



Access to Seeds
Index

Methodology for the Access to Seeds Index 2019

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

Amsterdam,
February 2018

Introduction

The Access to Seeds Index 2019 will more than double the total number of companies assessed.

“The heart of the solution of SDG 2 is the smallholder farmer,” a seed industry leader said at the Responsible Business Forum on Sustainable Development in Johannesburg in August 2017. He was referring to zero hunger, one of the 17 Sustainable Development Goals (SDGs) introduced by the United Nations in 2015 to end all forms of poverty by 2030. The comment shows that raising the productivity of smallholder farmers is very much on seed companies’ agenda, a fact that was underlined by the findings of the first Access to Seeds Index, published in February 2016.

Achieving SDG 2 starts with enabling farmers to produce more food in the regions that are considered food insecure. Agriculture in these regions is dominated by smallholder farmers, and sufficient access to quality seeds of improved varieties is one of the many challenges these farmers face. Although seed companies are increasingly responsive to this challenge, many smallholders have yet to be reached.

Creating a better understanding of how seed companies are improving access to quality seeds and, in turn, how they are contributing to the SDGs, is what the Access to Seeds Index set out to do. The index is published every two years in order to monitor progress over time. The next index is scheduled for the first half of 2019.

The seed industry can be described as a small group of global leaders and a long tail of regional and national seed companies. The 2016 Index included an evaluation of global seed companies operating in four index regions – Latin America, South and Southeast Asia, Western Africa and Eastern Africa – as well as regional companies in Eastern Africa. The regional index showed that regional companies play a key role in reaching smallholders and are leading the way in addressing specific challenges such as breeding for local crops or providing dedicated services to women farmers.

Following the Eastern African example, new regional indexes focusing on Western and Central Africa and South and Southeast Asia are currently being developed. Meanwhile, the scope of the Regional Index for Eastern Africa will be expanded to include Southern Africa. Regional landscaping studies have already been carried out and identified around 20 leading seed companies in each region whose activities will be further researched for inclusion in the 2019 Index. As a result, the 2019 Index will more than double the number of companies assessed: from 25 to 60.

Since its publication, the 2016 Index has been widely discussed with farmer organizations, seed companies and policymakers in all four index regions. Although it seems obvious that achieving food security requires ongoing cooperation and coordination between these parties, it has become clear that these are often lacking. We hope that the evidence base provided by the index will help to fill this gap.

The discussions also provided input for a thorough review of the index methodology. There is now a greater focus on topics considered to be particularly relevant and a reduced number of indicators. We thank all the stakeholders who provided input and the experts who helped to review and improve the methodology.

On behalf of the Access to Seeds Index team,

Ido Verhagen,
Executive Director



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1. Why an Access to Seeds Index?

Increasing smallholder farmer productivity is key to achieving SDG 2: zero hunger. The Access to Seeds Index aims to encourage seed companies to increase their contribution to this goal.

Hunger is a daily reality for 1 billion people, and 2 billion suffer from various forms of malnutrition. The global population is expected to grow by another 2 billion in the coming decades, precisely in those regions that are currently considered food insecure.

The smartest way to tackle the pressing challenges of food insecurity is to enable farmers to produce more – and more nutritious – food. Agriculture in food insecure regions is dominated by 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. Insufficient 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 leading global seed companies – generally at the forefront of research and development – while examining the crucial role regional seed companies play in delivering industry 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. Published every two years, the index aims to monitor progress over time and to encourage the seed industry to step up its efforts.

Private sector engagement is at the heart of the SDGs adopted by the United Nations in 2015. By creating a better understanding of the seed industry's role, the index aims to contribute to achieving these goals.

The index is published by the Access to Seeds Foundation, an independent, non-profit organization based in Amsterdam, The Netherlands, which is dedicated to assessing the seed industry's contribution to smallholder farmer productivity. The foundation is allied with the World Benchmarking Alliance, a global initiative aimed at benchmarking the private sector's contribution to the SDGs.

By creating a better understanding of the role of the seed industry, the index aims to contribute to achieving the Sustainable Development Goals.



2. What Did the 2016 Index Show?

Although many smallholders have yet to be reached, raising smallholder farmer productivity is high on the seed industry's agenda. Regional seed companies play a key role in delivering industry products to the farm gate.

"What are you going to measure? The seed industry is not at all interested in smallholder farmers." This was one of the reactions received when the idea for an Access to Seeds Index was first presented to a wider audience in July 2013. Three years later, the results of the first index showed that statements like this need to be reexamined. Although there is a lot of room for improvement and many smallholders have yet to be reached, the industry is clearly considering ways to service this emerging customer base. The results also showed that it is possible to implement sustainable business practices that serve the interests of both companies and entrepreneurial smallholders.

2016 Index Insight – Global seed companies have a presence in all index regions, with a clear gap in Western Africa



The index assessed company efforts in areas such as breeding, distribution and adoption as well as how companies handle their intellectual property in emerging markets. The parameters for the first assessment were based on one basic question posed to numerous stakeholders in and around the seed industry: How do you expect seed companies to improve access to quality seeds for smallholder farmers?

Some of the examples highlighted in the first index involve high-tech solutions, such as solar-powered weather stations and mobile technologies that can provide low-cost crop insurance against weather risks. Others are more low key, such as the use of mobile seed shops with agronomists providing advice in remote villages and at local markets where smallholders generally buy their seeds.

2016 Index Insight – Seed companies, most notably regional companies, are making a broad portfolio available in index countries

Field crops	In regional portfolio global seed companies	Number of regional companies with crop in portfolio
Rice, paddy	●	★★★★★
Maize	●	★★★★★
Wheat	●	★★★★
Sorghum	●	★★★★★
Millet		★★★
Beans, dry	●	★★★★★
Soybean	●	★★★★★
Cowpea		★★★★★
Chickpea		●
Pigeon pea		★★★★
Potato		●

Vegetables	In regional portfolio global seed companies	Number of regional companies with crop in portfolio
Onion	●	★★★★★
Tomato	●	★★★★★
Okra	●	★★★★★
Pepper (hot)	●	★★★★★
Pumpkin	●	★★★★★
Squash	●	★★★★
Gourd	●	★★★★
Eggplant	●	★★★★★
Cabbage	●	★★★★★
Pepper (sweet)	●	★★★★★
Cauliflower	●	★★★★★
Green bean		★★★★★
Green pea		★★★★
Cucumber	●	★★★★★
Watermelon	●	★★★★★
Lettuce	●	★★★★★
Carrot	●	★★★★★
Melon		★★★★★

The 2016 Index provided a unique insight into the seed industry's current efforts to raise smallholder farmer productivity.

Overall, the index provided a unique insight into the seed industry's current efforts. Company scorecards enumerated these efforts at the individual company level. Industry-level analysis revealed the industry's coverage in countries with a smallholder presence, food security challenge and agricultural potential. Company rankings provided insight into leadership at both the global and regional level, highlighting, for instance, the important role regional companies play in reaching smallholder farmers.

