Western Africa (WA)

Eastern Africa (EA)

South and Southeast Asia (SSEA)

Index Vegetable Crops in Portfolio

	Sales				Breeding Focus			
	LA	WA	EA	SSEA	LA	WA	EA	SSEA
Broccoli			●	●			●	
Cabbage		●	●	●		●	●	●
Carrot		●	●	●			●	
Cauliflower			●	●		●	●	●
Chili pepper	●		●	●	●	●	●	●
Cucumber	●	●	●	●	●	●	●	●
Eggplant	●	●	●	●	●	●	●	●
Gourd	●	●	●	●	●		●	●
Green bean						●	●	●
Lettuce	●	●	●	●	●		●	●
Melon	●			●	●	●	●	●
Okra		●	●	●		●	●	●
Onion			●	●	●	●	●	●
Pumpkin	●	●	●	●	●	●	●	●
Spinach				●				
Squash					●	●	●	
Sweet pepper	●		●	●	●	●	●	●
Tomato	●	●	●	●	●	●	●	●
Watermelon	●	●	●	●	●	●	●	●

■ Through its marketing, packaging and labeling practices, the company attempts to accommodate the needs of smallholder farmers. It has created both small pouch and value pack sizes and made packaging available in local languages. It also offers open-pollinated varieties (OPVs) and different grade seeds.

■ The company has implemented several programs to encourage the adoption of suitable varieties for smallholder farmers: it promotes a peer-learning approach, which involves supporting key farmers who showcase profitable and sustainable cultivation techniques; its extension services advise on all aspects of crop production from land preparation to harvest, and it has demonstration farms that are used for village training events.

■ The company has in place a strong system for tracking customer feedback and grievances. The system includes contracting surveyors to conduct market research, collecting feedback from its field promoters and local dealers, and managing complaints through its complaint-handling system.

Notable Findings

■ East-West Seed has dedicated resources and programs for improving smallholder farmers' access to seeds, including reinvesting 3% of its global sales into farmer training and a budget of 3% of company revenue for knowledge transfer and extension. These resources are distributed across several countries, among them Indonesia, Myanmar, the Philippines, Thailand, Vietnam, Tanzania and countries in Western Africa.

■ The company is involved in setting up a gene bank in Bogor, Indonesia for the purpose of conserving local germplasm. It is envisaged that this gene bank will operate in the public domain with open access. The company has also provided non-financial support to a public gene bank in Thailand.

■ The company develops and markets a significant number and range of local crops, including amaranth, black nightshade, spider plant, African kale, kangkong, palak, tinda and roselle.

■ The company is engaged in several collaborative research projects with local public or private partners in at least five of the Index countries where it is active. For example, it works with the Asian Vegetable Research and Development Center and several universities (including in India, Indonesia, the Philippines and Thailand) to develop new tomato varieties, and with peer Rijk Zwaan and Wageningen University and Research Centre in the Netherlands on the Seeds of Expertise for the Vegetable Industry of Africa (SEVIA) project in Tanzania.

■ The company has established distribution channels in over half of the Index countries and leverages direct and indirect channels to supply seeds to dealers and sub-dealers in small towns and villages. Through an extensive sub-dealer network, it is able to reach remote areas. It also markets 100% of its Index crop varieties in the 30 countries where it is active, and on several occasions has collaborated with public research institutes to market their varieties.

■ The company has a strong commitment to building the capacity of smallholder farmers. One of the company's strategic objectives is knowledge transfer and it commits to equipping farmers with knowledge to leverage improved seeds.

■ The company supports farmer organizations in 75% of the countries where it is active, especially since its demonstration farms and programs enable the establishment of informal community groups.

■ In 2014, 90% of the 16,000 farmers it employed to produce seeds were considered smallholder farmers.

■ The company actively supports government efforts to improve registration and certification systems in six of the countries where it is active. Activities include providing training and advisory services to government departments and staff, and participating in roundtable discussions and working groups addressing these matters.



Access to Seeds
Index

Enza Zaden

Corporate Data

Headquarters: Enkhuizen, the Netherlands
Ownership type: Private
Group revenue (2014): USD 177,599,710

Enza Zaden Beheer B.V. (Enza Zaden) is a vegetable seed company. Family-owned, the company was founded in 1938 and is based in the region of the Netherlands known as 'Seed Valley'. It has subsidiaries in South and North America, Australia and New Zealand, Europe, Africa and Asia.

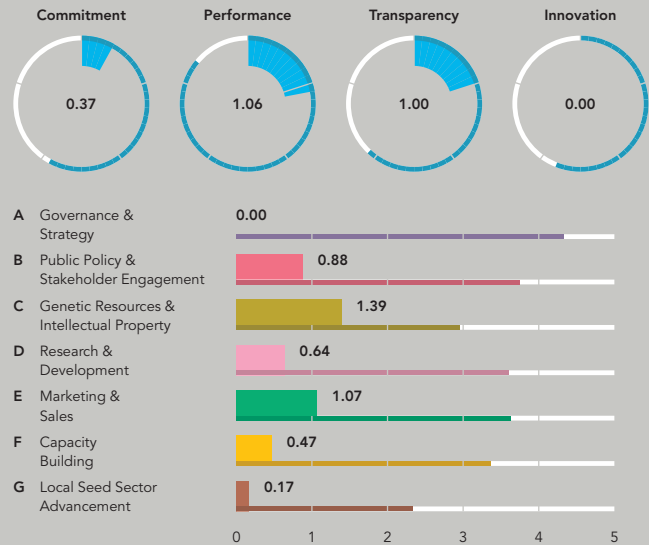
7

rank out of 10
score 0.77

Global Index – Vegetable Seed Companies

Ranking seventh in the Global Index of Vegetable Seed Companies, Enza Zaden's below-average performance is characterized by a lack of transparency and commitments related to access to seeds. Despite this overall weak performance, strong marketing & sales

activities could be used to engage more with smallholder farmers in Index countries, thereby improving farmers' access to quality seeds and building their capacity.



Leading Practices

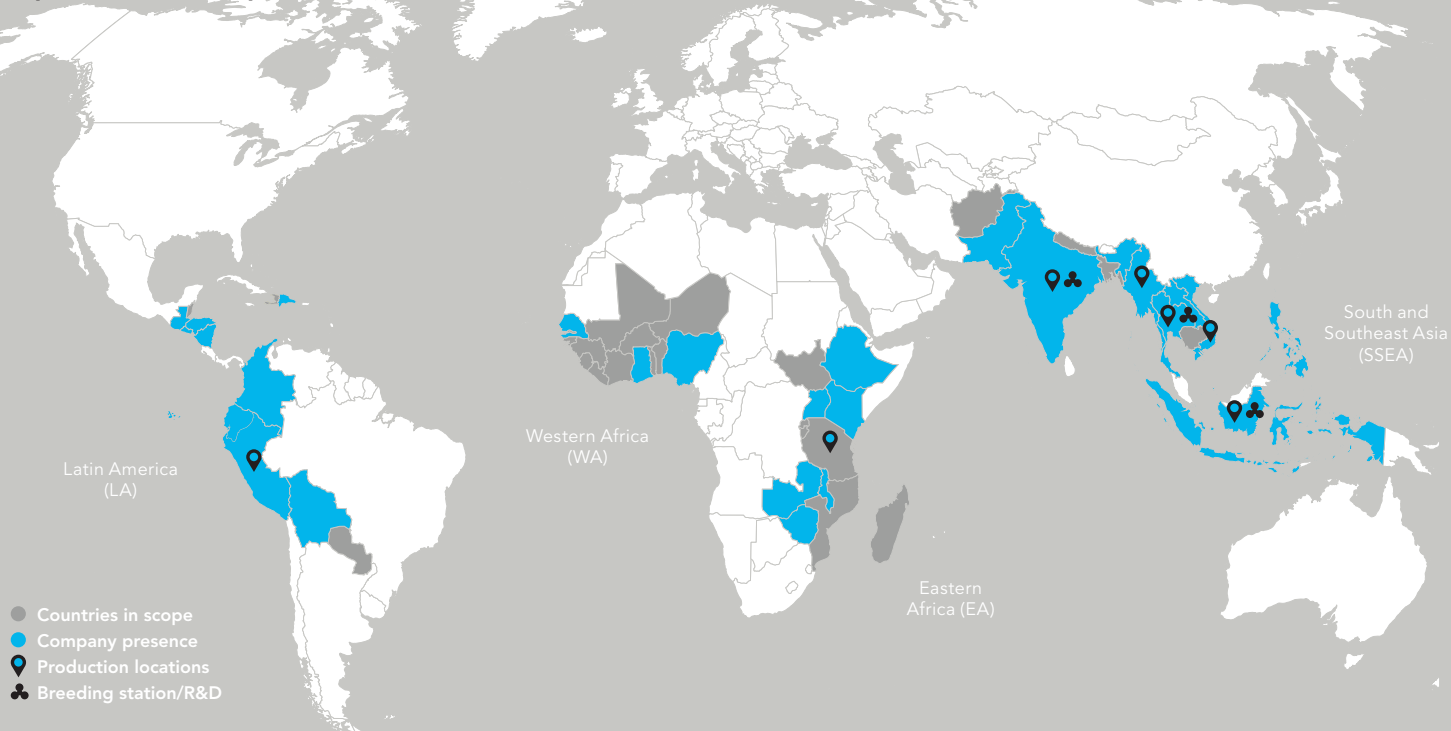
■ Enza Zaden has distribution networks in all regions. In some Index countries, the company has established third-party distribution and a product portfolio that is adapted to local growing conditions and requirements. In others, it is in the process of developing networks, testing its varieties for local adaptability and establishing commercial businesses.

■ The company reports the ambition to release varieties adapted for local growing conditions and requirements for its full portfolio in all Index regions by 2018.

Areas for Improvement

■ Enza Zaden is encouraged to improve the transparency of its activities related to access to seeds for smallholder farmers by increasing its public disclosure, and to formulate company policies on its engagement with smallholder farmers in the countries where it operates.

Operations in Scope



Index Vegetable Crops in Portfolio

	Sales				Breeding Focus			
	LA	WA	EA	SSEA	LA	WA	EA	SSEA
Broccoli					⌘	⌘	⌘	⌘
Cauliflower	●	●	●	●	⌘	⌘	⌘	⌘
Chicory					⌘	⌘	⌘	⌘
Chili pepper	●			●	⌘	⌘	⌘	⌘
Cucumber	●		●	●	⌘	⌘	⌘	⌘
Eggplant			●	●	⌘	⌘	⌘	⌘
Gherkin				●	⌘	⌘	⌘	⌘
Gourd				●	⌘	⌘	⌘	⌘
Leek					⌘	⌘	⌘	⌘
Lettuce	●		●	●	⌘	⌘	⌘	⌘
Melon					⌘	⌘	⌘	⌘
Onion	●	●	●	●	⌘	⌘	⌘	⌘
Pumpkin					⌘	⌘	⌘	⌘
Spinach					⌘	⌘	⌘	⌘
Squash					⌘	⌘	⌘	⌘
Sweet pepper	●		●	●	⌘	⌘	⌘	⌘
Tomato	●		●	●	⌘	⌘	⌘	⌘
Watermelon				●	⌘	⌘	⌘	⌘

Notable Findings

Enza Zaden conducts variety testing in all of the Index countries where it has distribution networks. In total, an estimated 70-80% of the company's portfolio is covered by variety trials in Index countries, and the company actively carries out research at its stations in India, Indonesia and Thailand. In Indonesia, this is in the form of a joint venture with East-West Seed.

Through a collaboration with the NGO Fair Planet, which also cooperates with other Global Index companies, Enza Zaden promotes the adoption of suitable vegetable crops in Ethiopia through variety trials with smallholder farmers. These are combined with capacity-building activities.



Corporate Data

Headquarters: Saint Beauzire, France
Ownership type: Private (cooperative)
Group revenue (2014): USD 1,969,000,000

Groupe Limagrain Holding SA (Groupe Limagrain) is a cooperative holding company that produces and markets field crop and vegetable seeds, cereal-based products such as baked goods and pastries, and animal feed for farmers and processors. Seeds are marketed globally through ten subsidiaries. The company was founded in 1942 as Coopérative de Production et de Vente de Semences Sélectionnées du Massif Central. It changed its name to Groupe Limagrain Holding SA in 1965.

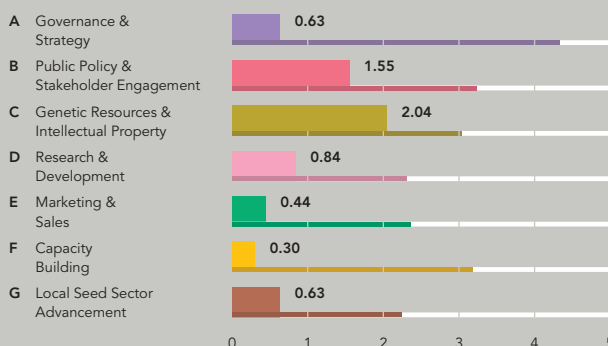
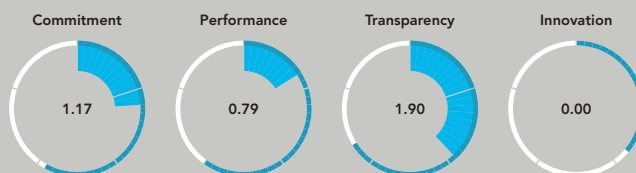
6

rank out of 7
score 0.97

Global Index – Field Crop Seed Companies

Groupe Limagrain ranks sixth in the Global Index of Field Crop Seed Companies, indicating multiple opportunities to increase access to seeds for smallholder farmers in Index countries. Although the company is actively involved in several multi-

stakeholder initiatives that support food security and smallholder farmers in Index countries, it is encouraged to articulate additional commitments and strategies related to access to seeds.



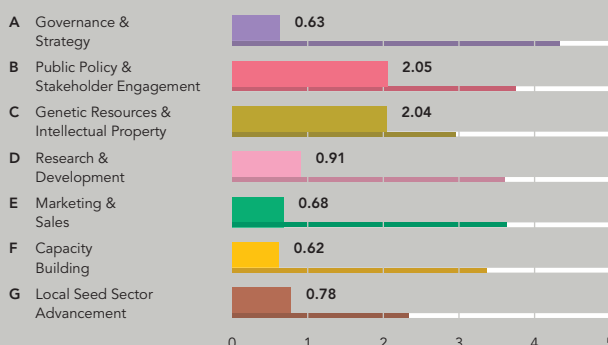
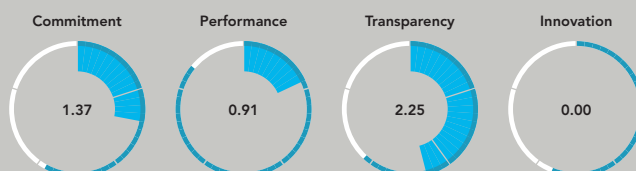
6

rank out of 10
score 1.13

Global Index – Vegetable Seed Companies

Ranking sixth in the Global Index of Vegetable Seed Companies, Groupe Limagrain's average performance reflects a number of strengths as well as opportunities to improve access to seeds for smallholder farmers in Index countries. The company is involved

in a range of activities to enhance smallholder farmers' access to quality vegetable seeds in Ethiopia through on-farm demonstrations and training programs. Among several suggested improvements, it is encouraged to extend these programs and types of services to other Index countries.



Leading Practices

■ Groupe Limagrain is a founding member of two multi-stakeholder initiatives originating in France that are relevant for access to seeds: Movement for a World Organization of Agriculture (Momagri) and the Foundation for World Agriculture and Rurality (FARM).

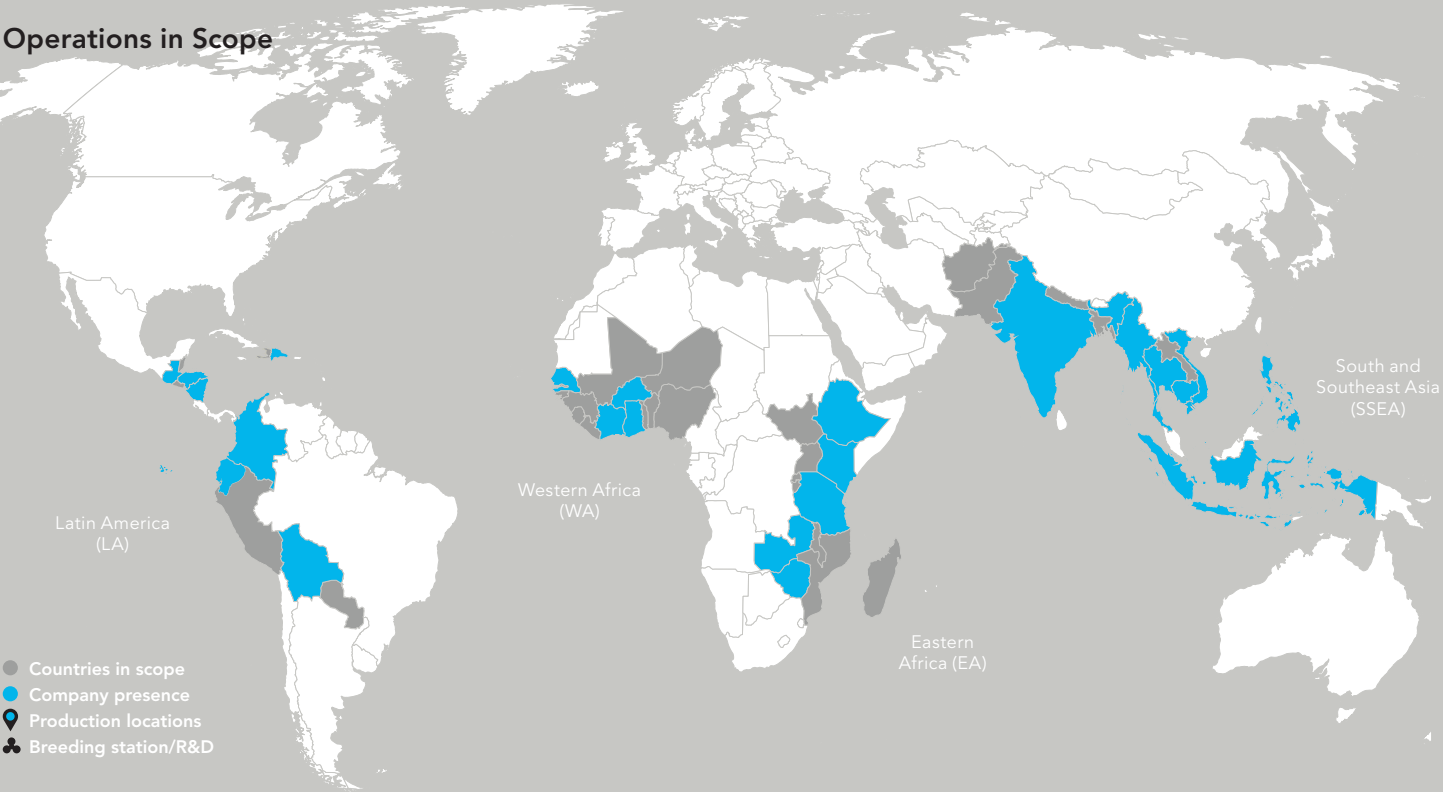
■ Group Limagrain and its subsidiary Hazera have played a major role in establishing the NGO Fair Planet, which runs comparative vegetable variety trials and a training program to transfer know-how and cultivation practices to local farmers in Ethiopia.

Areas for Improvement

■ Groupe Limagrain discloses five major CSR commitments, including enhancing global food security by empowering farmers worldwide. In order to translate this commitment into action, the company is encouraged to set and report progress towards related targets.

■ The company is encouraged to expand its agricultural services programs aimed at smallholder farmers, currently in place in Ethiopia through the NGO Fair Planet, to all its subsidiaries and more Index countries where it is active.

Operations in Scope



Index Field Crops in Portfolio

- Maize
- Soybean
- Wheat

Index Vegetable Crops in Portfolio

- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Chicory
- Chili pepper
- Cucumber
- Leek
- Lettuce
- Melon
- Onion
- Pumpkin
- Squash
- Sweet pepper
- Tomato
- Watermelon

Notable Findings

■ Groupe Limagrain discloses a commitment to enrich biodiversity and make genetic resources accessible to society.

■ The company states that the systems of plant variety rights and patent rights can coexist and that the breeders’ exemptions must be a fundamental part of any intellectual property system applied to plant innovation. The company adds that it lobbies for breeders’ exemptions and supports a French regulation which states that farmers growing protected commercial varieties may, for some crops, save the seeds of part of their harvest if they pay a royalty called the Mandatory and Voluntary Contribution. The smallest farmers are exempt from this royalty.

■ The company states that it creates, produces and distributes field crop seeds and vegetable seeds adapted to the different climates and soils of each market, adding that it aims to remain close to markets so that it can permanently adapt germplasm and varieties.

■ The company also reports that its subsidiary Hazera has obtained ISO 9001 certification for quality management at its Dutch and Israeli sites.



KWS

Access to Seeds
Index

Corporate Data

Headquarters: Einbeck, Germany
Ownership type: Private and listed
Group revenue (2014): USD 1,178,007,000

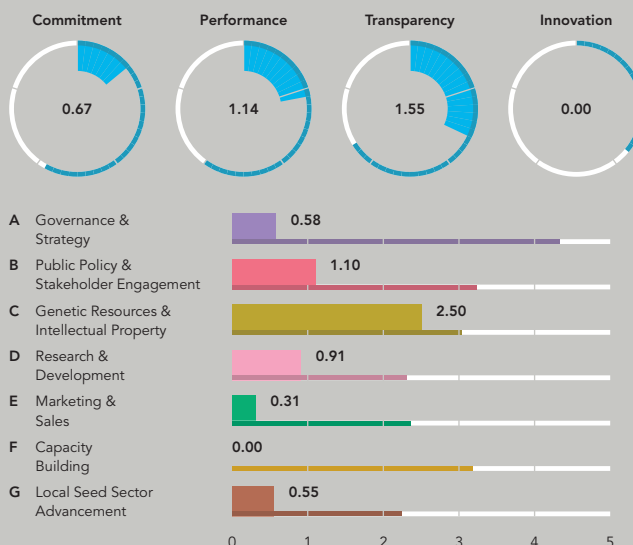
KWS SAAT SE (KWS), together with its subsidiaries, is a plant breeding company with global reach. It operates primarily through its maize, sugar beet and cereals segments. The maize segment produces and sells maize for grain and silage as well as oilseed crops, legumes and sorghum. The sugar beet segment breeds sugar beet and potato. The cereals segment produces and distributes hybrid rye, wheat and barley. KWS was founded in 1856.

7

rank out of 7
score 0.97

Global Index – Field Crop Seed Companies

KWS ranks at the bottom of the Global Index of Field Crop Seed Companies. It exhibits some strengths in Genetic Resources & Intellectual Property in the form of support for local gene banks in Peru and Ethiopia. Overall, however, its disclosure is poor and it could do more to link its activities to the needs of smallholder farmers in Index countries.



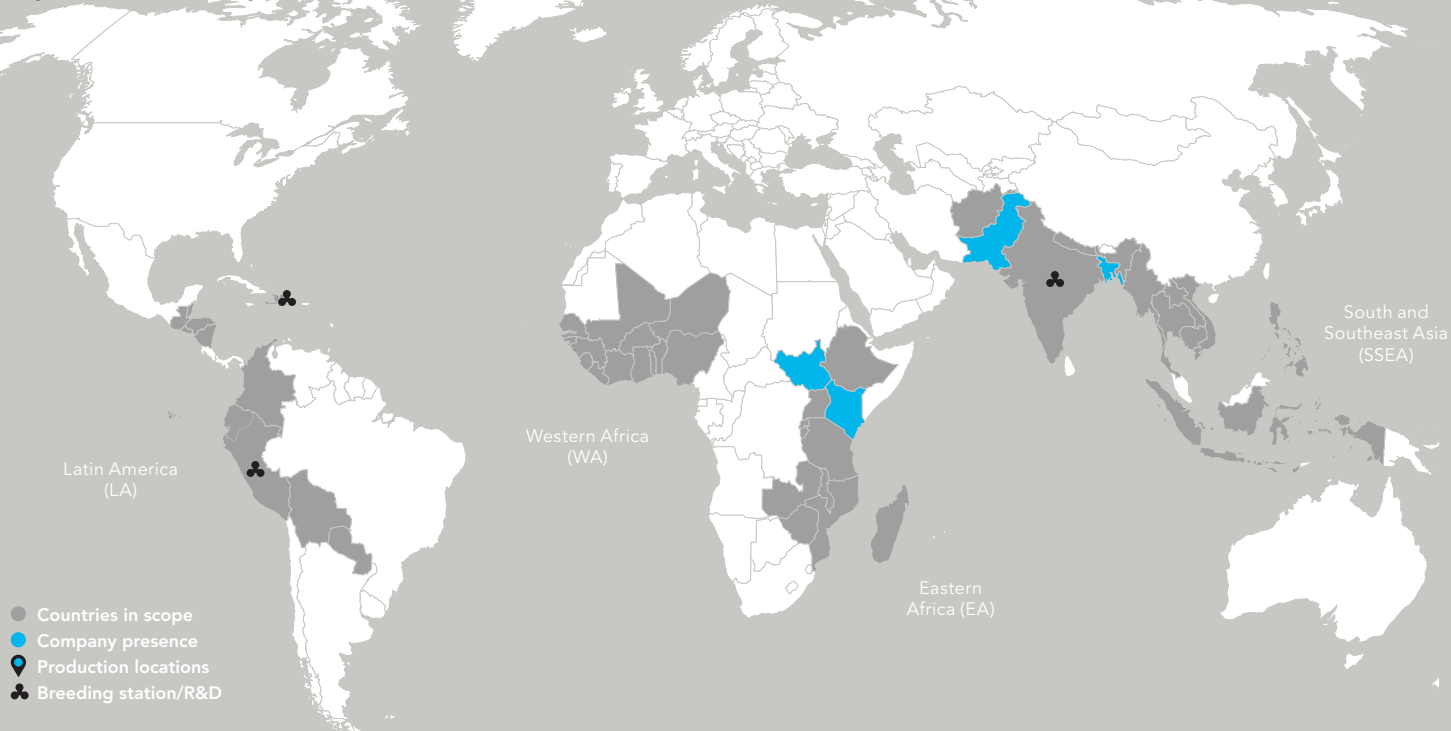
Leading Practices

- KWS supports research capacity building in Peru through knowledge sharing and training sessions with gene bank scientists on genotype analysis and the identification of duplicates.
- It also assists local gene banks in Peru with maize and quinoa and in Ethiopia with wheat and barley, by sharing its experience of conserving and using genetic resources. In addition to developing the skills of researchers, the company donates parent material for crossing and/or provides equipment and financial support for field trials.

Areas for Improvement

- KWS is encouraged to increase its disclosure across all measurement areas and better linking its activities to the needs of smallholder farmers. Given its product portfolio, the company could also consider becoming more active in breeding for smallholder farmers in Index countries.

Operations in Scope



Index Field Crops in Portfolio

Barley	
Maize	
Potato	
Sorghum	
Soybean	
Wheat	

Notable Findings

■ KWS states that it financially supports the International Treaty on Plant Genetic Resources for Food and Agriculture.

■ The company discloses a commitment to seed quality for all the countries where it is active, stating that its seeds must fulfill statutory requirements for purity and germination capacity and must be officially approved. It also states that the guidelines of the EC, OECD or International Seed Testing Association (ISTA) must be fulfilled depending on the seeds' country of destination, but that it pursues and enforces 'far higher standards of quality throughout the group'.



Access to Seeds
Index

Monsanto

Corporate Data

Headquarters: St Louis, Missouri, USA
Ownership type: Listed
Group revenue (2014): USD 10,740,000,000

Monsanto Co. (Monsanto) operates in two segments: seeds and genomics and agricultural productivity (including agrochemicals). The seeds and genomics segment produces field crop seeds and vegetable seeds under multiple brands. This segment also develops biotechnology traits and licenses germplasm and traits to seed companies. Monsanto was founded in 1901 in the USA and has since expanded its operations to Canada, Latin America, Europe, Africa and Asia Pacific.

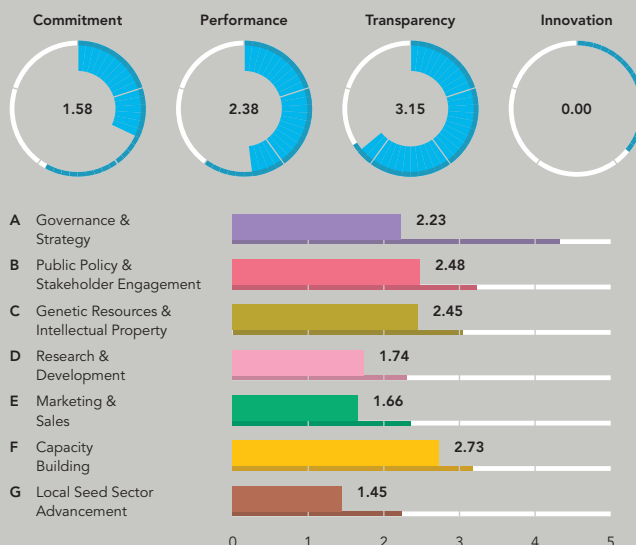
4

rank out of 7
score 2.06

Global Index – Field Crop Seed Companies

Monsanto ranks fourth out of seven field crop seed companies, outperforming most of its peers in Capacity Building and scoring highly on Transparency. The company is actively engaged in several multi-stakeholder programs that target food security

crops, but there is room to improve in Governance & Strategy, Research & Development and Local Seed Sector Advancement.



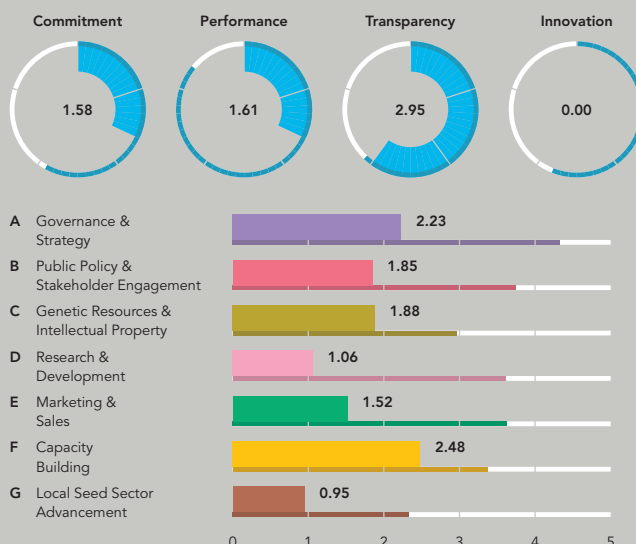
4

rank out of 10
score 1.64

Global Index – Vegetable Seed Companies

Monsanto ranks fourth out of ten vegetable seed companies, scoring relatively high in Capacity Building and outperforming peers on Transparency. There is room to improve in Research & Development and Public Policy & Stakeholder Engagement. The

company's widespread vegetable breeding and seed production activities in Index countries offer opportunities in Local Seed Sector Advancement.



Leading Practices

■ Monsanto provides intellectual property under a royalty-free license to the Bt Cowpea Partnership, and licenses royalty-free germplasm and biotech traits for use by smallholder farmers to the African Agriculture Technology Foundation as part of its involvement in the Water Efficient Maize for Africa (WEMA) partnership. In addition, it demonstrates efforts to keep old varieties with expired plant variety protection (PVP) certificates available on the market.

■ Monsanto builds research capacity in Index countries, for example through its Beachell-Borlaug International Scholars Program, which provides fellowships to individuals seeking a PhD in rice or wheat breeding in 11 Index countries.

■ The company supplies specific hybrid seeds to farmers in 'resource-constrained countries' using differential pricing. It offers financial services for the maize and vegetable value chain through the SAGCOT partnership in Tanzania, in which peers Syngenta and Bayer CropScience are also involved. It also participates in the World Economic Forum's (WEF) Partnership for Indonesia Sustainable Agriculture, which helps maize farmers to obtain financing.

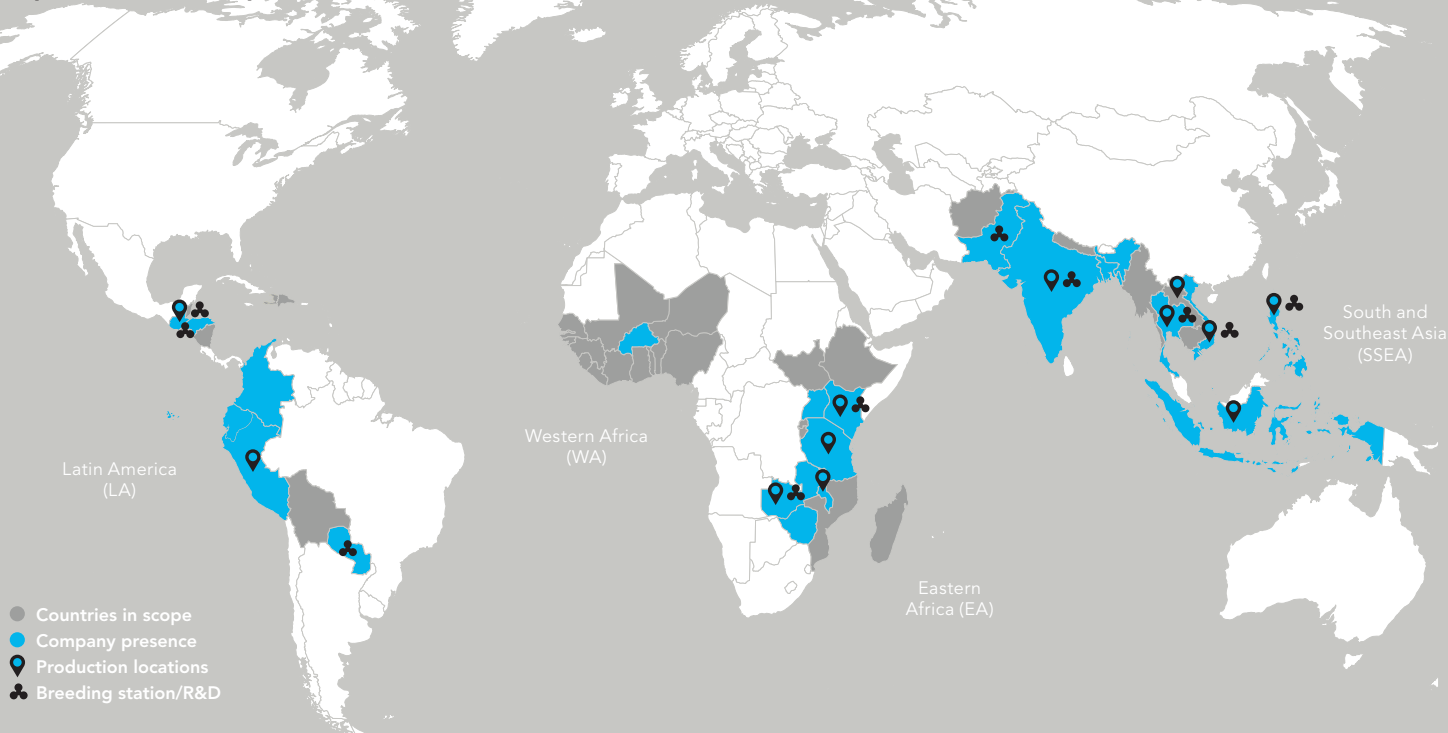
■ The company performs strongly in the provision of ICT support for smallholder farmers. In India, its mobile platform software Farm AgVisory Service (MFAS) distributes weather data and connects farmers with advisors who offer advice on field crops and vegetable farming.

Areas for Improvement

■ Monsanto outperforms its peers in the development of improved varieties of local field crops, particularly through its partnerships for cassava and cowpea. However, it underperforms in the testing of its existing portfolio, which, due to its size, could be better utilized.

■ Although no evidence was found of the company blocking the use of farm-saved seeds, it lacks a commitment on the issue. The company could consider specifically allowing the use of farm-saved seeds for non-commercial purposes by smallholder farmers.

Operations in Scope



Index Field Crops in Portfolio

Beans, dry
Maize
Sorghum
Soybean
Wheat

Index Vegetable Crops in Portfolio

Broccoli
Cabbage
Carrot
Cauliflower
Chili pepper
Cucumber
Eggplant
Gherkin
Green bean
Green pea
Leek
Lettuce
Melon
Onion
Pumpkin
Spinach
Squash
Sweet pepper
Tomato
Watermelon

Notable Findings

■ Monsanto participates in multi-stakeholder initiatives that focus on sustainable agriculture and increased yields such as the New Vision for Agriculture, World Economic Forum's Grow Africa and Grow Asia.

■ Like its peer Dow AgroSciences, Monsanto collaborates with the Virus Resistant Cassava for Africa (VIRCA) project, to develop new forms of cassava that are resistant to cassava mosaic disease (CMD) and cassava brown streak disease (CBSD).

■ The company has a policy on the quality and safety of varieties and seeds and biosafety in Index countries as well as a commitment to ethical marketing. While not in Index countries, in 2012 a court in Brazil found Monsanto to be in breach of advertising standards, ruling that its commercials for GM soybean lacked the scientific evidence to support the claimed environmental benefits. Authorities in South Africa ordered the company to withdraw a commercial for GM crops on similar grounds in 2014.

■ In its seed production operations, Monsanto has implemented social standards guided by the Universal Declaration of Human Rights and the ILO Declaration on Fundamental Principles and Rights at Work. Monsanto's Supplier Code of Conduct refers to the company's Human Rights Policy.

■ The company has relatively strong commitments to access to seeds for smallholder farmers, setting itself the goal of improving the lives of 'an additional 5 million people in resource-poor farm families by 2020'.



Access to Seeds
Index

Rijk Zwaan

Corporate Data

Headquarters: De Lier, the Netherlands
Ownership type: Private
Group revenue (2014): USD 426,463,140

Rijk Zwaan Zaadteelt en Zaadhandel B.V. (Rijk Zwaan) is a family-owned vegetable seed company. It was founded in 1924 and is based in De Lier, the Netherlands. The company has sales offices and breeding and production facilities all over the world.

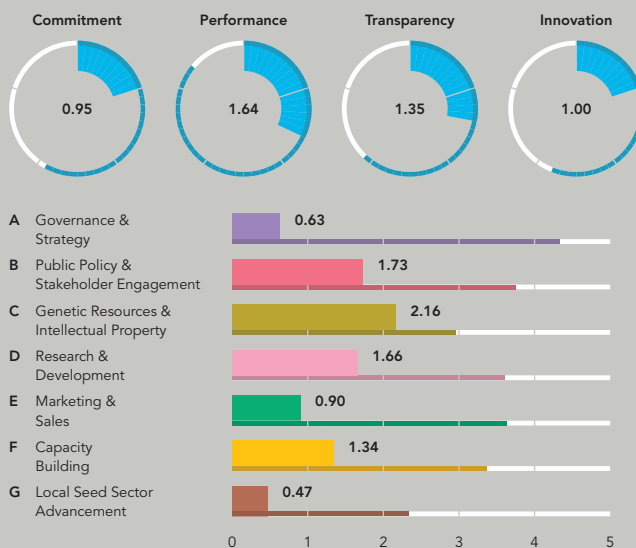
5

rank out of 10
score 1.36

Global Index – Vegetable Seed Companies

Ranking fifth in the Global Index of Vegetable Seed Companies, Rijk Zwaan exhibits a number of strengths but also opportunities to improve access to seeds for smallholder farmers in Index countries. The company performs well on increasing access to genetic

resources for further development, and leads Afrisem, an innovative commercial breeding program that focuses on developing local crops for Eastern Africa. The company is encouraged to expand its local capacity-building activities in Index countries, to ensure that smallholder farmers are better able to realize the full potential of quality seeds of improved varieties.



Leading Practices

Afrisem, a breeding program founded in 2008 in Tanzania by Rijk Zwaan in collaboration with East-West Seed, focuses on key local crops such as African eggplant, hot pepper and African kale.

