Method Paper

The Crop Science Sustainability Target for Smallholder Farmers

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Introduction

Smallholder Farmers play a pivotal role in ensuring food security in low- and middle-income countries. In Asia and Sub-Saharan Africa, for example, smallholder farmers – many of them are women – provide more than half of the food supply[i]. But many still struggle to make a living as they are highly vulnerable to extreme weather conditions and crop losses. They often lack access to the solutions available.

As a global leader in agriculture, Bayer wants to help improve local food supply and reduce poverty in rural communities. The Crop Science sustainability target is to support 100 million smallholder farmers in low- and middle-income countries by 2030. Our progress is monitored with a Key Performance Indicator (KPI: Smallholder Farmer Reach), which is defined as '**Number of smallholder farmers in low- and middle-income countries (LMICs) supported by products, services and partnerships**'.

Since the KPI is defined specifically for Bayer's Crop Science business, we cannot rely on standardized measuring methods. We defined a proprietary methodology based on available and reliable data and conservative assumptions.

This document aims to provide a general description of the methodology applied to calculate the respective KPI, as well as the different data sources used.

Definitions

In the following table important terms are defined.

Key terms	Definition
Smallholder farmer	A farmer who farms crops on less than 10 ha (FAO[ii])
Low- and middle-income countries (LMICs)	All countries included in the World Bank list[iii] of countries with low-income, lower middle-income, and upper middle-income economies as per 1 July 2019
Products & services	Commercial products e.g., seeds, traits and crop protection products, as well as services such as training, advisory services or digital solutions
Using Bayer products & services	Any smallholder in LMICs using at least one product or service provided by Bayer in the reporting period
Average Bayer farmer spends	Average expenditure of all Bayer farmers per treated ha in a specific country per main crop group and indication
Indication (Product line)	Crop protection (Herbicides, Fungicides, Insecticides), Seed Growth, Seeds & Traits, Vegetable Seeds,
Country-crop combination	Combination of different main crop groups and countries
Crop main group	There are 14 crop main groups defined at Bayer, such as cereals, corn/maize, rice etc. The crop main groups overarch various crops. For example, the crop main group of cereals includes wheat, barley, etc.

Methodology

For this challenge, all Crop Science business units in the low- and middle-income countries (LMICs) have been taken into scope.

There are three channels contributing to the target of supporting 100 million smallholder farmers:

- Bayer's commercial channel, which provides smallholder farmers with Bayer products via local commercial channels in a country
- partnership channel (non-commercial), in which we support smallholder farmers with non-commercial services and solutions together with external partners
- Bayer's digital channel (non-commercial), in which we support digitally active smallholder farmers with agronomic advisory.

When deriving the KPIs for 2019 and 2020, we only considered data from the commercial channel. In 2021, Bayer established the non-commercial partnership channel, whose contribution to the KPI has been incorporated since then. From 2025 onwards, the digital channel is also included in the reach derivation.

Commercial Channel

The calculation process of the commercial channel is performed in four steps to obtain the number of smallholder farmers in LMICs supported by products and services.

Step 1: Collect relevant raw data	Step 2: Calculate total number of farmers supported	Step 3: Correct overlaps across indications	Step 4: Calculate final number of smallholders supported

Step 1: Collect relevant raw data

Purpose	To collect relevant raw data for the calculation of the total number of farmers supported by Bayer.
Assumption	Smallholder farmers buy specific products for their relevant crops.
Process	Sales data (denominated in Euro terms) as well as crop main group and LMIC specific raw data for each indication are collected from different data sources (see below in the Data Sources section). Only data of relevant crop main groups for smallholder farmers in LMICs are considered.
Output	• Sales and volume data specific to country-crop combination and indication. • Crop main group and country specific data, e.g., crop seasons, seeding rates, average farm sizes, average Bayer farmer spend per ha.

Step 2: Calculate total number of farmers supported

Purpose	To derive the total number of farmers supported per indication.
Process	Two major calculation approaches are considered: The number of farmers supported by the crop protection and vegetable seeds indications are calculated by a sales approach with the following formula:

$$Number\ of\ farmers\ = \frac{Bayer\ Sales\ [EUR]}{Avg.\ Bayer\ farmer\ spend\left[\frac{EUR}{ha}\right] \times Avg.\ farm\ size[ha]}$$

For the indications seeds (corn/rice), seed growth[*] and traits the calculation follows a volume approach with the following formula:

$$Number\ of\ farmers\ = \frac{Bayer\ Sales\ Volume\ [kg]}{Avg.\ Bayer\ farmer\ seeding\ rate\ [\frac{kg}{ha}]\ \times\#\ Seasons \times Avg.\ farm\ size[ha]}$$

*Seed growth calculation considers sales volumes in liters and a dose rate parameter.

Output	Total number of farmers supported per crop main group and indication by Bayer in each LMIC.