3. How Was the 2016 Index Received?

One of the main goals of the Access to Seeds Index is to provide an evidence base for the conversation on how the seed industry can support smallholder farmer productivity. The publication of the 2016 Index resulted in coverage in over 170 media outlets, new initiatives by policymakers and discussions around the globe at events hosted by organizations including the Food and Agriculture Organization of the United Nations (FAO), World Bank and African Union.

Presentations and discussions

Four regional roundtable events were organized in Goma (Democratic Republic of Congo), Hanoi (Vietnam), Ouagadougou (Burkina Faso) and Johannesburg (South Africa) to discuss the findings with farmers and farmer organizations.

Consultations with individual companies primarily took place during the annual seed congresses organized by AFSTA and APSA. During APSA's 2016 congress in Incheon, South Korea, the Access to Seeds Index team was invited to present its plans to develop a regional index for Asia, which will include regional companies active in South and Southeast Asia.

Media exposure and peer-reviewed papers

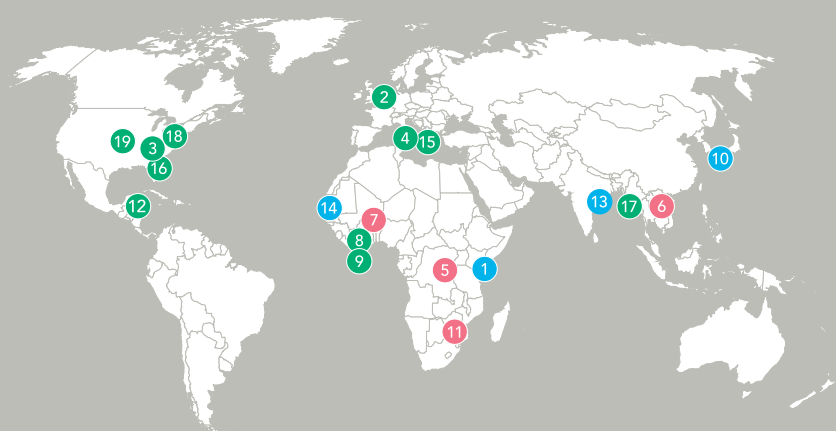
The index was covered by more than 170 media outlets, from global digital platforms such as The Guardian and BBC News, to Eastern Africa's Business Daily, and national newspapers including the *Swazi Observer* and *Nong Nghiep Viet Nam*. Most articles were in English, but several also appeared in French, Spanish, Italian, German and various national languages. The index was referenced in four peer-reviewed scientific papers addressing the role of the seed industry in improving access to quality seeds for smallholder farmers.

Industry response and policy implications

Following the publication of the index, the FAO and World Bank organized debates that further explored the role the seed industry can play and how the index's findings should be incorporated into the industry's policies and approaches.

The African Union and AfricaSeeds organized the workshop 'Measuring Seed Sector Performance' for national policymakers to discuss the index's findings and other initiatives and implications for national policies. In Thailand, government officials organized a workshop on how Thai seed companies can expand their role in providing access to the latest seed technologies.

The European Union identified the index as one of the key contributions by member states to the SDG agenda. The United States Agency for International Development (USAID) used the finding on the currently limited activities targeting women farmers to inform its Gender and Social Inclusion Action Plan.

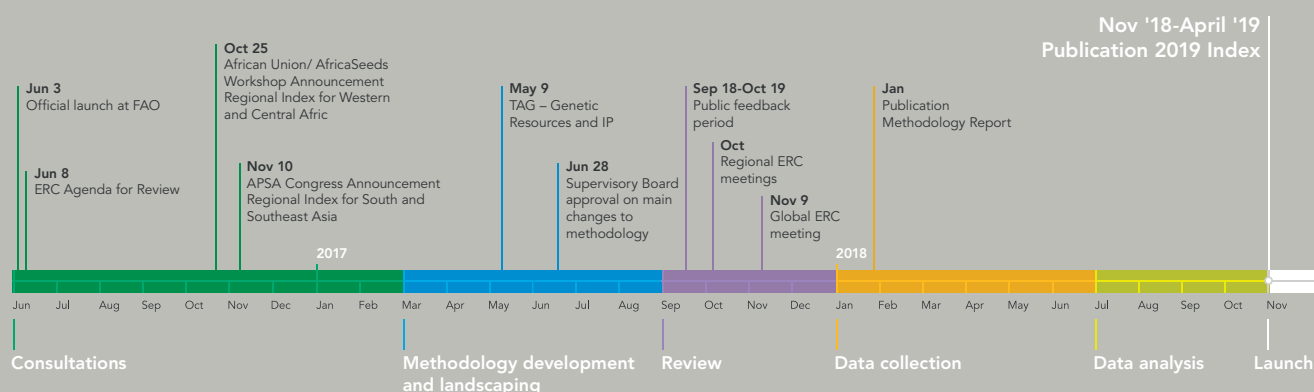


- Presentations and discussions
- Farmer consultations
- Company consultations

- 1 AFSTA Congress – company consultations
Nairobi, March 1-3, 2016
- 2 Agriterro Dutch Seed Debate
The Hague, April 6, 2016
- 3 IFPRI Policy Seminar
Washington DC, April 28, 2016
- 4 Official launch at FAO Headquarters
Rome, June 3, 2016
- 5 Regional Farmer Consultation
Goma, July 12-14, 2016
- 6 Regional Farmer Consultation
Hanoi, August 6, 2016
- 7 Regional Farmer Consultation
Ouagadougou, October 18-19, 2016
- 8 AfricaSeeds/African Union Seed
Sector Conference
Abidjan, October 24-26, 2016
- 9 African Development Bank –
presentation
Abidjan, October 27, 2016
- 10 APSA Congress – industry presentation
Incheon, November 8, 2016
- 11 Regional Farmer Consultation
Johannesburg, November 28-29, 2016
- 12 UN Biodiversity Conference
Cancun, December 5, 2016
- 13 NSAI Indian Seed Congress –
company consultations
Kolkata, February 12-14, 2017
- 14 AFSTA Congress – company
consultations
Dakar, February 28-March 2, 2017
- 15 Bioversity International –
AgroBiodiversity Index Consultations
Rome, March 8, 2017
- 16 World Bank Food for All Talk
Washington, April 13, 2017
- 17 NSTDA Seminar for the Thai seed
industry
Chiang Mai, July 3, 2017
- 18 UN High-level Political Forum on
Sustainable Development
New York, July 10-19, 2017
- 19 2017 Borlaug Dialogue –
The World Food Prize
Des Moines, October 17, 2017

4. How Was the Methodology Developed?

The methodology is the result of extensive stakeholder engagement and expert review. It is refined after the publication of each index.



Publication of the 2016 Index

The first Access to Seeds Index was published on February 25, 2016. The official presentation of the findings took place on June 3, 2016, at the FAO headquarters in Rome.

Consultations

Following its initial evaluation of the 2016 Index, the Expert Review Committee agreed on an Agenda for Review on June 8, 2016. This identified areas where the methodology should be refined. Companies featured in the index were asked on an individual basis for their feedback on the findings and the data collection process. To discuss the findings with farmers and farmer organizations, four regional consultation events were organized in Western, Eastern and Southern Africa and Asia. One of the outcomes of these events was the desire to see regional indexes developed for Western Africa and Asia, following the Eastern African example.