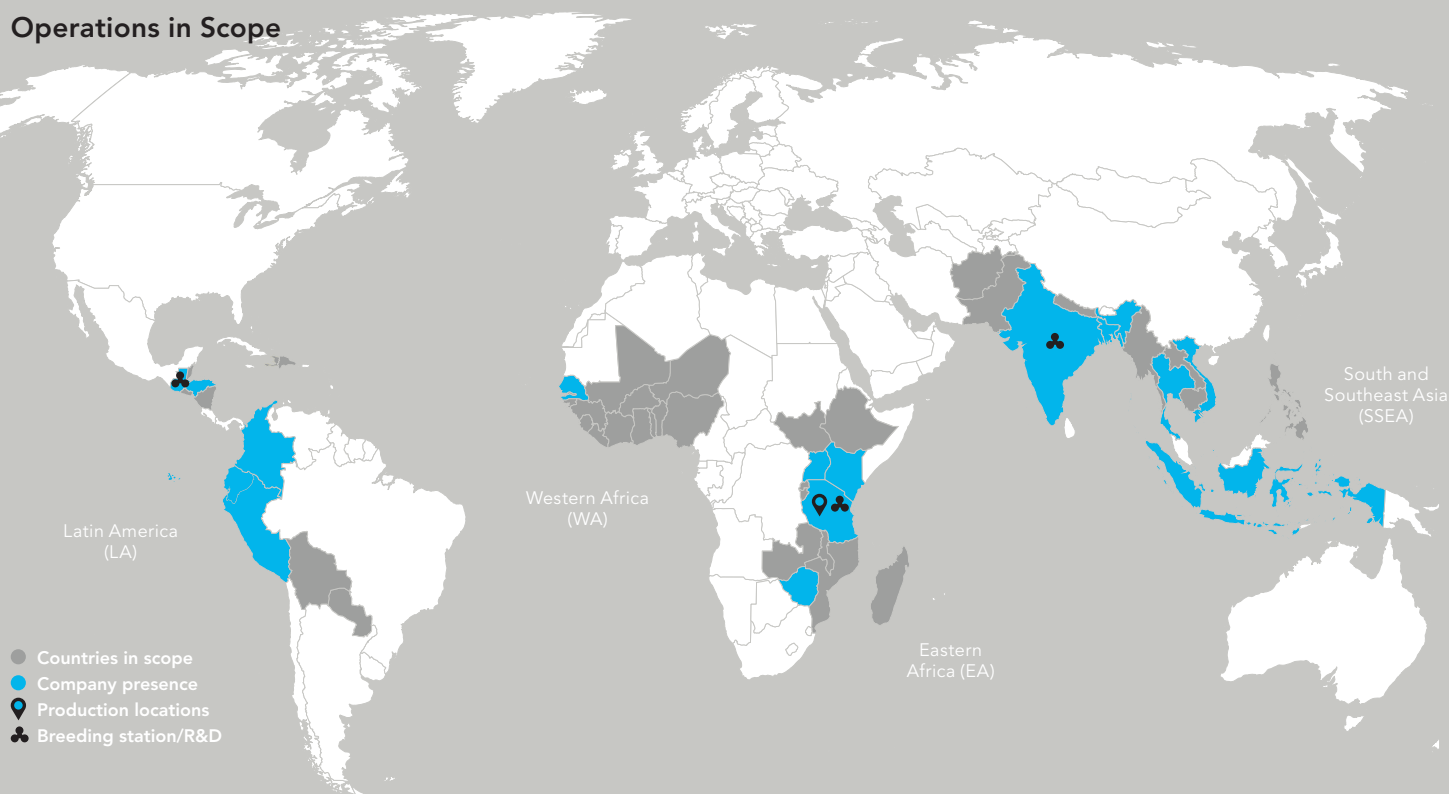
Areas for Improvement

The Afrisem breeding program aims eventually to provide African farmers with hybrid varieties and enable employees to contribute to the development of horticulture on the continent. Rijk Zwaan could set and disclose formal strategic objectives to strengthen the effectiveness of this program to improve access to seeds for smallholder farmers.

Expanding the company's capacity-building programs to benefit a larger number of farmers in more Index countries could also help to increase sustainably farmers' productivity and income.

Rijk Zwaan scores highly in R&D relevant to Index countries, but lowly in Marketing & Sales. It would be logical to match these R&D investments with an equal effort in Marketing & Sales.

Operations in Scope



Index Vegetable Crops in Portfolio

Broccoli
Cabbage
Carrot
Cauliflower
Chicory
Chili pepper
Cucumber
Eggplant
Gherkin
Leek
Lettuce
Melon
Spinach
Squash
Sweet pepper
Tomato
Watermelon

Notable Findings

■ Rijk Zwaan states that biological material protected by patent rights should be freely available for the development of new varieties, which amounts to the equivalent of a breeders' exemption in patent law. As one of the principal founders of the International Licensing Platform (ILP) for vegetable plant breeding, Rijk Zwaan supports the guaranteed access to crucial vegetable plant traits that are currently covered by patent claims by ILP member companies.

■ The company provides access to its own genetic resources through its participation in Afrisem, but also regularly donates old varieties to the public gene bank of the Centre for Genetic Resources Netherlands (CGN), based in Wageningen, the Netherlands. The varieties donated are available under the Multilateral System.

■ All seeds produced by Rijk Zwaan globally are shipped to the company's Seed Technological Centre in De Lier and tested for seed identity (varietal trueness), seed purity, seed-borne diseases, germination and vigor under different conditions.

■ The company contributes regularly to capacity-building programs. In a training program hosted by the University of Horticultural Science in Kolar, India in 2014, the company provided advice on cultivating vegetable crops to more than 75 growers and 100 final-year horticultural students. The company also supports the horticultural college in Chimaltenango (Guatemala), where local growers, mostly women, attend courses on vegetable cultivation, marketing and organization.

■ Rijk Zwaan is a partner in Seeds of Expertise for the Vegetable Industry of Africa (SEVIA), a public-private partnership that includes East-West Seed and Wageningen University and Research Centre in the Netherlands. SEVIA aims to contribute to Africa's food security and vegetable industry development. It currently conducts independent variety testing in locations in Tanzania important for vegetable growing. The partnership's other activities include establishing demonstration fields at local growers, grower groups and cooperatives to introduce new cultivation technologies, as well as organizing 'training of trainers' sessions for horticultural workers.



Sakata

Access to Seeds
Index

Corporate Data

Headquarters: Yokohama, Japan
Ownership type: Listed
Group revenue (2014): USD 529,815,790

Sakata Seed Corporation (Sakata), together with its subsidiaries, sells horticultural products and materials in Asia, North, Central and South America, Europe, and the Near and Middle East. The company breeds, produces, procures and wholesales vegetable, flower and grass seeds, flower bulbs, vegetable and flower seedlings, and agricultural and horticultural products and services, including for the hobby gardening market. The company was founded in 1913.

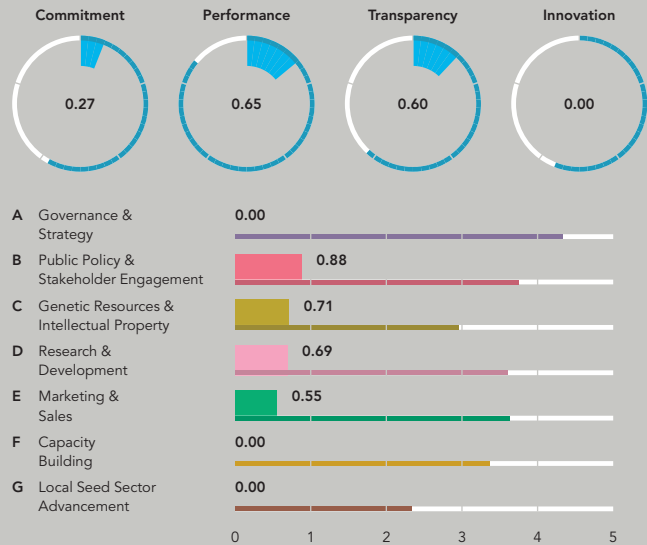
10

rank out of 10
score 0.48

Global Index – Vegetable Seed Companies

Despite having a presence in all Index regions, Sakata ranks tenth and last in the Global Index of Vegetable Seed Companies, underperforming in all seven measurement areas. Its ranking reflects its weak disclosure of commitments and activities related

to access to seeds and an overall lack of transparency. Nevertheless, the company has put in place some programs that have the potential to positively impact access to seeds for smallholder farmers, especially where R&D and quality management systems are concerned.



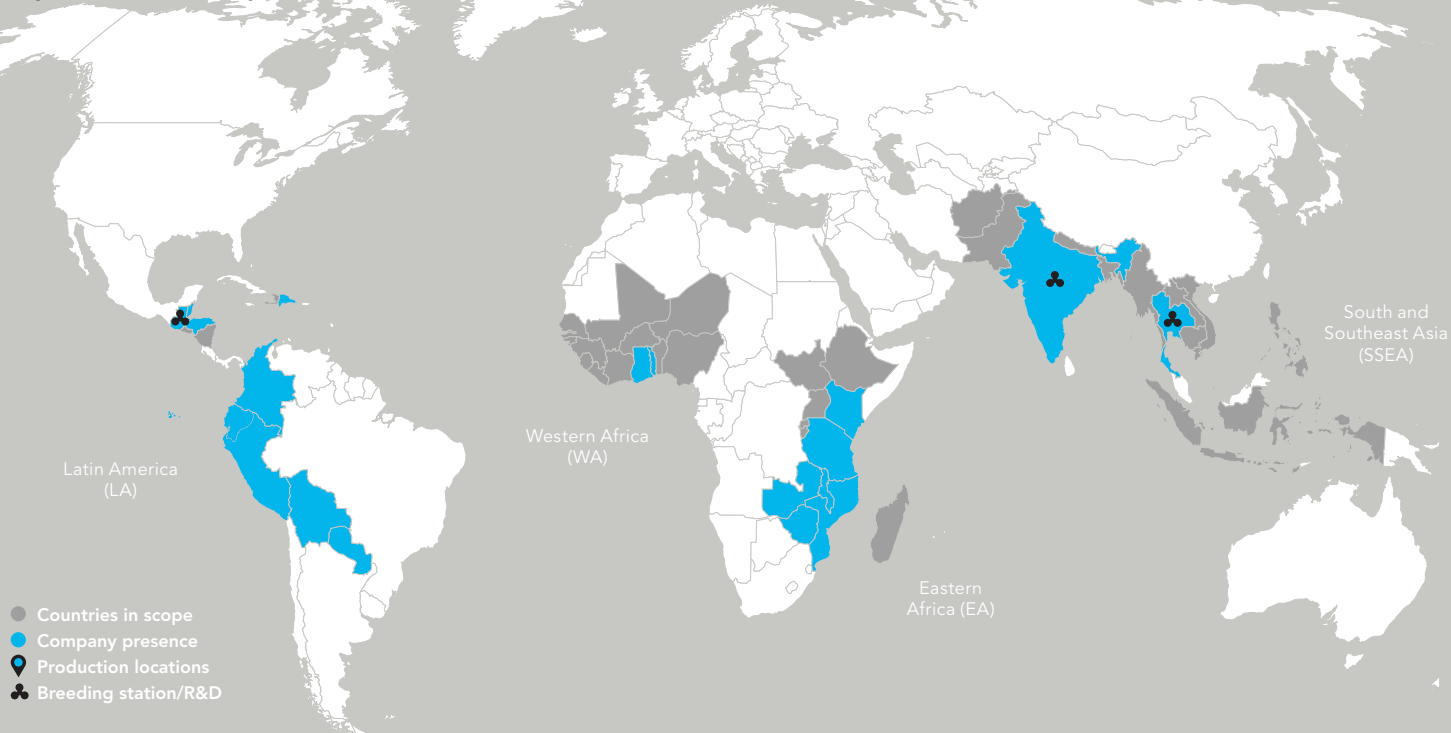
Leading Practices

- No leading practices were identified.

Areas for Improvement

- Sakata has an extensive global presence, but it is unclear whether this is leveraged for the benefit of smallholder farmers. The company is therefore encouraged to use its country presence to positively impact access to seeds.
- The company could enhance the disclosure and transparency of its activities related to access to seeds for smallholder farmers, and develop formal commitments or policies to guide these activities.

Operations in Scope



Index Vegetable Crops in Portfolio

Broccoli
Cabbage
Carrot
Cauliflower
Cucumber
Eggplant
Lettuce
Melon
Okra
Onion
Pumpkin
Spinach
Squash
Sweet pepper
Tomato
Turnip
Watermelon

Notable Findings

■ In South Africa, Sakata cooperates with the Japanese International Cooperation Agency (JICA) in a project encouraging smallholder farmer autonomy. Although outside the Index's geographic scope, the project is an indication of some level of commitment on Sakata's part to support smallholder farmers.



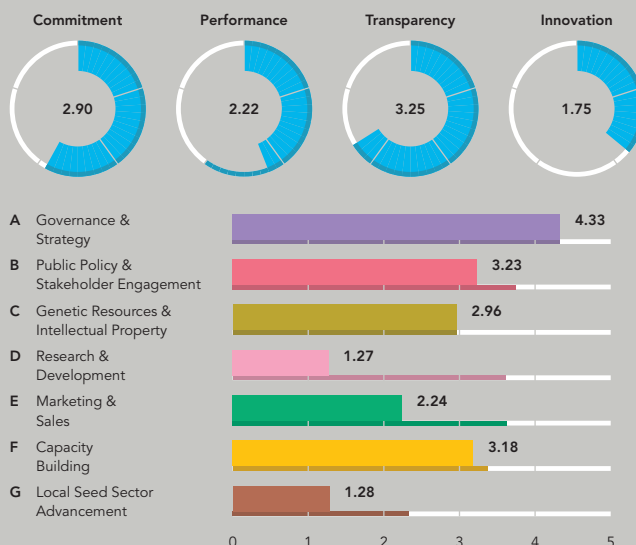
2

rank out of 7
score 2.50

Global Index – Field Crop Seed Companies

Syngenta ranks second in the Global Index of Field Crop Seed Companies, largely as a result of strong performance in Governance & Strategy and Capacity Building and a high Transparency score. The company has implemented comprehensive manage-

ment systems to govern its access to seeds initiatives. It has also introduced several innovative practices, often based on work carried out by the Syngenta Foundation. However, it could capitalize further on opportunities in Research & Development and Local Seed Sector Advancement.



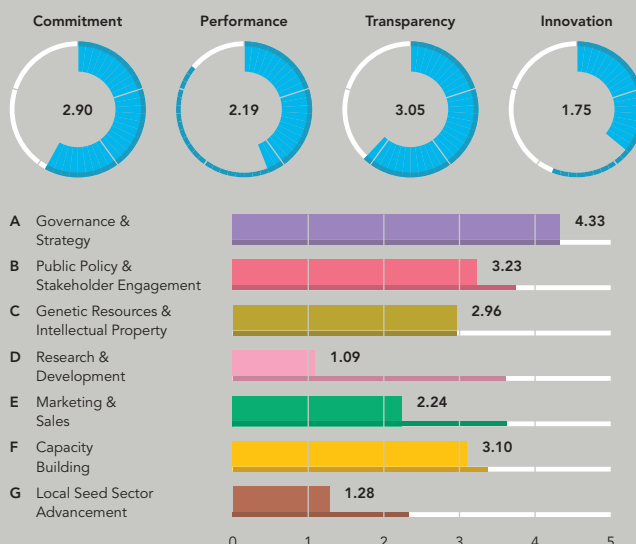
2

rank out of 10
score 2.45

Global Index – Vegetable Seed Companies

Syngenta ranks second in the Global Index of Vegetable Seed Companies, thanks to strong performance in Governance & Strategy and Capacity Building and a high Transparency score. The company has implemented comprehensive management systems

to govern its access to seeds initiatives. It has also introduced several innovative practices, often based on work carried out by the Syngenta Foundation. However, it could capitalize further on opportunities in Research & Development and Local Seed Sector Advancement.



Leading Practices

■ The Good Growth Plan is Syngenta's commitment to making a measurable contribution by 2020, including reaching 20 million smallholder farmers and enabling them to increase productivity by 50%. Notably, Syngenta links executive compensation to performance stock units (PSUs), which are determined based on four internal performance measures, including progress toward Good Growth Plan targets.

■ The Syngenta Foundation pilots a large proportion of Syngenta's programs and initiatives for smallholder farmers in Index countries. One of these initiatives is ACRE, a spin-off insurance products and advisory company in Africa. By the end of 2014, ACRE had reached an estimated 230,000 farmers in Kenya, Rwanda and Tanzania.

■ Syngenta takes a holistic approach to addressing the needs of smallholder farmers. It leverages its integrated business model (business segments structured around crops rather than agricultural inputs) to provide agricultural advisory services that cover seeds, agrochemicals and other inputs to smallholder farmers in Index countries.

■ Efforts to link local small- and medium-sized seed enterprises with public and private breeders through the company's Seeds2B project are considered an innovative way of advancing the local seed sector in Index countries.

■ The company has articulated and endorsed strong commitments to access to seeds for smallholder farmers across all measurement areas. It demonstrates transparency and accountability by publicly disclosing its commitments and programs.

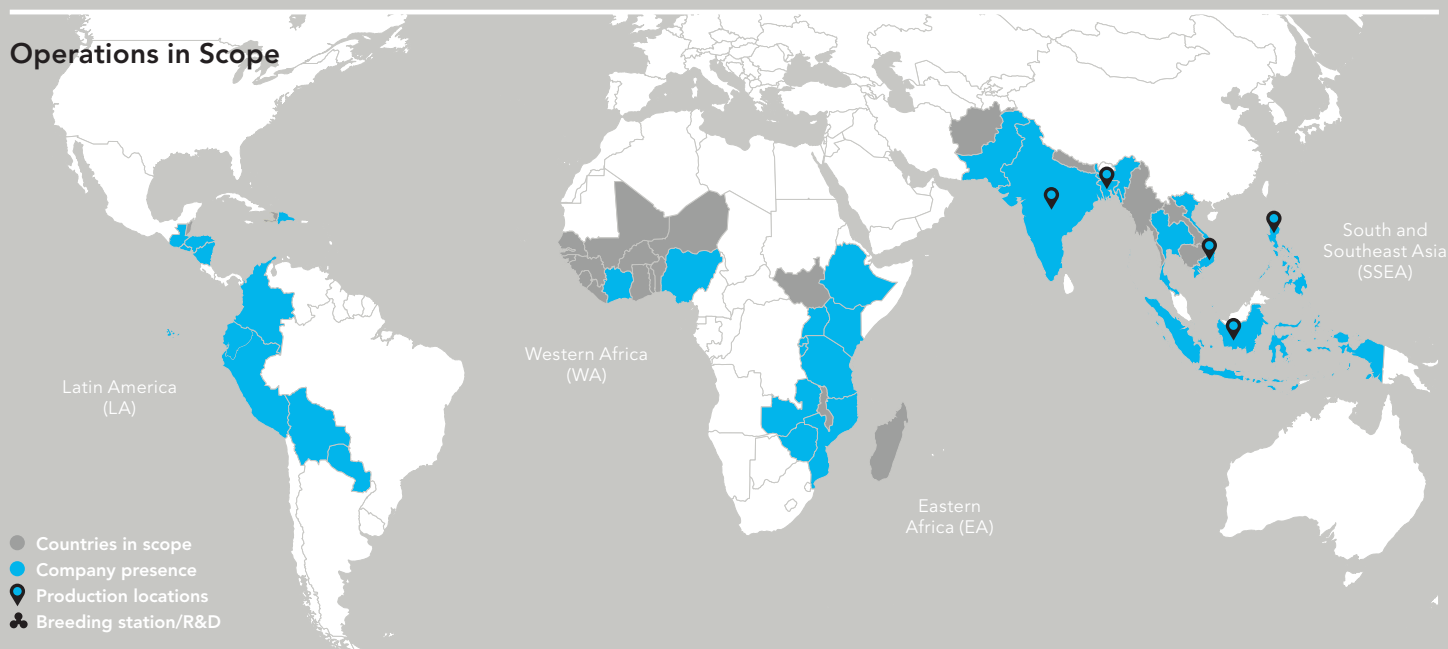
Areas for Improvement

■ Syngenta participates in multi-stakeholder partnerships, including the New Alliance for Food Security and Nutrition and the New Vision for Agriculture. It is encouraged to increase disclosure of its exact role in and contributions to these partnerships.

■ While the Good Growth Plan states that the company aims to develop new smallholder solutions under its R&D portfolio, only limited information is available about the actual breeding programs for specific crops and how these target the needs of smallholder farmers.

■ The company has established seed distribution channels in all four Index regions, but it could improve disclosure of the type of marketing activities it undertakes in each market.

Operations in Scope



Index Field Crops in Portfolio

Barley
Maize
Potato
Rice, paddy
Soybean
Wheat

Index Vegetable Crops in Portfolio

Broccoli
Cabbage
Carrot
Cauliflower
Chili pepper
Cucumber
Eggplant
Green bean
Green pea
Leek
Lettuce
Melon
Okra
Onion
Spinach
Squash
Sweet pepper
Tomato
Watermelon

Notable Findings

■ Syngenta publicly discloses its positions on access to crop and genetic resources, the breeders' exemption under plant variety protection (PVP) laws, the farmers' privilege and support for public gene banks. However, it is not explicit about its support for the breeders' exemption or public gene banks other than those under the aegis of the Global Crop Diversity Trust, of which it is a corporate sponsor. The company states that it recognizes the right of farmers to save seeds as outlined within the framework of UPOV 1991, specifying that farmer-saved seeds should be limited to crops where seed is traditionally saved, such as large acreage field crops, and should not be allowed for high-value crops, such as vegetables and flowers, or for GM crops that require stewardship.

■ Syngenta does not pursue or enforce patents and applications in seeds or biotechnology in least developed countries (LDCs) for either private or non-commercial use. It is the company's policy not to enforce patent rights where agriculture is undertaken for subsistence purposes.

■ Syngenta works with the International Maize and Wheat Improvement Center (CIMMYT) to develop new varieties of wheat. It has also partnered with HarvestPlus to develop new varieties of sweet potato in Mozambique and Uganda, millet in India, maize in Zambia and cassava in Nigeria; and with the University of Bern in Switzerland to develop new varieties of tef.

■ Syngenta collaborates with NGO Fair Planet in Ethiopia on variety trials of vegetable crops and smallholder farmer capacity building.

■ In Bangladesh, Syngenta trains smallholder farmers on the safe use of crop protection products, while in Vietnam farmers are instructed on the safe use of agricultural products and responsible production methods. Furthermore, the Syngenta Foundation helps smallholder farmers in Bangladesh and India to join cooperatives or groups to benefit from economies of scale when purchasing agricultural inputs.

■ Syngenta offers advisory or extension services to smallholder farmers in Guatemala, Nicaragua, Tanzania and Kenya, either in multi-stakeholder partnerships or through the Syngenta Foundation. The company offers integrated advice on crop protection inputs in Nicaragua, and works with Norwegian chemical firm Yara International ASA to support rice and maize farmers in Tanzania.

■ Syngenta's contracts with seed producers forbid the use of child labor. In India, the company has worked with the Fair Labor Association (FLA) since 2004 to address labor standards, including health & safety, wages and benefits, working hours, harassment and discrimination, on seed farms.

■ In Kenya, Syngenta and the Syngenta Foundation have developed Farmforce, a mobile-based business solution that simplifies the production management of smallholder farmers, increases crop traceability and enables access to formal markets.



Takii

Access to Seeds
Index

Corporate Data

Headquarters: Kyoto, Japan
Ownership type: Private
Group revenue (2014): Unknown

Takii & Co. Ltd. (Takii) is active in the breeding, production, marketing and sale of vegetable and flower seeds. The company was founded in 1835. It is based in Japan and has operations in the USA, Brazil, the Netherlands, China, Hong Kong, South Korea, India and Indonesia.

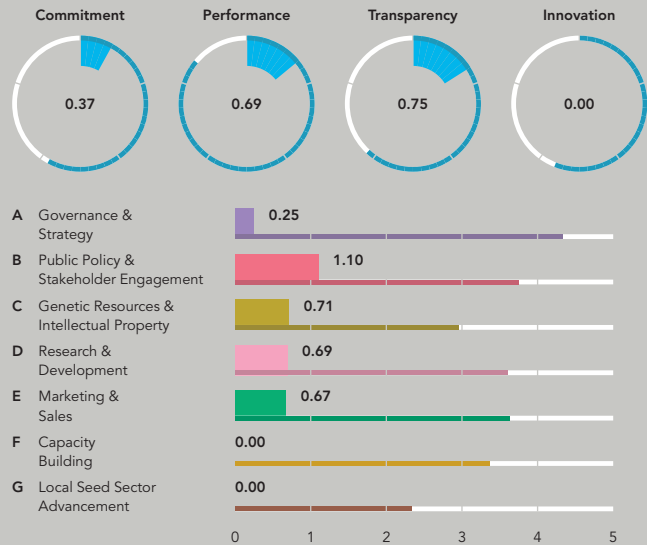
9

rank out of 10
score 0.55

Global Index – Vegetable Seed Companies

Takii ranks ninth in the Global Index of Vegetable Seed Companies. Its poor performance is a reflection of its lack of formal commitments governing its activities related to access to seeds for smallholder farmers as well as an overall lack of transparency.

Nevertheless, the company has put in place some programs that positively impact smallholder farmers and access to seeds. Through its R&D program, it develops disease- and climate-resilient varieties, both of which would benefit smallholder farmers.



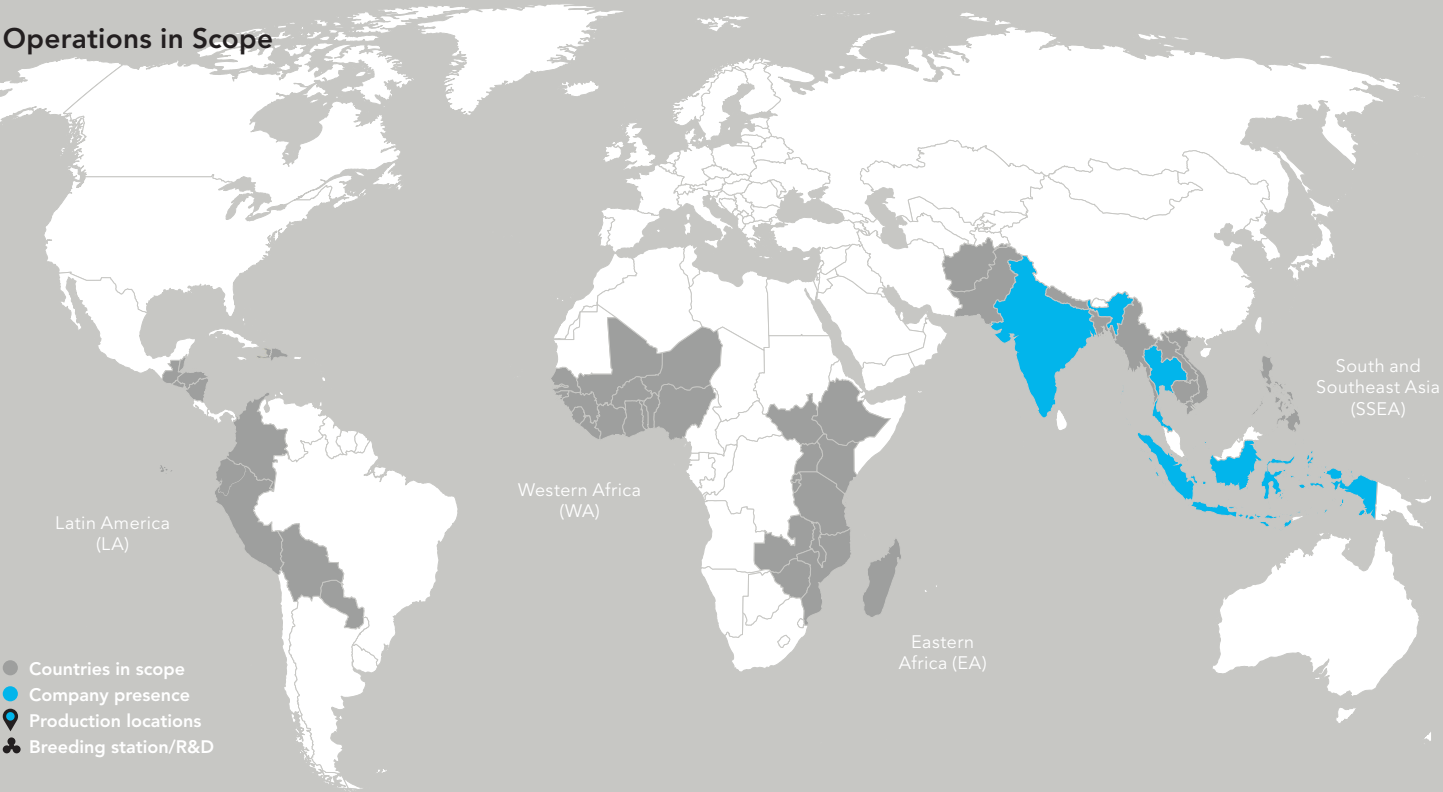
Leading Practices

- No leading practices were identified.

Areas for Improvement

- Overall, Takii is encouraged to disclose more information about its programs and policies related to access to seeds for smallholder farmers. It is also encouraged to articulate a formal commitment that addresses access to seeds for smallholder farmers.
- It is known that Takii has an R&D program dedicated to developing varieties that are disease and climate resilient, traits that are beneficial to smallholder farmers in Index regions. However, the company does not disclose whether and how these varieties are made available to smallholder farmers in Index countries.

Operations in Scope



Index Vegetable Crops in Portfolio

Broccoli	
Cabbage	
Carrot	
Cauliflower	
Chili pepper	
Cucumber	
Eggplant	
Lettuce	
Melon	
Onion	
Spinach	
Squash	
Tomato	
Turnip	
Watermelon	

Notable Findings

- Takii states publicly that it is committed to serving a diverse set of customers by adapting its production to various climate conditions, while working with local research stations. The company is also committed to developing better tasting varieties and varieties resilient to the impacts of climate change.
- The company reports that it has subsidiaries in Indonesia and India but does not disclose information about the scope of the activities of these subsidiaries.



Extension services

East-West Seed trains Malian farmers in advanced agricultural practices such as irrigation and mulching. Extension services and agronomic training can help farmers to realize the full potential of quality seeds of improved varieties.

Part V

Regional Access to Seeds Index for Eastern Africa

The Regional Access to Seeds Index for Eastern Africa evaluates the leading seed companies in this region on their efforts to improve access to seeds for smallholder farmers. A tailor-made methodology was designed, with input from a Regional Expert Review Committee, which addresses the specific challenges faced by smallholder farmers in accessing quality seeds of improved varieties in Eastern Africa. Using the framework developed for the Global Index as a guide, the methodology was adapted at the scope and measurement area levels.

The seven measurement areas for the Regional Index for Eastern Africa are: (1) Governance & Strategy, (2) Public Policy & Stakeholder Engagement, (3) Genetic Resources & Intellectual Property, (4) Research & Development, (5) Marketing & Sales, (6) Capacity Building and (7) Production.

In each measurement area, companies are assessed with indicators in four categories: Commitment, Performance, Transparency and Innovation. The contribution of each of these indicator categories is reflected in each company's score in that measurement area. The practices that received scores on the Innovation indicators (unique in the sector) are highlighted at the end of each measurement area chapter. As innovative practices could not always be identified, this indicator category may be missing from a company's score and some measurement areas.

Agriculture and the Seed Industry in Eastern Africa

Agriculture is the backbone of the economies in Eastern Africa. However, productivity is low²⁴ and the region has one of the highest population growth rates in the world. An estimated 80%²⁵ of farmers are smallholders who cultivate low-yield food crops on small plots²⁶ and rely on rain-fed irrigation with a minimal use of inputs. Farmers obtain seeds through both formal and informal channels, but the latter is by far the largest source. In Kenya, for example, 90% of the seeds used are farm saved or from the informal village market'.²⁷ Climate change is increasingly affecting global crop yields, particularly in resource-constrained regions like Eastern Africa.²⁸ Weather-related crop failure as a result of drought or heavy flooding is common, causing economic losses and undermining food security. Smallholder farmers are particularly vulnerable as they depend on agriculture for their livelihoods. And because smallholders have limited reserves, they have limited resilience and capacity to adapt.

The Seed Industry

Seed companies active in Eastern Africa can be categorized into four groups, namely international, national, regional and niche. The formal seed sector typically originated from public sector institutions. However, from the late 1990s a commercial seed sector started to emerge, mainly as a result of market liberalization and deregulation.²⁹ This encouraged international companies like Monsanto, Syngenta and DuPont Pioneer to start business activities in the region. Several regional and national operators were acquired by international companies, such as the 2013 acquisition of MRI Seed Zambia Ltd. by Syngenta. Similarly, a number of parastatal companies that dominated national markets were privatized,³⁰ such as Zamseed, and others were sold. For example, the National Seed Company of Malawi was purchased by Cargill Seeds and later by Monsanto in 1998.³¹ Other state-owned companies continue to operate, like Ethiopian Seed Enterprise, and focus solely on domestic markets. Kenya Seed Company is also state owned but operates outside state boundaries at a regional level. Victoria Seeds and NASECO started as national businesses and now serve regional markets.

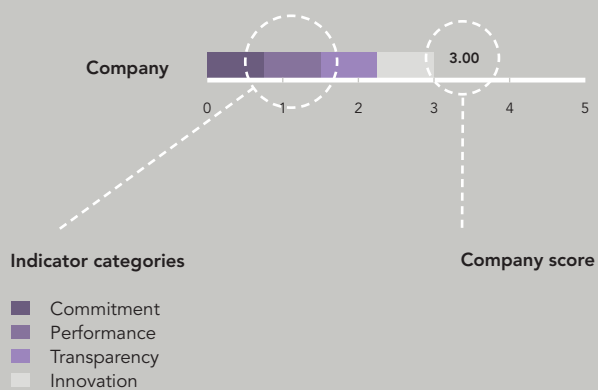
Niche companies constitute a unique category and play an important role at the local level. These companies are diversified in their origin, ownership and mode of operation. They include farmer-based companies or cooperatives, such as Meki Batu in Ethiopia, which sell seeds at grassroots level at local markets. Many of these companies, for instance Dryland Seed Limited in Kenya, specialize in developing varieties for local agroecological zones including drylands and high altitudes typically underserved by the larger seed companies.³² Yet despite the important role they play in the local seed industry, these companies fall outside the scope of the Regional Access to Seeds Index for Eastern Africa, mainly due to their size and limited regional presence.

The Seed Industry and the Business-enabling Environment

A business-enabling environment, supportive of the growth of the formal seed sector, is a necessary condition for delivering high-quality seeds and technologies to smallholder farmers.³³ Governments play a leading role in establishing such an enabling environment. Despite recent efforts to improve seed sector competitiveness in Eastern Africa, inadequate policies and regulations as well as relatively low government investment in agriculture hinder the substantial development of a dynamic and responsive seed industry. These regulatory failures reduce the availability of improved varieties, increase the cost of varieties that do enter the market and hamper future innovation by new seed companies.

An effective seed regulatory framework encompasses effective policies, administrative procedures, regulations and efficient infrastructure supporting business activities by small, medium and large business enterprises. The World Bank identifies five basic elements that contribute to the strengthening of a national seed sector, namely 1) the regulatory framework governing the seed sector, 2) the requirements for the evaluation and registration of new varieties, 3) the availability of initial seed classes, 4) seed quality control requirements and 5) the extent of international and regional trade.³⁴ The state and quality of these elements, but also the political context and government capacity, differ greatly per Index country in the region. For instance, research shows that it takes an average of 12 months for new crop varieties to reach farmers in South Africa, in Zimbabwe it is almost two years, and in Kenya and Uganda it is three years.³⁵ These differences may impact the business opportunities for private seed companies and the prospects to initiate activities.

How the Company Rankings Work per Measurement Area



Measurement Area

A

Governance & Strategy

This measurement area seeks to capture the extent to which seed companies are involved in advancing a professional seed sector on a local level. Companies can contribute to the development of the technical capacity of national agricultural research institutes and training in specific areas for the national seed certification agency. In addition, seed companies have extensive skills and experience in research, seed production and value chains that can be very useful for building a national seed industry. Sharing these skills can be important for developing national seed associations and seed companies, and for the emergence of farmers as local seed suppliers.

One Focus Area

Access to Seeds for Smallholder Farmers

Seed companies can contribute to smallholder farmer development by increasing smallholder farmers' access to knowledge, technologies, varieties and seeds, thereby enhancing their productivity in a sustainable way. A clear commitment coupled with programs and resources to help improve the situation of smallholder farmers explains how companies can contribute based on their portfolios, assets and capabilities.

Main Findings in Governance & Strategy

Regional Index companies integrate smallholder farmers into their business models

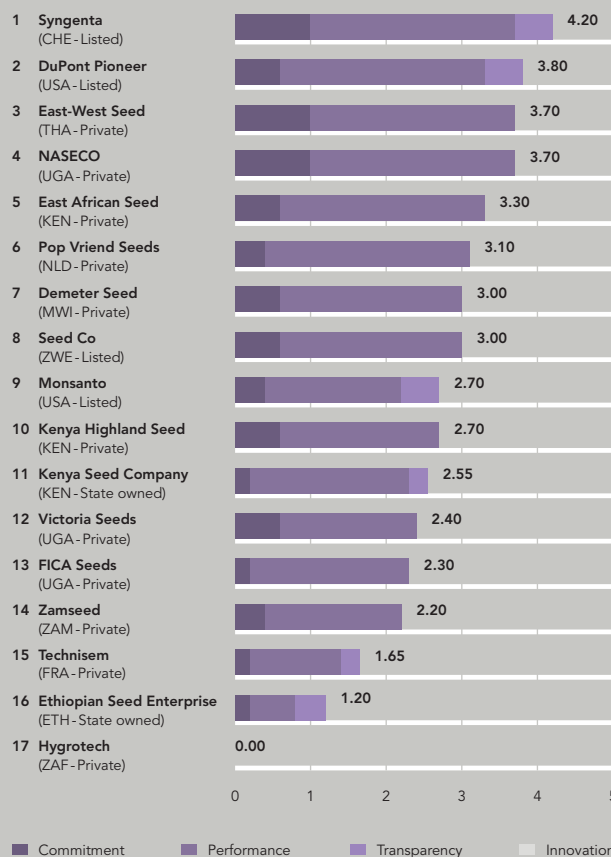
Smallholder farmers make up the essential customer base for five out of 17 Regional Index companies, indicating the importance of smallholder farmers for these companies. One in three companies have formal corporate commitments that are closely aligned with the needs of smallholder farmers. The majority of companies have informal commitments to contribute to farmers' needs but do not explicitly reference smallholder farmers.

Strong programs related to access to seeds are in place; opportunities exist to expand their scope

Six out of 17 companies have strong programs to reach smallholder farmers, yet opportunities exist even among the leaders. Programs could be expanded to cover at least half of the countries in Eastern Africa where Index companies operate. It is worth noting that four of the six companies with strong access to seeds programs also have formal commitments in place.

How Companies Perform

Regional Index – Governance & Strategy



Field crop and vegetable seed company Syngenta leads the measurement area ranking, followed closely by field crop seed company DuPont Pioneer. Vegetable seed company East-West Seed and field crop seed company NASECO are tied in third place. NASECO is based in Uganda and is active in another three Eastern African countries. In these countries, the company has established strategies and programs recognizing and addressing the needs of smallholder farmers.

Hygrotech is the only company that discloses no relevant information. It is thus unclear whether or how the company addresses the needs of smallholder farmers in its business strategy.

No innovative practices were identified for Governance & Strategy.

Focus Area 1: Access to Seeds for Smallholder Farmers

Regional Index companies have accountability and management systems in place

Six out of 17 companies publicly disclose information on their governance & strategy related to access to seeds for smallholder farmers. With the exception of Ethiopian Seed Enterprise and Hygrotech, which disclose no information to this effect, all companies have implemented varying degrees of oversight of issues relevant to access to seeds. Eleven of the 17 companies have instituted a management system with senior management oversight of access to seeds-related programs or activities, and track their progress.