Step 3: Correct for overlaps across indications

Purpose	To correct for double counting of farmers, using products of more than one indication.
Assumption	One farmer may purchase more than one Bayer product within a year. For example, farmers who buy seeds from Bayer may also buy crop protection products from Bayer.
Process	Considering that it is difficult to calculate the different possible combination uses of the products, we follow the maximum reach principle: Within each crop main group per country, we identify the indication with the largest number of farmers. Only this number is further used, and other indication values are ignored. For instance, considering the country Indonesia and the crop main group of corn/maize, the number of farmers supported will be calculated for all indications. If the maximum number of farmers is supported in the indication seed, then the number of Bayer farmers supported for seed will be taken, and the number of farmers supported through herbicides, fungicides, etc. will be ignored. The same procedure will be carried out for other crop main groups in Indonesia, such as rice, vegetables, etc.
Output	Number of unique farmers supported in LMICs per crop main group.

Step 4: Calculate final number of smallholders supported

Purpose	To calculate the number of smallholder farmers in LMICs supported by Bayer.

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Process   Data for smallholder shares for each country-crop combination is obtained from public census sources or, if not available, from Bayer's country representatives. This step is necessary because the number of farmers obtained in step 3 includes not only smallholder farmers, but also farmers with bigger farms.

The final KPI is derived by multiplying the total number of unique farmers supported from step 3 with the smallholder share for each country-crop combination.

Output   Number of smallholder farmers in LMICs supported by Bayer per crop main group.

Data Sources

The following sources are used in our KPI derivation process for the commercial channel.

Source	Description
Public Census	Publicly available census data provided by governments or other official institutions, for example The Food and Agriculture Organization of the United Nations provides information about smallholder farmers in step 4.
Private Panel / Survey	Independent surveys and panel data by private third parties are used to obtain specific data points, such as average farm size, crop cycles, smallholder share etc., in step 1 and step 4.
SAP	SAP is the Enterprise Resource Process System used by Bayer. Data is extracted for sales and volume data in step 1.
World Bank	A list of low- and middle-income countries as per 1 July 2019 is obtained from this international financial institution, which is used to define the country scope in step 1.
Expert Opinion	In case none of the above-mentioned data sources holds the information needed, a Bayer internal expert provides a data-point estimate. Rational and logic (e.g. calculation) are outlined and checked prior to any inclusion.

Partnership Channel (non-commercial)

Our non-commercial partners must fulfill certain criteria to be considered for inclusion into the Smallholder Reach KPI. These include that the partner follows the same KPI definitions, has passed a reporting due diligence process and eliminates any smallholder farmer overlaps within the partnership project. All partners agree to provide Bayer with full insights into the data trails, calculation rules, and their internal control processes.

Step 1: Gather data from Partners	Step 2: Correct overlaps with Bayer's commercial channel

For each partnership, the smallholder farmer reach is derived based on smallholder farmer reach information provided by the partner for the reporting year and an overlap factor that corrects the partnership's reach for any potential overlap with Bayer's commercial channel.

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Digital Channel (non-commercial)

For the digital channel the same definition of smallholder farmers applies as for commercial and partnership, i.e. only smallholders with less than 10ha of farm size may be counted.

The following set of criteria must be fulfilled by the digital solution and its active users: The digital solution has a clear focus on agronomic advisory to support informed decision making for smallholders, excluding features directly linked to commercial transactions or intended to create commercial demand.

The digital solution allows for unique active user identification to accommodate a user count without overlaps. The users have been actively using the solution during the reporting period in a meaningful way to support their farming. This excludes, for instance, webpage or passive video views on social media due to the lack of unique user identification and meaningful mutual interaction.

For each digital solution, the smallholder reach will be derived from unique active user data for the respective reporting period.
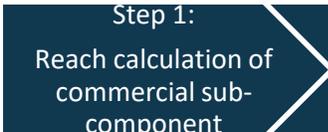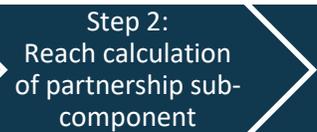
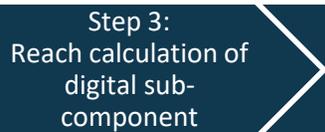| Step 1: Gather Data from Digital Reporting	Step 2: Correct overlaps with other channels

Total KPI calculation

The total number of smallholder farmers supported is calculated by summing up the number of smallholder farmers reached through commercial products as well as non-commercial partnerships and digital solutions.

Step 1: Reach calculation of commercial sub-component	Step 2: Reach calculation of partnership sub-component	Step 3: Reach calculation of digital sub-component	Step 4: Calculation of KPI

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[i] http://www.fao.org/3/ar588e/ar588e.pdf

[ii] http://www.fao.org/3/a-i6858e.pdf

[iii] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

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