Methodology review and landscaping

The input gathered during the consultation process was used to review the methodology in early 2017. Although the consultations resulted in proposals to introduce new parameters, the overall objective was to reduce the number of indicators used in the first index.

Landscaping studies to determine which companies to include in the new regional indexes for Western Africa and Asia started in March 2017 and were conducted by consultants within each region. The landscaping study for the Regional Index for Eastern Africa was updated to explore the possibility of extending the scope to include Southern Africa. To gather stakeholder input on the parameters for the Genetic Resources and Intellectual Property measurement areas, a Technical Advisory Group (TAG) made up of industry, public research and civil society representatives convened on May 9. The main changes to the methodology were discussed and approved by the Supervisory Board on June 28.

Public consultation

In order to allow a broader group of stakeholders to provide feedback on the revised methodology, this consultation document was published on September 18, 2017. Stakeholders were given one month to submit their feedback. In the meantime, regional expert review committees (ERCs) convened to evaluate the landscaping studies and the approach for their respective regions. The global ERC discussed the outcomes of these regional meetings as well as the public consultation process on November 9. On December 6, the Supervisory Board gave its final approval.

Data collection

The data collection for the 2019 Index is due to start in early 2018. The companies selected for inclusion were informed about the data collection process in the fall of 2017. They will be asked to complete a questionnaire in a carefully managed process that ensures equal treatment of each company. To facilitate the process, a user-friendly online data collection platform is being developed.

Data analysis

The analysis of the data both at a company and industry level is overseen by the Access to Seeds Index's lead researchers. For verification purposes, the researchers conduct an extensive quantitative and qualitative check of each indicator for each company. Scoring is carried out according to scoring guidelines approved by the Supervisory Board. For specific areas, technical experts review the analysis. Everyone involved in the data collection process has signed a confidentiality agreement.

Publication of the 2019 Index

The 2019 Index is scheduled for publication between November 2018 and April 2019. The regional indexes for Asia and Africa will be published on different dates during this period before publication of the global results.

5. Outline of the Methodology

The Access to Seeds Index is a relative ranking, comparing companies with each other rather than against an absolute, ideal state. As such, companies themselves set and raise the bar. The index focuses on seed companies with an integrated business model, from breeding and production through to marketing and sales. For benchmarking purposes, companies are grouped according to whether they operate globally or regionally.

	Commitment 20%	Performance 60%	Transparency 10%	Leadership 10%
10%	Governance & Strategy			
10%	Genetic Resources			
10%	Intellectual Property			
20%	Research & Development			
10%	Seed Production			
20%	Marketing & Sales			
20%	Capacity Building			

The Access to Seeds Index uses a weighted scorecard with a total of 59 indicators to measure and compare company performance.

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. The geographic scope and crop scope define the countries and crops for which the index evaluates company activity.

Measurement areas

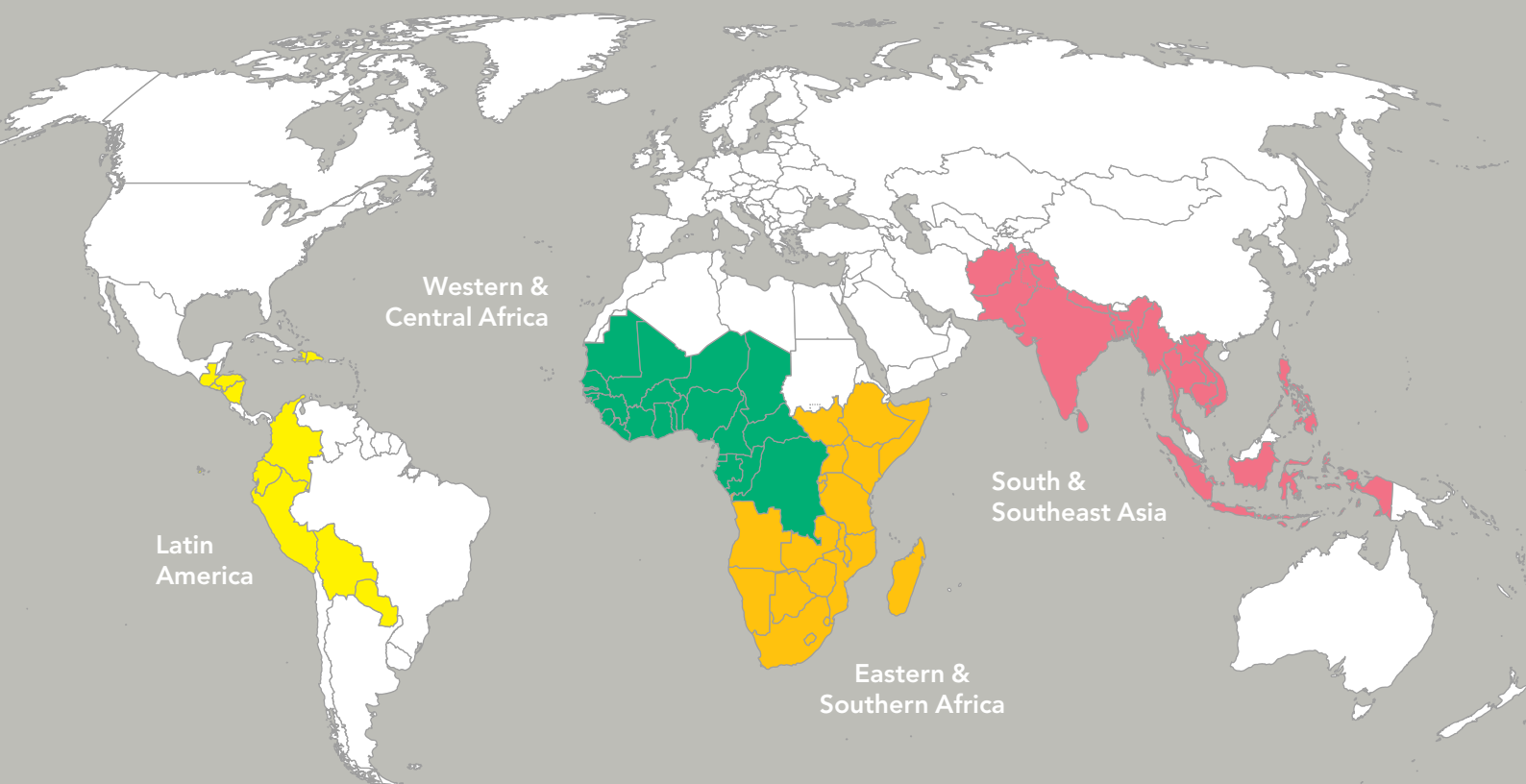
The index matches company performance with stakeholder expectations. Based on the results of the stakeholder engagement process, seven measurement areas were identified where stakeholders expect or desire company activity. The index uses a weighted scorecard approach, which means that every indicator in a measurement area is assigned a score according to pre-set scoring criteria. The total score is the sum of the scores in each measurement area.