Monsanto, Zamseed and Technisem have a management system and responsibilities assigned for access to seeds-related programs. But in contrast to their peers, they lack a means to measure progress against targets that explicitly address access to seeds for smallholder farmers.

In addition to accountability and management systems, Syngenta, East-West Seed and NASECO have corporate commitments that are closely aligned with the needs of smallholder farmers. These commitments are integrated into corporate mission statements by East-West Seed and NASECO, and into long-term strategies by Syngenta through its Good Growth Plan.

Six companies – DuPont Pioneer, East African Seed, Demeter Seed, Seed Co, Kenya Highland Seed and Victoria Seeds – have less strong commitments, and only DuPont Pioneer's is formal. In its Global Food Security Goals, the company states that it focuses on 'enabling farmers to be more productive', by providing improved seeds and developing stronger food value chains in collaboration with partners.

Regional Index companies demonstrate engagement through activities and programs

While a large number of companies do not formally and consistently address the needs of smallholder farmers in their strategies, 15 out of 17 companies have implemented programs and activities relevant to access to seeds.

Six out of 17 companies have established robust programs to reach smallholder farmers: Syngenta, DuPont Pioneer, East-West Seed, NASECO, East African Seed and Pop Vriend Seeds. All six have a strategic approach and a dedicated budget to meet the needs of smallholder farmers through their programs.

However, opportunities exist even among the leaders. As the programs implemented by the six companies cover less than 50% of the Regional Index countries where the companies are active, there is significant potential to expand.

The country coverage varies significantly among the leaders. East-West Seed's programs cover one of the seven Eastern African countries where the company operates, whereas East African Seed covers three out of nine countries.

Regionally based companies Demeter Seed, Seed Co, Victoria Seeds and Ethiopian Seed Enterprise score in the lower range of the Regional Index in terms of access to seeds programs and dedicated resources. Compared to their leading peers, these companies disclose limited details on their programs and resources.

Who is Responsible for Implementing Access to Seeds Programs?

Formalizing commitments and assigning responsibilities are of great importance for setting and meeting targets. Targets are also more likely to be achieved when responsibility is assigned at a more senior level.

Despite few formal commitments by Regional Index companies, senior management is usually assigned responsibility for reaching access to seeds-related targets. The approach to assigning responsibility and accountability for access to seeds activities differs.

Kenya Seed Company and FICA Seeds hold their boards of directors accountable for policies, commitments and targets. The management of the two companies is responsible for access to seeds-related activities. FICA Seeds' CEO spearheads initiatives for supporting smallholder farmers. Kenya Highland Seed has a management structure that includes the two directors, with

assistance from the Sales and Product Development teams, for establishing commitments, programs and activities and achieving access to seeds targets.

NASECO's managing director is responsible and accountable for programs and activities related to access to seeds. The company's management team also discusses breeding, R&D, seed production and marketing.

Demeter Seed's general manager is responsible and accountable for access to seeds policies, strategies, commitments and targets as well as related programs and activities. By comparison, Victoria Seeds' marketing department is responsible for access to seeds policies, commitments and targets. Together with the operations department, the marketing department is also responsible for programs and activities related to smallholder farmers.

Measurement Area

B

Public Policy & Stakeholder Engagement

This measurement area seeks to capture how companies engage with policymakers and other stakeholders to influence national, regional and international policies and markets in ways that can affect access to seeds for smallholder farmers. Companies can be actively involved in collaborative initiatives, international alliances or seed associations that play a role in seed sector development in Eastern Africa.

Three Focus Areas

Industry Engagement

Companies are in a position to promote awareness of the role that the seed industry can play in smallholder farmer development through access to seeds. Through active membership in seed associations and industry organizations, including participation on boards, in relevant committees and working groups, seed companies can contribute to a greater understanding of the specific needs of smallholder farmers in Index countries and the opportunities to meet those needs.

Multi-stakeholder Initiatives

In order to contribute to global food security and improved access to seeds, it is important that seed companies engage and collaborate with stakeholders. These include universities, international research organizations, farmer organizations, local and international NGOs, and industry peers. Examples of such collaborations are the establishment of public-private partnerships or participation in international alliances.

Lobbying and Public Dialogue

Seed companies have a significant influence on public policy matters relevant to access to seeds. Many stakeholders stress that lobbying activities in Index countries should go through national trade associations. The policy positions that companies advocate through their lobbying activities, as well as their participation in trade associations, think tanks, interest groups or other organizations, are an important element of their contribution to access to seeds. It is crucial that companies are transparent about their lobbying activities as well as their membership in and financial support for trade associations and other organizations that advocate public policy positions that may impact access to seeds. Moreover, seed companies are in a position to engage actively in the public debate on global food security.

Main Findings in Public Policy & Stakeholder Engagement

The majority of Regional Index companies actively participate in industry associations

The majority of companies participate in national industry associations, but the African Seed Trade Association (AFSTA), a regional initiative, is the organization of which the most companies are members.

Opportunities exist to develop formal policies on engagement and industry collaborations

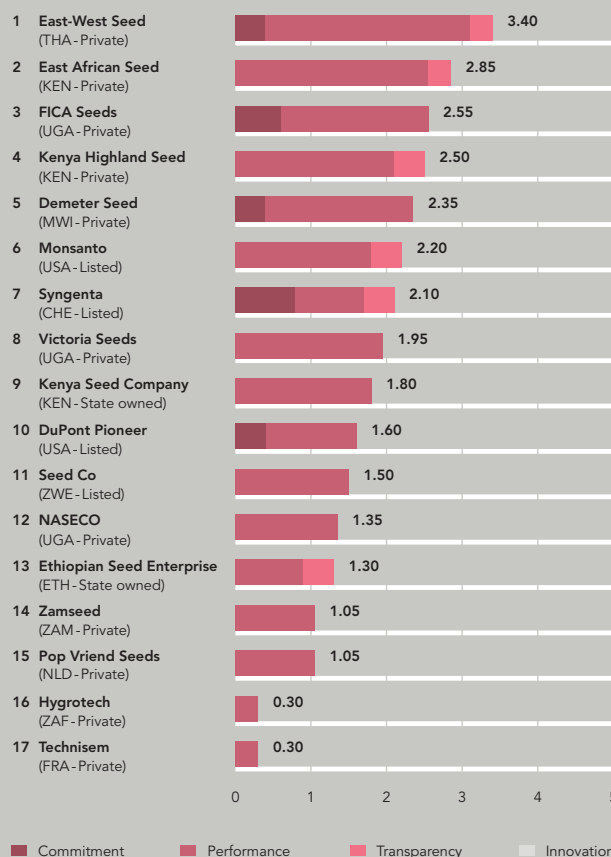
There is an opportunity for companies to develop formal commitments or policies that govern their engagement in multi-stakeholder and industry collaborations. Only one company, Syngenta, currently has a policy of this kind in place. Several other companies have general statements regarding this issue, but they are not considered formal commitments.

The regional industry's perspective is represented in international dialogue

Companies are helping to ensure that the regional industry's perspective is represented in international dialogue. Several companies leverage their influence to advocate policies related to creating market linkages and improving the affordability of seeds. Moreover, the majority of companies take part in international conferences, roundtables and/or workshops where they represent the regional industry's perspective.

How Companies Perform

Regional Index – Public Policy & Stakeholder Engagement



The three companies that score best in this measurement area are East-West Seed, East African Seed and FICA Seeds. East-West Seed tops the ranking for its willingness to advocate public policy positions that benefit smallholder farmers as well as its participation in global and regional multi-stakeholder initiatives, and regional and national trade associations.

The leading companies engage in public policy advocacy through trade associations and other channels on issues of interest to smallholder farmers. Furthermore, the leaders are not only members of numerous regional and national seed trade organizations, they are also active on the boards and executive committees of these organizations. For example, East-West Seed's general manager sits on the executive committee of the Tanzanian Seed Trade Association; East African Seed's CEO previously chaired the African Seed Trade Association and the Seed Trade Association of Kenya; and FICA Seeds is a member of the executive committees of the African Seed Trade Association and the Uganda Seed Trade Association.

The average performers in this measurement area, which include Monsanto, Syngenta, Victoria Seeds, Kenya Seed Company and DuPont Pioneer, often do not have a policy guiding their stakeholder and industry engagement activities. Although they do not oppose public policies that support smallholder farmers, it is often unclear whether or how they leverage their influence to support policies that align with smallholder farmers' interests. Nevertheless, the average performers often participate in multi-stakeholder initiatives and industry associations, and several make an effort to represent the regional industry's perspective in international forums.

Four out of 17 companies – Zamseed, Pop Vriend Seeds, Hygrotech and Technisem – score poorly relative to their peers, largely due to a lack of transparency around their public policy and stakeholder engagement activities. Although none of the poor performers is engaged in activities that inhibit access to seeds for smallholder farmers, neither do they appear actively to support the interests of smallholder farmers or multi-stakeholder initiatives related to access to seeds. That being said, Pop Vriend Seeds makes some effort to represent the regional industry's perspective in international forums, and Zamseed is an active member of both local and regional seed trade associations.

Low-scoring companies can improve their performance by developing a policy or formal commitment to govern their stakeholder and industry engagement activities; engaging in collaborative multi-stakeholder initiatives, whether through trade associations or other organizations; and publicly disclosing these activities.

No innovative practices were identified for Public Policy & Stakeholder Engagement

Regional Index companies are members of national and regional industry associations, and several companies sit on boards or executive committees

Thirteen out of 17 companies participate in national or regional industry associations. Notably, ten out of the 17 companies are members of the African Seed Trade Association (AFSTA), a regional initiative, and the same number of companies hold memberships in national associations. Associations mentioned include the Seed Trade Association of Kenya (STAK), the Tanzania Seed Trade Association (TASTA) and the Uganda Seed Trade Association (USTA).

Companies are also assuming leadership roles within these industry associations. In fact, 11 of the companies participating in industry associations also sit on boards or committees and/or participate in working groups within these organizations. Companies in leadership positions are particularly well placed to support and promote smallholder farmer development. Seven out of 17 companies score full points in this area. These companies have not only assumed leadership roles but are also using their memberships to advance the interests of smallholder farmers.

Focus Area 2: Multi-stakeholder Initiatives

Regional Index companies are willing to collaborate in regional and global multi-stakeholder initiatives that support the interests of smallholder farmers

More than half of the companies (11 out of 17) are engaged in multi-stakeholder initiatives. East-West Seed, Monsanto and DuPont Pioneer outperform their peers in this area for participating in both regional and global initiatives. Furthermore, the company was one of three partners, alongside Rijk Zwaan and Wageningen University, to be awarded a grant to establish the African Institute for Vegetable Technology under the Seeds of Expertise for the Vegetable Industry of Africa (SEVIA) project, and to develop the African vegetable seed sector by providing varieties adapted to farmers. DuPont Pioneer demonstrates its leadership in multi-stakeholder engagement by supporting the African Biofortified Sorghum initiative, which aims to improve the productivity of smallholder farmers in Ethiopia. In addition, it participates in several global initiatives such as Grow Africa, Grow Asia and the World Economic Forum's New Vision for Agriculture.

Eight out of 17 companies disclose some information on their participation in regional and global multi-stakeholder initiatives, but six out of 17 companies do not disclose any information. Examples of unique collaborations include Kenya Highland Seed's partnership with the Africa Enterprise Challenge Fund to train smallholder farmers in Kenya, Uganda and Tanzania and thereby 'improve revenue income as well as food security by providing hybrids to increase crop yields'. In addition, East African Seed, Monsanto and Kenya Seed Company participate in Water Efficient Maize for Africa (WEMA). WEMA is a public-private partnership to develop drought-tolerant and insect-resistant maize, and to make the varieties available royalty-free to smallholder farmers in sub-Saharan Africa.

Regional Index companies may consider developing policies to guide their approach to multi-stakeholder collaboration and engagement

Only five out of 17 companies have a commitment to work with stakeholders and engage in industry dialogue. However, four of these five commitments are informal, meaning they are not contained within a formal policy. Companies are encouraged to develop policies to articulate and formalize their commitment to multi-stakeholder collaboration and engagement.

Syngenta demonstrates leadership by having a formal policy in place: its stakeholder and industry engagement commitment is contained within its Good Growth Plan. The company states that it is committed to improving farmer productivity, including smallholder farmers, by working 'in partnership with governments, farmers, NGOs, international organizations and academics'. However, although Syngenta outperforms all other companies in this focus area, its statement does not include a commitment to lobby for the interests of smallholder farmers.

Focus Area 3: Lobbying and Public Policy Dialogue

Public policy advocacy centers on market linkages and seed affordability

Although none of the Regional Index companies appears to be engaging in public policy advocacy that inhibits access to seeds for smallholder farmers, six out of 17 companies do not engage in public policy advocacy that supports smallholder farmers' interests. For the remaining 11 companies that are engaged in advocacy, activities are commonly centered on creating market linkages and improving seed affordability.

Companies proactively represent the regional industry's perspective in broader international discussions and global forums

Although six out of 17 companies do not disclose any activities in this measurement area, the remaining 11 take part in international forums and represent the regional industry's perspective at these forums. East African Seed and FICA Seeds outperform their peers not only by participating in at least five forums but also engaging senior leadership in these forums. For example, FICA Seeds represents the regional industry through its executive level membership in the Uganda Seed Trade Association and at global forums when it is invited. The company states that it has attended several global forums (although it does not specify which ones) where it provided information on the seed sector in Uganda. It has also presented papers on various relevant topics. Similarly, East African Seed's senior management is involved in the African Seed Trade Association and has used its membership to promote access to modern technologies for African farmers.

Among the remaining companies, Kenya Highland Seed states that it has participated in discussions on the vegetable seed industry at two African Seed Trade Association congresses in the last two years; Kenya Seed Company reports sending delegations, including its CEO and technical staff, to various conferences such as ISF, ISTA and Borlaug Global Rust Initiative forums; and NASECO has been involved in various working groups where it advocated a harmonized seed movement, and has assisted in the harmonization process of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).

Leveraging Seed Association Memberships to Further Smallholder Farmers' Interests

Improving the affordability and availability of seeds for smallholder farmers is a common theme among Regional Index companies that engage in lobbying and public policy activities. Several companies participate in these practices through their memberships in national seed trade associations. For example, East African Seed and Victoria Seeds lobbied for agricultural inputs in

Uganda to be exempt from value-added tax, helping to ensure that the price of these inputs is affordable for farmers. The tax regime levied in June 2014 was reversed in November 2014. In another example, East-West Seed's managing director, in his role as president of the African Seed Trade Association, advocated policies supporting access to agricultural technologies for African farmers.

Measurement Area

C

Genetic Resources & Intellectual Property

Access to genetic resources is vital for seed companies and smallholder farmers to develop new varieties. At the same time, intellectual property (IP) protection enables companies to generate a return on R&D investment through licensing. IP protection can, however, have implications for established smallholder practices such as farm-saved seeds and the breeders' exemption. This measurement area therefore seeks to clarify and assess companies' positions on these issues.

Three Focus Areas

Conservation and Use of Crop and Genetic Diversity

The growth of the formal seed sector can reduce local crop diversity currently conserved in situ by farmers and communities. Seed companies can help preserve local crop diversity and informal seed systems by supporting freely accessible public gene banks for ex situ conservation and community seed banks for in situ conservation. Additionally, companies can help preserve agricultural diversity, e.g. by engaging with local governments, supporting the Global Crop Diversity Trust and the International Treaty for Plant Genetic Resources for Food and Agriculture, and continuing to breed using local varieties from public and private gene banks.

Access to Genetic Resources

Access to genetic resources is important for breeding companies, public research institutes and smallholder farmers to develop varieties tailored to local conditions and crop preferences. Support for public gene banks and community seed banks, as well as access to company gene banks and commercial varieties for further breeding, can facilitate the development of new varieties appropriate for smallholder farmers.

Intellectual Property Rights

The handling of intellectual property rights can significantly impact access to seeds for smallholder farmers. The long-established breeders' exemption makes commercial varieties available for further breeding; the farmers' privilege allows on-farm seed saving. This access may, however, be restricted by the use of contractual clauses and patents, not just on plant varieties but also on traits, methods and technologies. Conversely, specific licensing strategies can improve access to patented varieties, traits, methods and technologies for national agricultural research institutes and private plant breeders to develop new varieties appropriate to the needs of smallholder farmers.

Main Findings in Genetic Resources & Intellectual Property

National and regional companies are stronger than their global counterparts in Performance, but not in Commitment

Companies that originate in Eastern Africa and have activities in one or multiple countries outperform their counterparts that originate outside the region on the conservation and use of genetic resources and on support for public gene banks. Performance on access to company genetic resources shows a similar pattern. However, while global companies that originate outside the region display average performance overall, they publicly disclose strong commitments.

Regional Index companies collaborate with national and international partners in the area of genetic resources

Most national and regional companies work with partners in their country of origin to encourage the conservation and use of a diverse set of crops and genetic resources, support public gene banks and provide access to company genetic resources. These partners are typically part of the national agricultural research system and comprise universities, gene banks and public research institutes. In addition, five of the six companies collaborating with national partners also work with international research institutes such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Global companies that originate outside the region collaborate primarily with international research partners or provide support in large-scale partnerships such as Water Efficient Maize for Africa (WEMA).

Positions and activities related to genetic resources & intellectual property are not transparent

While global companies that originate outside Eastern Africa publicly disclose commitments or activities related to genetic resources & intellectual property, not one of their regional counterparts does so publicly. On engagement, however, nine out of the 11 national and regional companies that originate in Africa provided commitments. These commitments do not necessarily translate into initiatives, however, as only seven companies undertake activities relevant to this measurement area.

Regional Index companies are divided in their support for farm-saved seeds

Although saving seeds is a common practice among many small-holder farmers in Eastern Africa, five out of 13 companies (38%) reporting on this issue oppose farm-saved seeds. This position is driven by companies' strategic focus on affordable hybrids rather than open-pollinated varieties (OPVs) as well as claims about the quality of farm-saved seeds and food security risks.

Regional Index – Genetic Resources & Intellectual Property



Syngenta, DuPont Pioneer and Monsanto lead this measurement area, thanks to a combination of average scores on Performance and high scores on Commitment. These companies are committed to the conservation and use of a diverse set of crops and genetic resources in Regional Index countries, and publicly disclose (at least partially) their policies and practices regarding intellectual property protection. Syngenta, in first place, has formalized its commitments and explicitly makes an exception for subsistence farmers, as its policy is 'not to enforce patent rights where agriculture is undertaken for subsistence purposes'. Behind Syngenta are DuPont Pioneer and Monsanto, which score highly on access to company genetic resources for donating germplasm to the African Biofortified Sorghum (ABS) initiative, Water Efficient Maize for Africa (WEMA) and the Bt Cowpea Partnership. These are three partnerships in which companies have donated germplasm or participate in research for the development of genetically modified crop varieties with a specific focus on developing traits that are also useful for smallholder farmers. These projects have not yet resulted in commercially available GM varieties in the Regional Index countries. All companies involved have committed to ensuring and managing biosafety of GM varieties.

The large group of companies in the mid-range of this measurement area typically have similar activities to the higher performers but lack commitments related to genetic resources. East African Seed, which ranks fifth, helps local gene banks to conserve genetic material in Kenya, Tanzania and Uganda. However, it lacks commitments on the conservation and use of crop and genetic diversity. NASECO, in ninth place, stands out for its germplasm donations to the Maize and Wheat Improvement Center (CIMMYT) and National Crops Resource Research Institute of Uganda. But it also lacks commitments on the conservation and use of crop and genetic diversity.

Ethiopian Seed Enterprise and Hygrotech rank at the bottom of this measurement area. These companies appear to lack both commitments and activities that support the conservation and use of crop and genetic diversity in Regional Index countries. Technisem and Kenya Highland Seed perform marginally better due to existing albeit weak commitments.

No innovative practices were identified for Genetic Resources & Intellectual Property

Focus Area 1: Conservation and Use of Crop and Genetic Diversity

Opportunities remain to scale up partnerships with local gene banks in Eastern Africa

Only three companies, including Kenya Seed Company and Seed Co, currently engage in partnerships with gene banks in Eastern Africa to multiply and/or characterize and evaluate germplasm that may be suitable for smallholder farmers in Index countries. In total, there are 11 partnerships, with six partners focusing on four different crops. These partners are either Kenyan or international research institutes. Furthermore, in six of the 11 partnerships, the focus is on maize.

For example, Kenya Seed Company, which ranks fourth, collaborates with the national seed banks at the Genetic Resources Research Institute in Kenya, and with international research institutes CIMMYT and ICRISAT to characterize and evaluate germplasm of maize, sorghum and finger millet. For maize, the traits include tolerance to abiotic stress such as drought or resistance to pests and diseases such as streak virus. For sorghum, the company also focuses on nutritional traits. In total, 920 accessions³⁶ of maize have been tested and assessed, and 100 of both sorghum and finger millet.

Clear opportunities exist to increase gene bank support to include vegetable crops, which are not currently part of any of the partnerships, and to expand to other Regional Index countries. Support includes in-kind donations, financial contributions and technical assistance with multiplication of germplasm that could be relevant for smallholder farmers in Regional Index countries.

Companies partner with local gene banks or support international research institutes

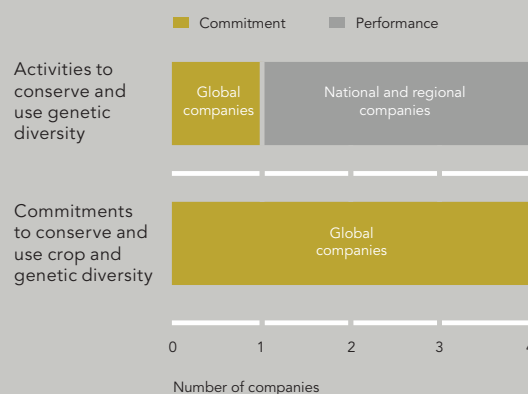
Aim of partnership	Company	Crop	Partner
Multiplication	East African Seed	Maize	CIMMYT
			AATF
			KALRO
		Sorghum	ICRISAT
		Pigeon pea	ICRISAT
		Beans	KALRO
Characterization & evaluation	Kenya Seed Company	Maize	CIMMYT
			ICRISAT
			GeRRI (KALRO Genetic Resources Research Institute)
		Sorghum	ICRISAT
	Seed Co	Maize	Kenyan public gene bank

Opportunities exist to improve commitments to conserve and use crop and genetic diversity

Global companies differ from national and regional companies in the quality of their commitments to crop and genetic diversity. Whereas Syngenta, DuPont Pioneer, Monsanto and East-West Seed all have commitments, formalized or not, national and regional companies do not disclose any commitments of this type.

However, commitments and activities do not always correspond: Kenya Seed Company, East African Seed and Zamseed, for instance, have activities to conserve and use crop and genetic diversity but without corresponding commitments. Thus, companies that originate outside Africa have opportunities to put their commitments into practice within the Index region; and companies that originate in the region have opportunities to disclose commitments, preferably formalized as policies, to better reflect their actual performance.

Commitment and Performance pattern of Index companies with regard to the conservation and use of crop and genetic diversity



Focus Area 2: Access to Genetic Resources

C

The majority of Regional Index companies provide access to their genetic resources in Eastern Africa

Seed companies, research institutes and multi-stakeholder initiatives are involved in the research & development of quality seeds of improved varieties for the region. Partners can benefit from increased access to one another's germplasm and traits. Often, companies' germplasm falls under plant variety protection (PVP) or intellectual property (IP) protection. On the one hand, this IP protection enables companies to generate a return on their R&D investments. On the other, it can impact farm-saved seeds and the breeders' exemption. Striking a balance between protection and access is therefore a challenge for the industry. In light of this challenge, it is notable that a relatively high ten out of 17 companies (59%) grant access to their genetic resources for the benefit of smallholder farmers in Index countries.

In most of these cases, companies donate their germplasm, including germplasm with abiotic stress tolerance, to local or international research partners, who then use it for research and breeding purposes. NASECO has donated MLN-tolerant lines to

CIMMYT and the National Crops Resources Research Institute (NACRRI) of Uganda. Kenya Seed Company has donated germplasm for drought-tolerant maize to CIMMYT's Drought Tolerant Maize for Africa (DTMA) project and disease-resistant maize to Water Efficient Maize for Africa (WEMA), a public-private partnership led by the Kenya-based African Agricultural Technology Foundation (AATF).

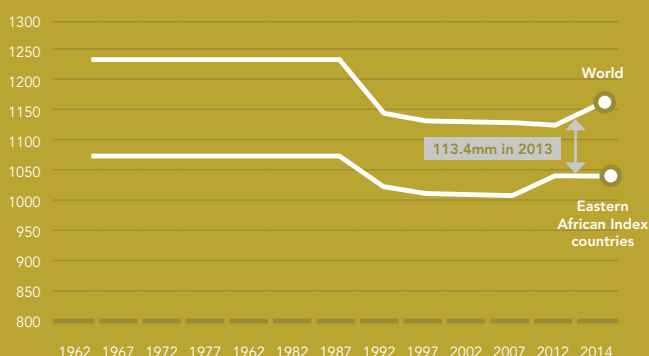
Among the companies that originate outside Eastern Africa, Monsanto contributes germplasm to the WEMA project, and has donated royalty-free IP for cowpea to the Bt Cowpea Partnership. DuPont Pioneer undertakes similar efforts, donating germplasm to the African Biofortified Sorghum (ABS) initiative. Additionally, the company is currently in talks with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to allow the research institute access to its millet germplasm. Among the vegetable seed companies, East-West Seed has contributed its germplasm to Seeds of Expertise for the Vegetable Sector of Africa (SEVIA), and to the Afrisem partnership with Rijk Zwaan.

Sharing Germplasm and Biotechnology Traits for Water-efficient Maize

Eastern Africa is relatively prone to drought, of which the 2011 drought in the Horn of Africa is one of the most extreme examples. Many of the region's smallholder farmers rely on rain-fed

agriculture for their livelihoods, and with climate change causing increasingly erratic rainfall, the need for improved drought-tolerant varieties is pressing.

Average rainfall in Eastern Africa is consistently lower than the global average



Average precipitation
(mm per year)

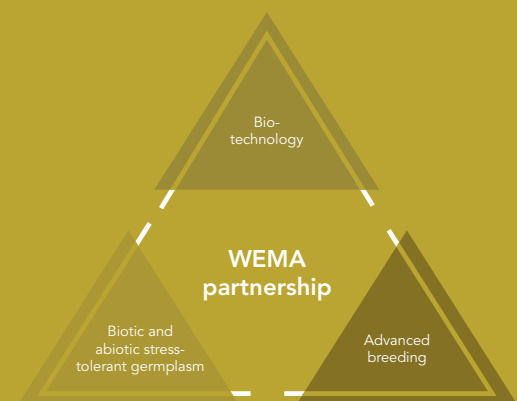
The Water Efficient Maize for Africa (WEMA) partnership is working to address these issues by developing and marketing royalty-free varieties of drought-tolerant and insect-protected maize. Coordinated by the African Agricultural Technology Foundation (AATF), it combines three complementary approaches: germplasm, which is chosen specifically for Africa; advanced breeding, which allows direct selection for beneficial drought-tolerance characteristics in germplasm; and biotechnology to enhance the improved germplasm.

Monsanto and Kenya Seed Company contributed to this effort in the early stages by donating germplasm. Kenya Seed Company contributed disease-tolerant maize and Monsanto

contributed maize varieties from its global proprietary collection. Although the name of the partnership suggests a focus on drought tolerance, insect protection is equally important, as 'some of the most dramatic losses occur when drought conditions and insect pressure combine in the field'. Insects reduce plants' ability to use water and nutrients, which are already limited in many of the areas where smallholder farmers are active.

In addition, Monsanto licensed two biotechnology traits to further enhance the improved germplasm. The activities of both companies, combined with efforts by the other partners, resulted in the release in 2014 of the first WEMA hybrid maize varieties in Kenya, Tanzania and Uganda.

The WEMA partnership combines three complementary approaches to develop improved maize varieties



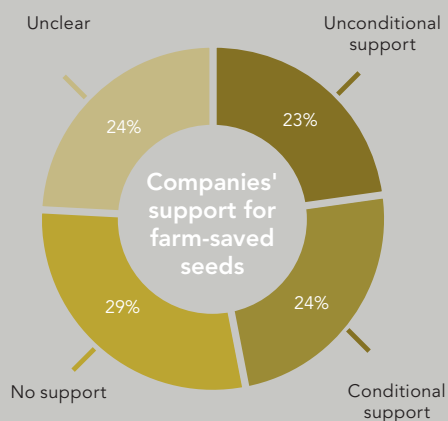
Focus Area 3: Intellectual Property Rights

Regional Index companies are divided in their support for farm-saved seeds

Farm-saved seeds rank high on companies' agenda, with 13 out of 17 companies (76%) articulating a position on the issue. Currently, these positions differ. Eight companies (62% of those with a position) support the practice, while the remaining five (38%) argue that it does not encourage smallholder farmer productivity.

Most companies that oppose farm-saved seeds explain their stance from a business or environmental perspective. Kenya Seed Company, for instance, does not encourage farm-saved seeds, stating that it provides improved seeds of open-pollinated varieties (OPVs) 'at affordable rates to farmers in the region'. Kenya Highland Seed cites environmental reasons, stating that due to the potential loss of traits, farm-saved seeds are 'detrimental to the income revenues of the farmer and ultimately food security'. East African Seed similarly expresses concerns that farm-saved seeds will result in 'genetic drift', and reduced crop productivity and farmer profitability.

Regional Index companies are divided in their support for farm-saved seeds



Measurement Area

D

Research & Development

This measurement area focuses on companies' research & development efforts, including through partnerships with (local) research institutes, especially activities that consider local conditions in the Index region and key crops for farmers in this region. These activities include adapting global crops for local use and breeding programs aimed at improving e.g. the yield, pest and disease resistance and climate resilience of local crops.

Three Focus Areas

Improved Varieties for Smallholder Farmers

Plant-breeding activities tailored to the needs and preferences of smallholder farmers in Index regions demonstrate companies' commitment to the development of improved varieties. By conducting variety trials and on-farm demonstrations, companies can test varieties in their existing portfolio for suitability in the Index region. They can also contribute to the availability of improved varieties in the Index region through dedicated breeding programs or targeted approaches in their general breeding programs focusing on both global and local crops.

Specific Traits for Smallholder Farmers

Dedicated programs to develop specific traits with tolerance to abiotic stresses such as heat, drought, flooding and salinization and resistance to pests and diseases, can significantly improve crop yield and performance. Such traits can subsequently be used in breeding programs with local varieties for Index countries. Similarly, the development of improved varieties with specific traits that increase the nutritional value of crops can contribute greatly to food and nutrition security.

Local Cooperation

Specific needs, preferences and knowledge can be incorporated into companies' breeding programs by involving local farmers, consumers and other stakeholders in the variety selection through variety trials and demonstrations. Cooperation with local research institutes and farmer organizations can also be of tremendous value. In some cases, local research institutes may already have developed germplasm that is available for use in breeding programs.

Main Findings in Research & Development

Regional Index companies breed for virtually all global crops

Companies breed improved varieties for smallholder farmers for all but one global field crop (foxtail millet) and all but three global vegetable crops (chicory, garlic and gherkin). Companies breed primarily for resistance to pests and diseases and tolerance to abiotic stresses, but also focus on other important characteristics such as cultural and nutritional values. The total harvested area of the three crops not bred is relatively small and thus does not represent a material opportunity for breeding expansion.

Maize, tomato and onion are the most popular crops within their respective crop groups. Eight of the 11 companies involved in field crops are developing new varieties of maize, by far the region's largest crop in terms of area harvested, amounting to 15 million hectares,³⁷ an area bigger than Malawi. Six of the 14 companies involved in vegetable seeds are breeding new varieties of tomato and/or onion.

The industry targets local crops

Companies breed improved varieties for smallholder farmers in Eastern Africa for seven of the ten local priority crops. These crops were identified based on stakeholder consultations and, as for the Global Index crops, are divided into field crops and vegetables. Amaranth is the most popular local vegetable crop, with five companies breeding for broad adaptation and high and medium altitudes. The most popular local field crops are cowpea and pigeon pea, for each of which two companies have a breeding program. Only for lablab, a species of bean native to Africa, and tef, a food grain grown in Ethiopia and Eritrea,³⁸ was no evidence found that they are in the breeding programs of companies in the scope.

Regional Index companies utilize their local presence in R&D

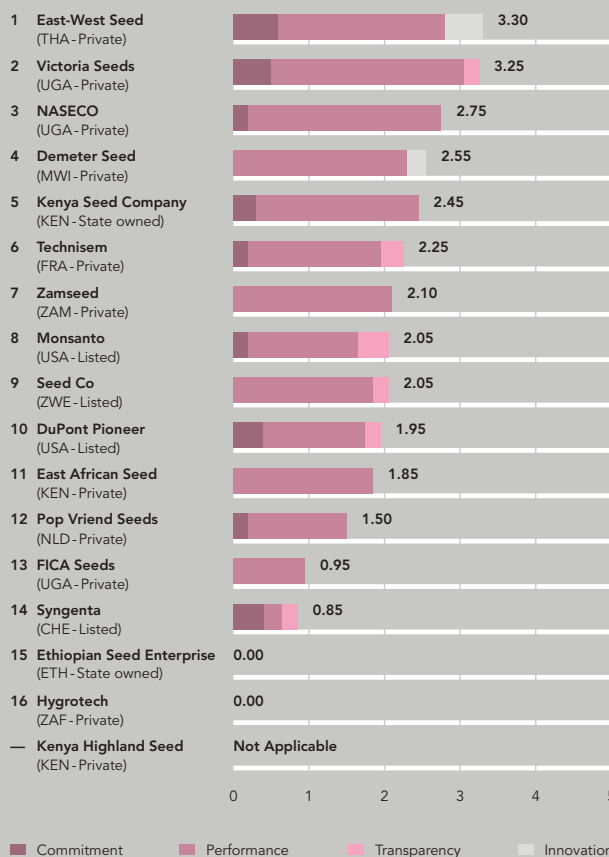
Companies utilize local farmers in several ways during research, pre-breeding and breeding. During research and pre-breeding, 11 seed companies actively collaborate with smallholder farmers to inform their R&D decisions, either directly or indirectly. Notably, four companies state that they involve women farmers in this process. During the breeding stage, companies again partner with smallholder farmers, but in this case for participatory breeding in which smallholder farmers are part of on-farm trials and variety selections. In addition to farmers, 11 companies partner with national and international research institutes or local private partners in breeding varieties for Eastern Africa.

Regional Index companies focus on results

Companies tend to be more focused on R&D results than on formalizing R&D commitments. While results are valued, commitments could help companies to determine a strategic direction.

How Companies Perform

Regional Index – Research & Development



East-West Seed and Victoria Seeds lead this measurement area, with strong performance across all indicators. They are followed by NASECO, Demeter Seed, Kenya Seed Company and Technisem, which all perform well on testing existing varieties and developing new varieties for smallholder farmers but lack formal commitments and transparency. The companies differ significantly in the allocation of R&D budgets for varieties/traits suitable for smallholder farmers, ranging from 10% to 100% of R&D budget, and breeding programs for suitable traits.

The low-ranking companies disclose limited information. Yet even among these companies some interesting activities can be identified, for instance in collaborative research.

Ethiopian Seed Enterprise and Hygrotech are the only companies that do not disclose any details about their R&D activities, making it unclear how their R&D approach relates to smallholder farmers.

Focus Area 1: Improved Varieties for Smallholder Farmers

Regional Index companies actively breed new and improved varieties of Global Index crops

If Global Index crops are prioritized, based on the area harvested in Eastern Africa and the number of companies breeding new varieties of these crops, it becomes apparent that companies are breeding improved varieties of all the most popular crops. Ten out of 17 companies breed field crops and 11 breed vegetable crops. Maize is the most popular field crop, as eight out of the 11 companies with field crops in their portfolio breed new varieties. Chili pepper, onion, watermelon and tomato are the most popular vegetable crops. Five out of the 14 companies with vegetable crops in their portfolio breed new varieties of cabbage, chili pepper and watermelon, while onion and tomato are in the breeding programs of six vegetable seed companies. The table shows the number of companies breeding new varieties, and the area harvested for these crops.

Number of Regional Index companies breeding new varieties and the area harvested for these crops.

Number of Regional Index companies breeding new varieties	Area harvested		
	Small	Medium	Large
	Large		
	Average		
Small	Small		
	Medium		
	Large		
	Average		
Average	Small		
	Medium		
	Large		
	Average		
Small	Small		
	Medium		
	Large		
	Average		

For the number of companies breeding, small is <3 companies, average 3-5, large >5. For field crop area harvested, small is <0.5 mln ha, average 0.5-2 mln ha, large >2 mln ha. For vegetable crop area harvested, small is <5,000 ha, average 5-50,000 ha, large >50,000 ha

Three categories of crops deserve further mention. Firstly there are crops that are popular with farmers but for which only an average number of companies breeds new varieties. These are three field crops, dry beans, rice and wheat, and one vegetable crop, sweet pepper. The reasons for crop breeding preferences of Regional Index companies in these crops may be found on various levels. Rice, wheat and dry beans are usually sold as OPVs and not as hybrids, although this is not the case for sweet pepper. Also, at the company level, companies may be focusing on crops with relatively aligned R&D processes to achieve cost efficiencies. At the industry level, some companies have specialized in breeding specific crops for which they have established a market presence.

Zamseed, for instance, invests in wheat. Victoria Seeds stands out for its sweet pepper breeding activities. In addition, public research institutes and multi-stakeholder partnerships play a relatively significant role in the development of improved varieties of some of these crops. For example, improved varieties of dry beans and rice have been or are currently being developed by research institutes or in partnerships. NASECO, for instance, markets rice varieties developed by the Consultative Group on International Agricultural Research (CGIAR) institutes and focuses its own breeding on broad adaptation.

The fact that there is little or no breeding ongoing in the region for crops that are moderately popular with farmers such as foxtail millet, potato, garlic, leek, gourd and turnip may indicate a gap, although niche seed companies and the informal seed system might play an important role for these crops.

The third category encompasses crops with a relatively small harvested area but extensive breeding, including field crop soybean and vegetable crop watermelon. This could be explained by the fact that these crops have a large global significance and are marketed on a world scale so are relatively easy to have in a portfolio in Eastern Africa as well.

Regional Index companies breed new varieties of local priority crops

Eight companies have breeding programs for local crops. These breeding programs cover all local priority crops except for tef and lablab. Amaranth is the most popular local vegetable crop, while cowpea and pigeon pea are the most popular local field crops. The popularity of amaranth and cowpea in breeding programs reflects the growing popularity of these crops in Eastern African cuisine and the fact that they are well adapted to regional cultivation conditions.³⁹

Local crop activities of Regional Index companies

● No. of companies known to distribute
● No. of companies known to have a breeding program

Local Field Crops	1	2	3	4	5	6	7
Chickpea	●						
Cowpea	●	●	●	●	●	●	●
Lablab	●						
Pigeon pea	●	●	●	●			
Tef	●	●					
Local Vegetable Crops							
Amaranth	●	●	●	●	●	●	●
Black nightshade	●	●	●	●	●		
Crotalaria	●	●	●				
Jew's mallow	●	●	●	●			
Spider plant	●	●	●	●			

Focus Area 2: Specific Traits for Smallholder Farmers

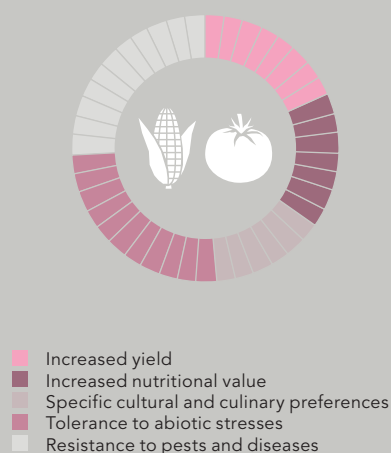
Regional Index companies have implemented breeding strategies for smallholder farmers

All companies focus on a broad set of traits useful for smallholder farmers in their breeding programs. These include tolerance to abiotic stresses, such as high temperatures, and resistance to biotic stresses, such as locally occurring pests. For instance, Kenya Seed Company breeds maize for drought traits, whereas East African Seed breeds maize for tolerance to maize lethal necrosis (MLN) disease.⁴⁰

Seven companies focus on increased nutritional values as part of their breeding programs, which include breeding for traits such as vitamin or mineral content. NASECO, for example, breeds yellow maize with increased pro-vitamin A content. Six companies also focus on specific cultural and culinary preferences, which can be related to certain colors or tastes. Here, several types of traits were identified, ranging from lower bitterness in black nightshade by East African Seed to faster cooking time by Demeter Seed. East-West Seed adds that it breeds for improved shelf life and transportability.

