



## Method Paper

# The Crop Science Sustainability Challenge for Smallholders

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## Introduction

Smallholders play a pivotal role in ensuring food security in low- and middle-income countries. In developing countries, for example, smallholder farmers – many of them are women – provide more than half of the food supply<sup>i</sup>. 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 Challenge 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), which is defined as **‘Number of smallholder farmers in low- and middle-income countries (LMIC) 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
<b>Smallholder farmer</b>	A farmer who farms crops on less than 10 ha (FAO <sup>ii</sup> ).
<b>Low- and middle-income countries (LMIC)</b>	All countries included in the World Bank list <sup>iii</sup> of countries with low-income, lower middle-income, and upper middle-income economies as per 1 July 2019 are considered to be low- and middle-income countries.
<b>Products &amp; services</b>	Commercial products e.g. seeds, traits and crop protection products as well as services such as trainings, advisory services or digital solutions.
<b>Using Bayer products &amp; services</b>	Any smallholder in LMIC using at least one product or service provided by Bayer in the reporting period.
<b>Average Bayer farmer spend</b>	Average expenditure of all Bayer farmers per treated ha in a specific country per main crop group and product.
<b>Crop protection products</b>	Herbicides, fungicides, insecticides.
<b>Country-crop combination</b>	Plantation combination of different crops and countries.
<b>Main crop group</b>	There are 16 main crop groups defined at Bayer, such as cereals, corns, rice etc. The main crop groups overarch various crops. For example, the main crop group of cereals includes the crops wheat, barley etc.

## Methodology

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

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

- commercial channels, which provides smallholder farmers with Bayer products and services such as trainings, advisory services or digital solutions via local commercial channels in a country;
- partnership channels, which supports smallholder farmers through direct partnerships, third-party partnerships or campaigns.

In the KPI derivation performed in 2019 and 2020, we have only considered data from the commercial channels. The partnership channels will be incorporated in the future as appropriate, i.e. when generating reach beyond the commercial channels.

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



### 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.
Process	Sales data (denominated in Euro terms) as well as crop and country specific raw data for each product line (i.e. herbicides, fungicides, insecticides, seeds, traits, vector control) are collected from different data sources (see below in the section Data Sources). Only data about smallholder relevant crops and data specific to LMIC are considered.
Output	<ul style="list-style-type: none"> <li>• Sales and volume data specific to country-crop combination and product line.</li> <li>• Crop and country specific data, e.g. on seasons per crop, seeding rates, average farm sizes, average farm spend per ha in LMIC.</li> </ul>

### Step 2: Calculate total number of farmers supported

Purpose	To derive the total number of farmers supported per product line.
Process	The number of farmers supported by the crop protection product lines is calculated with the following formula:

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

For the other product lines of seeds and traits the formula is as follows:

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

Output Total number of farmers supported per product line by Bayer in each LMIC

### Step 3: Correct for overlaps across product lines

**Purpose** To correct for double counting of farmers, using more than one product line.

**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 and identify within one main crop group per country only the largest number of farmers per product line. Only this number is further used, and other product line values are ignored. For instance, considering the country India and the main crop group of rice, the number of farmers supported will be calculated. If the maximum number of farmers are supported in the product line seed, then the number of Bayer farmers supported for seed will be taken, and the numbers of farmers supported in crop protection, vector control etc. will be ignored. The same procedure will be carried out for other crop types in India, such as cereals, corn, vegetables, etc.

**Output** Number of unique farmers supported in LMIC per main crop group.

### Step 4: Calculate final number of smallholders supported

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

**Process** Data for smallholder shares for each country-crop combination are 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 LMIC supported by Bayer.

## Data Sources

The following sources are used in our KPI derivation process.

Source	Description
<b>Public Census</b>	Publicly available census data provided by governments or other official institutions, for example The Food and Agriculture Organization of the United Nations provide information about small holders in step 4.
<b>Private Panel / Survey</b>	Dedicated 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.
<b>SAP</b>	SAP is the Enterprise Resource Process System used by Bayer. Data is extracted for sales and volume data in step 1.
<b>World Bank</b>	A list of low- and middle-income and high-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.
<b>Expert Opinion</b>	In case none of the above-mentioned data sources holds the information needed, an estimation of value is provided by a Bayer internal expert. Logic (e.g. calculation) is outlined and checked prior to any inclusion.

## Outlook

As described, the approach adopted for the years 2019, 2020 exclusively reflects commercial channels data only. In future, we will also incorporate the input from the partnership channels. The methodology of the partnership channels will be included in this paper accordingly.

<sup>i</sup> <http://www.fao.org/3/ar588e/ar588e.pdf>

<sup>ii</sup> <http://www.fao.org/3/a-i6858e.pdf>

<sup>iii</sup> <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>