Indicators

Indicators address specific topics within the measurement areas. There are four categories of indicators. Commitment indicators focus on strategies, policies and targets; Performance indicators assess actual activities, programs and products; Transparency indicators evaluate whether companies disclose information through their own communications channels; and Leadership indicators reward activities or approaches that stand out or can be considered innovative in the industry.

6. Scope of the 2019 Index

The Access to Seeds Index assesses the efforts of the world's leading seed companies to improve access to field crop and vegetable seeds for smallholder farmers in four regions. To ensure a fair and meaningful analysis, the research scope defines which countries, companies and crops are taken into account. Company scores are scaled for size, portfolio and presence.



6.1. Geographic Scope

The index measures seed companies' efforts to improve access to quality seeds in countries with (1) a significant smallholder farmer presence (2) a food security challenge and (3) agricultural potential. The countries that meet all these criteria determine the geographic scope. The

main changes compared to the 2016 Index are in Africa. Following advice from regional experts, Western Africa has been expanded to include countries in Central Africa, and Eastern Africa has been extended to include Southern Africa.

Disclaimer: Country borders or names do not necessarily reflect the Access to Seeds Foundation's official position. Maps used are for illustrative purposes and do not imply the expression of any opinion on the part of the Foundation, concerning the legal status of any country or territory or concerning the delimitation of frontiers or boundaries.

Latin America

The countries in Central America, the Caribbean and South America that meet the criteria for index country selection are combined in one index region: Latin America. As a result of its improved score on the Global Hunger Index, Belize is excluded from the scope of the 2019 Index.

Bolivia, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, Paraguay, Peru

Western & Central Africa

All the countries in this index region meet the criteria for index country selection. Following advice from regional experts, the boundaries of this index region are based on membership of CORAF/WECARD. For the 2016 Index, the United Nations geoscheme was used to delineate the region. Consequently, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea, Gabon, Mauritania and Republic of the Congo are now part of the 2019 Index scope. CORAF/WECARD member Mauritania did not meet the criterion for agricultural potential.

Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Republic of the Congo, Senegal, Sierra Leone, The Gambia, Togo

Eastern & Southern Africa

This index region includes all SADC and EAC member states plus Ethiopia and Somalia. All countries in this region meet the criteria for index country selection, with the exception of Botswana and Angola. These countries were added to the scope following advice from the African Union that the index would be more relevant for policymakers if all the countries in sub-Saharan Africa were included.

Angola, Botswana, Burundi, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Somalia, South Africa, South Sudan, Tanzania, Uganda, Zambia, Zimbabwe

South & Southeast Asia

This index region includes all the countries that meet the criteria for index country selection. Although Indonesia scored above the yield gap threshold, it was included following advice from external experts. Sri Lanka is a new addition to the scope as it meets all the criteria. Due to incomplete data, it was not included in the 2016 Index.

Afghanistan, Bangladesh, Cambodia, India, Indonesia, Laos, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam

Criteria for Index Country Selection

	Criterion	Source	Threshold
Challenge	Food insecurity	Global Hunger Index, (IFPRI, 2016)	<9.9
	Yield gap	Global Agro-Ecological Zones, (IIASA/FAO, 2012)	<55%
	Smallholder farmers growing target crops	Spatial Production Allocation Model (IFPRI, 2005)	Subsistence and low-input management
Potential	Crop suitability	Global Suitability Index (IIASA/FAO, 2006)	>20
	Share of cropland	World Soil Database (IIASA/FAO, 2008)	>5%
	Market accessibility	Travel time to major city (IRC/LRM, 2008)	<4 hours

6.2. Crop Scope

In addition to activities in global crops – as defined by FAOSTAT – the index also evaluates company activities in local crops, sometimes referred to as neglected and underutilized crops. Although other crops are relevant for smallholder farmers, such as cotton and fodder crops, the index's focus remains on food crops for direct consumption.

The index uses this data to evaluate whether companies have specific crops in their portfolios of value to smallholder farmers, and where companies see opportunities to develop suitable varieties tailored to regional conditions and preferences. The global crops were selected based on total area of cultivation according to FAOSTAT (2014). In addition, only crops that featured in at least two of the top 20 lists of major crops for each of the four index regions were selected.

Global Field Crops

	Crop	Crop type	Area harvested (ha), 2014
1	Rice, paddy	Cereals	121,317,400
2	Maize	Cereals	59,330,018
3	Wheat	Cereals	46,700,902
4	Sorghum	Cereals	27,185,972
5	Millet	Cereals	26,370,471
6	Beans, dry	Pulses/legumes	22,538,058
7	Groundnut	Pulses/legumes	18,404,704
8	Soybean	Pulses/legumes	18,242,868
9	Cowpea	Pulses/legumes	12,282,440
10	Chickpea	Pulses/legumes	11,767,109
11	Sesame	Oil crops	7,452,258
12	Pigeon pea	Pulses/legumes	7,024,642
13	Potato	Roots & tubers	5,129,675
14	Sunflower	Oil crops	3,500,229

Area harvested in index countries in Sub-Saharan Africa, Latin America, and South and Southeast Asia. Source: FAOSTAT, 2014.

Global Vegetable Crops

	Crop	Area harvested (ha), 2014
1	Onion	2,608,345
2	Tomato	1,975,372
3	Okra	1,751,489
4	Pepper (hot)	1,489,027
5	Pumpkin	
6	Squash	879,065
7	Gourd	
8	Eggplant	840,546
9	Cabbage	744,585
10	Pepper (sweet)	609,025
11	Cauliflower	599,486
12	Green bean	596,468
13	Green pea	571,041
14	Cucumber	334,418
15	Watermelon	308,548
16	Lettuce	206,273
17	Carrot	175,969
18	Melon	174,988

Area harvested in index countries in Sub-Saharan Africa, Latin America, and South and Southeast Asia. Source: FAOSTAT, 2014.

Local crops

Due to their geographic specificity, several local crops are currently not included or included only to a limited extent in the scope of commercial seed companies.

This list of important local crops was composed following expert consultation. The list is non-exhaustive and only provides an indication of the kind of local crops on which seed companies could focus.

Local crops

Crop type	Sub-Saharan Africa	Asia	Latin America
Cereals and pseudo-cereals	Fonio Tef African rice	Buckwheat Job's tears Proso millet	Quinoa Cañihua Kiwicha
Pulses/legumes	Lablab Long bean Bambara groundnut	Mung bean Lentil Rice bean	Chocho Lupin bean Jicama
Roots and tubers	Yam Sweet potato Livingstone potato	Cassava Sweet potato Taro	Yakón Ulloco Arracacia
Vegetables	Amaranth Jew's mallow Spider plant	Kangkong Purslane Yard long bean	Papalo Caihua Tomatillo

Non-exhaustive list of local crops in the index regions.

6.3. Company Scope

The global index focuses on the activities of global seed companies operating in all four index regions. The regional index, meanwhile, assesses the role of regional and national seed companies in a specific region.