Despite the implementation of relevant breeding programs, no companies have strong commitments to develop traits that are useful for smallholder farmers in the region. Only four companies have any commitment at all, and only DuPont Pioneer's commitment is formal.

Number of companies developing traits useful for smallholder farmers in the region



Focus Area 3: Local Cooperation

R&D decisions are informed by smallholder farmers' preferences through direct and indirect mechanisms

Eleven companies collect feedback to inform their R&D priorities. Information gathering is conducted directly via face-to-face contact with farmers and demonstration services, and indirectly through civil society organizations, research institutes and the supply chain. Direct contact has the advantage of allowing companies to interact with farmers, building closer relationships and ensuring that these relevant stakeholders have the opportunity to contribute to R&D activities. However, the process can be time and resource intensive, especially for companies with a wide country presence. Seven out of the 11 companies that collect feedback use both direct and indirect mechanisms.

The information gathered covers all Regional Index countries, with a strong focus on Tanzania and Uganda, where there is a high concentration of companies, stations of international research institutes and NGOs.

However, only four companies have explicit mechanisms to include the perspective of women farmers, even though women represent up to 80% of farmers in Regional Index countries. Demeter Seed, Kenya Seed Company, NASECO and East African Seed demonstrate leadership in this respect by gathering women's perspectives on field days and during demonstrations.

Feedback mechanisms employed to gather and incorporate smallholder farmers' preferences in R&D processes. In total, nine Regional Index companies provided information on feedback collection

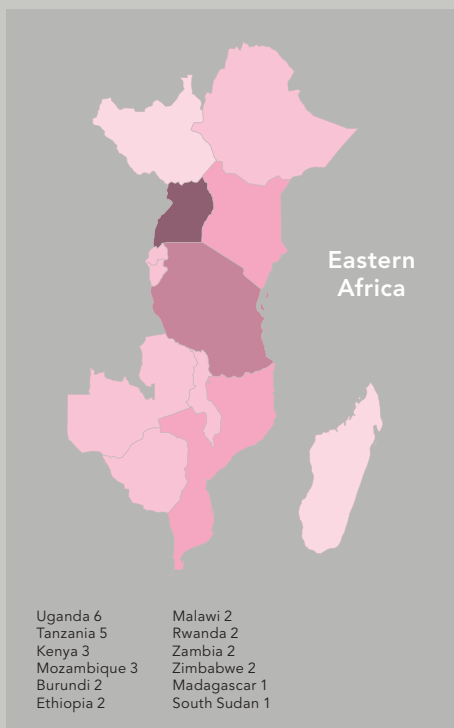
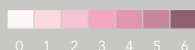
Mechanisms to incorporate smallholder farmers' preferences in R&D processes			Number of companies that pursue this approach
Direct	Face-to-face	Personal interviews	1
		Breeders' interaction with farmers	1
		Product managers	2
	Demonstration services	Field days	3
		Demonstration plots	2
		On-farm visits	1
Indirect	Civil society organizations	Local extension workers	1
		Farmer organizations	1
		NGOs	2
	Research institutes	CGIAR Centers	1
		NARS	1
		Universities	1
	Supply chain	Contracted sales agents	2
		Agrodealers and other retailers	3
		Producers	3

Regional Index companies work with international, public and private research organizations to develop improved varieties

Twelve companies collaborate with research institutes to develop improved varieties. Such institutes include the Consultative Group for International Agricultural Research (CGIAR), National Agricultural Research Systems (NARS) and private partners. When developing field crop varieties, most companies collaborate with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Maize and Wheat Improvement Center (CIMMYT). CIMMYT offers both a large supply of germplasm and expertise on the maize and wheat within the Index region. ICRISAT, meanwhile, focuses on dryland improvement, an important consideration for seed companies seeking to develop drought-tolerant varieties.

Only four companies explicitly state that they grant free access to the results of their collaborative work to local partners. Other companies are vague or disclose only limited information about the conditions of use that apply to local partners. There is significant room for increased transparency of companies' activities, as access for local partners is essential for facilitating further research.

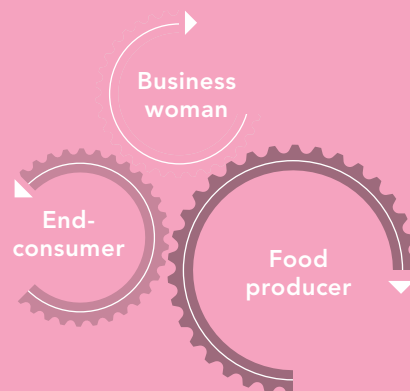
Number of companies that collect feedback for their R&D in Regional Index countries



Furthermore, knowledge sharing can not only be facilitated through research collaborations but also by including smallholder farmers in the R&D process. Nine companies include smallholder farmers in the R&D process through participatory breeding. Five companies include smallholder farmers in their R&D process in Uganda, three each in Kenya and Tanzania, and one each in Burundi, Rwanda and Zimbabwe.

Women Farmers as Customers and End-consumers

Women's multiple roles in food production and consumption



Acknowledging the important role of agriculture and smallholder farmers in increasing food production and boosting economic growth, organizations such as the United Nations' Food and Agriculture Organization and the World Bank have explored potential drivers and barriers to this growth. They found that one of the key constraints is the presence of a 'wide and pervasive gender gap in agricultural productivity'.⁴¹ Women farmers, in particular, have been found to produce less per hectare than men, indicating potential for increased productivity if women farmers are more thoroughly supported by seed companies.

Women play multiple and concurrent roles throughout the food value chain. Women are farmers, entrepreneurs, mothers, cooks, innovators and educators.⁴² Due to this plurality of roles, women farmers can be considered both seed company customers and end-consumers in the broader food value chain. Seed companies can best serve this customer segment by adopting approaches that target women's multiple roles and needs.

Four companies explicitly focus on incorporating feedback provided by women farmers in their product development. NASECO, for instance, ensures that women farmers are included in 'participatory evaluations' of their crops. The other three companies, Demeter Seed, Kenya Seed Company and East African Seed, incorporate women farmers' preferences into their breeding decisions. Typically, information is gathered during field days or at demonstration plots, either directly or through questionnaires. In contrast, East-West Seed states that it collects data from farmers in general but not specifically from women. Victoria Seeds, despite lacking explicit feedback systems for women, has a strong focus on women farmers, providing technologies, extension support and access to markets. The remaining companies, about 50%, do not disclose whether or how they incorporate women farmers' perspective into their breeding priorities.

Demeter Seed addresses the multiple roles of women farmers in Eastern Africa

Demeter Seed's approach to women farmers is considered innovative due to its ability to address women's multiple roles. The company focuses not only on the preferences of women as farmers and entrepreneurs but also as end-consumers and mothers managing household nutrition. This is apparent in the explicit focus on breeding traits for reduced flintiness and cooking time, potentially freeing up women for other activities, including childcare and growing more food to increase family income.

East-West Seed develops varieties with traits of special interest to smallholder farmers and collaborates in breeding company Afrisem

East-West Seed's collaboration with Rijk Zwaan in Afrisem is considered innovative for its focus on developing local crops for Eastern Africa. In addition, East-West Seed is conducting exploratory research into developing bitter melon varieties with higher levels of saponins, an anti-diabetic. This research is considered innovative because it addresses the increasing incidence of diabetes in Eastern African countries (see the Global Index chapter on Research & Development for further details).

Measurement Area

E

Marketing & Sales

This measurement area assesses the ways in which companies make quality seeds of improved varieties available and affordable to smallholder farmers and promote adoption. This could include tailored packaging and trusted distribution networks. Promotion of new varieties can be done through demonstrations and on-farm trials, helping to raise awareness among smallholder farmers of advancements in breeding and the use of other inputs. Other relevant practices are similar to those used in developed countries, including professional testing of varieties before release, quality assurance and after-sales support systems.

Five Focus Areas

Release of New Varieties

New varieties are most beneficial when tailored to the needs of smallholder farmers in Index countries. These varieties may be the result of companies' global breeding programs or varieties that were developed by companies' local breeding programs or local research institutes. Smallholder farmers often use open-pollinated varieties (OPVs), from which they can save seeds for their own use in the next growing season. This seed-saving system is not technically possible with F1 hybrids, which are the commercial standard for many crops because in general they produce better yields. The indicators consider how companies deal with this issue and whether they accommodate the differing capacity levels of smallholder farmers.

Quality of Varieties and Seeds

Most Index countries have legislation and regulations regarding quality control and the testing of new varieties and seed lots, but the capacity of the national institution to implement the regulations is weak or in some cases nonexistent. It is the role of seed companies to ensure that only varieties suited to local conditions are released into the market, and that the seeds of these varieties meet certain minimum standards. This can be done through professional variety testing and adherence to internationally adopted quality control protocols and codes, e.g. on biosafety. Seed quality should also be maintained throughout the distribution channel.

Packaging, Distribution and Affordability

When entering a new market, an existing distribution network can be used or new distribution channels created. This is of particular relevance when trying to reach smallholder farmers in remote regions. Depending on the local situation, it may be necessary to target specific groups such as women and young farmers, who play a significant role in agriculture and increasing agricultural productivity. Distribution channels must be robust and reliable in order to minimize the sale of counterfeit seeds. Training distributors in inventory management and taking responsibility for the distribution channel can help to prevent misuse. The packaging should include clear instructions and warnings in the local language and in pictograms. Finally, smallholder farmers generally require smaller quantities of seeds and a pricing strategy adapted to their local situation. Affordability can also be improved when breeding companies partner with other organizations to introduce finance or insurance services.

Adoption Strategies and Access to Adjacent Technologies

A promotional strategy, including field days and initiatives targeting lead farmers, which improves local knowledge about different varieties and their potential should be implemented. During demonstrations and on-farm trials, the use of adjacent technologies such as agrochemicals, fertilizers and irrigation can be introduced. Since some of the companies in the Index scope are also leading suppliers of agrochemicals, these companies should ensure that only registered pesticides are promoted and protocols on pesticide safety are followed.

After-sales Support

In order to ensure that the varieties and seeds they produce meet local needs and demands, companies should have customer feedback and grievance mechanisms in place. This feedback can serve as an important part of the learning process for breeders.

Market opportunities exist for several Index crops

Overall, companies actively market varieties of all Index crops across Eastern Africa. The large marketing focus on traditionally popular field crops such as maize and vegetable crops such as tomato and onion comes as no surprise. However, there are also crops for which market opportunities remain. For instance, varieties of wheat, which is harvested extensively in Eastern Africa, are not included in many portfolios. Garlic and potato, popular with smallholder farmers in the region, are even less common. This could be due to the very nature of potato, a tuberous crop that is normally multiplied asexually and follows quite a different R&D process.

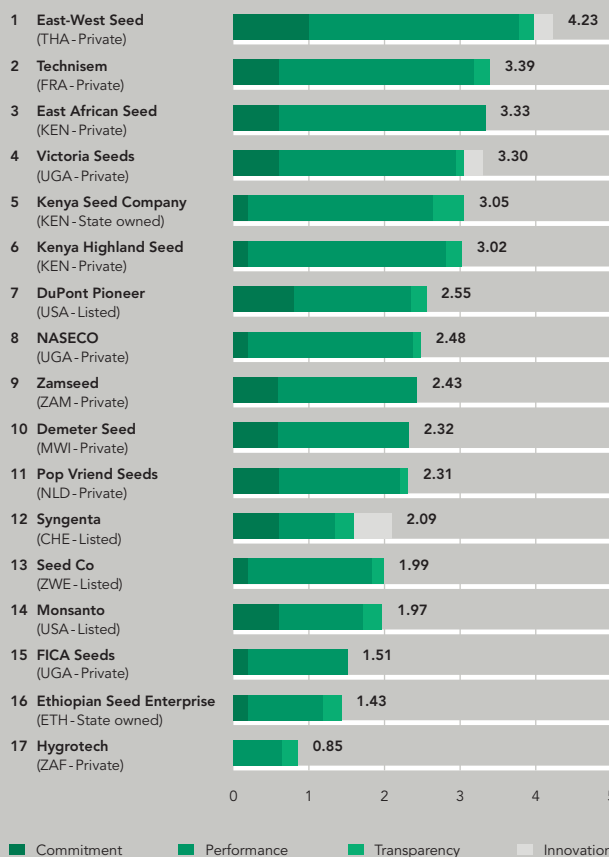
Regional Index companies effectively supply improved varieties to smallholder farmers

Index companies originating in Eastern Africa are more active than their global peers in the development and deployment of marketing strategies tailored to the needs of smallholder farmers. Specifically, these companies are more likely to use open-pollinated varieties (OPVs), different seed grades, localized seed packages and appropriate demonstration services. Their marketing activities are adapted to reflect differences in language, culture and agricultural practices. A particularly effective strategy deployed by a number of companies originating in Eastern Africa is the use of social media alongside traditional media to collect farmer feedback and market hand-planted seed grades.

There is a divergence between Performance and Commitment

There is a clear divide in the Regional Index: global companies tend to outperform their national and regional peers on the quality of their commitments, while companies based in Eastern Africa excel on performance. Although national and regional companies are highly effective in both marketing seed varieties and the use of appropriate marketing strategies, their commitments are less advanced. The two companies with the strongest commitments regarding the quality and safety of varieties are both global.

Regional Index – Marketing & Sales



Overall performance in this measurement area is high, with most companies reporting good practices in at least one or two focus areas. East-West Seed leads the ranking, displaying robust commitments, innovative marketing activities and high scores across the board. The company has the most comprehensive policy on quality and safety of varieties and seeds. This addresses testing, registration and certification when launching new varieties in Regional Index countries, and protocols and codes for variety registration and seed quality for countries that lack such protocols and codes. Furthermore, the company takes an innovative approach to increasing access to inputs other than seeds for smallholder farmers; and to its system to track, process and handle smallholders' complaints.

Technisem, East African Seed and Victoria Seeds follow, with high scores for most focus areas. Technisem, in second place, excels in providing adapted packaging at affordable prices to smallholder farmers throughout the region. East African Seed brings varieties developed by public research institutes to market, while Victoria Seeds uses innovative mobile seed shops to reach smallholder farmers in remote areas.

Hygrotech ranks last, preceded by Ethiopian Seed Enterprise and FICA Seeds. Although they demonstrate some strengths in marketing commercial varieties to smallholder farmers, these low-scoring companies appear to have no activities at all or programs with only limited scope.

Focus Area 1: Release of New Varieties

While all Index crops are marketed in the region, market opportunities remain

Collectively, companies market varieties of all global field and vegetable crops in Eastern Africa. Maize and soybean are two of the most frequently marketed global field crops (out of a total of nine), offered by all regional companies with field crop seeds in their portfolio. In comparison, 15 of the 25 global vegetable crops are in the portfolio of at least ten of the 14 companies selling vegetable seeds. Local priority crops are also well represented, with only one crop, chickpea, currently marketed by only one company in the region. Cowpea, on the other hand, is in the portfolio of seven out of 11 companies selling field crops.

Overview of crops by area harvested and number of companies marketing varieties

Number of companies marketing crop in Regional Index countries			
Large	Soybean	Millet	Beans, dry
	Broccoli	Carrot	Maize
	Cauliflower	Eggplant	Rice, paddy
Average	Cucumber	Green bean	Sorghum
	Lettuce	Leek	Cabbage
	Melon	Pumpkin	Chili pepper
Small	Okra	Squash	Onion
	Spinach		Sweet pepper
	Watermelon		Tomato
Small	Chickpea	Potato	
	Chicory	Garlic	
	Gherkin		
Area harvested			

For the number of companies, small is <3, average 3-5, large >5. For the area of field crops harvested, small is <0.5 mln ha, average 0.5-2 mln ha, large >2 mln ha. The area of vegetable crops harvested is small <5,000 ha, average 5-50,000 ha, large >50,000 ha

Nevertheless, market opportunities remain. Regional Index crops can be divided into nine categories, based on the area harvested (small, average, large), and the number of companies marketing it (small, average, large). As may be expected, there are no large area crops that are not being offered by Index companies in the region. However, opportunities exist in two other of the nine categories: crops harvested in large areas and offered by an average number of companies; crops harvested in average areas and offered by a small number of companies.

Falling into the first category is wheat, for which around 2 million hectares – or about 3% of the total arable land in Eastern Africa⁴³ – was harvested in 2013, though this crop is in the portfolio of only seven companies. Two crops, potato and garlic, fall into the second category. Potato, a field crop, is only offered by two companies, although it is estimated that almost 1 million hectares were harvested in 2013. Garlic, a vegetable, is the seventh crop in Eastern Africa in terms of area harvested, but is only offered by two companies.

Regional Index companies market varieties developed by research institutes to smallholder farmers

Eight companies, almost half, market varieties developed by national and international research institutes. The crops, countries and research institutes are diverse. In terms of crops, field crops seem to be more popular than vegetables, with millet, potato and barley being the only field crops not marketed in such collaborations. East African Seed has collaborated with AVRDC, an international nonprofit institute for vegetable research and development, to market varieties of African eggplant, spider plant, black nightshade, crotalaria and Ethiopian mustard to smallholder farmers in Kenya, Tanzania and Uganda.

International research institutes that have established marketing collaborations with Regional Index companies include CGIAR centers such as CIMMYT, as well as universities in North America and Europe. In addition, the majority of companies market varieties that are developed by national research institutes, including Uganda's National Semi-Arid Resources Research Institute (NaSARRI) and National Agricultural Research Organisation (NARO).

Kenya Seed Company is notable for having two partnerships with African research institutes. In collaboration with KALRO and CIMMYT, it markets Ua Kayongo, a maize hybrid that is coated to control striga infestation in maize. It also collaborates in New Rice for Africa, which is being developed by the Africa Rice Center. While most partnerships occur with institutes based in Kenya and Uganda, the varieties are marketed across the region, including in Burundi, Rwanda, Tanzania and Zimbabwe.

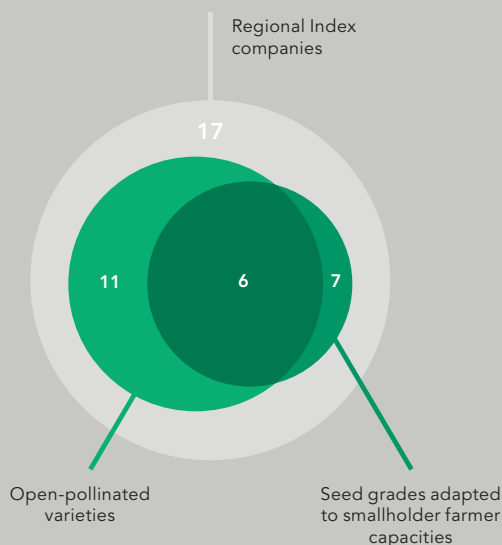
The use of OPVs and different seed grades reveals different marketing strategies to accommodate several stages of farmer development

Companies use two, often overlapping, marketing strategies to accommodate the varying capacity levels of smallholder farmers in Eastern Africa. Companies target resource-constrained smallholder farmers with open-pollinated varieties (OPVs) and seed grades for hand planting, and more advanced farmers with more advanced seed grades, for instance those that are coated or encrusted. Eleven out of 17 companies market OPVs, while seven out of 17 use different seed grades to accommodate different smallholder farmer capacity levels. Overall, OPVs are used in addition to hybrid varieties to account for the fact that smallholder farmers may not be able to invest in new seeds every season and allow for the traditional practice of farm-saved seeds. As such, OPVs can be used as part of a market-entry strategy for seed companies, and to introduce smallholder farmers to buying seeds more frequently.

Focus Area 2: Quality of Varieties and Seeds

The marketing of different types of varieties and seed grades is somewhat contested. On one side of the spectrum are companies that view offering various seed grades as a way to accommodate differing farmer needs and capacity levels, from smallholder farmers who require seeds for hand-planting to semi-commercial and commercial smallholder farmers who might require seeds that are suitable for machine-planting. Some companies offer a range of grades. For example, Kenya Seed Company offers hand-plant, medium-flat and large-flat grades, while NASECO focuses only on hand-plant grades, marketing these in 98% of all cases. Larger scale companies, including DuPont Pioneer and Monsanto, also offer more seed types. Monsanto states that it 'offers three-way and double-cross hybrids in more resource-constrained countries'. On the other side of the spectrum are companies, such as Zamseed, which explicitly refrain from offering lower grade seeds. This can be explained by a strategic focus on ensuring uniform quality for all customers, small or large.

Regional Index companies use two, often overlapping, strategies to accommodate the different capacity levels of smallholder farmers



Regional Index companies ensure quality of varieties and seeds in Index countries throughout the value chain

The importance of seed quality assurance within the industry is underscored by the finding that all companies bar one, Hygrotech, have activities to ensure seed quality across distribution channels. Quality assurance efforts include certification, monitoring, shelf-life, anti-counterfeit and training programs.

The majority of companies, or 12 out of 17, actively monitor the seed quality in their distribution networks. Eleven companies report on training stockists, agents and dealers across the distribution networks. Ten companies have adopted shelf-life management and anti-counterfeit programs as well as certified quality assurance systems such as ISO 9001 and the International Seed Testing Association (ISTA) certifications. Shelf-life management and anti-counterfeit measures demonstrate that seed companies' quality assurance efforts span the broader seed value chain.

Number of Regional Index companies with quality management programs and activities



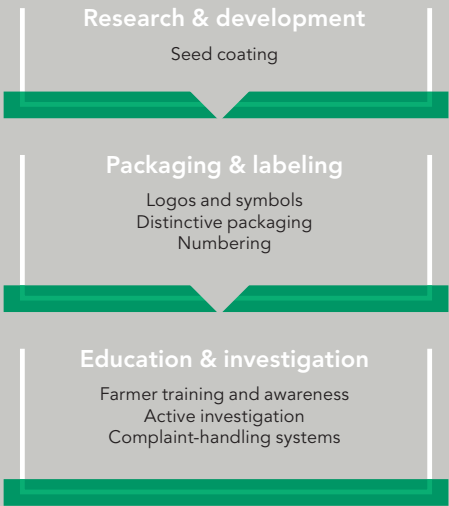
Shelf-life management includes efforts before and after seeds enter distribution networks. Most often, companies choose to label packages with expiration dates and instructions on shelf life. Companies can also maintain low inventories at dealerships that supply local dealers and agents, an approach adopted by East-West Seed. Kenya Highland Seed takes an alternative approach, actively advising customers on seed stock quantities.

An after-sales strategy involves companies recalling seeds after a specific time frame or when certain quality standards are not met. Five out of 17 companies withdraw seeds from their distributors once the selling seasons end. East-West Seed sets a specific threshold and, in some countries, withdraws all seed from dealers after six months. In addition, East-West Seed uses quality measures to decide when seeds need to be withdrawn. East African Seed and Kenya Seed Company state that they take samples of their seeds to determine whether seeds still meet quality standards.

Focus Area 3: Packaging, Distribution and Affordability

Anti-counterfeit measures can be implemented during R&D, packaging and labeling and after sale. One company applies coatings of a distinct color during the R&D of its seeds, making them easy to recognize by smallholder farmers. Anti-counterfeit measures are most often applied during packaging and labeling. Nine companies report a variety of approaches, including the use of logos and symbols (e.g. DuPont Pioneer and Seed Co), laminated packaging (NASECO), batch numbers (East African Seed) and watermarked labels (Syngenta).

Companies prevent counterfeit seeds throughout the value chain



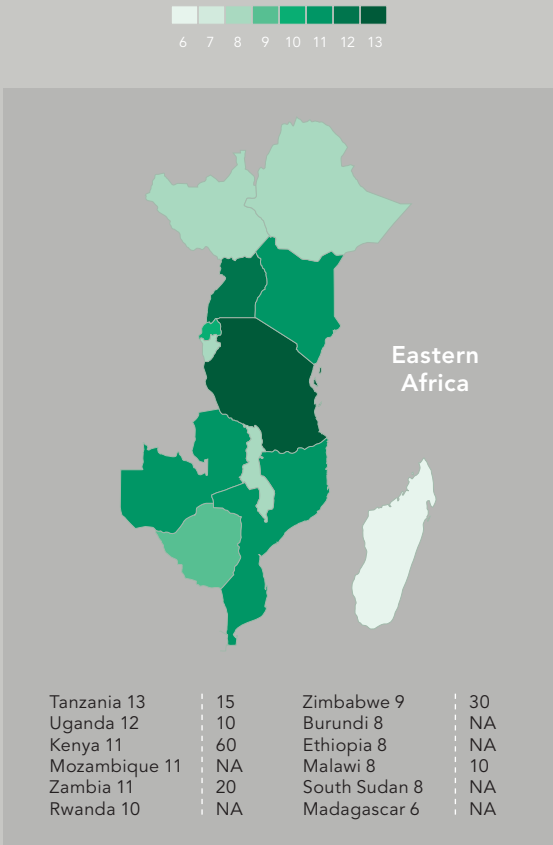
Additionally, five companies target counterfeit seeds on the market. East African Seed and DuPont Pioneer focus on training and awareness campaigns for farmers on the negative impact of counterfeit seeds. East-West Seed and Seed Co teams actively scout the market for counterfeit seeds. East-West Seed and DuPont Pioneer also have complaint-handling systems in place for farmers to report counterfeit seeds.

Regional Index companies have established distribution channels in all Regional Index countries and reach remote areas

Collectively, companies have established distribution channels to market their seeds to smallholder farmers in all Regional Index countries. The highest concentration of companies can be found in Tanzania, Uganda, Kenya, Mozambique and Zambia. The International Seed Federation (ISF) estimates that in 2011 Kenya's seed market was worth about \$60 million, making it the largest market in Eastern Africa.⁴⁴ Tanzania and Zambia are estimated to have markets worth \$15 million and \$20 million, respectively. Only eight companies have established distribution channels in the Zimbabwe with the second-largest market in the region, worth \$30 million. Furthermore, only four companies, East-West Seed, Technisem, Pop Vriend Seeds and Seed Co, have established distribution channels in Madagascar.

Twelve companies reach remote areas through their distribution channels, using local agrodealers, shop outlets and local representatives. Other approaches include tuk-tuks (Victoria Seeds), employing sales agronomists (East African Seed), working with local schoolteachers (Demeter Seed) and selling through smallholder farmers (DuPont Pioneer).

Number of Regional Index companies with distribution channels per country + value of seed market (ISF) in USD million (if available)



Regional Index companies use a wide range of programs to improve seed affordability

Companies acknowledge the importance of affordable seeds for smallholder farmers, with 13 out of 17 companies offering affordable pricing through microfinance, group buying, differential pricing schemes, insurance schemes or tailored cost models.

Regional Index companies generally use four different affordability strategies



Companies generally employ four different affordability strategies for their seeds. The most common strategy is microfinance (or access to credit), offered by five companies. NASECO, one of the five, offers 'seasons-long interest-free loans for inputs and provides financial assistance' to smallholder farmers in Uganda.

Collective buying is the second most popular strategy, offered by four companies. As an example, East-West Seed supports the creation of smallholder farmer cooperatives, giving farmers greater bargaining power. Kenya Seed Company and NASECO offer discounts for smallholder cooperatives and groups.

Pricing schemes are the third most widely used strategy, offered by four companies including East-West Seed and Kenya Highland Seed. The latter also takes into account the small quantities of seed that smallholder farmers typically require and offers a discount structure 'according to the amount of seed being purchased'. Another pricing scheme, adopted by three companies, is a tailored cost model. These companies lower the costs of specific products in targeted markets. Zamseed, for instance, partners with Zambian NGO Musika to select rural agents who can run mobile sales for the company. Zamseed states that these rural agents reduce transportation costs, making it possible to sell seeds at a lower price.

The fourth strategy is insurance schemes, offered by three companies, to protect smallholder farmers against crop failure caused by climatic events. The Syngenta Foundation's Agriculture and Climate Risk Enterprise (ACRE) – privatized in 2014 – has two separate types of insurance schemes available. The first loan-linked insurance, is intended for smallholders 'with a loan and input package from a microfinance institution (MFI) worth \$100 or more'. The second is a replanting guarantee, whereby farmers purchasing a certified seed or fertilizer can pay for an insurance that expires two weeks after sending an SMS that the product has been used. In the event of a drought in that period, 'the farmer receives an SMS voucher for a new bag of seed to replant within the same season'.

Regional Index companies use different ranges of appropriate package sizes

Companies market a wide variety of package sizes to cater to a range of farmers. The most important differentiating factor is the type of crop: vegetable seed packages are much smaller than field crop seed packages. In addition, there are variations within these two categories. For vegetable seeds, appropriate sizes start from one gram, with the most variations offered by Technisem, East African Seed and Kenya Highland Seed. The first two offer sachets of one gram, while Kenya Highland Seed markets '100 seeds packages'. NASECO offers 250gr packages, the smallest field crop seed packaging offered by any Regional Index company.

Seed packages are also adapted to local needs in other ways. East-West Seed, Technisem and NASECO use pictograms and pictures on their packaging to instruct smallholder farmers who may be illiterate. Furthermore, it is common practice to include instructions in local languages such as Swahili and Luganda, alongside English, French and Portuguese.

Focus Area 4: Adoption Strategies and Access to Adjacent Technologies

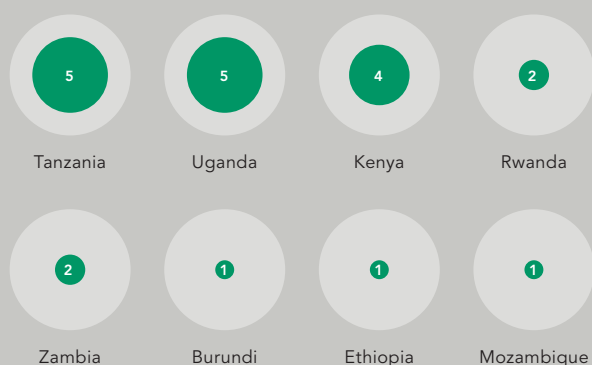
Regional Index companies invest heavily in demonstration services

To increase the adoption rates of improved seed varieties, almost all companies invest in demonstration services such as field days. Field days usually have a wide scope, covering all aspects of crop production from land preparation to harvest, and typically include demonstrations on the use of appropriate varieties, proper cultivation practices and agrochemicals.

Companies take different approaches to field days, among them the use of 'key farmers' to demonstrate improved seeds and techniques to neighboring farmers, ad-hoc demonstrations and workshops, government collaborations and agricultural trade shows.

Demonstration services are available throughout the region. The largest number of companies offering field days can be found in Tanzania and Uganda, with five each, and in Kenya, where four companies held field days between 2012 and 2014.

Number of Regional Index companies with field days per country



To support these activities, companies make investments accounting for between 0.5% and 20% of their revenue derived from regional sales. Four of the 13 companies that provided such data reinvested 10% of their revenues in 2013 and 2014 in demonstration services. Kenya Highland Seed and Demeter Seed invested 15-20% of their regional sales revenue in the same years in field days, the most of any company.

NASECO has invested more in demonstrations in Index countries than it earns there. In Burundi, the company states that it invests 200% of its revenues from that country in demonstrations, emphasizing that adoption strategies are a key priority.

Focus Area 5: After-sales Support

Regional Index companies use digital and physical feedback channels to track and respond to smallholder farmers' complaints

More than half of the companies have implemented systems to track, process and respond to feedback from smallholder farmers. Companies typically opt for traditional feedback channels. Demeter Seed, for example, uses stock lists and agrodealers to collect feedback.

Some companies have also implemented digital feedback channels. Victoria Seeds and Kenya Highland Seed use direct telephone lines and text messaging (SMS) to gather feedback and respond to smallholder farmers. Kenya Seed Company combines SMS services with social media and an interactive website. Digital and physical channels are also frequently combined. FICA Seeds and Seed Co use radio talk shows, while Seed Co additionally uses television talk shows to collect feedback – two channels not currently used by any other peer.

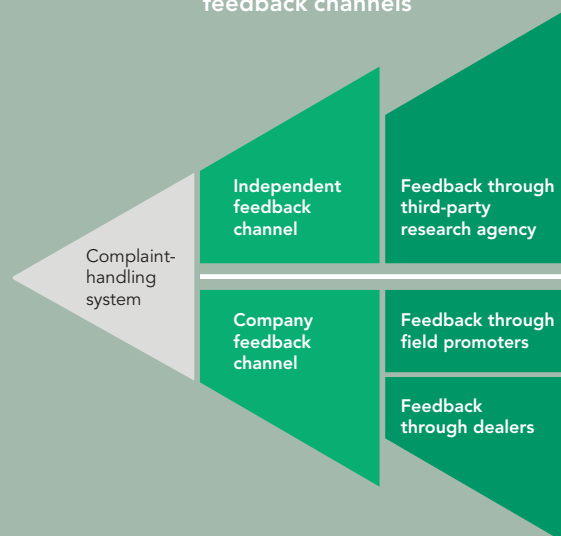
Victoria Seeds mobilizes seed sales in Uganda

Victoria Seeds' packaging, distribution and affordability activities in Uganda are considered innovative for their efforts to market seeds to smallholder farmers in remote areas. In Uganda, where smallholder farmers account for around 75% of agricultural production,⁴⁵ the company has established a network of more than 400 retail stockists that service smallholder farmers throughout the country. To reach remoter areas, 'mobile seed shops' in the form of tuk-tuk motorbikes are used. The company also aims to improve the availability of quality seeds in (former) conflict areas, as its development of new facilities in 2008 in the formerly Lord's Resistance Army-controlled city of Gulu demonstrates.

East-West Seed gathers smallholder farmer feedback through several channels

East-West Seed's system to track and process complaints from smallholder farmers in Regional Index countries is considered innovative for its company-wide scope and use of third-party surveyors. In order to ensure that varieties and seeds meet company quality standards and local smallholder demands, East-West Seed has implemented a complaint-handling system (CHS), which retrieves customer feedback through a number of channels.

East-West Seed uses several feedback channels



First, the company conducts so-called 'usage, attitude and image' marketing research for which it hires an independent research agency. This agency uses qualitative focus group discussions and quantitative surveying to gather feedback from smallholder farmers about East-West Seed's products and services. Second, field promoters gather feedback from farmer customers at meetings on a bi-monthly basis. Third, smallholder farmers are also able to provide feedback to dealers, who forward this to the respective sales teams. After receiving feedback from these three channels, complaints and feedback are registered in the CHS and passed on for further investigation to the relevant teams, who then try to resolve the issue.

Syngenta innovates to improve access to insurance for smallholder farmers

The Agriculture and Climate Risk Enterprise (ACRE), a spin-off company of the Syngenta Foundation, is innovative in Eastern Africa for its approach to providing affordable crop insurance for smallholder farmers in Kenya, Rwanda and Tanzania. By the end of 2014, an estimated 230,000 farmers had been insured (see the Global Index chapter on Marketing & Sales for further details).

Measurement Area

F

Capacity Building

This measurement area focuses on the ways in which seed companies invest in local capacity building to ensure that farmers have the right knowledge and tools to realize the full potential of quality seeds of improved varieties. Offering or participating in extension services and agronomic training and education such as field schools can help achieve this goal. This area presents many opportunities for public-private partnerships.

Three Focus Areas

Capacity Building

Activities that build the capacity of smallholder farmers and farmer cooperatives include extension service, training and educational programs. The development of such activities and programs shows the willingness of companies to invest in the capacities of smallholder farmers and to help improve the yield and performance of local crops. Extension services can be offered by companies themselves or in partnership with local organizations. Training and educational programs for smallholders, such as field schools and field days, can be organized for specific target groups including women, young farmers or community trainers. Seed companies can connect different programs and topics so that technical expertise and adjacent technologies are included in extension services. (Mobile) ICT applications that provide agronomic support and advice to farmers deserve a special mention.

Farmer Organizations

Farmer organizations can help smallholders to acquire skills, access financial and agricultural inputs such as credit, seeds and fertilizers, and process and market their products more effectively through the development of linkages to output markets.

Access to Output Markets

Most farmers grow crops not only for their own use but also for commercial sale. Breeding companies can help farmers to increase the profitability of their business by linking them to output markets and assisting in the development of a local or regional market. Additionally, companies can partner with other organizations to offer farmers training on post-harvest handling and product hygiene.

Main Findings in Capacity Building

Capacity-building initiatives exist in all Regional Index countries. Regional Index companies target Kenya, Tanzania and Uganda

The seed industry builds smallholder farmer capacity in all Regional Index countries. Kenya, Tanzania and Uganda are the most popular, with Tanzania targeted by ten of the 17 companies. The number of companies involved in capacity-building programs has a weak correlation with the number of companies present in a given country.

Almost all Regional Index companies provide extension and advisory services, crucial for building smallholder farmer capacity

The importance of capacity building to both smallholder farmers and the regional seed industry is emphasized by companies' widespread use of extension programs: all but one of the companies offer farmers some form of advisory service.

Opportunities exist to improve the extent of support for farmer organizations

Although both farmer organizations and market access are considered key factors in farmer development, more companies are active in the latter. However, a few companies were found to place emphasis on farmer organizations. Companies can further boost farmer development by increasing support for farmer organizations focused on improving agricultural practices and strengthening programs that target smallholder farmers' access to downstream markets.

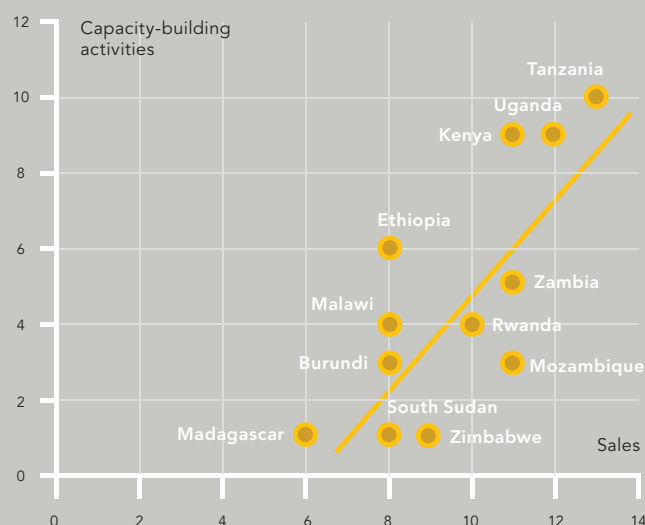
Regional Index companies include women farmers but do not target them

Consistent with the performance of Global Index companies, few companies report targeted capacity-building initiatives for women farmers. While some companies incorporate women in their general capacity-building activities, those that implement targeted trainings are rare and do not elaborate on their activities. Collectively, disclosed training programs, both targeted and general, offered by nine companies reach more than 1.3 million women farmers, and range from general agronomic training and quality control to developing entrepreneurial skills.