For the 2019 Index, the geographic scope of the Regional Index for Eastern Africa will be extended to include Southern Africa. New regional indexes for Western and Central Africa and South and Southeast Asia will also be developed.

Global index

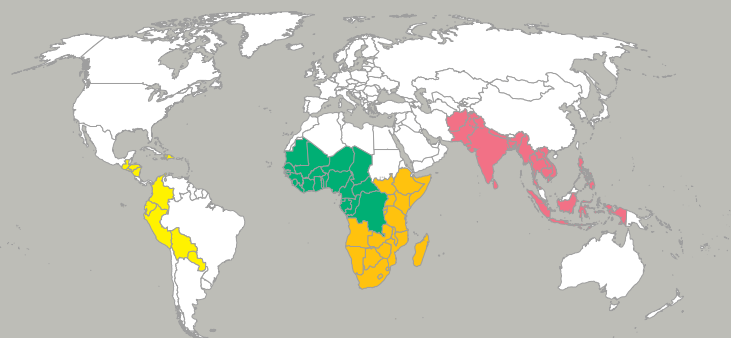
The global index focuses on leading seed companies with an integrated seed business model (breeding, production, distribution) that operate on a global scale. Companies selected for inclusion fall into three categories. The first category is made up of companies with a field crop seed segment in their portfolio and revenues over \$1,000 million. Some of these companies are currently involved in mergers or acquisitions, the progress of which will determine whether these companies are assessed separately or as a new, combined entity. The second

category is made up of companies with only a vegetable seed segment and revenues over \$100 million. In the third category are regional leaders with a global presence and revenues over \$100 million. The inclusion of this third category in the global index is the result of advice from stakeholders and the Expert Review Committee.

For more information, read the regional landscaping studies available on our website, which were used to inform company selection for the 2019 Index.

Global Access to Seeds Index

	Company	Country	Seed portfolio	Seed sales 2016 (\$mIn)	Ownership	Category
1	Advanta	ARE	Field crops & vegetables	194	Listed	III
2	Bayer*	DEU	Field crops & vegetables	1,502	Listed	I
3	Bejo	NLD	Vegetables	194	Private	II
4	DowDuPont**	USA	Field crops	8,180	Listed	I
5	East-West Seed	THA	Vegetables	150	Private	II
6	Enza Zaden	NLD	Vegetables	266	Private	II
7	Groupe Limagrain	FRA	Field crops & vegetables	1,471	Cooperative/Listed	I
8	KWS	DEU	Field crops	1,153	Listed	I
9	Monsanto*	USA	Field crops & vegetables	10,437	Listed	I
10	Rijk Zwaan	NLD	Vegetables	407	Private	II
11	Sakata	JPN	Vegetables	399	Listed	II
12	Syngenta (ChemChina)***	CHE	Field crops & vegetables	2657	Private	I
13	Takii	JPN	Vegetables	428	Private	II



Source: 2015 or 2016 annual reports, stakeholder and expert consultations, and Phillips McDougall 2015 industry analysis.

*On September 14, 2016, Bayer and Monsanto announced that they had signed a definitive agreement under which Bayer will acquire Monsanto. The acquisition is subject to customary closing conditions, including receipt of required regulatory approvals. Based on the outcome of this process, the new company might feature as a combined entity in the 2019 Index.

**On September 1, 2017, DowDuPont announced the successful completion of the merger between The Dow Chemical Company ('Dow') and E.I. du Pont de Nemours & Company ('DuPont'), effective August 31, 2017. The combined entity now operates as a holding company under the name 'DowDuPont' with three divisions: Agriculture, Materials Science and Specialty Products. The company announced its intention to create three independent, publicly traded companies. Seed sales for DowDuPont represent cumulative seed sales for DuPont Pioneer and Dow AgroSciences over 2016.

***On October 26, 2017, the request for delisting of Syngenta shares from SIX Swiss Exchange was approved by SIX Exchange Regulation, following the announcement that ChemChina's participation in Syngenta has exceeded 98% of Syngenta's share capital.

Regional indexes

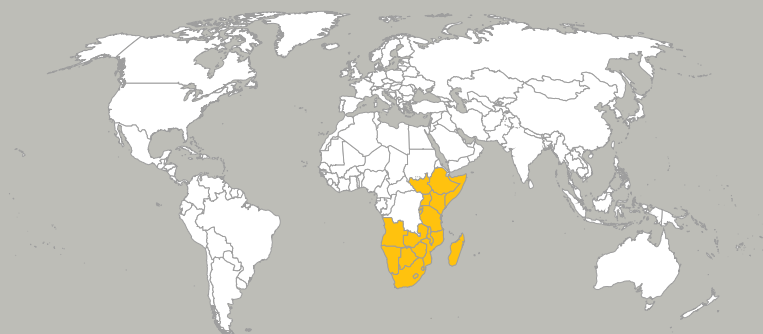
The regional indexes evaluate the activities of seed companies in specific regions. The company lists are the result of landscaping studies in each region performed by regional consultants and research firms.

The selection criteria are (1) an integrated seed business model (2) regional presence or a dominant position in one country (3) physical presence and business activities in the region and (4) peer recognition as a leading company.

Regional Index for Eastern & Southern Africa

	Company	Country	Seed portfolio	Ownership
1	Capstone Seeds	ZAF	Field crops	Private
2	Darusalam Seed Co	SOM	Field crops	Private
3	Demeter Seed	MWI	Field crops	Private
4	DowDuPont	USA	Field crops	Listed
5	East African Seed	KEN	Field crops & vegetables	Private
6	East-West Seed	THA	Vegetables	Private
7	Ethiopian Seed Enterprise	ETH	Field crops	State owned
8	Equator Seed Co	UGA	Field crops	Private
9	FICA Seeds	UGA	Field crops & vegetables	Private
10	Hygrotech	ZAF	Vegetables	Private
11	Kenya Seed Company	KEN	Field crops & vegetables	State owned
12	Kenya Highland Seed	KEN	Vegetables	Private
13	Klein Karoo Seed Marketing	ZAF	Field crops & vegetables	Private
14	Monsanto*	USA	Field crops & vegetables	Listed
15	NASECO	UGA	Field crops	Private
16	Pop Vriend Seeds	NLD	Vegetables	Private
17	Seed Co	ZWE	Field crops & vegetables	Listed
18	Starke Ayres	ZAF	Vegetables	Private
19	Syngenta (ChemChina)	CHE	Field crops & vegetables	Private
20	Technisem	FRA	Vegetables	Private
21	Victoria Seeds	UGA	Field crops & vegetables	Private
22	Zamseed	ZAM	Field crops & vegetables	Private

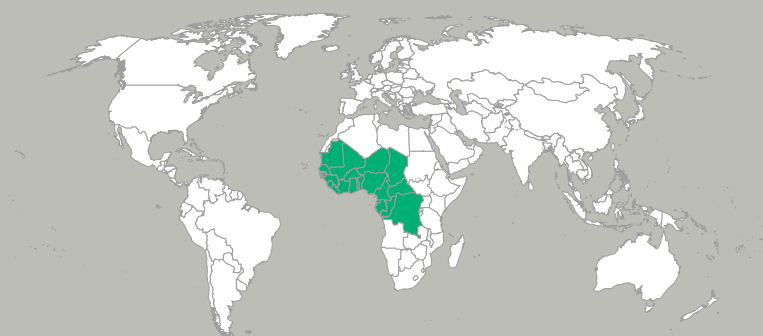
*On September 14, 2016, Bayer and Monsanto announced that they had signed a definitive agreement under which Bayer will acquire Monsanto. The acquisition is subject to customary closing conditions, including receipt of required regulatory approvals. Based on the outcome of this process, the new company might feature as a combined entity in the 2019 Index.



Regional Index for Western & Central Africa

	Company	Country	Seed portfolio	Ownership
1	AGRIPLUS	MLI	Field crops & vegetables	Private
2	AINOMA	NER	Field crops & vegetables	Private
3	BILOHF	CIV	Field crops & vegetables	Private
4	Da-Allgreen Seeds	NGA	Field crops & vegetables	Private
5	DowDuPont	USA	Field crops	Listed
6	East-West Seeds	THA	Vegetables	Private
7	Faso Kaba	MLI	Field crops & vegetables	Private
8	GAWAL	CHN	Field crops & vegetables	Private
9	Heritage Seeds	GHA	Field crops	Private
10	Maslaha Seeds	NGA	Field crops	Private
11	Monsanto*	USA	Field crops & vegetables	Private
12	NAFASO	BFA	Field crops	Private
13	Pop Vriend Seeds	NLD	Vegetables	Private
14	Premier Seed	NGA	Field crops & vegetables	Private
15	Seed Co	ZWE	Field crops & vegetables	Listed
16	SEDAB	SEN	Field crops	Private
17	SEMAGRI	CMR	Vegetables	Private
18	Soprosa	MLI	Field crops & vegetables	Private
19	Syngenta (ChemChina)	CHE	Field crops & vegetables	Private
20	Technisem	FRA	Vegetables	Private
21	Tropicasem	SEN	Field crops & vegetables	Private
22	Value Seed	NGA	Field crops & vegetables	Private

*On September 14, 2016, Bayer and Monsanto announced that they had signed a definitive agreement under which Bayer will acquire Monsanto. The acquisition is subject to customary closing conditions, including receipt of required regulatory approvals. Based on the outcome of this process, the new company might feature as a combined entity in the 2019 Index.



Regional Index for South & Southeast Asia

	Company	Country	Seed portfolio	Ownership
1	Acsen HyVeg	IND	Field crops & vegetables	Private
2	Advanta	ARE	Field crops & vegetables	Listed
3	Bayer*	DEU	Field crops	Listed
4	Bioseed	IND	Field crops & vegetables	Listed
5	BRAC	BGD	Field crops & vegetables	Intl. NGO
6	Charoen Pokphand	THA	Field crops & vegetables	Listed
7	DowDuPont	USA	Field crops	Listed
8	East-West Seed	THA	Vegetables	Private
9	Groupe Limagrain	FRA	Field crops & vegetables	Cooperative/Listed
10	Kalash Seeds	IND	Field crops & vegetables	Listed
11	Known-You Seed	TWN	Field crops & vegetables	Listed
12	Lal Teer Seed	BGD	Vegetables	Listed
13	Mahyco	IND	Field crops & vegetables	Private
14	Monsanto*	USA	Field crops & vegetables	Listed
15	Namdhari Seeds	IND	Field crops & vegetables	Listed
16	National Seeds Corporation	IND	Field crops & vegetables	State owned
17	Nongwoo Bio	KOR	Vegetables	Listed
18	Nuziveedu Seeds	IND	Field crops	Listed
19	Punjab Seed Corporation	PAK	Field crops & vegetables	State owned
20	Rallis/Metahelix	IND	Field crops	Listed
21	Sakata	JPN	Vegetables	Private
22	Syngenta (ChemChina)	CHE	Field crops & vegetables	Private
23	Takii	JPN	Vegetables	Private
24	Vinaseed	VNM	Field crops & vegetables	Listed

*On September 14, 2016, Bayer and Monsanto announced that they had signed a definitive agreement under which Bayer will acquire Monsanto. The acquisition is subject to customary closing conditions, including receipt of required regulatory approvals. Based on the outcome of this process, the new company might feature as a combined entity in the 2019 Index.



7. Indicators of the 2019 Index

A. Governance & Strategy

This measurement area evaluates whether companies have strategies in place to contribute to smallholder farmer productivity and the Sustainable Development Goals (SDGs). It highlights the way in which companies include smallholder farmers in their core business strategies by assessing the governance structures, targets, budgets and programs in place to do so. More broadly, the measurement area aims to identify the extent to which companies are dedicated to achieving the SDG targets.

SDGs

The SDG framework comprises 17 goals with 169 targets aimed at mobilizing companies to invest in sustainable development. For example, seed companies can contribute to achieving specific goals such as zero hunger (SDG 2), gender equality (SDG 5), climate action (SDG 13) and life on land (SDG 15).

Access to seeds for smallholder farmers

Seed companies can contribute to enhancing smallholder farmer productivity in a sustainable way by increasing their access to knowledge, technologies, varieties and seeds. A clear commitment and strategy articulates how companies will contribute based on their portfolios, assets and capabilities.

Governance and accountability

Clearly formulated goals and targets within company governance structures improve implementation and assessment. Introducing incentives and assigning responsibility to the board or senior executives ensures that a company's commitments to access to seeds are integrated into its business practices.

Support for an enabling environment

Building an enabling environment that supports access to seeds is essentially a government's responsibility. However, companies can contribute to this, for instance through their lobbying activities or active participation in local seed trade associations. Companies can also help to advance local seed sectors, acknowledging the role of local actors, farmer cooperatives and the informal seed sector.

A.I Commitment

A.I.1 SDGs

The company has a policy statement that articulates a commitment and strategy to incorporate the SDGs into its business practices, or formulates in general terms how it aims to contribute to global food and nutrition security.

A.I.2 Access to seeds for smallholder farmers

The company has a policy statement that articulates a commitment and strategy to contribute to improved access to seeds for smallholder farmers in index countries.

A.II Performance

A.II.1 Governance and accountability

The company has assigned executive responsibility and incentivized management to implement and measure its programs and activities related to SDG targets and access to seeds for smallholder farmers in index countries.

A.II.2 Company resources

The company has allocated resources to ensure a strategic and proactive approach to meeting the SDGs and access to seed targets in its core business.

A.II.3 Codes of business conduct

The company has codes of business conduct in place that set internal standards on anti-corruption, lobbying activities, social standards and biosafety.

A.II.4 Enabling environment

The company actively contributes to building a supportive, enabling environment for access to seeds for smallholder farmers in index countries, for instance through its lobbying activities and in-kind support.

A.II.5 Local seed sector advancement

The company has activities that help to advance the development of the seed sector in index countries, acknowledging the role of local actors, farmer cooperatives and the informal seed sector.