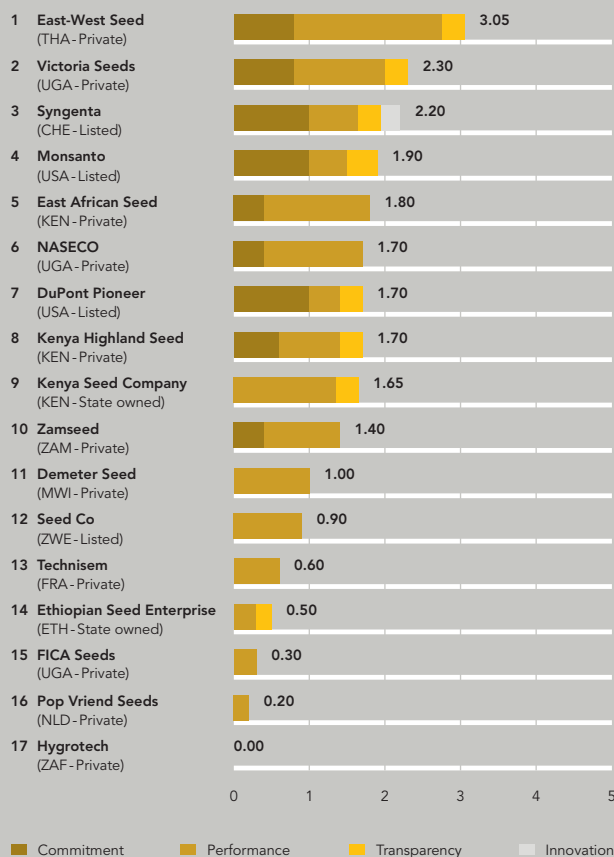
Performance exceeds commitments to improve smallholder farmers' capabilities

All companies are active in some form of training and education targeting smallholder farmers, although only nine companies disclose any form of commitment to invest in local capacity.

Correlation between the number of companies present in a country and their involvement in capacity-building programs in that country



Regional Index – Capacity Building



East-West Seed is the stand-out performer in this measurement area, significantly outpacing its peers. Victoria Seeds ranks second, with activities in the majority of capacity-building focus areas. Syngenta comes in a close third, its performance driven by formal commitments and innovative practices. No clear characteristics define the leaders in this measurement area.

Behind the top three, Monsanto, East African Seed, NASECO, DuPont Pioneer and Kenya Highland Seed each demonstrate leading practices in at least one of the focus areas.

Notably, three of the companies that also appear in the Global Index – Syngenta, Monsanto and DuPont Pioneer – are the only Regional Index companies with a formal commitment to help smallholder farmers to sustainably intensify their production and increase their income.

Closing out the ranking are Ethiopian Seed Enterprise, FICA Seeds, Pop Vriend Seeds and Hygrotech. All four companies have significantly lower scores, disclosing limited to no activity involving capacity building for smallholder farmers in Regional Index countries. Disclosure is a key area of opportunity for these companies to close the gap with the leading industry peers. They are also encouraged to support and facilitate the establishment of farmer organizations and downstream markets.

Regional Index companies advance farmer capacity in all Index countries

Kenya, Tanzania and Uganda account for the most capacity-building initiatives, with the activities of ten companies concentrated in Tanzania. Kenya and Uganda follow closely, with nine companies each undertaking capacity-building activities.

Five companies focus their efforts on only one or two countries, and in four of these cases, one of the countries is either Tanzania or Uganda. In contrast, the company with the greatest reach, Kenya Highland Seed, has smallholder capacity-building activities in as many as eight countries.

Three countries have only one company each that reports capacity-building programs: South Sudan, Madagascar and Zimbabwe. In South Sudan, political instability may deter companies from providing training and extension activities.

More than three quarters of Regional Index companies are involved in some form of agricultural advisory service

Companies report capacity-building activities in all Regional Index countries. Six companies disclose activities in more than 50% of Regional Index countries where they are active and approximately one third of companies are involved in a broad range of endeavors. These vary from providing advice on agronomic practices to crop protection management and agrochemical application. Companies offer extension services through their own extension employees as well as partner organizations. Demonstration plots and farmer field days are a common avenue for companies to showcase products and provide a setting for practical trainings. However, no companies elaborate on the details of their capacity-building activities.

Overall, companies have integrated advice on adjacent inputs and technical expertise into extension services. However, disclosure is limited on the actual implementation. Kenya Seed Company states that it participates in collaborative events with a range of stakeholders, including governments, which allow it to provide crop protection and soil-testing services in Kenya, Tanzania and Uganda.

East African Seed explains that, as part of its extension services, it 'serves as a single window for all crop solutions', providing complete crop technology to farmers in Kenya, Rwanda, Tanzania and Uganda as well as training on agronomic and plant-protection solutions. DuPont Pioneer's Soil Doc program in Zambia focuses on the effective use of fertilizer.

Similarly, some companies state that capacity-building activities support their existing extension services but fail to disclose many details. NASECO reports that its own extension staff works with NGOs and private organizations to provide training and showcase demonstration farms. Victoria Seeds has established partnerships with local development organizations that seek to deliver extension services in Uganda.

The range and extent of activities in this measurement area underline the importance of capacity building. Benefits include farmer development, as companies possess key competencies and knowledge on how to increase production; and market development, as higher capacity levels can increase adoption rates of improved varieties.

Formal education is provided in partnership with local and international players

Contributions to formal education programs are sparse, with only five companies disclosing details of their activities in the Index scope. Most often, companies engage in collaborative efforts with colleges, universities or postgraduate programs in agriculture. Demeter Seed reports that its general manager was involved in developing a curriculum for tertiary training in seeds; East African Seed participates in university-led agricultural exhibitions encompassing integrated crop management; and NASECO's company representatives give lectures in plant breeding and seed technology for master's and doctorate programs. In addition, four companies support post-high school education by offering internship or trainee positions to students from local universities.

Furthermore, companies contribute to capacity building through programs for next-generation farmers. Although these programs do not specifically target smallholder farmers, companies report educational visits and agricultural demonstrations for schoolchildren and/or youth, and model farms for schools. Specifically, DuPont Pioneer has partnered with the 4-H Council, an initiative of the US Cooperative Extension System (CES) and the US Department of Agriculture. The partnership seeks to strengthen youth development in rural African communities. In the context of the initiative, DuPont Pioneer provides training for leaders and mentors on agricultural innovation and farming practices as well as 'culturally relevant, research-based tools, expertise and resources that can be used at the local level'.

NASECO highlights its partnership with the Cooperative League of the USA (CLUSA), the trade association for cooperative businesses in the United States. The partnership aims to improve food security for smallholder farmers in Uganda. The company supports this objective by engaging with farmers during CLUSA-organized workshops, demonstrating varieties and providing training sessions on grain production.

Opportunities exist to advance smallholder farmers' use of information and communications technologies (ICT)

Seven out of the 17 companies, almost half of them global players, have implemented some form of ICT to support capacity building for smallholder farmers. The majority of initiatives have been implemented in Kenya.

Three companies, DuPont Pioneer, Kenya Highland Seed and Kenya Seed Company, use SMS messaging or coding systems to communicate seed prices, availability, technical information or sales. Providing product information, guidance and resources to farmers via ICT increases access to information, of particular importance to farmers located in remote areas. This enables farmers to make more informed decisions in a timely manner.

Two other companies, East-West Seed and East African Seed, have websites dedicated to providing agronomy support. Notably, East-West Seed's Plant Health Doctor Initiative provides farmers with an online diagnostic reference tool, describing and providing images of the most common diseases that occur in a number of Index vegetable crops. The initiative is under development in the Eastern Africa region.

Syngenta's Farmforce is a mobile-based business solution for Kenyan farmers, which the company says increases crop traceability and enables farmers to access formal markets. Syngenta's Agriculture and Climate Risk Enterprise (ACRE), as outlined above, also makes use of ICT to handle crop insurances with smallholder farmers.

Companies are also adopting social media to promote products, provide information and inform farmers of upcoming events. ICT as a whole is becoming increasingly important as farming operations become more complex and field data more comprehensive.

Systems and services that aggregate and analyze information add significant value thanks to their ability to provide timely, actionable insights to farmers. These, in turn, can help support sustainable increases in productivity and income levels. Companies can leverage ICT to support other capacity-building focus areas, by providing information on adjacent inputs or education programs and/or facilitating connections to farmer cooperatives or downstream markets.

Regional Index companies include women farmers but do not target them

Three companies, East-West Seed, Victoria Seeds and Kenya Seed Company, have programs that focus exclusively on educating and training women farmers in Kenya, Uganda and Ethiopia, respectively. In Uganda, Victoria Seeds provides 'seed technologies, extension support and access to markets to [women] farmers', with the aim of increasing 'their efficiency in production, crop output and income levels'. The company reports that it has reached more than 2,800 women with its training in both production and business skills. East-West Seed (and some of its peers) partners with the NGO Fair Planet to empower women farmers, providing them with affordable seeds, entrepreneurial training and marketing opportunities in Ethiopia.

Another six companies have programs that include an element targeting women farmers, although this is not their main focus. Programs cover agronomy, best practices for seed production and quality control and marketing opportunities.

As the productivity of women farmers in Africa is significantly lower per hectare than that of men,⁴⁶ targeted efforts to provide tailored training programs for women farmers would help to reduce the barriers to growth for this typically underrepresented group and support their contribution to agricultural development.

Focus Area 2: Farmer Organizations

Support for farmer organizations and cooperatives could be enhanced

Seven companies disclose general support for farmer organizations or cooperatives, but only East-West Seed and NASECO provide details about the scope of their involvement. An additional five companies list some activity related to supporting farmer organizations, but here too the scope of involvement is unclear.

In partnership with USAID, NASECO has trained seed producer organizations in Burundi and Uganda. The company also organizes monthly company-wide meetings, supporting the creation of farmer groups in seed production. On a broader scale, East-West Seed runs training programs and advisory services in collaboration with community-based organizations and notes that its demonstration farms enable the establishment of informal community groups.

Companies could further improve performance in this focus area by targeting their efforts and cooperating with local and global peers to establish or facilitate farmer organizations. By supporting the development of cooperatives focused on improving agricultural practices, companies increase efficiencies in capacity building, through partnerships with other industry players that seek to help farmers acquire skills, access financial and agricultural inputs and develop linkages with output markets. Companies can also benefit from farmer organizations, since these organizations can serve as intermediaries between seed companies and farmers.

Focus Area 3: Access to Output Markets

Regional Index companies have the tools to narrow value chain gaps and encourage downstream links

Approximately half of the companies offer general support to output markets, with some companies connecting farmers with partners further down the value chain. Monsanto, through its involvement in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT), trains local agrodealers in Tanzania and helps tomato smallholders to buy and market their products collectively. Peers Monsanto and Seed Co are also involved in this initiative. East-West Seed and Syngenta, which are listed on both the Regional and Global Indexes, collaborate in Ethiopia with Fair Planet, a nonprofit organization whose objectives include linking smallholder farmers to vegetable marketing channels, cooperative unions and farmer groups.

Some may argue that companies based in the region are better placed than their global peers to capitalize on opportunities for partnerships, given their positioning and knowledge of the local markets. Investments in building value chains, particularly downstream linkages, can provide farmers with the necessary conditions to transition from small-scale subsistence to commercial farming and enable them to strengthen business relationships collectively, which in turn can lead to more consistent sales and higher incomes.

Innovation Overview

Syngenta links ICT systems and micro-insurance

Syngenta's Agriculture and Climate Risk Enterprise (ACRE) offers affordable insurance products against drought and excess rain, aimed at smallholder farmers in Kenya, Rwanda and Tanzania. ICT is used to collect weather data from satellites and automated weather stations as a proxy for farmers' crop health. SMS messages are sent between the company and smallholders to advise on harvests and collect insurance premiums or automatically pay out claims (see the Global Index chapter on Capacity Building for further details).

Measurement Area

G

Production

The limited availability of quality seeds is a major constraint for smallholder farmers in Eastern Africa. Local seed production can address this issue by improving local access to appropriate, affordable seeds on a continuous basis. This measurement area seeks to identify whether seed companies produce seeds locally and the extent to which smallholder farmers are involved in this process.

Two Focus Areas

Local Seed Production

Seed companies can encourage local seed production in Regional Index countries by enabling smallholder farmers to produce seeds under fair conditions. Working with local seed growers generates incomes and contributes to capacity building. The construction of local production facilities can also create employment opportunities and encourage knowledge transfer. Through partnerships with local seed companies, these facilities can access advanced technologies and expertise.

Maintenance Programs and Quality Management

Seed quality can be influenced by a variety of factors. To ensure the consistent quality of basic seed and old varieties, seed companies or their subcontractors can implement robust maintenance programs during (local) seed production as well as management systems in the later phases of planting, harvesting, processing, storing and packaging.

Main Findings in Production

Seed production takes place in all Regional Index countries. Overall, companies perform well in this measurement area, with seed production taking place in all 12 Regional Index countries. At the same time, the level of public disclosure could be improved. Companies typically choose to concentrate production in a few locations rather than across all the countries where they operate. The most production activity is found in Tanzania and Uganda.

Regional Index companies involve smallholder farmers in seed production

Almost all companies with production activities state that they involve smallholder farmers in Regional Index countries.

Transparency of social standards in seed production can be improved

Eight companies disclose their social standards for seed production. This represents a significant opportunity for the remaining companies to introduce social standards, as well as monitor and report on compliance activities.

Quality management systems are in place, though opportunities remain

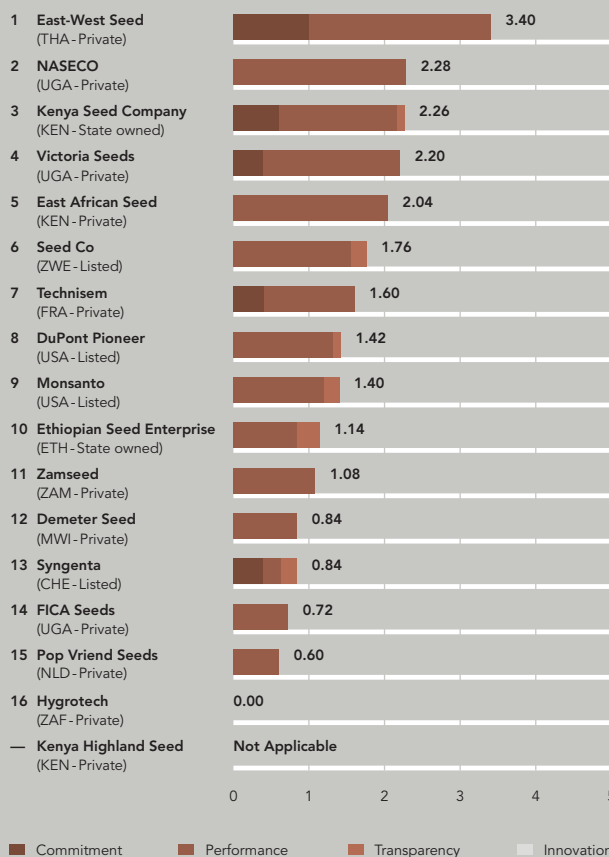
There are opportunities to improve the performance and disclosure of quality management systems. Almost two thirds of companies carry out some form of quality management activity, though it is unclear whether this aligns with international standards. Companies are encouraged to disclose the scope of operations covered by their quality management programs.

Opportunities exist to convey formal commitments

East-West Seed is the only company in the Regional Index to disclose a formal commitment to produce seeds in Regional Index countries and involve smallholder farmers in production activities.

How Companies Perform

Regional Index – Production



East-West Seed, NASECO and Kenya Seed Company lead the ranking in this measurement area, thanks to their high scores in both focus areas. East-West Seed and NASECO have implemented strong maintenance programs, whereas Kenya Seed Company reports robust quality management practices. East-West Seed significantly outpaces its peers, with strong commitments to regional production involving smallholder farmers.

Hygrotech is the only company to provide no information on its production activities in Regional Index countries. Demeter Seed, FICA Seeds and Pop Vriend Seeds rank at the lower end of the measurement area. While all three companies actively produce in Regional Index countries and involve smallholder farmers in seed production, they are encouraged to improve the transparency of their quality management systems and social standards in production activities.

No innovative practices were identified for Production

Focus Area 1: Local Seed Production

Regional Index companies actively engage in local seed production

Fourteen companies produce seeds in at least one Regional Index country, and ten of these produce seeds in at least one quarter of the Regional Index countries where they are active. Seeds are produced in all Eastern African countries, with a concentration in a few specific locations. Tanzania and Uganda are the most reported countries, with six companies active in each, followed by Ethiopia, Kenya and Zambia, with four companies each.

The concentration of production in these five countries could be attributed to the geographic distribution of companies' headquarters and main markets. Three companies producing in the region are based in Kenya and three in Uganda.

Syngenta and Hygrotech are the only companies in the Regional Index to provide no evidence of seed production in Regional Index countries, although both companies are involved in seed production in other countries in sub-Saharan Africa.

Involving smallholder farmers in seed production is common

More than two thirds of companies include smallholders in their seed production activities in Regional Index countries. NASECO outperforms its peers, reporting that 90% of its production is carried out by smallholder farmers or farmer cooperatives. East-West Seed and East African Seed report rates of 80% and 70%, respectively.

Syngenta, Monsanto and DuPont Pioneer have the most potential to increase smallholder involvement in production activities, indicating a significant opportunity for these global players.

Regional Index companies demonstrate awareness of social standards

Eight companies disclose their social standards in seed production. There is evidence to suggest that companies are aware of labor issues in seed production, as many companies report adherence to local labor laws.

Monsanto demonstrates leadership in this area by formulating and disclosing a Human Rights Policy, which is guided by the Universal Declaration of Human Rights and the International Labour Organization's (ILO) Declaration on Fundamental Principles and Rights at Work. The policy encompasses nine elements including child labor, forced labor, safety and compensation, and is embedded in the company's Supplier Code of Conduct. In addition, the company states that it works to identify and do business with partners who aspire to ethical standards consistent with this policy.

Besides monitoring systems to track compliance, best practices for ensuring social standards in production include many forms of supplier engagement. For instance, companies offering training or financial incentives to seed suppliers, enforcing supplier codes of conduct that meet international standards, such as those outlined by the ILO, or integrating fair labor conditions into contracts with seed producers, which are subject to termination if violations are found.

Companies could improve their performance by disclosing minimum labor standards for all seed production activities carried out for them, and by introducing formal monitoring systems to track compliance within their own operations as well as their supply chains. Social standards that meet internationally recognized workplace norms, including forced and child labor, health & safety, minimum wages and acceptable working conditions, are particularly important in emerging economies with weaker oversight from national governments. Companies can support the development and enforcement of standards in Regional Index countries and work with producers in the value chain to improve practices where cases of non-compliance are found.

Focus Area 2: Maintenance Programs and Quality Management

Programs to maintain the quality of basic seed and old varieties exist, but the industry overall could improve

Six companies have implemented programs to maintain the quality of basic seed and old varieties, reporting programs applicable to two or more crops used by smallholders in Index countries. The remaining companies do not provide clear evidence of how they support the quality of basic seed and old varieties.

East-West Seed demonstrates leadership by monitoring every phase of the seed life cycle, from first generation to commercial seed production, as well as field activity, and recording all information in an internal database system. The company's breeders conduct field visits to validate the purity of new parental lines, disposing of any stock seed batches that do not meet quality standards. Another notable example is East African Seed's engagement with national and international research organizations in Kenya, Uganda and Tanzania. The company supplies these organizations with purified parent seed from its breeding programs to preserve the quality of basic seed.

Maintenance programs are an important part of conserving the quality of basic seed, ensuring that priority crops and local varieties are preserved over time. Companies could work with farmers and other local players in informal seed systems to establish programs to safeguard the purity of seed of important old varieties.

Opportunities exist for Regional Index companies to improve disclosure on quality management systems

More than two thirds of the companies disclose information about quality management activities during seed production. However, the exact nature and scope of these activities is often unclear. Only three companies report externally certified systems that extend to more than 50% of seed production. Kenya Seed Company, East African Seed and DuPont Pioneer are the only companies to disclose full-scope quality management systems with external certifications, such as ISO 9001, covering 100% of their production operations. Close to one third of the companies, disclose no information regarding quality management systems.

East-West Seed states that 100% of the seed it produces is subject to quality assurance scrutiny. The company has a dedicated quality management team and monitors all stages between first generation to commercial seed. All quality information is recorded in the company's internal database, which offers 100% traceability of quality issues for all of its products.

While it is unclear whether Syngenta has local seed production activities in Eastern Africa, the company states that it has a quality management system modelled on ISO 9001. The company does not specify, however, whether the system extends to its third-party production licensees or whether it is externally certified.

Demeter Seed registers farmer groups with Malawi's Seed Services Unit, but it is unclear what part of the company's seed production is covered by quality management systems or whether such systems are externally certified.

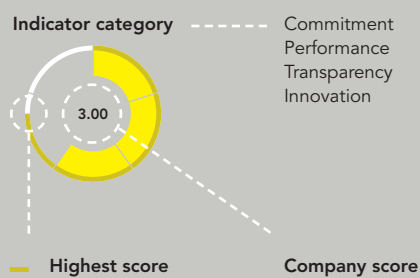
Quality seeds are the cornerstone of smallholder productivity and economic growth in Regional Index countries. Companies are encouraged to be more transparent about seed production quality assurance, and ensure that where needed further quality management systems will be introduced, subjecting seeds to a set of tests, measures and procedures in line with international certification standards, to assure the consistent quality of seeds throughout the production process.



Seed production

A farmer checks if the maize is ready for harvesting at a NASECO seed production site in Nalweyo, Uganda. Smallholder farmers are not only end-users of seeds but can also be partners of seed companies in their seed value chain, for instance in seed production. NASECO reports that more than 90% of its seed production is carried out by smallholder farmers and farmer cooperatives.

How the Company Scores and Rankings Work: per Indicator Category



per Measurement Area



Regional Access to Seeds Index for Eastern Africa – Company Scorecards

Company scorecards present the individual scores of the Regional Index companies. A scorecard reflects a company's overall ranking as well as its ranking per measurement area and indicator category (Commitment, Performance, Transparency and Innovation). It also offers insights into practices that are considered leading in the industry, areas for improvement and notable findings. An overview is provided of a company's operations in the Index region and its crop portfolio, where available.



Demeter Seed

Access to Seeds
Index

Corporate Data
Headquarters: Lilongwe, Malawi
Ownership type: Private

Demeter Seed Ltd. (Demeter Seed) breeds, produces and markets a range of field crop seeds. The company is a sub-division of Demeter Agriculture Ltd (DAL), which has been engaged in the agricultural production of commodities and seeds since 2004. It focuses on selected bean, soybean and maize seeds grown both on Demeter Seed's farm and by outgrowers. Seeds are processed, treated and packed at the main facility in Lilongwe before being distributed through the company's own network of outlets as well as through distributors outside Malawi.

9

rank out of 17
score 1.96

Regional Index – Eastern Africa

Most of Demeter Seed's activities are located in Malawi and to a lesser extent in Mozambique, Tanzania and Zambia. Smallholder farmers are engaged in several company activities including Research & Development and Production. R&D programs are informed by local knowledge and

feedback, and robust distribution networks meet smallholder needs. Relatively little public information on the company is available, however. This is reflected in its low Transparency score and overall ranking in ninth place in the Regional Index.



Leading Practices

Demeter Seed is engaged in industry and public dialogue, and participates in multi-stakeholder initiatives. For example, it has lobbied independently and in collaboration with stakeholders on issues of interest to smallholder farmers in Malawi, its senior management is active in the Seed Trade Association of Malawi and it has attended several forums to support regional seed trade harmonization.

The company gathers local knowledge and feedback to inform its R&D programs in Malawi, primarily through its point-of-sale interactions and during field days. This has resulted, among other things, in the incorporation of traits such as flintiness for reduced cooking time into breeding activities.

The company adapts its packaging and distribution practices to meet the needs of smallholder farmers. For instance, it employs a vast distribution network, including indirect channels such as agrodealers and schoolteachers, and offers various pack sizes (including 1, 2, 3, 5 and 8 kilogram packages) in Malawi.

The company builds the capacity of smallholder farmers in Malawi by teaching agronomic best practices for quality control and providing logistical support. It has also contributed to tertiary training and hosted students for practical training.

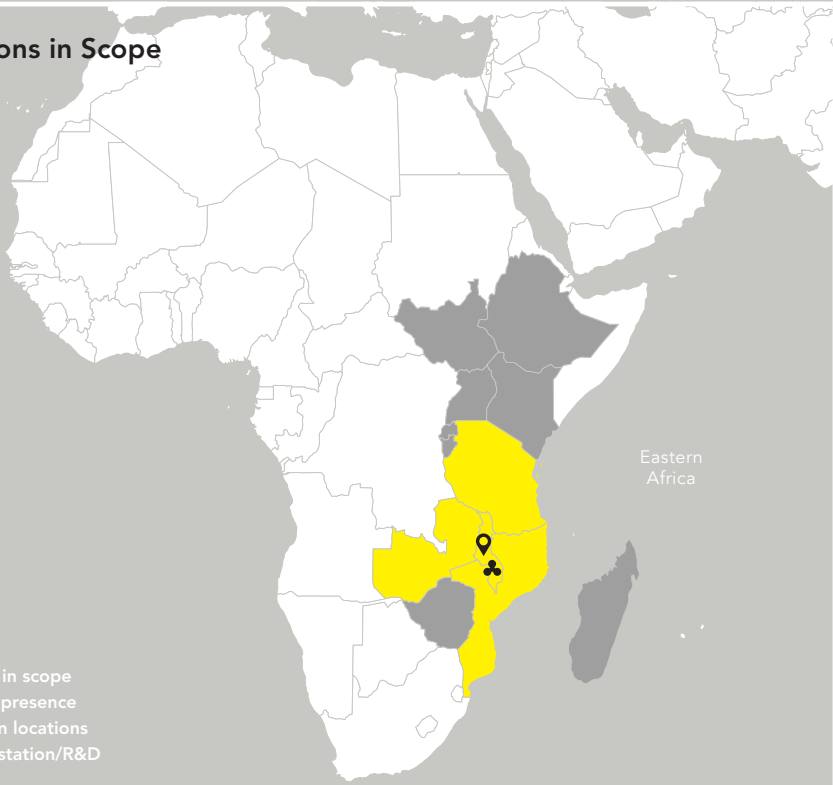
Areas for Improvement

Demeter Seed could significantly improve its transparency by publicly disclosing more about its activities and commitments.

It could also expand its programs and activities that support smallholder farmers beyond Malawi to the other three countries where it is active, namely Mozambique, Tanzania and Zambia, and broaden its marketing & sales activities by developing seed affordability programs for smallholder farmers.

Operations in Scope

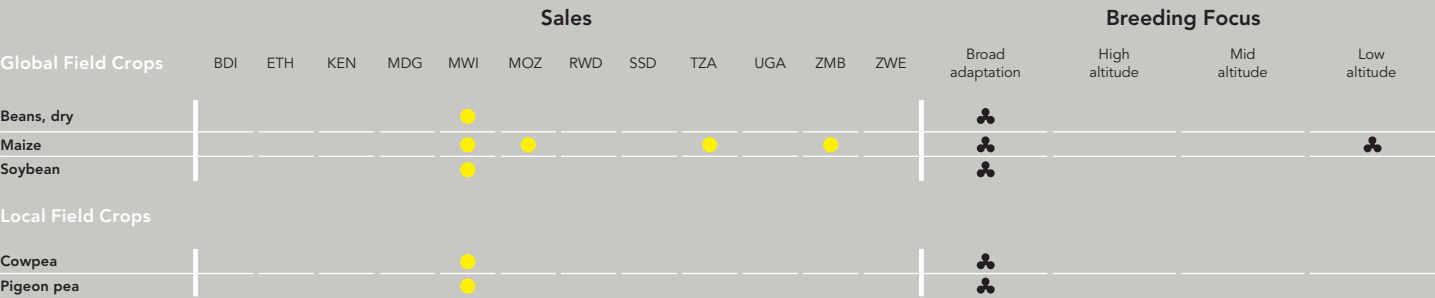
- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Notable Findings

- When releasing new seed varieties, Demeter Seed makes an effort to market commercial varieties and varieties developed by research institutes that are appropriate to the needs of smallholder farmers.
- The company accommodates the differing capacity levels of smallholder farmers by offering both hybrid and open-pollinated (OPV) maize varieties.
- The company aims to involve smallholder farmers in its seed production, stating that 25% of its seed production in Malawi is carried out by smallholders or farmer cooperatives.

Index Crops in Portfolio





Access to Seeds
Index

DuPont Pioneer

Corporate Data

Headquarters: Johnston, Iowa, USA
Ownership type: Listed
Group revenue (agriculture segment) (2014):
USD 11,304,000,000

Pioneer Hi-Bred International, Inc. was established in the USA in 1926 and later renamed Pioneer. After its acquisition by E.I. du Pont de Nemours and Company (commonly referred to as DuPont) in 1999, it became known as DuPont Pioneer. The company supplies a diverse range of field crop seeds alongside crop protection products. DuPont Pioneer acquired the South Africa-based field crop seed company Pannar Seed in 2013. Pannar Seed has subsidiaries in eight other African countries.*

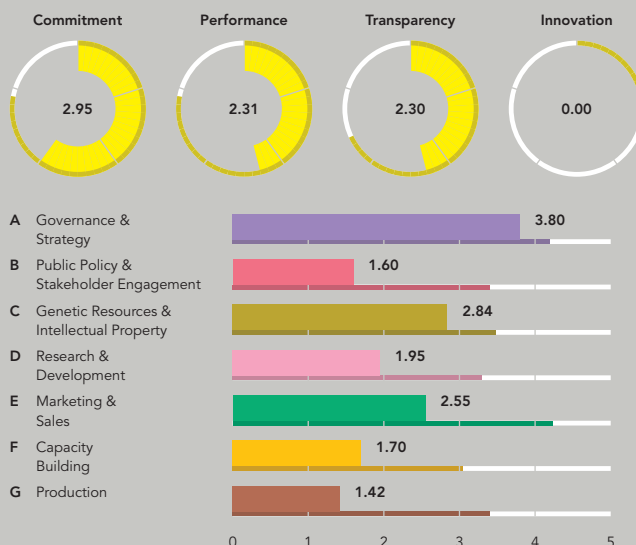
6

rank out of 17
score 2.21

Regional Index – Eastern Africa

DuPont Pioneer ranks sixth in the Regional Index, thanks to strong performance in Governance & Strategy and Genetic Resources & Intellectual Property. The company has formal commitments to food security and access to seeds, which are integrated into its overall strategy. It scores well

on Commitment and Transparency. DuPont Pioneer has opportunities to improve in Public Policy & Stakeholder Engagement and Research & Development.



Leading Practices

■ One of DuPont Pioneer's Global Food Security Goals is to improve agricultural development. The company states that it focuses on 'enabling farmers to be more productive, not only through the provision of improved seeds but also by developing stronger food value chains in collaboration with partners in support of rural agricultural communities worldwide'. Moreover, it is committed to increasing the productivity and incomes of smallholder farmers in an environmentally sustainable way, with the goal of improving the livelihoods of 3 million smallholder farmers and their rural communities, including in Eastern Africa.

■ DuPont Pioneer strongly supports the breeders' exemption in plant variety protection (PVP) law and has worked to stop treaties or laws from limiting the exemption.

■ The company has a position statement on biodiversity principles, which includes a commitment to conserve and protect natural resource biodiversity; consider the concerns of local communities in the selection, design, production and introduction of products; and publicly advocate these positions.

■ The company actively supports the advancement of research capacity in Index countries. In 2013, it established the African Research Technology Hub in South Africa, which serves the entire continent. Similarly, it partners with local universities and many of the CGIAR centers, including CIMMYT, IRRI, ICRISAT and CIAT, in its research efforts. It states that it has more than 500 R&D collaborations, which include material transfer agreements, intellectual property (IP) considerations and royalty stipulations.

■ The company provides transgenic DNA constructs, currently for testing purposes only, to the African Biofortified Sorghum (ABS) project, which aims to combat human micronutrient deficiencies by developing nutrition-enhanced sorghum. In addition, it has donated its intellectual property to the Improved Maize for African Soils (IMAS) partnership, the resulting inbreds and hybrids of which will be made available royalty-free to national programs and smallholder farmers.

■ The company has distribution channels to make its seeds specifically accessible to smallholder farmers in all 12 Regional Index countries, with an important role for its subsidiary Pannar Seed. Remote areas are serviced through local shops, smallholder farmers in some countries and village-level systems in others.

■ The company provides advisory and extension services through a number of programs and collaborations. These include the AMSAP project in Ethiopia, for which it provides capacity training, agronomic advice and technical assistance; the ZAMSAP program in Zambia, which addresses OPV to hybrid adoption and value chain support; and the Soil Doc Program, also in Zambia, which focuses on the efficient use of fertilizer.

Areas for Improvement

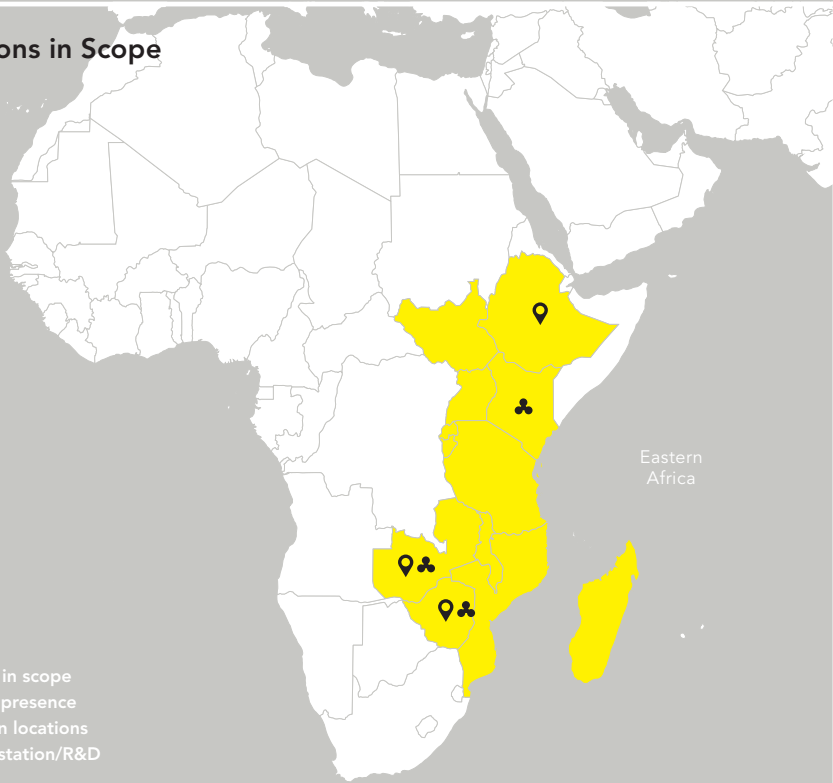
■ As subsidiary of a large agrochemical company, DuPont Pioneer could strengthen its efforts to ensure that smallholder farmers in Regional Index countries have access to the necessary agricultural inputs other than seeds. The company could consider activities to facilitate capacity building around the appropriate and sustainable use of inputs.

■ The company could also consider leveraging its experience of operating in Eastern Africa, together with its commitments to global food security, to increase its participation in regional public policy debates and multi-stakeholder and industry initiatives to improve access to seeds for smallholder farmers in the region.

■ The company produces seeds in three of the 12 Regional Index countries. It is unclear whether the company involves smallholder farmers in seed production and it is encouraged to disclose information in this regard.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Notable Findings

- DuPont Pioneer participates in a number of global policy debates and other collaborative initiatives. It leads Measuring Global Progress toward Food and Nutrition Security, a report informed by stakeholder engagement, and has contributed to the New Alliance for Food Security and Nutrition, a collaboration with USAID that aims to reduce global hunger by enabling smallholder farmers' access to agricultural innovations. In addition, it has sponsored the Global Food Security Index, a worldwide perspective on food insecurity compiled by the Economist Intelligence Unit.
- DuPont Pioneer is involved in the development of improved varieties suitable for smallholder farmers in Regional Index countries for maize, one of the seven Index crops in its portfolio. In addition, it performs variety trials in eight of the 12 Regional Index countries for five of the seven Index crops in its portfolio.
- DuPont Pioneer is involved in the R&D of specific traits tailored to the needs of smallholder farmers, including resistance to pests and diseases and abiotic stress tolerance, higher nutritional values and increased yields. The company also reports activities to develop a nutritious and easily digestible sorghum variety, and improved maize varieties that are better at capturing fertilizer, thereby increasing yield. The company also refers to breeding for culinary preferences.
- DuPont Pioneer accommodates the differing capacity levels of smallholder farmers by offering different grade seeds and selling seeds in appropriately sized packages.

Index Crops in Portfolio

Global Field Crops	Sales											
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE
Beans, dry	<div></div>		<div></div>	<div></div>		<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Maize	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Pearl millet												
Rice, paddy												
Sorghum	<div></div>		<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Soybean	<div></div>		<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Wheat	<div></div>		<div></div>	<div></div>		<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>



Access to Seeds
Index

East African Seed

Corporate Data

Headquarters: Nairobi, Kenya
Ownership type: Private

East African Seed Co. Ltd (East African Seed) supplies agricultural chemicals and equipment, ornamental seeds and a wide range of global field crop and vegetable seeds. The company was established in 1972 in Kenya and today has sales and breeding locations throughout Eastern Africa. The agrochemical division has operated under the Agriscope brand since 2003.

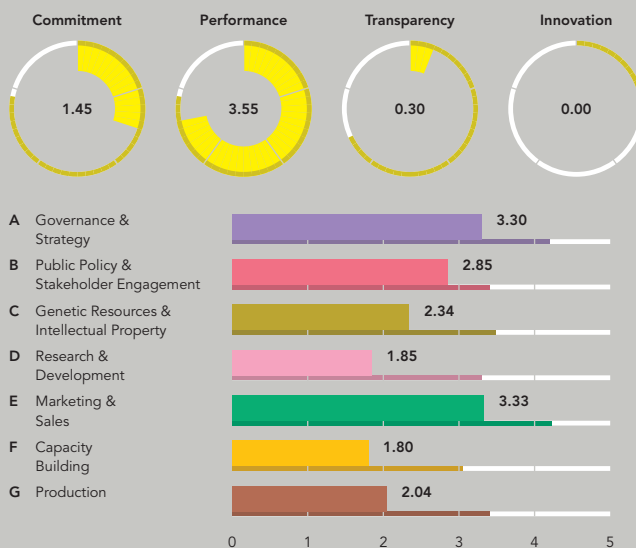
3

rank out of 17
score 2.45

Regional Index – Eastern Africa

East African Seed ranks third in the Regional Index, a position it owes primarily to activities and programs supporting access to seeds and smallholder farmers. The company has developed a strategy and supporting governance structure that prioritizes access to seeds for smallholder farmers.

It also makes a strong effort to accommodate the needs of smallholders in its marketing & sales practices, whether by providing a range of seed package sizes and distributing in remote areas or ensuring the affordability of its seeds. Finally, the company engages in public policy and industry activities, particularly through industry associations, and attempts to represent the region's perspective in global forums when possible. Opportunities exist for East African Seed to improve its policy commitments and public disclosure of its activities and programs across most measurement areas.



Leading Practices

East African Seed has extensive R&D programs that include developing improved varieties for nearly all of the local crops it markets (five out of six), and investing a large part of its R&D budget in developing varieties suitable for smallholder farmers. The company breeds for traits that are tailored to the needs of smallholder farmers, including resistance to pests and diseases, abiotic stress tolerance and high yields, and takes into account specific local tastes and cultural preferences.

East African Seed provides price lists to its distributors (including the sale price to farmers), and supplies seeds through NGOs or government programs, thereby cutting out the middlemen and ensuring the affordability of its seeds.

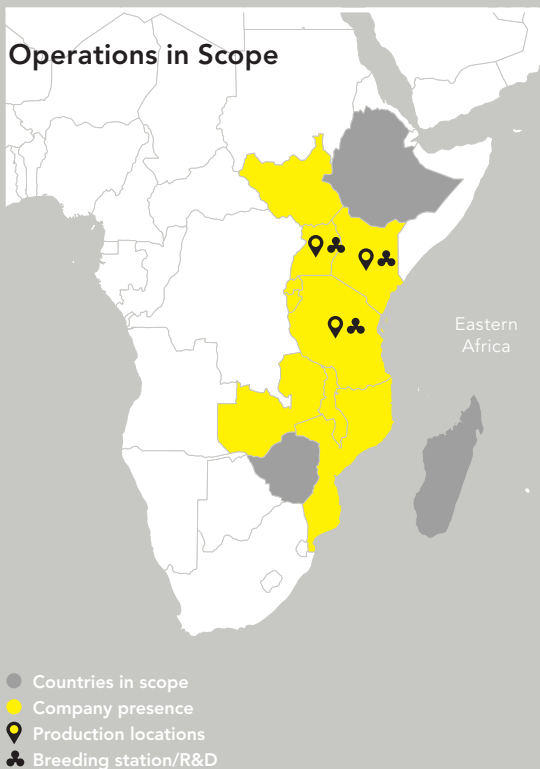
The company supports local seed production, producing in three countries – Kenya, Tanzania and Uganda – in the Index region. Seventy percent of its seeds are produced by smallholders.

Areas for Improvement

East African Seed could expand its knowledge-gathering and feedback programs beyond Kenya, Tanzania and Uganda, to include smallholder farmers in all the countries where it is active.

The company complies with all national labor laws for its seed production activities. However, it could additionally consider establishing a set of minimum social standards and applying these across its production processes.

Operations in Scope



Notable Findings

■ East African Seed is involved in several industry associations at the national and regional level, and has leveraged its leadership role in these associations to promote the regional perspective globally.

■ The company engages in some public policy and multi-stakeholder activities related to access to seeds. For example, it successfully lobbied for agricultural inputs in Uganda to be exempt from value-added tax, and has similar ongoing lobbying activities in Kenya. The company also partnered with the African Agricultural Technology Foundation on the Water Efficient Maize for Africa (WEMA) project.

■ The company accommodates the needs of smallholder farmers in its marketing & sales practices: it offers a variety of seed package sizes; it markets open-pollinated varieties (OPVs) for maize, sorghum, sesame, cowpea, dry beans, soybean and green grams (mung beans) in Regional Index countries; and its distribution channels service remote areas.

■ It has a robust marketing & sales program, marketing all the crops in its portfolio in all the countries where it is active, and helping to market varieties developed by national and international research institutes.

■ It promotes the use of ICT and publishes and distributes flyers, posters and guides for farmers on crop production technologies in all Regional Index countries where it is active. A website provides additional crop information.

■ The company participates in agricultural exhibitions organized by universities and government agencies in three countries where it is active. It also organizes demonstrations in schools and trains young farmers on crop management practices.

■ The company has a robust quality assurance system. It makes an effort to ensure the affordability of its seeds, and has put in place a system for collecting feedback and addressing farmer grievances.

Index Crops in Portfolio

	Sales												Breeding Focus			
Global Field Crops	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Beans, dry			●							●						
Maize			●					●	●	●				●	●	●
Rice, paddy										●						
Sorghum									●	●			●			
Soybean										●						
Global Vegetable Crops																
Broccoli	●		●		●	●	●	●	●	●	●					
Cabbage	●		●		●	●	●	●	●	●	●					
Carrot	●		●		●	●	●	●	●	●	●					
Cauliflower	●		●		●	●	●	●	●	●	●					
Chili pepper	●		●		●	●	●	●	●	●	●					
Cucumber	●		●		●	●	●	●	●	●	●					
Eggplant	●		●		●	●	●	●	●	●	●					
Gourd			●		●	●	●	●	●	●	●					
Green pea			●						●	●	●					
Leek	●		●		●	●	●	●	●	●	●					
Lettuce	●		●		●	●	●	●	●	●	●					
Melon	●		●		●	●	●	●	●	●	●					
Okra	●		●		●	●	●	●	●	●	●					
Onion	●		●		●	●	●	●	●	●	●					
Pumpkin	●		●		●	●	●	●	●	●	●					
Spinach	●		●		●	●	●	●	●	●	●					
Squash	●		●		●	●	●	●	●	●	●					
Sweet pepper	●		●		●	●	●	●	●	●	●					
Tomato	●		●		●	●	●	●	●	●	●					
Turnip	●		●		●	●	●	●	●	●	●					
Watermelon	●		●		●	●	●	●	●	●	●					
Local Field Crops																
Cowpea			●							●						
Local Vegetable Crops																
Amaranth	●		●		●	●	●	●	●	●	●		●			
Black nightshade	●		●		●	●	●	●	●	●	●		●			
Crotalaria			●							●	●		●			
Jew's mallow			●							●	●		●			
Spider plant			●							●	●		●			



Access to Seeds
Index

East-West Seed

Corporate Data

Headquarters: Nonthaburi, Thailand
Ownership type: Private
Group revenue (2014): USD 136,272,641

East-West Seed Company Ltd. (East-West Seed) is a vegetable seed company that originally focused on breeding and marketing varieties in Asia. It was founded in 1982 in the Philippines but moved its headquarters to Thailand shortly afterwards. More recently, the company has expanded its operations to other tropical and sub-tropical parts of the world, including Eastern Africa. It established the Afrisem breeding company in cooperation with Rijk Zwaan in Tanzania in 2008.

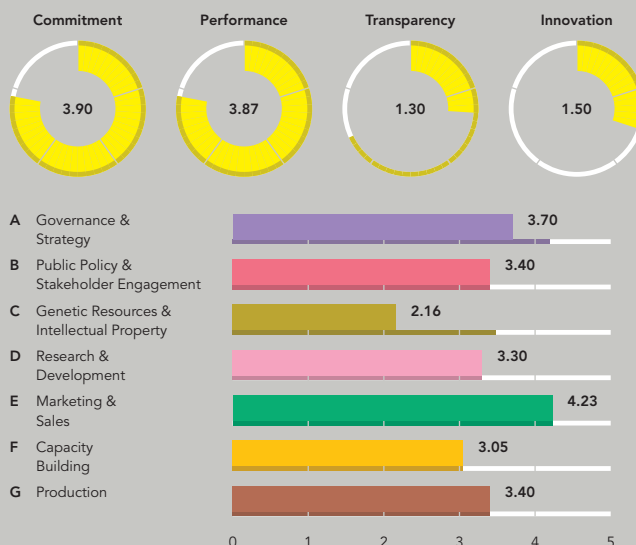
1

rank out of 17
score 3.38

Regional Index – Eastern Africa

East-West Seed leads the Regional Index ranking. It performs strongly across all measurement areas, with programs and initiatives supporting access to seeds for smallholder farmers and the commitments and policies to back them up. It has an extensive distribution channel, and develops packaging and

labeling that address smallholder farmers' needs. It has introduced not only a quality management system but also a system for collecting and handling feedback and grievances. Due to the nature of its business model, in which smallholder farmers are the primary customers, the company has developed a robust governance & strategy system around access to seeds for smallholder farmers. Similarly, the company is engaged in several public policy, industry dialogue and multi-stakeholder initiatives that support the interests of smallholder farmers. Finally, the company leads in innovation in several areas.



Leading Practices

Through its joint participation with Rijk Zwaan in the Afrisem breeding company in Tanzania and the Seeds of Expertise for the Vegetable Industry of Africa (SEVIA) project, East-West Seed has shared its germplasm for breeding purposes. Both initiatives specifically aim to support smallholder farmers through improved production systems and varieties.

East-West Seed demonstrates a strong commitment to access to seeds for smallholder farmers and discloses a supporting strategy. In its mission statement, the company articulates the importance of farmers and how it intends to serve them in a manner that 'improves their livelihoods and income'. It is also committed to employing a variety of tools and methods to fulfill this mission such as developing local breeding, extension and marketing capabilities. The company considers 90% of its customer base to be smallholder farmers.

East-West Seed scores highest among its Regional Index peers for its multi-stakeholder and policy advocacy activities. The company discloses several public policy initiatives aimed at improving access to seeds for smallholder farmers. Specifically, these initiatives support farmer education and market linkages for smallholder farmers. Similarly, the company is involved in several multi-stakeholder initiatives, such as the African Institute for Vegetable Technology, and contributes to the Global Crop Diversity Trust.

The company participates in projects with local partners, with the aim of developing improved varieties of local crops. For example, it works with the Tanzanian Vegetable Seed Program to breed and select nightshade, amaranth and spider plants.

The company also makes efforts to accommodate the needs of smallholder farmers through its marketing, packaging and labeling practices. It has created both small pouch and value pack seed package sizes and made packaging available in local languages. Similarly, it offers open-pollinated varieties (OPVs) and different grade seeds in the region. It should be noted that OPVs dominate East-West Seed's seeds sales in Eastern Africa.

The company supports capacity building in a number of ways. Its farmer education programs involve engaging with formal educational institutions and training next-generation farmers. It leverages ICT to facilitate farmer training and, through its Plant Health Doctor online platform, it provides key data to improve farming practices especially related to disease and pest management. Through its collaboration with the NGO Fair Planet in Ethiopia, the company aims to empower women farmers by providing them with affordable seeds, business skills and marketing opportunities.

Areas for Improvement

East-West Seed can improve its Transparency score by disclosing more information publically, especially on its production, marketing & sales and R&D activities. It could also consider expanding its strong agricultural advisory support programs to more of the Regional Index countries where it is active.

Operations in Scope



Notable Findings

■ East-West Seed supports the breeders' exemption and states that it makes its PVP-protected varieties available for breeding purposes, in compliance with national PVP laws. Moreover, it does not support the patenting of native traits, and states patent licensing platforms must guarantee that conventional breeding methods and native traits remain excluded from patentability.

■ Although there is no evidence that its breeding programs focus on improving nutritional value, the company does breed for other traits related to crop robustness and climate change resilience, which are useful to smallholder farmers. In particular, the company states that its breeding objectives are disease and insect resistance, heat tolerance, off-season adaptation, improved shelf life, transportability and higher yields.

■ The company has in place a strong system for tracking customer feedback and grievances. The system includes contracting surveyors to conduct market research, collecting feedback from its field promoters and local dealers, and managing complaints through its complaint-handling system.

■ The company supports farmer organizations or cooperatives that are focused on improving agricultural practices in Kenya, Tanzania and Uganda.

■ The company produces seeds in Tanzania, of which 80% are produced by smallholder farmers.

Index Crops in Portfolio

Global Vegetable Crops	Sales												Breeding Focus			
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Broccoli									●				●			
Cabbage		●							●	●	●	●	●			
Carrot									●				●			
Cauliflower									●				●			
Chili pepper		●	●	●		●			●	●	●	●	●		●	●
Cucumber		●							●	●	●	●	●			
Eggplant									●				●		●	●
Gourd		●							●	●	●	●	●			
Green bean													●			
Lettuce			●	●		●			●				●			
Melon									●				●			
Okra		●							●	●	●	●	●			
Onion			●						●				●			
Pumpkin		●							●	●	●	●	●			
Spinach													●			
Squash													●			
Sweet pepper		●							●	●	●	●	●			
Tomato		●							●	●	●	●	●			
Watermelon			●						●				●			
Local Vegetable Crops																
Amaranth									●			●	●			
Black nightshade									●			●	●			
Spider plant									●			●	●			



Access to Seeds
Index

Ethiopian Seed Enterprise

Corporate Data

Headquarters: Addis Ababa, Ethiopia
Ownership type: State owned

Ethiopian Seed Enterprise was established in 1978 and has operated in its present form since 2002. The company is the largest field crop seed producer and supplier in Ethiopia. It runs six seed production and processing centers, one main and six smaller laboratories, and several other facilities. Ethiopian Seed Enterprise is state owned and is supervised by the Ministry of Agriculture.

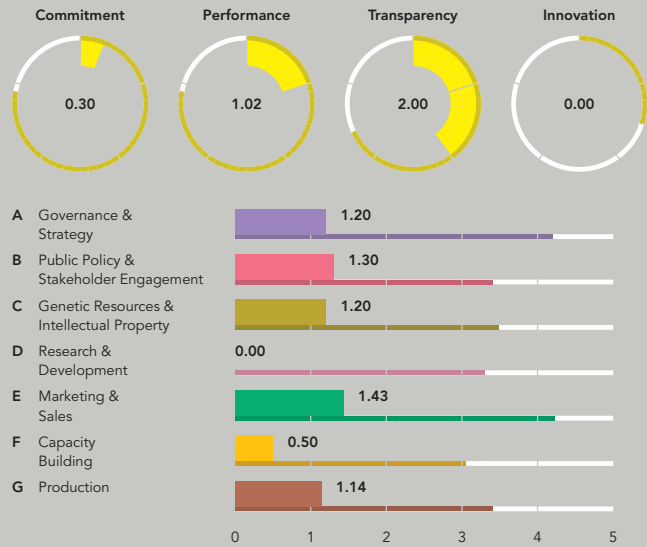
16

rank out of 17
score 0.87

Regional Index – Eastern Africa

Ethiopian Seed Enterprise was established to serve local farmers in Ethiopia, both small and large, and therefore has multiple opportunities to contribute to improving access to seeds for smallholder farmers. However, the company's performance in the Regional Index is weak, in

part due to limited disclosure, both publicly and on engagement, about its activities related to access to seeds.



Leading Practices

■ Ethiopian Seed Enterprise operates a central seed testing laboratory and has six smaller seed laboratories. The company also operates six seed production sites in different regions of the country, with a total area of 6,543 hectares of land under rain-fed conditions. In addition, two seed production sites produce seeds under irrigation.

Areas for Improvement

■ Ethiopian Seed Enterprise can improve its currently low score by disclosing formal policies and integrating access to seeds-related objectives and programs into its operations.

■ Since the company is a member of several industry associations, including the African Seed Trade Association and the Ethiopian Seed Association, it is encouraged to clarify how it represents the interests of the Ethiopian seed industry in such forums and policymaking processes.

■ The company collaborates with universities, research institutes and other (regional) seed enterprises to distribute seeds. It is encouraged to disclose details regarding the contributions these collaborations make to improving access to seeds for smallholder farmers.

■ The company appears to contract some smallholder farmers to grow its seeds, however the full scope of these activities is unclear.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D

Notable Findings

- As a state-owned company, Ethiopian Seed Enterprise makes use of distribution channels facilitated by the Ministry of Agriculture, leveraging regional agricultural bureaus to reach smallholder farmers.
- Ethiopian Seed Enterprise collaborates with the multi-stakeholder program on Integrated Seed Sector Development (ISSD) in Ethiopia. ISSD aims to develop a market-oriented and pluralistic seed sector in the country, making quality seeds of improved varieties available to and affordable for a large number of farmers.
- The company offers different forms of training to farmers, development agents and contract seed growers. The company also provides counseling and guidance, and general information on seed production and processes.

Index Crops in Portfolio

Sales												
Global Field Crops	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE
Barley												
Beans, dry												
Finger millet												
Maize												
Rice, paddy												
Sorghum												
Soybean												
Wheat												
Local Field Crops												
Tef												



Access to Seeds
Index

FICA Seeds

Corporate Data

Headquarters: Kampala, Uganda
Ownership type: Private
Total revenue (2014): UGX 7,116,955,000

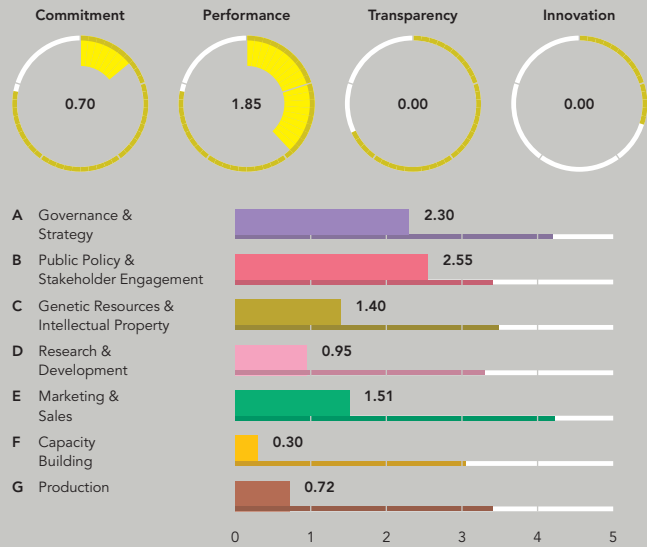
Farm Inputs Care Centre Ltd. (FICA Seeds) was founded in Uganda in 2001 and is privately owned. Its portfolio includes a diverse set of field crop and vegetable seeds, both open-pollinated varieties (OPVs) and hybrids, among them sunflower and cotton.

15

rank out of 17
score 1.25

Regional Index – Eastern Africa

FICA Seeds ranks 15th in the Regional Index. The company markets varieties appropriate for smallholders for 22 of the 24 Index crops in its portfolio (91%). Its core strengths lie in Public Policy & Stakeholder Engagement and Governance & Strategy, but significant opportunities for improvement remain.



Leading Practices

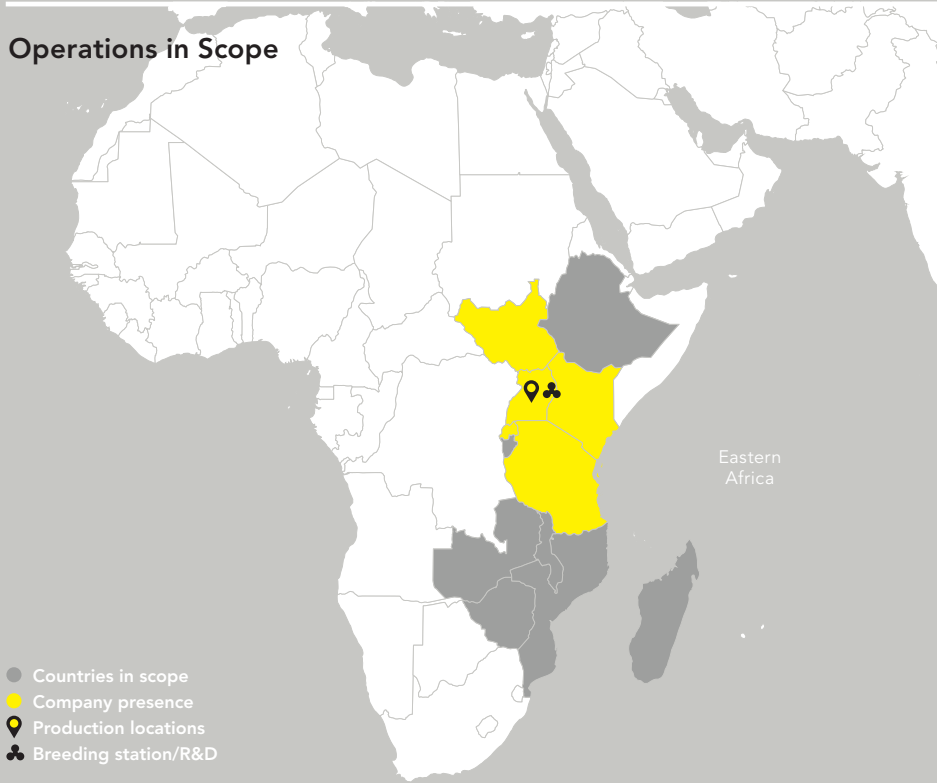
■ FICA Seeds states that 60% of its seed production is carried out by smallholder farmers and/or smallholder farmer cooperatives.

Areas for Improvement

■ FICA Seeds can greatly improve its Transparency score by enhancing public disclosure of its activities and commitments.

■ The company is encouraged to introduce social standards to ensure fair labor conditions in the production of its seeds in Regional Index countries, especially as the majority of its seeds are produced by smallholders.

Operations in Scope



Notable Findings

■ FICA Seeds defines smallholder farmers as subsistence farmers who have the potential to become commercial farmers when incorporated into the value chain.

■ The company has provided technical support to the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the Alliance for a Green Revolution in Africa (AGRA) conferences in the preparation for strategic plans to increase access to seeds for smallholder farmers. The company participates in public policy advocacy in Ethiopia, Kenya, Malawi and Uganda, but it is encouraged to disclose how its public policy engagement contributes to an enabling environment for smallholder farmers.

■ The company is involved in partnerships with peers and in participatory breeding with farmers. It is encouraged to disclose details about these activities.

Index Crops in Portfolio

Global Field Crops	Sales											Breeding Focus				
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Barley			●							●				●●●		
Beans, dry							●	●	●	●						
Maize			●				●	●	●	●			●●●	●●●		
Pearl millet										●						
Rice, paddy										●						
Sorghum								●		●						
Soybean										●						
Global Vegetable Crops																
Broccoli								●		●						
Cabbage								●		●						
Carrot										●						
Cauliflower										●						
Cucumber										●						
Eggplant										●						
Leek										●						
Lettuce																
Melon																
Okra								●		●						
Onion								●		●						
Pumpkin								●		●						
Spinach								●		●						
Sweet pepper								●		●						
Tomato								●		●						
Watermelon								●		●						
Local Field Crops																
Cowpea								●		●						



Hygrotech

Access to Seeds
Index

Corporate Data

Headquarters: Pyramid, South Africa
Ownership type: Private

Hygrotech Seed (Pty) Ltd. (Hygrotech) was founded in South Africa in 1984. It markets vegetable seeds alongside a range of other agricultural products. In 2011 it launched FertAgChem, a division dedicated to research and development of agricultural chemicals.

17

rank out of 17
score 0.32

Regional Index – Eastern Africa

As the Regional Index's weakest performer, Hygrotech has multiple opportunities to improve access to seeds for smallholder farmers in Eastern Africa. It could leverage its strong distribution and direct sales network to improve engagement with smallholder farmers as well as use this

engagement to inform its R&D focus. No evidence was found of activities related to access to seeds in Governance & Strategy, Research & Development, Capacity Building or Production.



Leading Practices

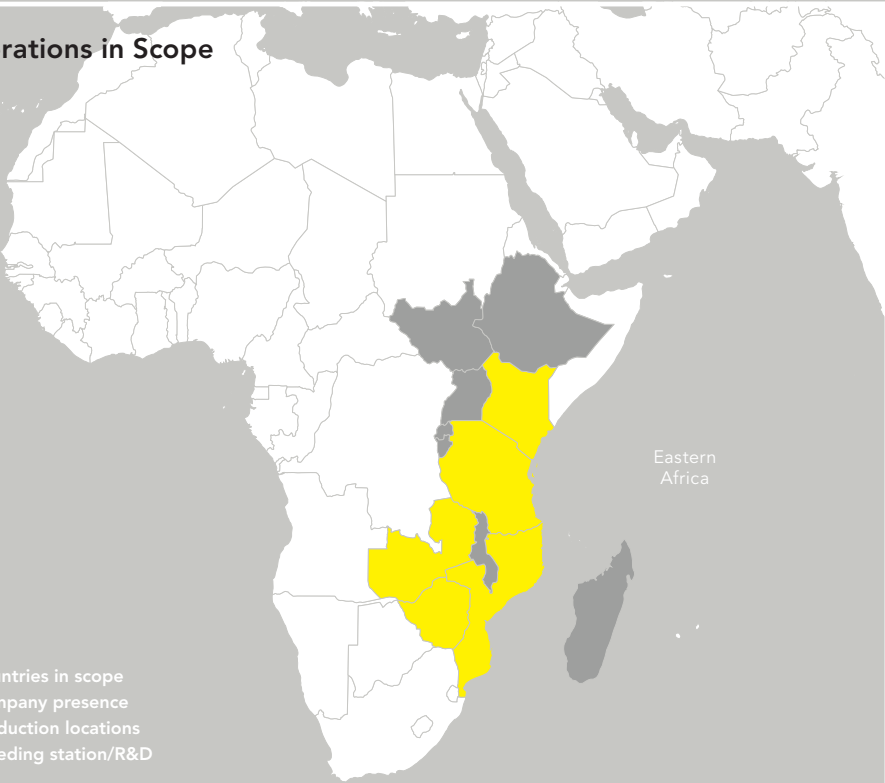
■ Hygrotech accommodates the differing capacity levels of smallholder farmers by marketing OPVs for crops where OPVs and hybrids are normally available.

Areas for Improvement

■ Hygrotech is encouraged to disclose the full scope of its access to seeds-related activities and the Regional Index countries where it operates, and to specify the varieties and traits used in breeding programs in order to clarify the level of suitability for smallholder farmers in Regional Index countries.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Notable Findings

No notable findings were identified.

Index Crops in Portfolio

Global Vegetable Crops

- Broccoli
- Cabbage
- Cauliflower
- Chili pepper
- Cucumber
- Eggplant
- Green bean
- Lettuce
- Melon
- Onion
- Pumpkin
- Squash
- Sweet pepper
- Tomato
- Watermelon



Access to Seeds
Index

Kenya Highland Seed

Corporate Data
Headquarters: Nairobi, Kenya
Ownership type: Private

Kenya Highland Seed Co. Ltd. (Kenya Highland Seed) was established in 1999 in Kenya and operates regionally. The company supplies open-pollinated varieties (OPVs) and hybrid vegetable seeds, the latter marketed under the name Royal Seed.

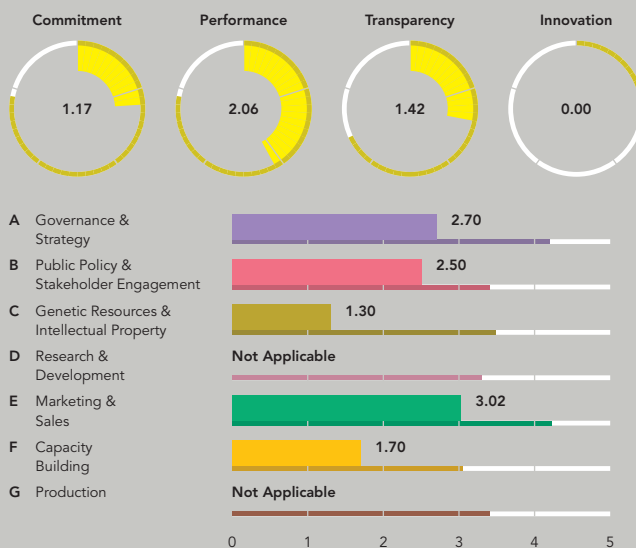
13

rank out of 17
score 1.62

Regional Index – Eastern Africa

Kenya Highland Seed ranks 13th in the Regional Index. It performs strongly in Public Policy & Stakeholder Engagement and Marketing & Sales but achieves only average scores in the other measurement areas. The company has no Research & Development and Production activities

and therefore these Measurement Areas were not scored. The company offers both OPV and hybrid vegetable seeds in packaging tailored to local needs. It could leverage its expertise in demonstration farms in Kenya, and expand capacity-building projects to other Regional Index countries.



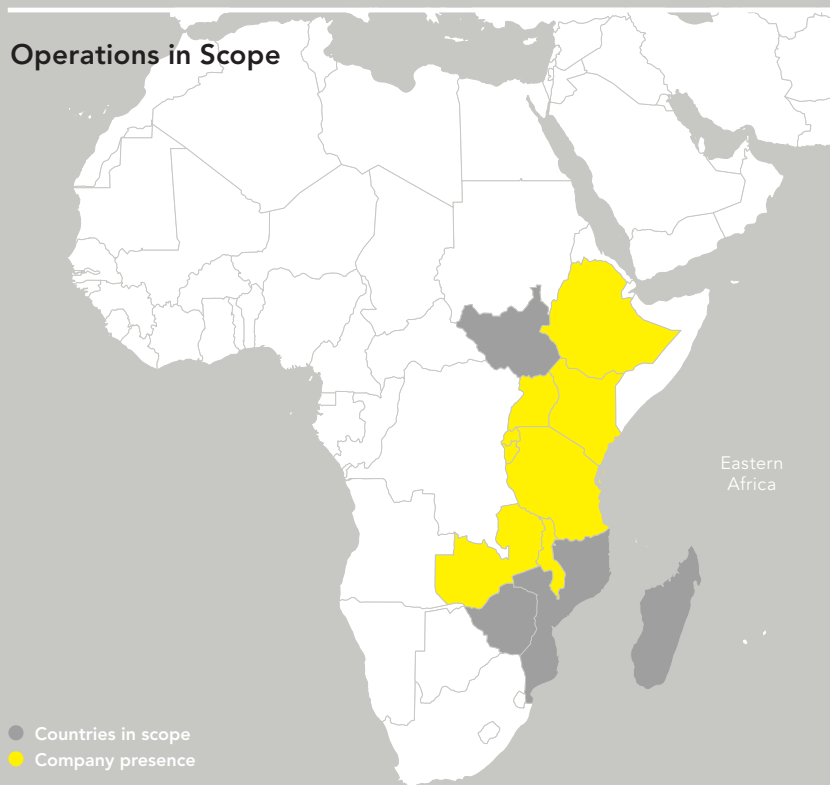
Leading Practices

- Kenya Highland Seed sells seed packages that are tailored to the needs of smallholder farmers. Local languages are used on packaging in all the Regional Index countries where the company operates, package sizes range from 100 seeds to 1kg and smallholder farmers can benefit from discounted pricing.
- The company connects smallholder farmers with dealers to ensure products are available at affordable prices and provides training on good agricultural practices, particularly the use of fertilizer.
- The company supports the advancement of ICT among smallholder farmers through its use of bulk SMS messaging to provide regular updates on products, seeds in stock, technical information on seeds as well as invitations to shows and demonstration field days.
- The company employs quality assurance systems and has a traceability system in place to address issues at all stages of distribution. It trains customers on seed storage to reduce quality loss and implements anti-counterfeit measures.

Areas for Improvement

- Kenya Highland Seed could consider increasing the overall transparency of its access to seeds-related programs and activities.
- The company states that training activities involve both men and women smallholder farmers, but it could consider organizing training sessions specifically addressing the needs of women farmers.

Operations in Scope



Notable Findings

- Kenya Highland Seed has partnered with the Africa Enterprise Challenge Fund (AECF), a six-year training initiative across Kenya, Tanzania and Uganda ending in 2018. The project seeks to improve the incomes and food security of smallholder farmers by providing them with high-yielding hybrid seeds.
- The company promotes the adoption of new varieties by actively reinvesting 15-20% of local sales in demonstration projects for smallholder farmers in Kenya, Tanzania and Uganda, three of the eight Regional Index countries where it is active.
- The company has a system in place to gather the feedback of smallholder farmers, mainly through demonstration field days, shows and agricultural training centers.
- The company markets seeds in eight Regional Index countries, though its direct distribution to agrodealers is limited to Kenya. In other countries, the company relies on regional agents and central dealers to distribute seeds.
- An intern program provides practical training for students from Kenyan universities. Topics covered include seed quality assessment, repacking, distribution, sales, product development, complaints handling and customer service.

Index Crops in Portfolio

Sales

Global Vegetable Crops

BDI ETH KEN MDG MWI MOZ RWD SSD TZA UGA ZMB ZWE

	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE
Broccoli	●	●	●		●		●		●	●	●	
Cabbage	●	●	●		●		●		●	●	●	
Carrot	●	●	●		●		●		●	●	●	
Cauliflower	●	●	●		●		●		●	●	●	
Chili pepper	●	●	●		●		●		●	●	●	
Cucumber	●	●	●		●		●		●	●	●	
Eggplant	●	●	●		●		●		●	●	●	
Gherkin	●	●	●		●		●		●	●	●	
Green bean	●	●	●		●		●		●	●	●	
Green pea	●	●	●		●		●		●	●	●	
Leek	●	●	●		●		●		●	●	●	
Lettuce	●	●	●		●		●		●	●	●	
Melon	●	●	●		●		●		●	●	●	
Okra	●	●	●		●		●		●	●	●	
Onion	●	●	●		●		●		●	●	●	
Pumpkin	●	●	●		●		●		●	●	●	
Spinach	●	●	●		●		●		●	●	●	
Squash	●	●	●		●		●		●	●	●	
Sweet pepper	●	●	●		●		●		●	●	●	
Tomato	●	●	●		●		●		●	●	●	
Watermelon	●	●	●		●		●		●	●	●	



Access to Seeds
Index

Kenya Seed Company

Corporate Data

Headquarters: Kitale, Kenya
Ownership type: State owned
Total revenue (2014): KES 5.992 billion

Kenya Seed Company Ltd. (Kenya Seed Company) is a state-owned company that researches, develops and markets field crop and vegetable seeds, pesticides and fertilizers. It was incorporated in 1956 and in 1979 it acquired Simpson and White Law, a vegetable seed company that trades under the brand name Simlaw Seeds. Kenya Seed Company also established the brands Kibo and Mt. Elgon in Tanzania and Uganda, respectively.

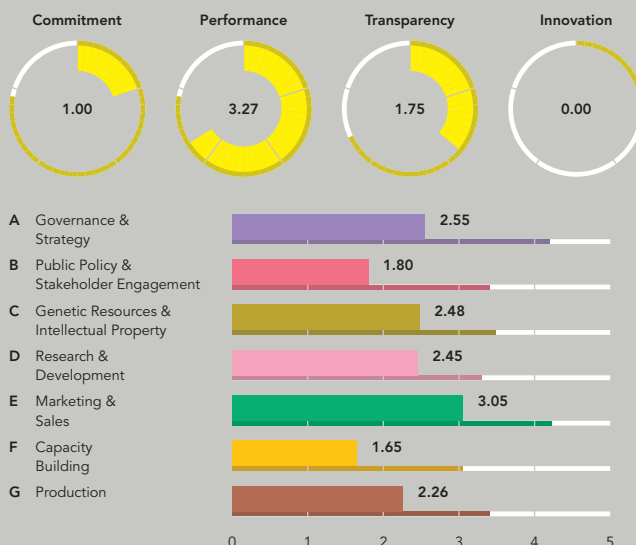
4

rank out of 17
score 2.34

Regional Index – Eastern Africa

Ranking fourth in the Regional Index, Kenya Seed Company exhibits a number of strengths related to improving access to seeds for smallholder farmers, particularly in Marketing & Sales. The company has implemented a robust feedback system, using multiple mechanisms and personal engagement during

field days, to ensure local knowledge and feedback are incorporated into its marketing & sales program. Feedback on its R&D program is also collected, including from women farmers, through stakeholder meetings and representatives in Rwanda, Tanzania and Uganda. The company is encouraged to formally disclose its commitments to increase access to seeds for smallholder farmers.



Leading Practices

■ Kenya Seed Company has contributed its own germplasm to collaborative projects aimed at developing varieties useful for smallholder farmers, donating drought-tolerant maize to CIMMYT's Drought Tolerant Maize for Africa project (DTMA) in Kenya and disease-resistant maize to the Water Efficient Maize for Africa (WEMA) project.

■ The company uses text messages (SMS), social media, a complaint-handling system, market surveys and an interactive website to collect feedback from smallholder farmers, including women, to inform its R&D and marketing activities. Feedback is also gathered during annual field days, demonstrations and shows. Furthermore, the company uses field visits as a more personal way of addressing farmers' complaints, and listening to advice on performance evaluations of its varieties in Regional Index countries.

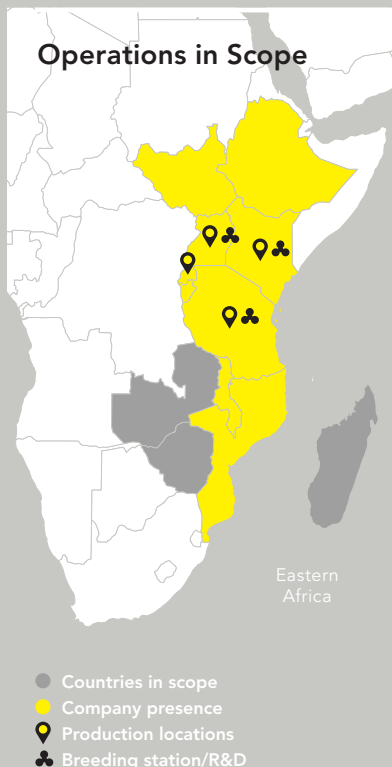
■ The company sells open-pollinated varieties (OPVs) and a variety of seed grades, including hand plant (HP), medium flat (MF) and large flat (LF) for machine planting. In addition, packaging is adapted to suit differing farmer capacities, including maize sold in packs of 2kg, 5kg and 10kg.

Areas for Improvement

■ Kenya Seed Company states that its ambition is to become the leading supplier of top seed in Africa. However, its mission and strategy with regards to smallholder farmers could be made considerably more explicit.

■ The company could also consider expanding its advisory services for women farmers beyond Kenya to all the countries where it is active.

Operations in Scope



Notable Findings

■ Kenya Seed Company has lobbied for seed policy development, reviews of seed regulations and harmonization of seed regulations in the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA).

■ The company collaborates with the national seed bank in Kenya and the international gene banks at CIMMYT and ICRISAT. It is working on drought resistance and virus or disease resistance for maize with CIMMYT, and on drought resistance and improved nutrition for sorghum and finger millet with ICRISAT.

■ The company provides crop protection and management services, agronomy services and soil testing in Kenya, Tanzania and Uganda. It does so in collaboration with a number of organizations, including One Acre Fund, Soil Cares and the Pest Control & Product Board of Kenya's Ministry of Agriculture.

■ The company has helped to bring several crops from research institutes to market, such as CIMMYT's Ua Kayongo and KSDTV maize in Kenya; Nerica (New Rice for Africa) rice in Kenya; maize, and wheat varieties in Rwanda; and maize varieties in Burundi.

■ The company has implemented partially certified quality assurance systems to ensure that seeds are of good quality when purchased by smallholder farmers in Regional Index countries. It reports ISO 9001: 2008, ISO 17025 and ISTA certifications and OECD seed schemes via the Kenya Plant Health Inspectorate Service (KEPHIS). Kenya Seed Company and KEPHIS undertake post-certification surveys and varietal purity verification and monitor the validity of shelf life of seed throughout the value chain.

■ To prevent the distribution of counterfeit seeds in the countries where it operates, Kenya Seed

Company uses measures including labeling, lot numbering and traceability, and differentiated packaging materials. It also organizes training programs and agricultural shows for distributors to build quality assurance capacity.

■ The company launched a year-long women farmers' education program in Kenya, reaching approximately a thousand women farmers. However, it is unclear whether this program is being continued.

■ The company states that it supports farmer cooperatives by offering 60-day credit facilities in Rwanda and credit on an annual basis in Kenya.

■ The company produces seeds in four out of the nine countries where it operates. In all four of these countries, the company licenses out its production although in Kenya, its home base, it also runs seed production activities itself.

Index Crops in Portfolio

	Sales												Breeding Focus			
Global Field Crops	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Barley			●											●		
Finger millet			●					●	●	●						●
Foxtail millet			●													
Maize			●			●	●	●	●	●			●	●	●	●
Pearl millet			●													●
Rice, paddy			●		●									●		
Sorghum			●		●			●	●	●					●	●
Soybean			●										●			
Wheat			●				●		●	●			●	●	●	
Global Vegetable Crops																
Broccoli			●						●	●						
Cabbage	●	●	●				●	●	●	●			●			
Carrot	●	●	●				●	●	●	●						
Cauliflower			●				●		●	●						
Chili pepper			●			●		●	●	●			●			
Cucumber			●				●		●	●						
Eggplant			●				●		●	●						
Green bean			●													
Lettuce			●				●		●	●						
Melon			●													
Okra			●				●		●	●						
Onion			●				●	●	●	●			●			
Pumpkin			●													
Spinach			●				●		●	●						
Sweet pepper			●						●	●						
Tomato			●				●	●	●	●			●			
Watermelon	●		●				●	●	●	●			●			
Local Field Crops																
Cowpea			●													●
Pigeon pea			●													
Local Vegetable Crops																
Amaranth			●				●		●	●				●		
Black nightshade	●		●				●	●	●	●						
Crotalaria			●													
Jew's mallow			●													
Spider plant	●		●													



Access to Seeds
Index

Monsanto

Corporate Data

Headquarters: St. Louis, Missouri, USA
Ownership type: Listed
Revenue (2014): USD 10,740,000,000

Monsanto Co. (Monsanto) operates in two segments: seeds and genomics, and agricultural productivity (agrochemicals). The seeds and genomics segment produces field crop and vegetable seeds. It also develops biotechnology traits and licenses germplasm and trait technologies to other seed companies. Monsanto was founded in 1901 and has operations worldwide. In Africa, it is headquartered in South Africa and has regional offices in Kenya and Malawi. In 1998, it acquired the National Seed Company of Malawi.