A.III Transparency

A.III.1 Transparency in Governance & Strategy

The company reports publicly on its policies, practices and results in this area.

A.IV Leadership

A.IV.1 Leadership in Governance & Strategy

The company has established innovative models or leading practices in this area.

B. Genetic Resources

Genetic resources are fundamental to sustainable food production. However, agricultural practices can impact existing genetic diversity. This measurement area seeks to clarify how companies support the conservation of genetic resources and how they share the benefits resulting from the use of publicly available genetic material.

Conservation of genetic resources

The growth of the formal seed sector can reduce local crop diversity currently conserved on farms and in communities. Seed companies can help conserve local crop and genetic diversity, for instance by supporting public gene banks and community seed initiatives.

Access and benefit sharing

Access and benefit sharing (ABS) refers to the way in which companies obtain genetic resources and how they share the benefits that result from their use, thereby contributing to international efforts to promote the conservation and use of genetic resources. This requires having a 'track and trace system' in place that demonstrates the origin of genetic resources used by companies and how access was obtained. Benefit sharing includes monetary and non-monetary contributions to conservation and use of genetic resources, such as to the Global Crop Diversity Trust in accordance with multilateral agreements like the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Convention on Biological Diversity (CBD).

B.I. Commitment

B.I.1 Policy on the conservation and use of genetic diversity

The company has a policy statement in place that demonstrates its commitment to the conservation and use of genetic diversity in index countries.

B.II Performance

B.II.1 Conservation of genetic resources

The company is involved in programs and/or initiatives that encourage the conservation of a diverse set of crops and genetic resources used by smallholder farmers in index countries, such as through collaboration with and/or support for international, national and/or community gene banks.

B.II.2 Access to genetic resources

The company makes genetic resources available, for example through the multilateral system of the ITPGRFA.

B.II.3 Track and trace system

The company has a system in place that demonstrates the origin of and the way in which the genetic resources used in its breeding programs and commercial portfolio were obtained.

B.II.4 Benefit sharing

The company contributes monetary and/or non-monetary forms of benefit sharing as outlined in international treaties such as the ITPGRFA.

B.III Transparency

B.III.1 Transparency in Genetic Resources

The company reports publicly on its policies, practices and results in this area.

B.IV Leadership

B.IV.1 Leadership in Genetic Resources

The company has established innovative models or leading practices in this area.

C. Intellectual Property

Intellectual property (IP) protection allows companies to generate a return on research and development investment. IP protection can, however, restrict established practices such as further breeding by other actors and on-farm seed saving. Because national IP regulations differ and many emerging economies still lack IP laws, this measurement area seeks to clarify and assess the positions of companies regarding IP, including patents and how companies provide access to their products in countries where regulations are still under development. It also reviews how companies regard farm-saved seed practices.

Pricing

To ensure that IP protection does not affect affordability, companies can apply differentiated pricing or market segmentation strategies when setting the price of products for smallholder farmers in index countries.

Licensing

Tailored or royalty-free licensing strategies can improve access to patented varieties, traits, methods and technologies for national agricultural research institutes and private plant breeders, thereby promoting the development of new varieties appropriate to the needs of smallholder farmers.

Breeders' exemption and farmers' privilege

The long-established breeders' exemption makes commercial varieties available for further breeding, while the farmers' privilege allows on-farm seed saving and exchange. This access can be restricted through the use of contractual clauses and patents, not just on plant varieties, but also on traits, methods and technologies.

C.I Commitment

C.I.1 Policy on IP protection

The company has a policy statement in place that clarifies how it handles intellectual property rights in index countries, including its position regarding farm-saved seeds and the use of its commercial varieties for further breeding.

C.II Performance

C.II.1 Pricing strategies

When marketing IP-protected products in index countries, either directly or indirectly, the company applies market segmentation and differential pricing strategies to ensure affordability for smallholder farmers.

C.II.2 Licensing

The company offers royalty-free licensing and/or lower price licensing of protected material for use in index countries.

C.II.3 Breeders' exemption

The company allows the use of commercial varieties for further breeding and refrains from using restrictive measures such as contractual clauses in index countries.

C.II.4 Farmers' privilege

The company allows the saving, use, exchange and/or sale of farm-saved seeds by smallholder farmers and refrains from employing restrictive measures such as contractual clauses in index countries.

C.III Transparency

C.III.1 Transparency in IP

The company reports publicly on its policies, practices and results in this area.

C.IV Leadership

C.IV.1 Leadership in IP

The company has established innovative models or leading practices in this area.

D. Research & Development

This measurement area focuses on companies' research and development (R&D) efforts, especially activities that consider local conditions in index regions. These activities include adapting global crops for local use and breeding programs aimed at improvement of, for example, yield, pest and disease resistance and climate resilience of local crops.

Testing

Testing varieties that are already available, either in a company's own collection or in research institutes, is a fast route to bringing new varieties to market. By conducting variety trials and on-farm demonstrations, for example, companies can test varieties in their existing portfolio for suitability in index regions.

Breeding for smallholder farmers

Companies can contribute to the availability of a diverse set of varieties tailored to the needs and preferences of smallholder farmers in index regions through their plant-breeding activities. Such activities can focus on global and local crops. This requires breeding programs informed by local knowledge and feedback.

Specific traits for smallholder farmers

Dedicated programs to develop specific traits with tolerance to abiotic stresses such as heat, drought, flooding and salinization, and the biotic stresses of pests and diseases, can significantly improve crop yield and performance. 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 collaboration

Through collaboration with local research institutes and farmer organizations, companies can leverage their technical strengths with local expertise. In some cases, local research institutes may already have developed germplasm that is available for use in breeding programs. Collaborative research is also a way to help advance local seed sectors.

D.I Commitment

D.I.1 Improved varieties for smallholder farmers

The company has a policy statement on developing new varieties and/or testing existing varieties appropriate to the local conditions and preferences of smallholder farmers in index countries.

D.II Performance

D.II.1 Testing

The company has activities to test crop varieties suitable for smallholder farmers in index countries, which includes varieties from the company's own portfolio and/or from public research institutes.

D.II.2 Developing improved varieties of global crops

The company has a breeding program that aims to develop varieties of global crops appropriate for smallholder farmers in index countries.

D.II.3 Developing improved varieties of local crops

The company's breeding program includes the development of varieties of local crops appropriate for smallholder farmers in index countries.

D.II.4 Breeding program for specific traits

The company's breeding program includes the development of specific traits useful to smallholder farmers in index countries, such as pest and disease management, increased crop robustness, climate change resilience and/or nutritional value.

D.II.5 Local knowledge and feedback

The company has mechanisms in place to ensure that the knowledge, preferences and feedback of local consumers, traders and smallholder farmers are incorporated into its breeding programs in index countries.

D.II.6 Collaborative research

The company is involved in collaborative research with local public or private partners such as research institutes, non-governmental organizations and/or farmers or farmer organizations in index countries.

D.II.7 Breeding activities in index regions

The company has its own breeding activities and/or facilities in index regions.