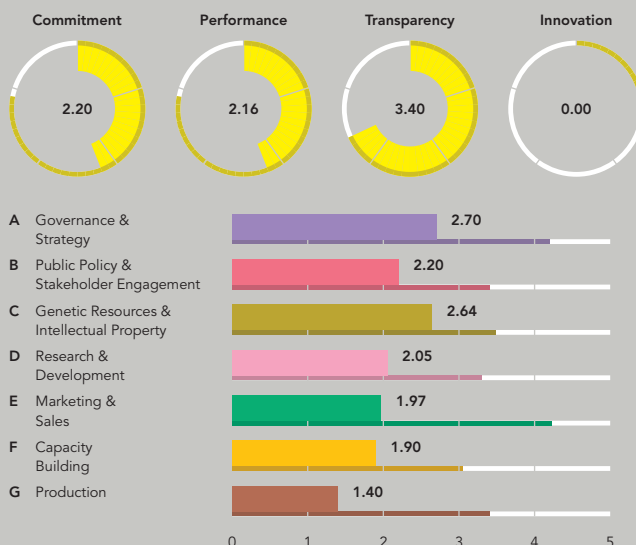
8

rank out of 17
score 2.08

Regional Index – Eastern Africa

Ranking eighth out of 17 Regional Index companies, Monsanto performs well in Research & Development, Genetic Resources & Intellectual Property, Marketing & Sales and Capacity Building. The company scores highly in collaborative research and the development of traits that are potentially

useful for smallholder farmers. It provides agricultural advisory services and supports access to financial services for smallholder farmers. However, it could leverage its experience in capacity building in a larger number of Regional Index countries, and expand its marketing activities of suitable commercial varieties in those countries.



Leading Practices

■ Monsanto provides access to its genetic resources for varieties for which plant variety protection (PVP) certificates from the United States Department of Agriculture (USDA) have expired. It has donated germplasm to the Water Efficient Maize for Africa (WEMA) project, and granted a royalty-free license for use of its intellectual property by the BT Cowpea Partnership, in which it collaborates with multiple research institutes.

■ The company offers farmers in Eastern Africa demonstrations and training opportunities. It also provides specific advisory services to and through a number of food security initiatives, including The Hunger Project in Malawi and the Southern Agricultural Growth Corridor (SAGCOT) in Tanzania, the latter also involving Syngenta and Seed Co.

■ In its seed production operations, Monsanto has implemented social standards guided by the Universal Declaration of Human Rights and the ILO Declaration on Fundamental Principles and Rights at Work. Monsanto's Supplier Code of Conduct refers to the company's Human Rights Policy.

Areas for Improvement

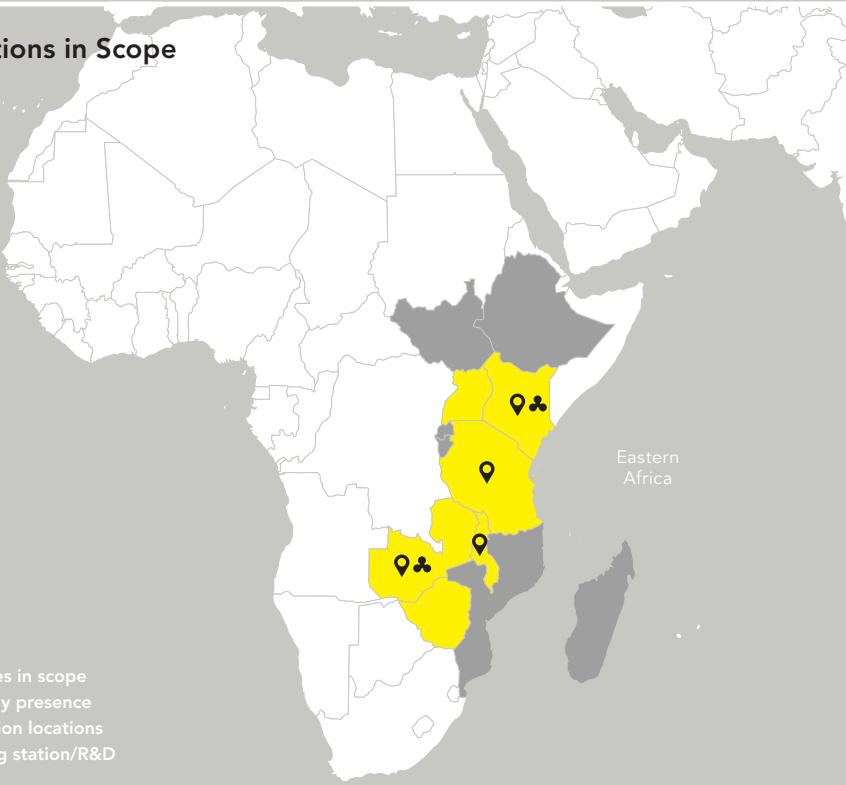
■ Monsanto has extensive operations in Eastern Africa. As smallholder farmers constitute a significant portion of the farmer base in the region, Monsanto could further tailor its products and services to the specific needs of these farmers.

■ Although no evidence was found of the company blocking the use of farm-saved seeds in Regional Index countries, it lacks a commitment on the issue. The company could consider specifically allowing the use of farm-saved seeds for non-commercial purposes by smallholder farmers.

■ Monsanto has an ICT program, which includes toll-free phone numbers, to provide farmers with agricultural advice in India. This program could be expanded to Regional Index countries in Eastern African.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Notable Findings

- Monsanto has made relatively strong commitments to improving access to seeds for smallholder farmers, specifically improving the lives of ‘an additional 5 million people in resource-poor farm families by 2020’.
- The company is extensively involved in collaborative research programs relevant for Eastern Africa. Besides the Water Efficient Maize for Africa (WEMA) project, these include the Virus Resistant Cassava for Africa (VIRCA) collaboration with the Donald Danforth Plant Science Center, and the Network for the Genetic Improvement of Cowpea for Africa (NGICA), in which the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the International Institute of Tropical Agriculture (IITA) and the Kirkhouse Trust also participate.
- Monsanto offers three-way and double-cross maize hybrids in resource-constrained countries in Eastern Africa to produce increased yields at lower seed costs.

Index Crops in Portfolio

Global Field Crops

- Beans, dry
- Maize
- Sorghum
- Soybean
- Wheat

Global Vegetable Crops

- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Chili pepper
- Cucumber
- Eggplant
- Gherkin
- Green bean
- Green pea
- Leek
- Lettuce
- Melon
- Onion
- Pumpkin
- Spinach
- Squash
- Sweet pepper
- Tomato
- Watermelon



NASECO

Access to Seeds
Index

Corporate Data

Headquarters: Kampala, Uganda
Ownership type: Private
Total revenue (2014): UGX 10,031,784,685

Nalweyo Seed Company Ltd. (NASECO) breeds, produces and sells a wide range of field crop seeds. It markets its products through non-governmental organizations, stockists, and wholesale and retail distributors across Eastern Africa. The company was founded in 1996 and is based in Uganda.

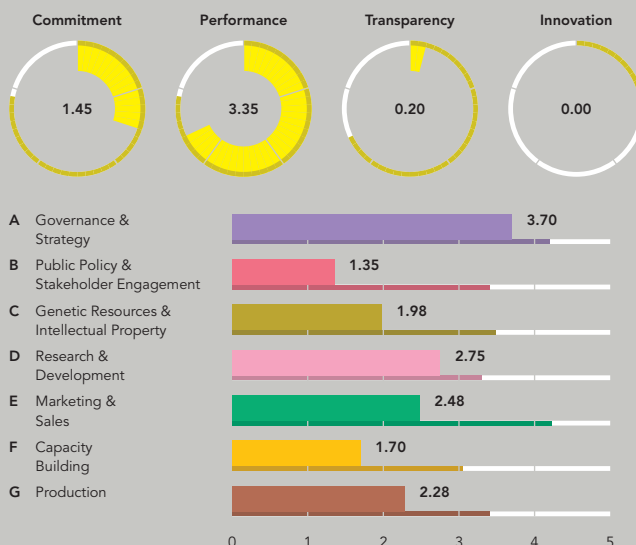
5

rank out of 17
score 2.32

Regional Index – Eastern Africa

NASECO ranks fifth in the Regional Index, its position driven by strong performance in Governance & Strategy, Research & Development and Marketing & Sales. NASECO's customer base consists almost entirely of smallholder farmers, contributing to a strong link between the company's

R&D activities and the needs of smallholder farmers. However, the company is encouraged to improve the transparency of its activities across all measurement areas and to expand the geographic scope of these activities.



Leading Practices

NASECO's breeding programs focus on traits suitable for smallholder farmers. Besides breeding for increased yields and abiotic stress tolerance and resistance to pests and diseases, the company also breeds for increased pro-vitamin A content in yellow maize and culinary preferences such as milling, poundability and cooking time.

The company engages in collaborative research through partnerships with local research institutes. It is also involved in participatory breeding or variety selection with smallholder farmers in Burundi and Uganda, two of the four Regional Index countries where it sells seeds.

The company accommodates the differing capacity levels of smallholder farmers by offering OPV maize seeds, which account for 50% of its maize varieties, and different seed grades. All varieties offered by the company are available for hand-planting.

The company sells seed packages tailored to smallholder farmers' needs, including 250g (sold in Burundi) and 2kg, 5kg and 15kg (sold in Uganda). The packaging features illustrations and instructions in English, French and Swahili. Brochures in local languages and with pictures are also available.

The company trains farmer groups and producer organizations in seed production in partnership with the United States Agency for International Development (USAID) in Uganda and Burundi.

Areas for Improvement

NASECO can improve its transparency by publically disclosing more information about its programs related to access to seeds for smallholder farmers.

The company was part of the harmonization process of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). It has been involved in various working groups and states that it actively contributes to these groups by advocating a harmonized seed movement. It could use this experience to represent smallholder farmers' interests in international forums and policymaking processes.

The company could consider expanding its activities related to affordability, packaging and training for smallholder farmers to all of the Regional Index countries where it is active.

Operations in Scope



Notable Findings

■ Ninety-five percent of NASECO's customer base is made up of smallholder farmers, which the company defines as farmers with 5-10 acres of land, not necessarily their own. Most of these customers are located in Burundi and Uganda. Smallholder farmers are integrated into the company's strategy as demonstrated by its tailored packaging and R&D activities, with a focus on low-input management, late weeding, droughts and floods.

■ NASECO has donated MLN-tolerant/resistant lines to CIMMYT, a non-profit international agricultural research organization that focuses on wheat and maize farmers in developing countries, and to the National Crops Resources Research Institute (NaCCRI) in Uganda.

■ The company markets varieties developed by local, national and international research institutes, including maize, soybean, rice, beans and sorghum, covering more than half of the Index crops in its portfolio.

■ The company has distribution channels in Burundi and Uganda and employs extension agents to link farmers to input markets and assure the availability of seeds. It reaches remote areas and has an internal target to supply seeds to within a 10km radius of farmers in these areas.

■ The company gives lectures at Makerere University in Kampala, Uganda and offers internships to national and international students. It has partnered with the NGO CLUSA on a project that aims to train and mentor 60,000 farmers, with a focus on young farmers in Uganda.

■ The company offers reduced prices and free delivery of its products to farmer groups. It also provides seasons-long interest-free loans for inputs and financial assistance to smallholder farmers in Uganda.

Index Crops in Portfolio

Global Field Crops	Sales												Breeding Focus				
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude	
Beans, dry										●				●●●		●●●	
Maize	●						●	●		●			●●●	●●●		●●●	●●●
Finger millet										●				●●●		●●●	
Pearl millet														●●●		●●●	
Rice, paddy										●			●●●				
Sorghum										●			●●●				
Soybean										●			●●●				
Wheat													●●●				
Local Vegetable Crops																	
Crotalaria										●			●●●				



Access to Seeds
Index

Pop Vriend Seeds

Corporate Data

Headquarters: Andijk, the Netherlands
Ownership type: Private

Pop Vriend Seeds B.V. (Pop Vriend Seeds) is a family-owned international seed company based in the Netherlands. It offers open-pollinated varieties (OPVs) and hybrid vegetable seeds for use in the Middle East, Africa and Eastern Europe.

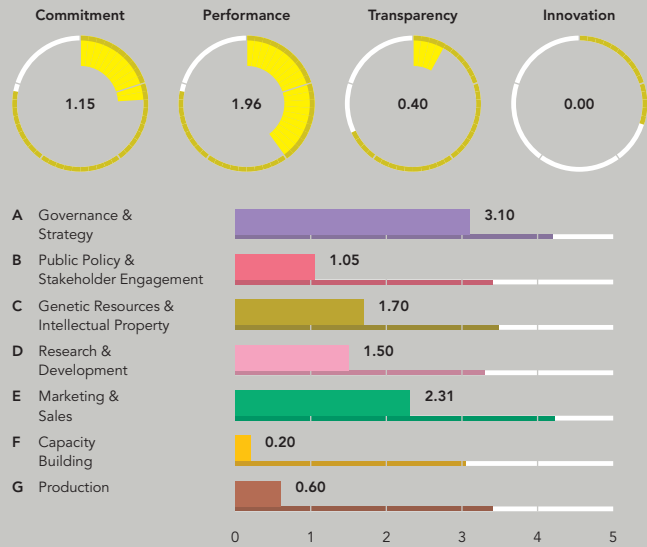
14

rank out of 17
score 1.45

Regional Index – Eastern Africa

Pop Vriend Seeds ranks at the lower end of the Regional Index, exhibiting strengths in some areas as well as many opportunities to improve. It achieves its highest scores in Governance & Strategy and Marketing & Sales. This is mainly due to an internal management information

system to measure progress against targets related to access to seeds and a product range that accommodates the differing capacity levels of smallholder farmers. The company's lowest scores are in Capacity Building and Production.



Leading Practices

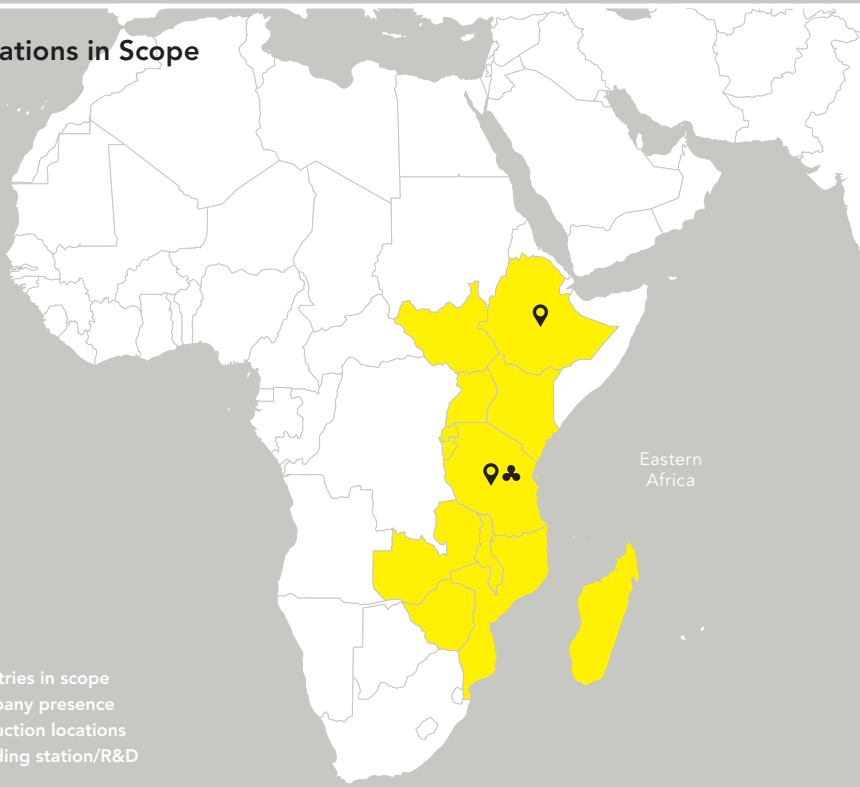
Pop Vriend Seeds breeds improved varieties for Eastern Africa for 17 of the 21 Index crops in its portfolio. For all of these 17 crops, the company offers open-pollinated varieties (OPVs), hybrids and different seed grades for the different capacity levels of smallholder farmers. In addition, the company is undertaking variety trials for eight of its Index crops in Ethiopia, Kenya and Tanzania.

Areas for Improvement

Pop Vriend Seeds is encouraged to enhance public disclosure of its access to seeds programs by communicating details of related commitments, programs and targets.

Operations in Scope

- Countries in scope
- Company presence
- 📍 Production locations
- 🌱 Breeding station/R&D



Notable Findings

■ Pop Vriend Seeds attends forums and African seed congresses, at which it aims to represent smaller seed companies in international dialogue.

■ Pop Vriend Seeds' seed quality meets ISTA standards and its quality team tests all seed stocks for germination, purity, moisture content, vigor, shelf life and seed-borne diseases. Its assurance systems include quality monitoring throughout its distribution network. Teams closely monitor the market for counterfeit seeds and are instructed to notify the company's head office immediately if they find falsified packaging.

Index Crops in Portfolio

Global Vegetable Crops	Sales												Breeding Focus			
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Broccoli		●					●						🌱		🌱	
Cabbage	●	●	●		●		●		●	●	●	●	🌱		🌱	
Carrot	●	●	●		●		●		●	●	●	●	🌱	🌱	🌱	🌱
Cauliflower	●	●	●		●		●		●	●	●	●	🌱		🌱	
Chili pepper	●	●	●		●		●		●	●	●	●	🌱	🌱	🌱	🌱
Cucumber	●	●	●		●		●		●	●	●	●	🌱		🌱	🌱
Eggplant	●	●	●		●		●		●	●	●	●	🌱		🌱	
Green bean		●	●				●		●		●	●	🌱	🌱	🌱	🌱
Green pea		●	●	●					●		●	●	🌱	🌱	🌱	🌱
Leek	●	●	●				●		●		●	●	🌱		🌱	🌱
Lettuce	●	●	●		●		●		●		●	●	🌱		🌱	🌱
Melon	●	●	●		●		●		●		●	●	🌱		🌱	🌱
Okra	●	●	●		●		●		●		●	●				
Onion	●	●	●		●		●		●		●	●	🌱		🌱	🌱
Pumpkin		●	●				●		●							
Spinach	●	●	●		●		●		●		●	●	🌱	🌱	🌱	🌱
Squash	●	●	●		●		●		●		●	●	🌱		🌱	🌱
Sweet pepper	●	●	●		●				●		●	●				
Tomato	●	●	●		●		●		●		●	●			🌱	🌱
Turnip	●	●	●		●		●		●		●	●			🌱	🌱
Watermelon	●	●	●		●		●		●		●	●			🌱	🌱



Seed Co

Access to Seeds
Index

Corporate Data

Headquarters: Harare, Zimbabwe
Ownership type: Listed
Group revenue (2014): USD 106,000,000

The origins of Seed Co Limited (Seed Co) date back to 1940, but it was officially founded by seed producers in 1983 as the Seed Co-operative Company of Zimbabwe. In 1996, it went public and was listed on the Zimbabwe Stock Exchange. Groupe Limagrain currently holds a 30% stake in the company.

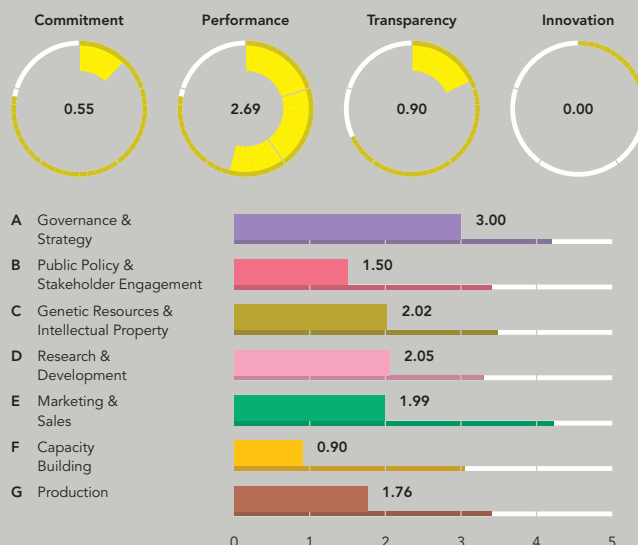
11

rank out of 17
score 1.82

Regional Index – Eastern Africa

Seed Co has an average ranking in the Regional Index. The company has a large crop portfolio and is present in all 12 Index countries. It performs well on the breeding of improved varieties, especially for field crops, based on smallholder farmers' preferences and has a quality assurance system that

includes monitoring of seed quality throughout the distribution network. With regard to its policies and contracts with farmers, the company is encouraged to include exemptions for the use of farm-saved seeds by smallholder farmers in Index countries.



Leading Practices

Seed Co gathers information during on-farm visits and variety demonstrations to help determine its R&D focus and priorities for breeding improved varieties for smallholder farmers in all countries where it is active.

It tracks the number of smallholder farmers it reaches through its education programs in Ethiopia, Kenya, Malawi, Tanzania, Uganda, Zambia and Zimbabwe.

The company has contributed its own germplasm to collaborative projects for breeding and multiplication purposes in several countries, including Kenya, Zambia and Zimbabwe. It has also granted access to its germplasm for research trials.

The company has a quality assurance system and ISO 17025 certification for its testing and calibration laboratories. The quality assurance system includes monitoring of seed quality throughout the distribution network. The company prevents seeds from being sold beyond their shelf life through follow-ups with seed distributors and by retaining unsold seeds. Additionally, it tackles counterfeit products by using company inspectors as well as symbols that are not easy to duplicate.

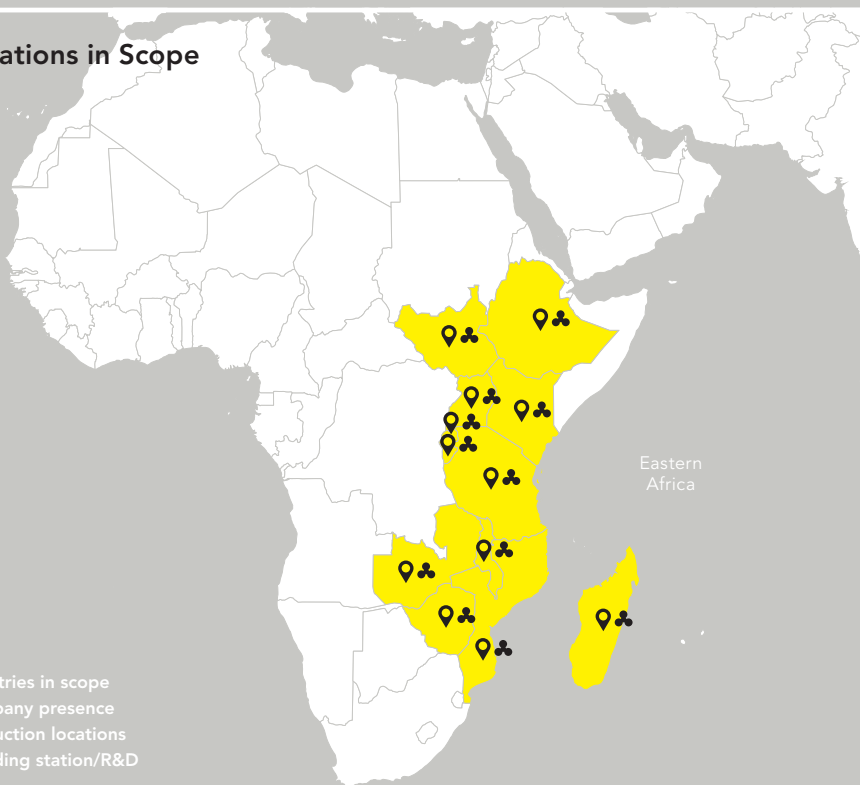
Areas for Improvement

Seed Co could improve its transparency by disclosing formal policies related to its programs for improving access to seeds.

The company has blocked the use of farm-saved seed in countries where it is legally possible to do so. It is encouraged to make an exception for smallholder farmers by including exemptions for the use of farm-saved seeds in relevant contracts.

Operations in Scope

- Countries in scope
- Company presence
- 📍 Production locations
- 🌱 Breeding station/R&D



Notable Findings

- Seed Co has a formal commitment to improve access to seeds for smallholder farmers, in line with the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim Asset).
- The company reinvests 5% of its local sales in demonstration projects for smallholder farmers.
- The company has seed production activities in all of the Regional Index countries where it is active, and 25% of its seed production is carried out by smallholder farmers.

Index Crops in Portfolio

Global Field Crops	Sales											Breeding Focus				
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Barley											●	●				
Beans, dry	●	●	●		●	●	●	●	●	●	●	●				
Maize	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Potato												●	●	●	●	●
Rice, paddy													●	●	●	●
Sorghum	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Soybean	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Wheat	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Global Vegetable Crops

Cauliflower																
Chilipepper																
Cucumber																
Eggplant																
Garlic																
Gherkins																
Gourd																
Green bean																
Green pea																
Leek																
Lettuce																
Melon																
Okra																
Onion																
Pumpkin																
Spinach																
Squash																
Sweet pepper																
Tomato																
Turnip																
Watermelon																

Local Field Crops

Cowpea																
Lablab																
Pigeon pea																
Tef																



Access to Seeds
Index

Syngenta

Corporate Data

Headquarters: Basel, Switzerland
Ownership type: Listed
Total group revenue (2014): USD 15,134,000,000
Total seed sales (2014): USD 3,155,000,000

Syngenta AG (Syngenta) offers a wide range of field crops, vegetable and flower seeds, and agrochemicals. Products are sold through independent distributors and dealers as well as directly to farmers. The Swiss-based company was founded in 2000 following the merger of Novartis Agribusiness and Zeneca Agrochemicals. It acquired MRI Seed Zambia Ltd. and MRI Agro Ltd. (MRI) in 2013.*

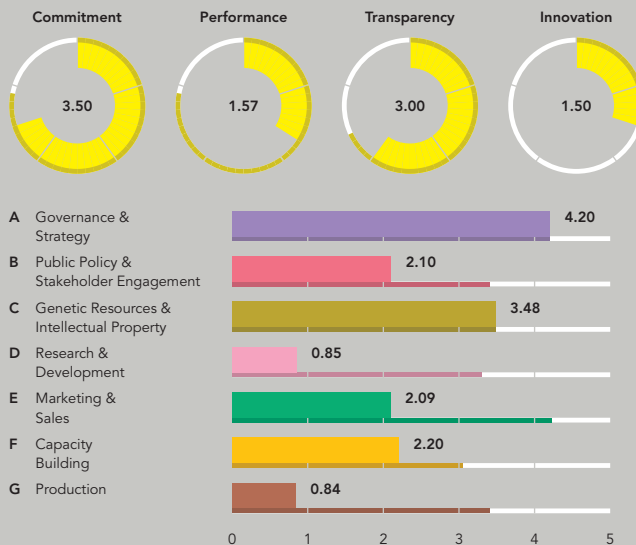
7

rank out of 17
score 2.09

Regional Index – Eastern Africa

Syngenta ranks seventh in the Regional Index, exhibiting both strengths and opportunities to improve access to seeds for smallholder farmers in Eastern Africa. Most of these strengths lie in Governance & Strategy and Genetic Resources & Intellectual Property. The company is highly

transparent compared to its peers, and has in place a robust set of commitments, management systems, programs and targets that govern its access to seeds initiatives. Among the innovative practices to support smallholder farmers is its agricultural insurance project in several Eastern African countries.



Leading Practices

■ The Good Growth Plan is Syngenta's commitment to make a measurable contribution by 2020. Among the six targets set out in the Plan is reaching 20 million smallholder farmers and enabling them to increase productivity by 50%. The Plan provides a centralized approach to managing access to seeds efforts, with regional implementation teams, assessments of performance against targets, and senior management responsibility and accountability.

■ Syngenta participates in multi-stakeholder initiatives related to access to seeds for smallholder farmers, including the New Alliance for Food Security and Nutrition (New Alliance) and the New Vision for Agriculture.

■ Kilimo Salama, an innovative agricultural insurance project funded through the Syngenta Foundation, evolved into the Agriculture and Climate Risk Enterprise (ACRE), a for-profit company, in June 2014. ACRE uses ICT and mobile payments to offer affordable insurance products for smallholders in Kenya, Rwanda and Tanzania. Since farmers' livelihoods are dependent on the success of their crops, a main source of risk is extreme weather. Weather data are collected from satellites and automated weather stations to estimate the health of farmers' harvests. The data is compared with a historical index and farmers receive automatic payouts when the weather falls outside the average. By the end of 2014, an estimated 230,000 farmers had been reached.

■ The Syngenta Foundation's Seeds2B project, initially launched in Kenya and Tanzania and later expanded to Malawi, Mali, Senegal and Zimbabwe, aims to improve smallholder farmers' access to high-quality seeds. Seeds2B is guided by three principles, including efforts to develop enabling seed policy environments by ensuring the proper functioning of seed systems through regulation, while creating attractive conditions for private seed sector development.

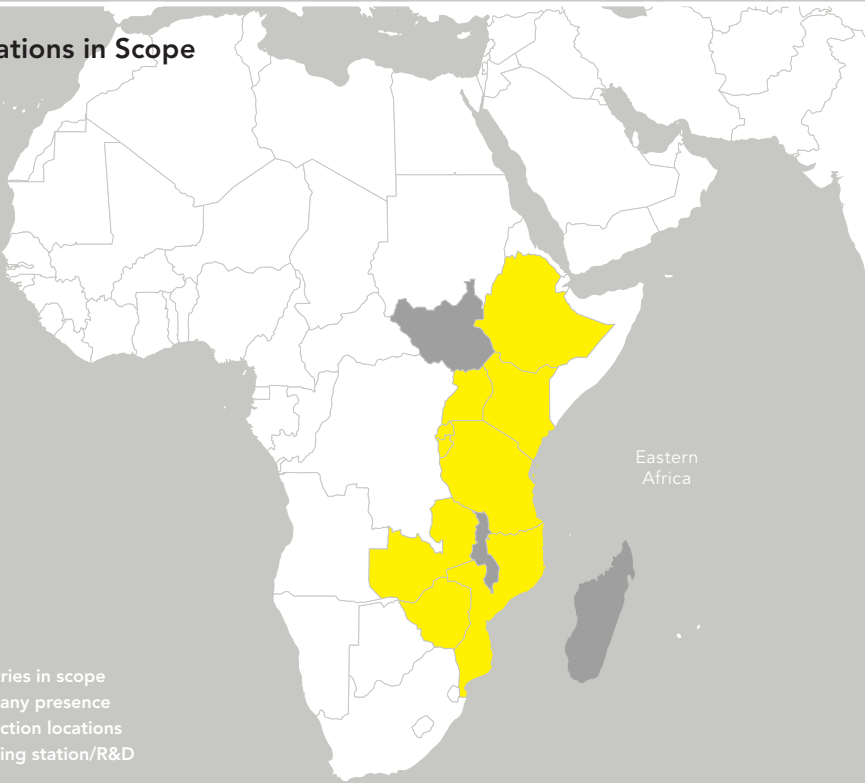
Areas for Improvement

■ Syngenta is encouraged to disclose information about its R&D programs with respect to breeding improved varieties suitable for smallholder farmers in Eastern Africa.

■ It is also encouraged to disclose details of the scope of its distribution channels in the Regional Index countries where it is active.

Operations in Scope

- Countries in scope
- Company presence
- Production locations
- Breeding station/R&D



Notable Findings

- Syngenta states that it recognizes the right of farmers to save seeds, but that this practice should not be allowed for high-value crops such as vegetables and flowers.
- Syngenta has partnered with the International Maize and Wheat Improvement Center (CIMMYT) to develop new varieties of wheat, and with the University of Bern (Switzerland) to develop varieties of tef. The company is also collaborating with HarvestPlus, an initiative of the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), to develop new varieties of sweet potato in Mozambique and Uganda and maize in Zambia.
- Syngenta has joined peers Groupe Limagrain, East-West Seed and Enza Zaden in working with the NGO Fair Planet in Ethiopia on variety trials of vegetable crops and smallholder farmer capacity building.
- The company scales its package sizes and pricing structures to accommodate the needs and budgets of smallholders who farm less than two hectares of land. Packaging is printed with watermarked labels to deter the sale of counterfeit seeds.
- The company offers advisory or extension services to smallholder farmers through the Syngenta Foundation and in partnerships. In Kenya, the Syngenta Foundation has integrated the use of crop protection products into its extension services. In Tanzania, the company works with Norwegian chemical firm Yara International ASA to support rice and maize growers.
- Also in Kenya, Syngenta and the Syngenta Foundation have developed Farmforce, a mobile-based business solution for outgrower schemes with smallholders. The technology simplifies the production management of smallholder farmers, increases traceability of crop location and enables access to formal markets.

Index Crops in Portfolio

Global Field Crops

- Barley
- Maize
- Potato
- Rice, paddy
- Soybean
- Wheat

Global Vegetable Crops

- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Chili pepper
- Cucumber
- Eggplant
- Green bean
- Green pea
- Leek
- Lettuce
- Melon
- Okra
- Onion
- Spinach
- Squash
- Sweet pepper
- Tomato
- Watermelon



Access to Seeds
Index

Technisem

Corporate Data

Headquarters: Longué-Jumelles, France
Ownership type: Private

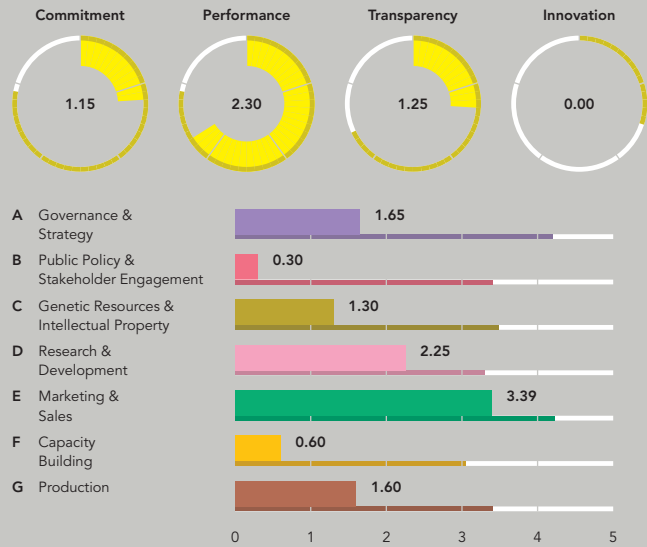
Technisem SAS (Technisem) was founded in France in 1985, with the aim of commercializing vegetable seeds for tropical areas especially Western Africa and the Middle East. Over the years, the company has expanded its activities to other parts of Africa, i.e. the Maghreb and Eastern Africa, as well as the Caribbean.

12

rank out of 17
score 1.73

Regional Index – Eastern Africa

Technisem ranks 12th out of 17 Regional Index companies. It scores well in Marketing & Sales and Research & Development, thanks to a relatively large portfolio of vegetable seeds targeting smallholder farmers including those in remote areas, but its position reflects its weaker performance in Public Policy & Stakeholder Engagement and Production.



Leading Practices

■ Technisem markets 16 of the 18 Index crops in its portfolio in Kenya, Madagascar and Mozambique, and collaborates with retailers and resellers in order to reach smallholder farmers in remote areas.

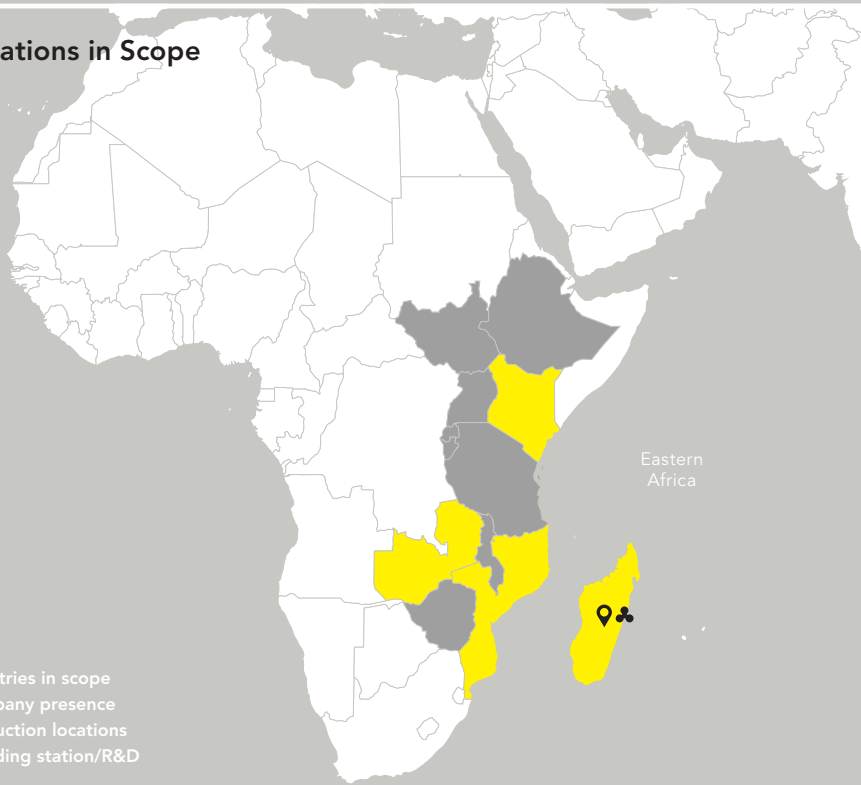
■ The company has programs to maintain the quality of basic seed and old varieties used by smallholder farmers in Regional Index countries.

Areas for Improvement

■ Technisem has not disclosed a commitment or strategy to improve access to seeds for smallholder farmers in Regional Index countries.

Operations in Scope

- Countries in scope
- Company presence
- 📍 Production locations
- 🌱 Breeding station/R&D



Notable Findings

Technisem collects feedback from smallholder farmers and tracks responses within the Regional Index country scope.

Technisem collaborates with laboratories and research institutes in various fields, including cell biology and biotechnology, to develop new varieties faster and more effectively. It is also involved with VEGEPOLYS, an association of companies, research centers and training organizations committed to creating synergies within jointly run innovative projects.

The company has implemented programs to provide agricultural advisory services in most of the Regional Index countries where it operates.

The company commits to testing the quality of its seeds, including in circumstances where no specific protocols or codes are in place. It complies with ISTA standards for assessing germination.

Index Crops in Portfolio

Global Vegetable Crops	Sales												Breeding Focus			
	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Broccoli			●	●		●										
Cabbage			●	●		●										
Carrot			●	●		●							🌱			
Cauliflower			●	●		●										
Chicory																
Chili pepper			●	●		●										
Cucumber			●	●		●										
Eggplant			●	●		●										
Gourd																
Green bean				●		●										
Green pea				●												
Leek			●	●		●										
Lettuce			●	●		●										
Melon			●	●		●										
Okra			●	●		●										
Onion			●	●		●							🌱			
Pumpkin			●	●		●							🌱			
Spinach						●										
Squash			●	●		●										
Sweet pepper			●	●		●										
Tomato			●	●		●							🌱			
Turnip				●		●										
Watermelon			●	●		●										
Local Vegetable Crops																
Amaranth			●	●		●					●		🌱			
Black nightshade			●	●												
Jew's mallow			●			●										
Spider plant													🌱			



Victoria Seeds

Access to Seeds
Index

Corporate Data

Headquarters: Kampala, Uganda
Ownership type: Private
Total food crop revenue (2014): UGX 6,278,047,537

Victoria Seed Limited (Victoria Seeds) was founded in 2004 in Uganda. It has operations in field crops and vegetable seeds, horticultural and oil crops, and crop protection products in both the domestic and regional market. Since its inception, the company has operated three seed processing facilities and two research facilities.

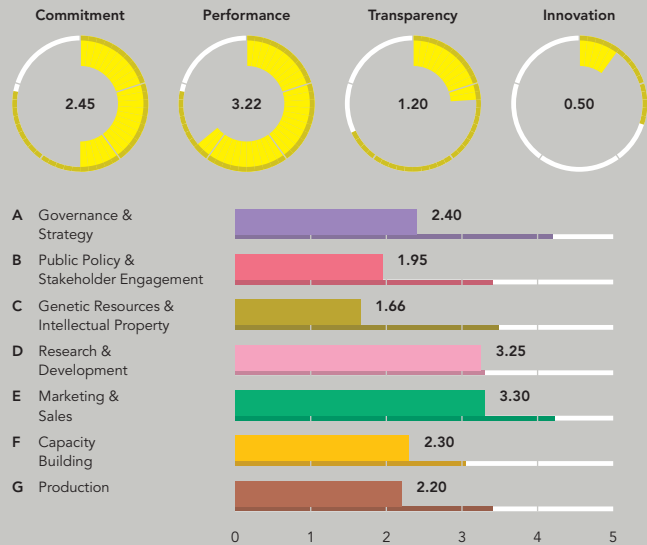
2

rank out of 17
score 2.59

Regional Index – Eastern Africa

Ranking second in the Regional Index, Victoria Seeds demonstrates numerous strengths in addressing access to seeds for smallholder farmers. It has a countrywide distribution network in Uganda and has developed improved varieties for three of the local crops in its portfolio suitable for mid-altitudes.

It is one of few companies with engagement and capacity building programs targeting women farmers. It is encouraged to provide more information about its activities outside Uganda.



Leading Practices

Victoria Seeds states that it aims to serve smallholder farmers, who produce more than 90% of agricultural output in Uganda. The company has an explicit focus on empowering rural women. It has set itself the goal of ensuring that at least 70% of the seed-producing farmers it recruits each season are women and it partners with organizations that share its vision.

Furthermore, it provides seed technologies, extension services and access to markets for women farmers to increase their production, crop output and income levels. More than 2,800 women in Uganda have so far been reached and trained in seed production and business skills.

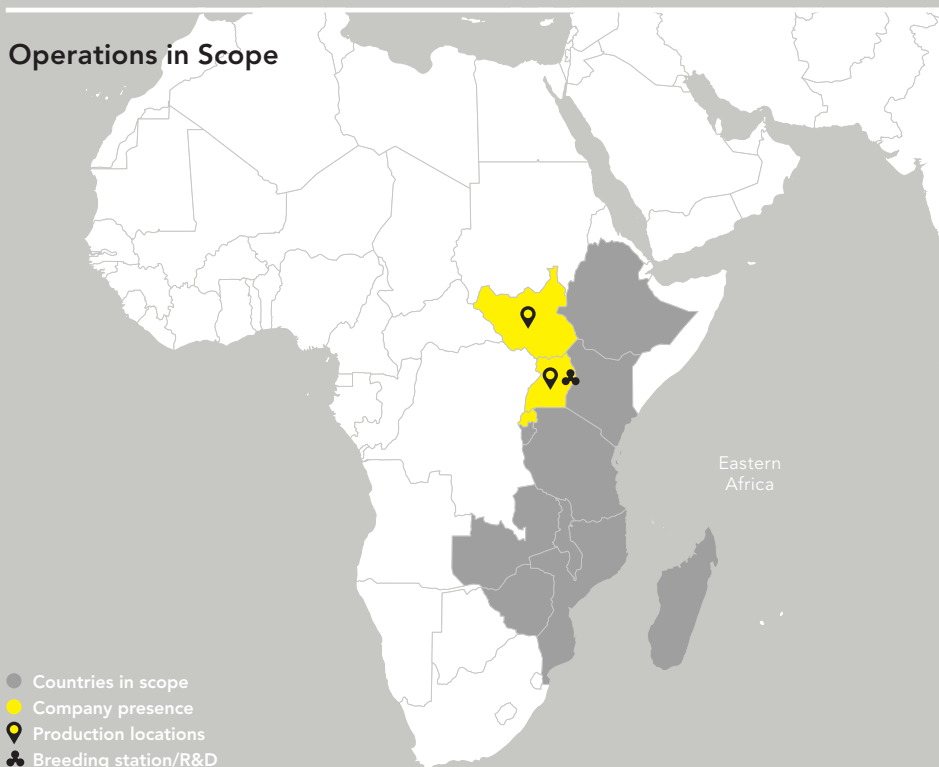
The company has established a countrywide network of more than 400 retail stockists in Uganda and intends to expand this further. Smallholder farmers in remote areas are reached using mobile seed shops (tuk-tuks).

The company also aims to improve the availability of quality seeds in (former) conflict areas. This is demonstrated by its development in 2008 of new facilities in the formerly Lord's Resistance Army-controlled city of Gulu in northern Uganda.

Areas for Improvement

Victoria Seeds is encouraged to disclose more information about its activities outside of Uganda.

Operations in Scope



Notable Findings

■ Victoria Seeds' managing director lobbied for agricultural inputs in Uganda to be exempt from value-added tax, helping to ensure that the price of these inputs is affordable for farmers. The levy imposed in June 2014 was reversed in November 2014. The company has also used its membership in seed trade organizations to lobby for tamper-proof labels and the elimination of counterfeit products.

■ The company holds field days and has implemented a learning platform with technology demonstrations. The company states that it works with development organization Sasakawa Africa Association (SAA), micro-financier Grameen Foundation and international not-for-profit TechnoServe to provide extension services to smallholder farmers in different parts of Uganda. The provision of toll-free phone lines also allows farmers to call in and speak to extension agents at no cost.

■ The company has seed production activities in Uganda, one of the three Regional Index countries where it is active, and is building up production in Rwanda.

Index Crops in Portfolio

	Sales											Breeding Focus				
Global Field Crops*	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Finger millet																
Maize																
Pearl millet																
Rice, paddy																
Sorghum																
Global Vegetable Crops																
Broccoli							●	●		●						
Cabbage							●	●		●				●	●	
Carrot							●	●		●						
Cauliflower							●			●				●	●	
Chili pepper							●			●				●	●	
Cucumber							●	●		●				●	●	
Eggplant							●	●		●				●	●	
Gourd							●			●						
Green bean							●			●						
Leek							●	●		●						
Lettuce							●	●		●						
Melon														●	●	
Okra								●		●				●	●	
Onion							●	●		●				●	●	
Pumpkin							●	●		●				●	●	
Spinach							●	●		●						
Squash							●			●						
Sweet pepper							●	●		●				●	●	
Tomato							●	●		●				●	●	
Watermelon							●	●		●				●	●	
Local Field Crops																
Cowpea								●		●						
Pigeon pea								●		●						
Local Vegetable Crops																
Amaranth							●	●		●					●	
Black nightshade							●	●		●						
Jew's mallow							●	●		●						
Spider plant							●	●		●					●	



Zamseed

Access to Seeds
Index

Corporate Data
Headquarters: Lusaka, Zambia
Ownership type: Private

Zambia Seed Company Limited (Zamseed) was founded in 1981 as a joint venture between the government of Zambia and several private entities, including the Zambia Seed Producers' Association (ZSPA) and the Zambia Cooperative Federation (ZCF), and with considerable support from the Swedish International Development Cooperation Agency (SIDA). The company has operations in field crop and vegetable seeds, with a focus on maize-breeding activities.

10

rank out of 17
score 1.84

Regional Index – Eastern Africa

Ranking tenth out of 17 Regional Index companies, Zamseed's performance is characterized by some strengths in Marketing & Sales and opportunities in Public Policy & Stakeholder Engagement and Capacity Building. Transparency can be improved.

Zamseed has established proactive

breeding programs covering all of its field and vegetable crops as well as the development of other varieties and local crops. The company uses field days and agricultural shows to make these improved varieties available to smallholder farmers in Regional Index countries.



Leading Practices

■ Zamseed has contributed its own germplasm to collaborative projects with international research institutes, including the International Maize and Wheat Improvement Centre (CIMMYT), the International Institute for Tropical Agriculture (IITA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). These contributions have helped breeding for crop varieties tailored to the needs of smallholder farmers in Regional Index countries.

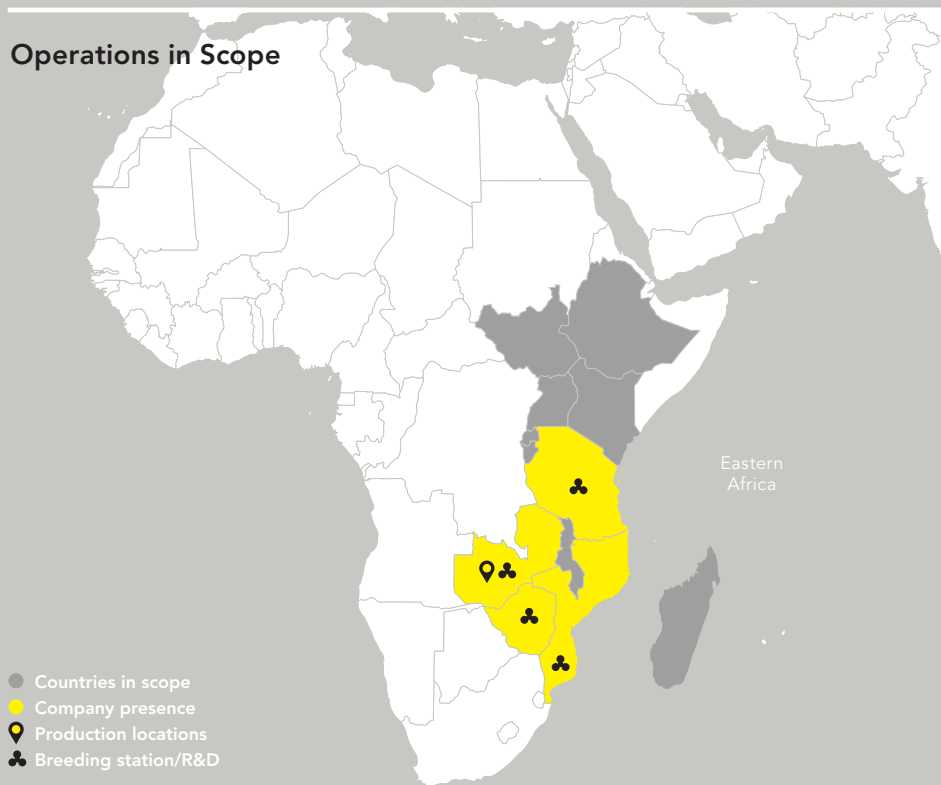
Areas for Improvement

■ Zamseed is encouraged to improve disclosure of its activities related to global food and nutrition security and access to seeds for smallholder farmers.

■ It is also encouraged to improve the disclosure of its activities in Capacity Building, details of which are currently limited.

■ Zamseed could leverage its industry position in Eastern Africa to engage stakeholders and policymakers, with the goal of creating an enabling environment for smallholder farmers.

Operations in Scope



Notable Findings

■ Zamseed uses annual field days and agricultural shows in Tanzania and Zambia to promote the adoption of improved varieties by smallholder farmers.

■ The company involves smallholder farmers in seed production in Zambia. Smallholder farmers account for 5% of the seed production of maize and 100% for other crops in its portfolio, although it is unclear which crops.

Index Crops in Portfolio

	Sales												Breeding Focus			
Global Field Crops	BDI	ETH	KEN	MDG	MWI	MOZ	RWD	SSD	TZA	UGA	ZMB	ZWE	Broad adaptation	High altitude	Mid altitude	Low altitude
Barley											●		●●●			
Beans, dry											●					
Maize									●		●	●	●●●			
Pearl millet											●					
Rice, paddy											●				●●●	
Sorghum											●				●●●	
Soybean											●				●●●	
Wheat											●				●●●	
Global Vegetable Crops																
Broccoli											●					
Cabbage											●					
Carrot											●					
Cauliflower											●					
Chili pepper											●					
Cucumber											●					
Eggplant											●					
Garlic											●					
Green bean											●					
Lettuce											●					
Melon											●					
Okra											●					
Onion											●					
Pumpkin											●					
Spinach											●					
Squash											●					
Sweet pepper											●					
Tomato											●					
Watermelon											●					
Local Field Crops																
Chickpea											●					
Cowpea											●					
Pigeon pea											●				●●●	
Local Vegetable Crops																
Amaranth											●					



Variety testing

Tomato seedlings are planted for variety testing in Butajira, Ethiopia. Fair Planet tests existing varieties that are made available by indexed seed companies. The trials are conducted using agronomic practices that are accessible and affordable to local smallholder farmers. In various regions, the selected varieties yielded more than five times the average national yield.

Limitations Overview

Methodology Limitations

Like any study, the Access to Seeds Index has certain limitations in its design. These limitations can be found in the scope of the Index, the methodology development, data collection and analysis.

Scope of the Index

In the course of the methodology development, criteria were established for the selection of companies, crops and countries included in the Index. Limitations arise with respect to the comparability of Index companies and the other factors that define the scope of the Index.

Comparing Companies

All companies included in the Index have an integrated business model and a physical presence in the four Index regions and are mutually recognized as peers. However, variations exist in the business models, crop portfolios, size and/or regional presence of the selected companies. To account for these differences, the approach to scoring on many of the indicators in the Performance category involves scaling. Furthermore, as field crop and vegetable seed companies have significantly different business models, two separate Indexes were created. Some differences can also be identified within the Regional Index. For instance, one company was found to lack any activities in R&D or production of Index crops.

Comparing Crops, Countries and Smallholder Farmers

The second limitation related to scoping is the differences that exist across Index crops, countries and types of smallholder farmers. Although the Index acknowledges the unique opportunities for and traits of Index crops, as well as the specific needs and differing demands of smallholder farmers in Index countries, this is not generally reflected in the scores. For instance, companies do not receive more points for an activity in a country with a larger smallholder base or more neglected smallholder needs. Based on insights from this Index, stakeholders could prioritize smallholder farmers' needs in some Index countries over others, and some crops over others, during the dialogue and methodology review of the next Index cycle.

Methodology Development

■ The Weighted Scorecard Approach

The Access to Seeds Index uses a weighted scorecard approach, which means that every indicator is assigned a score according to pre-set scoring criteria. Each category (Commitment, Performance, Transparency and Innovation) within a measurement area forms an indicator group and, within each group, weights are distributed evenly among indicators. However, because the number of indicators per indicator group differs, weight per indicator differs as well. For example, even though Performance in the Marketing & Sales measurement area (which has 11 indicators) receives more weight than Commitment in the Local Seed Sector Advancement measurement area (which has two indicators), the weight per indicator in the latter indicator group is greater because the weight is distributed over fewer indicators. As a result, individual indicators, especially in Transparency, receive relatively greater weight.

Weight per indicator
in a certain indicator group

Measurement Areas Global Index	Weight per Commitment Indicator	Weight per Performance Indicator	Weight per Transparency Indicator	Weight per Innovation Indicator
A	1.25%	1.67%	1.50%	1.00%
B	1.25%	1.25%	0.75%	1.00%
C	2.50%	1.43%	3.00%	2.00%
D	2.50%	1.43%	3.00%	2.00%
E	1.67%	0.91%	3.00%	2.00%
F	2.50%	0.83%	1.50%	1.00%
G	1.25%	0.83%	1.50%	1.00%

In addition, this approach does not differentiate between indicators within each indicator group and thus assumes the equal importance of all indicators within that group. It is conceivable that, upon further stakeholder consultation in the next Index cycle, it will become evident that some indicators within certain groups should be weighted more heavily than others and that differential weighting within some groups would produce more meaningful results. To account for different stakeholder expectations per indicator, indicator-level weights may be adjusted for future iterations of the Index.

■ Double Scoring Innovation

As companies develop innovative strategies and models to improve access to seeds, the Index aims to capture and score these activities. This is done by awarding scores to companies on Innovation, the fourth and final indicator category. Here, activities within the indicator categories Commitment and Performance considered innovative are rewarded with an additional score for Innovation. For example, in R&D a hypothetical company has an innovative mechanism to ensure that the local knowledge and feedback of smallholder farmers is incorporated into its breeding program. The company receives points for this both on the corresponding Performance indicator D.II.6 and the Innovation indicator D.IV.1.

A limitation of this approach is that such activities are scored twice. Innovation could theoretically be captured within the indicator itself, however the approach used provides a means of highlighting those activities that reflect disruptive innovation, especially with respect to the business model.

Data Collection

■ Company Disclosure

Data is collected from several sources, of which publically disclosed information and company feedback are the most important. Reliance on these sources may seem to put companies in control of the raw research data. However, assessing the data in a company's own reported documents and communications has several benefits. First, these materials provide information and insights into the company's approach to access to seeds that are simply not available elsewhere. Second, as corporate social responsibility (CSR) reporting through corporate documents and websites has evolved and become mainstream, it has gained considerable credibility. Despite these benefits, marked differences exist in public reporting on access to seeds issues between listed and non-listed companies. Listed companies are generally subject to more stringent legal and stakeholder requirements regarding CSR reporting. Listed companies are therefore more likely to report on access to seeds activities, which often fall within the scope of CSR reporting, and have more experience doing so.

■ Company Feedback

Company feedback was requested as a second source of data and to provide all companies with the same opportunity to share their access to seeds commitments and activities. This source is subject to the same limitations and benefits as publically disclosed information. However, it also enables the collection of undisclosed data, thereby reducing the significance of differing levels of disclosure between Index companies. As a result, it is relatively difficult for companies that disclose limited information and provide no feedback to gain high scores. At the same time, because scoring performance entails scaling, these companies could receive an unintended benefit. For instance, if a company reports having a program in Country A, but publicly disclosed information indicates the company has activities in only two Index countries, the scaling approach will conclude that the company has activities in 50% of Index countries where it is present. As this is an unintended benefit of non-reporting and the full scope of the company's activities are unclear, scores are awarded in the lowest positive answer category.

■ Use of Third-party Sources

For some indicators, third-party news sources were used to identify activities with a possible negative impact on access to seeds for smallholder farmers in Index countries. While information was taken from globally recognized news aggregators, some of the news items involving smallholder farmers may not be captured due to the perceived low significance of these items for news feeds.

■ Timing of Data Collection

Data collection was carried out between March and July 2015 for access to seeds commitments and activities relating to the last two fiscal years that were available for analysis at the end of this timeframe. As a result, relevant data published after this period, such as website updates and annual or CRS reports, is excluded.

Furthermore, any structural and strategic changes that can occur at a company or industry level, such as product divestments or mergers and acquisitions, cannot be incorporated in the final scope of the Index. For instance, had Monsanto's attempted acquisition of Syngenta been successful, it would have been completed during the data collection period and both companies would still have been listed separately in this Index.

Data Analysis

■ Data Availability

Finally, data gaps exist in some indicators. This may be due to a lack of reporting on these particular issues or simply because companies are not yet meeting stakeholder expectations. Nevertheless, these gaps limit industry-wide analysis. Examples can be found in the measurement areas Marketing & Sales and Local Seed Sector Advancement.

■ Nature of the Data

There are also limitations relating to the nature of the data. As this is the first Index and study of its kind, the data collected is mainly qualitative, cross-sectional and gathered for a specific point in time. Trend analysis will only be possible for the next Index when longitudinal data is available and changes can be perceived. As the Index assesses the efforts of the world's 13 leading seed companies and Eastern Africa's 17 leading seed companies, the sample size and number of unique observations is too small for meaningful statistical analysis. As a result, a qualitative research approach was chosen to derive conclusions from the data. This is because the interpretive approach is better suited to descriptive research and is useful for identifying and emphasizing the naturally occurring processes of social entities; the companies' approaches to access to seeds. Furthermore, the possible subjectivity in the interpretation and analysis of qualitative findings is mitigated by carrying out peer reviews throughout the research process. Finally, the Index is currently not designed to measure the direct impact of companies on access to seeds for smallholder farmers. Instead, this potential impact is derived from the quality and scope of a company's programs or policies. For example, in Marketing & Sales the actual impact of a company's affordability programs is not measured. Instead, this is derived from the program's quality and geographic spread.

Definitions

These definitions are meant to provide a clear understanding of phrases used in the Access to Seeds Index and may be updated from time to time.

Access to Seeds Strategy

A strategy that aims to increase access to seeds for smallholder farmers and incorporates the following six dimensions: availability, affordability, suitability, capability, profitability and autonomy.

Adoption Strategy

A strategy that enables smallholder farmers to start using a new agricultural product, for example tailored packaging and the establishment of trusted distribution networks.

Advocacy (1)

Any activity carried out to change public opinion or gain public support.

Agricultural Biodiversity (2)

Agricultural biodiversity is the diversity of crops and their wild relatives, trees, animals, microbes and other species that contribute to agricultural production.

Benefit Sharing (3)

The fair and equitable sharing of benefits derived from the utilization of plant genetic resources obtained from collections under the multilateral system of the IT-PGRFA.

Biofortification (4)

The practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals, in a food crop through agronomic practices, conventional plant breeding, or modern biotechnology.

Biosafety System (5)

Any legislation, regulation or policy intended to regulate and control the transfer, handling and use of living modified organisms that may have adverse effects on biological diversity. Such a system aims to ensure the safety of human and animal health and an adequate level of environmental protection.

Breeders' Exemption (6)

Exception to Breeders' Rights (see below), allowing plant breeders to use freely plant varieties for developing new and distinct plant varieties.

Breeders' Rights (6)

Rights granted to the breeder of a new variety of a plant species that give the breeder exclusive control over the propagating material (including seed, cuttings, divisions, tissue culture) of that new variety for a number of years.

Bribery (7)

The offering, promising, giving, accepting or soliciting of an advantage as an inducement for an action which is illegal, unethical or a breach of trust. Inducements can take the form of gifts, loans, fees, rewards or other advantages (taxes, services, donations, etc.).

Code of Conduct (7)

Statement of principles and values that establishes a set of expectations and standards for how an organization, government body, company, affiliated group or individual will behave, including minimal levels of compliance and disciplinary actions for the organization, its staff and volunteers.

Collaborative Research

Research that involves the cooperation of researchers, institutions, organizations, communities with farmers and/or farmer organizations.

Corruption (7)

The abuse of entrusted power for private gain.

Ex Situ Conservation (3)

Conservation of plant genetic resources for food and agriculture outside their natural habitat.

F1 Hybrid

Hybrid of two homozygous parent lines. The F1 hybrid combines desired traits of both parent lines and has a uniform phenotype.

Farm-saved Seed (6)

Seed that is produced on a farm for the purpose of re-sowing on the same farm and not for the purpose of sale.

Farmers' Privilege (6)

The practice by farmers of harvesting and saving seeds for their own use in the next growing season.

Formal Seed System (8, 9)

A framework of institutions, both public and private, and well-defined methodologies, linked together by their involvement in or influence on the multiplication, processing and distribution of improved seed.

Genetically Modified (GM) Varieties (10)

Crop varieties that have been modified by the application of recombinant DNA technology or genetic engineering, a technique used for altering a living organism's genetic material.

Genetic Resources or Germplasm (11)

Any material of plant origin, including reproductive and vegetative propagating material, containing functional units of heredity.

Global Crop Diversity Trust (12)

An independent international fund which has as its objective the provision of a permanent source of funds to support the long-term conservation of ex situ germplasm. This includes characterization, documentation, evaluation and exchange of related information, knowledge and technologies.

Global Field Crops or Staple Crops (13)

Plants grown for food that constitute the dominant part of the human diet and supply a major proportion of energy and nutrient needs.

Global Vegetable Crops (14)

Any of various herbaceous plants having fruit, seeds, roots, tubers, bulbs, stems, leaves or flower parts that are used as food.

Improved Variety (6)

A new variety of a plant species which produces higher yields, higher quality or provides better resistance to plant pests and diseases while minimizing the pressure on the natural environment.

In Situ Conservation (3)

The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated plant species, in the surroundings where they have developed their distinctive properties.

Inclusive Business Model (15)

Business model that integrates the poor, as consumers, distributors, suppliers and/or employees.

Index Country

Any country covered by the 2016 Access to Seeds Index.

Informal Seed System (8, 9)

An informally structured mechanism, such as retaining seed on-farm from previous harvests, farmer-to farmer seed exchange based on barter, social obligation, etc., by which farmers can fulfill their seed requirements.

Intellectual Property Rights (IPR) (16, 17)

The rights given to persons over the creation of their minds which the law protects from unauthorized use by others. IP is protected by, for example, patents, copyright and trademarks, which enable the creators to earn recognition or financial benefit from what they invent or create for a certain period of time. Industrial IP is protected primarily to stimulate innovation, design and the creation of technology. In this category fall inventions (protected by patents), industrial designs and trade secrets.

International Treaty (3)

The International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA), which strives for the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity as far as sustainable agriculture and food security are concerned.

Lobbying (18)

Any activity carried out to influence a government or (public) institution's policies and decisions in favor of a specific cause or outcome.

Local Crops (19, 20)

A diverse set of small crops that tend to be regionally important but are not traded around the world and receive little or no attention from commercial breeding companies. They often have a strong cultural significance and can be vital for the livelihood of smallholder farmers in developing countries. They are often called 'orphan' or 'neglected' crops.

Measurement Area

One of seven measurement areas in which the companies included in the 2016 Index are assessed. These are: governance and strategy, public policy and stakeholder engagement, genetic resources and intellectual property, research and development, marketing and sales, capacity building and local seed sector development (Global Index) or production (Regional Index). In each measurement area, companies are assessed with indicators in four categories: Commitment, Performance, Transparency and Innovation.

Methodology

The Index framework that measures the extent to which leading seed companies use their knowledge, technology, varieties and seeds to benefit smallholder farmers. The Index is guided by five principles, which, through rigorous stakeholder dialogue, led to seven measurement areas in which company activity is assessed. The five principles are: access dimensions, farmer as entrepreneur, farmer development, seed systems and sustainable intensification. The scope of the Index is defined in terms of the companies included, geographic focus and crop selection.

Multilateral System (3)

A structure, provided by the IT-PGRFA, through which participating parties (130 countries and the EU) agree to provide facilitated access to genetic resources for food and agriculture, and to share the benefits arising from the utilization of these resources on a complementary and mutually reinforcing basis.

Multiplication

Seed production.

Nagoya Protocol on Access and Benefit-sharing (21)

The Nagoya Protocol on Access and Benefit-sharing is a supplementary international agreement to the Convention on Biological Diversity (CBD). It provides a legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources (see also Benefit sharing).

Open-pollinated Variety (OPV) (22)

A variety naturally cross-pollinated by insects, birds, wind or water or by self-pollination from male and female flower parts on the same plant.

Phytosanitary System (23)

Any legislation, regulation or policy having the purpose to prevent the introduction and/or spread of pests of plants and plant products, or to limit the economic impact of regulated non-quarantine pests.

Public Gene Bank (24, 25)

A collection of seeds and other plant reproductive material, primarily of cultivated plants and their wild relatives. The mandate of a gene bank is to conserve these collected plant genetic resources and provide access to them.

Quality Assurance

A set of tests, measures and procedures, normally based on international and/or national certification standards, to assure the consistent quality of seeds throughout the processes of development, testing, production and packaging.

Quality Seeds (26)

Seeds that consistently meets required standards of genetic and physiological purity (viability and vigor) and good health.

Seed grade

The description of seed quality, based on the vigor and viability of the seed, and its adaptation to specific cultivation methods.

Sustainable Intensification of Agriculture (27)

Increasing yields using fewer resources and minimizing or reversing negative environmental impacts. This can be achieved by making the current agricultural system more efficient through the use of new technologies or by improving current production systems.

Technology (28, 29)

The application of scientific knowledge through which the genetic and physical characteristics of seeds are improved. It involves such activities as variety development, evaluation and release, seed production, seed processing, seed storage, seed testing, seed certification, seed quality control, seed marketing etc.

Variety (3)

Plant grouping, within a single botanical taxon of the lowest known rank, defined by the reproducible expression of its distinguishing and other genetic characteristics.

References Cited in Definitions

1. Oxford Dictionaries: <http://bit.ly/2071E4r>
2. Bioversity International: <http://bit.ly/1pDMzQW>
3. Part IV International Treaty on Plant Genetic Resources for Food and Agriculture: <http://bit.ly/1teJk8J>
4. WHO: <http://bit.ly/1KcBqpY>
5. The Cartagena Protocol on Biosafety: <http://bit.ly/1xcEQxm>
6. UPOV System of Plant Variety Protection: <http://bit.ly/1wqRY1I>
7. Transparency International, 2009, 'The Anti-Corruption Plain Language Guide': <http://bit.ly/1yoYaZm>
8. Overseas Development Institute: <http://bit.ly/1Kcsgtr>
9. Louwaars N., 2004, 'Seeds of Confusion. The Impact of Policies on Seed Systems': <http://bit.ly/1wmdGFb>
10. FAO: <http://bit.ly/1dHB1GQ>
11. FAO International Code of Conduct for Plant Germplasm Collecting and Transfer: <http://bit.ly/1ox4eie>
12. Article 1 Agreement for the Establishment of the Global Crop Diversity Trust: <http://bit.ly/1wuCIYW>
13. FAO, 1995, 'Staple Foods: What Do People Eat?': <http://bit.ly/1wmdUvT>
14. Oxford Dictionaries: <http://bit.ly/1vS3EfT>
15. Wach E., 2012, 'Measuring the 'Inclusivity' of Inclusive Business': <http://bit.ly/ZIV7Pn>
16. Cornell University Law School: <http://bit.ly/1ox53aV>
17. WTO: <http://bit.ly/1rrkH24>
18. Oxford Dictionaries: <http://bit.ly/1tNAY8V>
19. Stanford University: <http://stanford.io/1Kcu71j>
20. Bioversity International: <http://bit.ly/1nQHg6q>
21. CBD: <http://bit.ly/1PjlqQp>
22. FAO: <http://bit.ly/1OZxNjQ>
23. International Plant Protection Convention, International Standards for Phytosanitary Measures (ISPMs): <http://bit.ly/1wexTiD>
24. CGIAR: <http://bit.ly/10qA6u2>
25. Rasmussen M., 'The Role of Gene Banks in Finding and Conserving our Cultural Heritage': <http://bit.ly/ZOGcDE>
26. FAO, Sindhua J.S. and Kumarb I., 'Quality Seed Production in Hybrid Rice': <http://bit.ly/1z0IiPU>
27. IFPRI '2013 Global Food Policy Report': <http://bit.ly/10qA6KF>
28. Oxford Dictionaries: <http://bit.ly/1vS5JIP>
29. FAO, Feistritz W.P., 1975, 'Cereal Seed Technology: A Manual of Cereal Seed Production, Quality Control, and Distribution'

Acronyms

AATF	African Agricultural Technology Foundation	IUCN	International Union for Conservation of Nature
ARIPO	African Regional Intellectual Property Organization	JPN	Japan
ATSI	Access to Seeds Index	KALRO	Kenya Agricultural and Livestock Research Organization
AVRDC	Asian Vegetable Research and Development Center(World Vegetable Center)	KEN	Kenya
BDI	Burundi	KES	Kenyan shilling
Bt	Bacillus thuringiensis	MDG	Madagascar
CBSD	Cassava brown streak disease	MLn	Million
CEO	Chief executive officer	MLN	Maize lethal necrosis
CGIAR	Consultative Group for International Agricultural Research	MOZ	Mozambique
CGN	Netherlands Center for Genetic Resources	MWI	Malawi
CHE	Switzerland	NARO	National Agricultural Research Organization
CHS	Complaint-handling system	NARS	National Agricultural Research Systems
CIAT	International Center for Tropical Agriculture	NaSARRI	National Semi-Arid Resources Research Institute
CIMMYT	International Maize and Wheat Improvement Center	NLD	The Netherlands
CLUSA	Cooperative League of the USA	NGO	Non-governmental organization
CMD	Cassava mosaic disease	PPP	Public-private partnership
COMESA	Common Market for Eastern and Southern Africa	PVP	Plant variety protection
CSR	Corporate social responsibility	R&D	Research and development
DG	Directorate-general	RWA	Rwanda
DNA	Deoxyribonucleic acid	SADC	Southern Africa Development Community
EAC	East African Community	SMS	Short message service
ECOWAS	Economic Community of West African States	SPAM	Spatial Production Allocation Model
ERC	Expert Review Committee	SSD	South Sudan
ETH	Ethiopia	THA	Thailand
EU	European Union	TZA	Tanzania
FAO	Food and Agriculture Organization	UGA	Uganda
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database	UGX	Ugandan shilling
FDI	Foreign direct investment	UNDESA	United Nations Department of Economic and Social Affairs
FRA	France	UPOV	International Union for the Protection of New Varieties of Plants
GeRRI	Genetic Resources Research Institute	USA	United States of America
GCDT	Global Crop Diversity Trust	USD (\$)	United States dollar
HRI	Horticulture Research International (Warwick HRI)	USDA/ARS	Agricultural Research Service of the United States Department of Agriculture
DEU	Germany	ZAF	South Africa
GM	Genetically modified	ZAM	Zambia
Ha	Hectare	ZWE	Zimbabwe
ICARDA	International Center for Agricultural Research in the Dry Area		
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics		
ICT	Information and communications technology		
IFPRI	International Food Policy Research Institute		
IIASA	International Institute for Applied Systems Analysis		
IITA	International Institute of Tropical Agriculture		
INRA	French National Institute for Agricultural Research		
IP	Intellectual property		
IPR	Intellectual property rights		
IRRI	International Rice Research Institute		
ISF	International Seed Federation		
ISHI	International Seed Health Initiative		
ISO	International Organization for Standardization		
ISTA	International Seed Testing Association		
IT-PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture		

1. McGuire, Sperling (2016). 'Seed systems smallholder farmers use'. In: Food Security.
2. IFAD (2013). Smallholders, food security, and the environment.
3. Fair Planet website: www.fairplanetseeds.com
4. Howard (2009). 'Visualizing Consolidation in the Global Seed Industry: 1996-2008'. In: Sustainability.
5. Fernandez-Cornejo, Just, (2007). 'Researchability of Modern Agricultural Input Markets and Growing Concentration'. In: American Journal of Agricultural Economics
6. Seed Co website: seeds.seedco.co/share_price
7. Dupont Pioneer (2013). DuPont Pioneer Completes Acquisition of Pannar Seed. Dupont Pioneer website: www.pioneer.com/
8. KWS Brasil website: www.kws-sementes.com.br/
9. Syngenta (2015). Syngenta comments on Monsanto announcement'. Syngenta website: www.syngenta.com/
10. Syngenta (2016). ChemChina cash offer to acquire Syngenta at a value of over US\$ 43 billion. Syngenta website: www.syngenta.com/global/corporate/en/news-center/news-releases/
11. Dow (2015). DuPont and Dow to Combine in Merger of Equals'. Dow website: www.dow.com/news/press-releases/
12. AGRA (2015). The Africa Agriculture Status Report 2015 : Youth in Agriculture in Sub-Saharan Africa.
13. Syngenta (2014). The good growth plan.
14. Humanitarian Licensing Strategies ensure that humanitarian applications of technology are not inadvertently blocked by the terms common in commercial licenses. Bennet (2007). Reservation of Rights for Humanitarian Uses. In: IP Handbook, Specific Strategies and Mechanisms for Facilitating Access to Innovation. www.iphandbook.org/
15. Danforth Center website: <http://www.danforthcenter.org/>
16. The World Bank website: <http://www.worldbank.org/>
17. WHO (2003). Diabetes cases could double in developing countries in next 30 years. WHO website: <http://www.who.int/>
18. Balde et al. (2006). 'Herbal Medicine and Treatment of Diabetes in Africa: An Example from Guinea'. In: Diabetes & Metabolism.
19. CGIAR (2014). Annual Report.
20. ACRE website: [acreafrica.com/services./](http://acreafrica.com/services/)
21. ACRE website: acreafrica.com/services./
22. IFC website: www.ifc.org/
23. Syngenta Foundation website: <http://www.syngentafoundation.org>
24. OECD, African Development Bank, World Bank (2015). Africa Competitiveness Report.
25. Cardno (2014). Preliminary Report Regional Access to Seeds Index for Eastern Africa.
26. The size of these plots and the definition of a smallholder farmer differ between countries and between agro ecological zones. In areas with high population densities, smallholder farmers often cultivate less than one hectare of land, whereas they may cultivate ten hectares or more in semi-arid areas. Dixon, et al. (2004). 'Smallholders, Globalization and Policy Analysis'.
27. Barnett, Chisvo, Pinto (2011). East Africa Synthesis Report (Kenya, Tanzania, Uganda).
28. World Bank (2015). Shock Waves: Managing the Impacts of Climate Change on Poverty.
29. Bentley, Van Mele, Reece, (2011). How Seeds Work.
30. Tripp, Rohrbach, (2001). 'Policies for African Seed Enterprise D progress Report.
35. The African Seed Access Index (2015). Towards Competitive Seed Systems Serving Smallholder Farmers.
36. An accession is 'a distinct, uniquely identifiable sample of seeds representing a cultivar, breeding line or a population, which is maintained in storage for conservation and use'. FAO (2014).
37. FAOSTAT (2013).
38. Demeke, Di Marcantonio (2013) Analysis of incentives and disincentives for teff in Ethiopia.
39. Cernansky (2015). 'The rise of Africa's super vegetables'. In: Nature.
40. MLN is a combination of two viruses, the maize chlorotic mottle virus (MCMoV) and any of the cereal viruses in the potyviridae group, including the sugarcane mosaic virus (SCMV), wheat streak mosaic virus (WSMV) or maize dwarf mosaic virus (MDMV).
41. World Bank (2014). Levelling the field: Improving Opportunities for Women Farmers in Africa.
42. The Montpellier Panel (2012). Growth with Resilience: Opportunities in African Agriculture.
43. This excludes South Sudan as no 2013 data was available.
44. ISF (2013). Comparative analysis of the African seed industry with the rest of the world seed industry.
45. African Development Bank Group (2010). Smallholder Agriculture in East Africa: Trends, Constraints and Opportunities.
46. FAO (2011). Women in agriculture: closing the gender gap for development.



Support for local crops

Carmen Valle in her quinoa field in the Viscaya Valley, Peru. Quinoa is a local crop, high in protein and tolerant of dry soil. Indigenous peoples of the Andes have traditionally protected and preserved quinoa as a food for present and future generations. As part of a collaboration with the German government, KWS supports the quinoa work of the public gene bank in Peru through trainings.

Disclaimer

As a multi-stakeholder and collaborative project, the findings, interpretations and conclusions expressed herein may not necessarily reflect the views of all members of the stakeholder groups or the organizations they represent. The report is intended to be for information purposes only and is not intended as promotional material in any respect. The material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The report is not intended to provide accounting, legal or tax advice or investment recommendations. Whilst based on information believed to be reliable, no guarantee can be given that is accurate or complete.

Copyright

No part of this report may be reproduced in any manner without the written permission of the Access to Seeds Foundation.

Editor

Cecily Layzell, Amsterdam, The Netherlands

Design

Kummer & Herrman, Utrecht, The Netherlands

Coordinator Photography

Reem Saouma, Amsterdam, The Netherlands

Photography

The Access to Seeds Index aims to shine a light on how seed companies are supporting smallholder farmers to grow their business. The Access to Seeds Foundation commissioned photographers originating from the region to portray some of the current practices for this report.

Cover	Sebastián Montalvo Gray, Brooklyn, New York, USA
P. 2/3	Saving or purchasing seeds, Peru: Sebastián Montalvo Gray, Brooklyn, New York, USA
P. 16/17	Reaching the village level, Uganda: Humphrey Odera, Syokimau, Machakos county, Kenya
P. 29/29	Local breeding, India: Anurag Banerjee, Mumbai, India
P. 36/37	Adoption strategies, Ethiopia: Hollandse Hoogte
P. 48/49	Farmer education, India: Anurag Banerjee, Mumbai, India
P. 98/99	Seed insurance, Kenya: Humphrey Odera, Syokimau, Machakos county, Kenya
P. 128/129	Extension services, Mali: Meynard Tosay, Chiang Mai, Thailand
P. 174/175	Seed production, Uganda: Humphrey Odera, Syokimau, Machakos county, Kenya
P. 212/213	Variety testing, Ethiopia: Courtesy of Fair Planet
P. 222/223	Support for local crops, Peru: Sebastián Montalvo Gray, Brooklyn, New York, USA

Print

Platform P, Rotterdam, The Netherlands

Access to Seeds Foundation

Mauritskade 63
1092 AD Amsterdam
The Netherlands
www.accesstoseed.org
info@accesstoseed.org
T +31 8 53 03 29 32

The Access to Seeds Foundation is funded by the Bill & Melinda Gates Foundation, the Netherlands Ministry of Economic Affairs and the Netherlands Ministry of Foreign Affairs.



Government of the Netherlands

BILL & MELINDA
GATES foundation



Access to Seeds
Index

Bridging the gap between the
world's leading seed companies
and the smallholder farmer



Access to Seeds Index

Bridging the gap between the
world's leading seed companies
and the smallholder farmer