D.III Transparency

D.III.1 Transparency in R&D

The company reports publicly on its policies, practices and results in this area.

D.IV Leadership

D.IV.1 Leadership in R&D

The company has established innovative models or leading practices in this area.

E. Seed Production

Through local seed production, companies can address the limited availability of quality seeds while advancing the local seed sector. This measurement area seeks to identify whether companies produce seeds locally and the extent to which smallholder farmers are involved in this process.

Local seed production

Companies that produce seeds locally can help advance local seed sectors. By introducing new technologies and expertise to improve seed production, working with local seed growers can contribute to overall capacity building.

Labor standards

In producing seeds within index countries, companies should institute fair labor conditions and adhere to international labor standards. This could include addressing child labor, health and safety, and workers' benefits.

Quality management

Seed quality depends on a comprehensive approach to quality assurance based on international standards. To ensure consistent quality, seed companies, through their local partners or contract growers, should have robust seed quality management systems in place, from seed production to post-harvest handling, storage, processing and packaging.

E.I Commitment

E.I.1 Local seed production

The company has a clear commitment to producing seeds in index countries and to involving smallholder farmers in these activities.

E.II Performance

E.II.1 Seed production activities in index countries

The company produces seeds in index countries through its own facilities or through partnering with local companies or farmer organizations.

E.II.2 Engaging smallholder farmers in seed production

The company involves smallholder farmers in its seed production in index countries.

E.II.3 Quality management in seed production

The company has management systems in place to ensure quality throughout its seed production processes in index countries.

E.II.4 Labor standards in seed production

The company has labor standards in place to ensure fair labor conditions in the production of its seeds in index countries.

E.III Transparency

E.III.1 Transparency in Seed Production

The company reports publicly on its policies, practices and results in this area.

E.IV Leadership

E.IV.1 Leadership in Seed Production

The company has established innovative models or leading practices in this area.

F. Marketing & Sales

This measurement area assesses the ways in which companies make quality seeds of improved varieties available and affordable to smallholder farmers and how they promote adoption. This could include tailored packaging and building trusted distribution networks as well as offering demonstration activities that promote adoption.

Diverse portfolio

Companies can enhance access to seeds by offering a diverse portfolio of crops and varieties. This could include offering open-pollinated varieties (OPVs) alongside hybrids. By considering the diverse needs of smallholder farmers as entrepreneurs, companies can build the resilience of their business activities.

Tailored distribution practices

Companies can promote improved varieties, for example by establishing distribution channels that reach remote areas and offering tailored packaging appropriate to the needs of smallholder farmers. Adoption can be promoted by creating awareness through demonstrations, and by enhancing affordability through financial services such as insurance. Companies can also ensure that smallholder farmers in index countries have access to the necessary agricultural inputs other than seed.

Quality assurance and after-sales support

Companies can take steps to ensure that seed quality is maintained throughout the distribution system and that counterfeit seeds are not sold under their brand in index countries. These steps include customer feedback and grievance mechanisms for smallholder clients.

F.I Commitment

F.I.1 Marketing policy of commercial varieties

The company has made a commitment to market its varieties and seeds tailored to the needs of smallholder farmers in index countries, and has policies and codes of conduct governing its marketing activities.

F.I.2 Quality and safety of varieties and seeds

The company has policies and protocols in place in accordance with international best practices to ensure biosafety, increased product suitability and product quality when marketing seeds of improved varieties in index countries.

F.II Performance

F.II.1 Diverse portfolio

The company has made a diverse portfolio of seeds, seed types and varieties available to smallholder farmers in index countries.

F.II.2 Distribution channels

The company has established dedicated distribution channels and/or agro-dealer networks within index countries, which make its seeds accessible to smallholder farmers, including in remote areas.

F.II.3 Packaging and labeling

The company packages its products in quantities appropriate to the needs of smallholder farmers in index countries, and its packaging includes information in a local language, pictograms, and manufacture and expiry dates.

F.II.4 Other agricultural inputs

The company makes an effort to ensure that smallholder farmers in index countries have access to the necessary agricultural inputs other than seed, and learn about their appropriate and sustainable use.

F.II.5 Quality assurance and after-sales

The company has implemented management systems to ensure that its seed quality is maintained throughout the distribution system and that counterfeit seeds are not sold under its brand in index countries. It also has grievance mechanisms available to smallholder farmers in index countries.

F.II.6 Demonstration and promotion strategies

The company has programs, such as field days, demonstration services and promotion activities, to create awareness of suitable products available for smallholder farmers in index countries.

F.II.7 Affordability

The company is involved in programs, either directly or through partnerships, to help make seeds more affordable to smallholder farmers in index countries, such as providing credit and insurance.

F.III Transparency

F.III.1 Transparency in Marketing & Sales

The company reports publicly on its policies, practices and results in this area.

F.IV Leadership

F.IV.1 Leadership in Marketing & Sales

The company has established innovative models or leading practices in this area.

G. 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. This area presents many opportunities for public-private partnerships.

Extension

Extension services are activities that build the capacity of smallholder farmers. These include not only the use of improved varieties but also the appropriate application of other agricultural inputs and sustainable business practices. Companies can offer extension services themselves or in partnership with local organizations. To engage next-generation farmers in agriculture and address the specific demands of women farmers, tailored programs can be organized for these target groups.

Information and communication technology

As an enabling technology, information and communication technology (ICT) and mobile services provide numerous opportunities for smallholders to grow as entrepreneurs, for instance through provisioning, agronomic support and technical information. By collecting and aggregating data from farmers, ICT also enables companies and other actors to understand the demands and needs of smallholder farmers better.

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 their profitability by linking them to output markets and/or assisting in the development of a local or regional market. Companies can partner with other organizations to offer farmers training in areas such as post-harvest handling and product hygiene.

G.I Commitment

G.I.1 Capacity building

The company has a policy statement on building the capacity of smallholder farmers in index countries in order to increase their productivity, food and nutrition security, and resilience in a sustainable manner.

G.II Performance

G.II.1 Extension services

The company offers, directly or through local public or private partners, agricultural extension services to smallholder farmers in index countries.

G.II.2 Next-generation farmers

The company has programs in place to engage next-generation farmers in agriculture, such as support for formal education programs and/or institutions.

G.II.3 ICT

The company supports, directly or through partnerships, initiatives that advance the use of ICT by smallholder farmers in index countries to help build their capacity and inform their decision-making.

G.II.4 Programs for women farmers

The company supports programs, directly or through partnerships, which are specifically designed to enable women farmers in index countries to access and utilize seeds and adjacent technologies.

G.II.5 Access to output markets

The company is engaged in developing the food value chain in index countries through its involvement, directly or through partnerships, in collaborative initiatives that link smallholder farmers to output markets.

G.III Transparency

G.III.1 Transparency in Capacity Building

The company reports publicly on its policies, practices and results in this area.

G.IV Leadership

G.IV.1 Leadership in Capacity Building

The company has established innovative models or leading practices in this area.

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 it is accurate or complete.

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world's leading seed companies
and the smallholder farmer