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on Plant Genetic Resources
for Food and Agriculture**

**INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES
FOR FOOD AND AGRICULTURE**

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FUNDING STRATEGY AND RESOURCE MOBILIZATION**

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**FUNDING STRATEGY TARGET SETTING: COST BASED
METHODOLOGY**

At its Eighth Session, the Governing Body decided to establish, within the Funding Strategy, a target of USD \$0.9-1.1 billion per year over a period of 10 years with a milestone of 40% to be achieved by 2026 to support the implementation of the International Treaty through a wide range of sources and channels and decided to postpone establishing a target for the Benefit-sharing Fund.¹

Through Resolution 4/2023, the Tenth Session of the Governing Body (GB-10) recalled that text regarding a target range for the Benefit-sharing Fund remains bracketed in paragraph 36 of the Funding Strategy and noted the need to resolve this matter. Through Resolution 15/2023 it adopted the Multi-Year Programme of Work (MYPOW) 2024–2029 which includes a milestone to finalise the Benefit-sharing target of the Governing Body by its 11th Session (2025).

In order to take this work forward, including to support the enhancement process of the Multilateral System of Access and Benefit-sharing, this document is being provided to the Committee for background information. It contains the draft methodology developed by an independent expert economist in 2019 that was used by the Ad Hoc Committee on the Funding Strategy and Resource Mobilization (ACFSRM) in the process of identifying the targets of the International Treaty's Funding Strategy and Benefit Sharing Fund.

A summary of this methodology is also provided to the Committee through IT/GB-11/SFC-10/24/Inf.4 *Summary of methodology for target setting*. A presentation providing an overview of the methodology will be provided to the Committee at SFC-10 by the independent expert economist.

¹ Resolution 3/2019, paragraphs 3 and 19

Funding Strategy Target Setting: Cost-based Methodology

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This document was prepared at the request of the Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture.

The content of this document is entirely the responsibility of the author and does not necessarily represent the views of the Secretariat of the International Treaty on Plant Genetic Resources.

Funding Strategy Target Setting: Cost-based Methodology

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Executive Summary

This document contains the methodologies that have been further developed and used in the process of identifying the targets of the International Treaty’s Funding Strategy and Benefit Sharing fund.

The methodologies have been further developed based on the methodology options presented to the Committee on the Funding Strategy and Resource Mobilization at its tenth meeting, and the subsequent recommendations it made.

A “cost-based” methodology has been used for the overall target of the Funding Strategy and Benefit-sharing Fund. For the latter, a “needs-based” modular approach was combined with a “supply-based” methodology as recommended by the Committee.

Several estimates have recently been carried out on global financing needs of relevance to the conservation and sustainable use of PGRFA, and that cover or include at least some of the areas set out in the Results Framework of the Funding Strategy. They generally yielded a similar magnitude of resources, even if not directly comparable. Of particular note, FAO (2015) indicated that US\$ 977 million per year in additional rural investment in developing areas would be required for activities related to “*Preservation/improvement of crop genetic resources*” for sustainably ending hunger by 2030.

The establishment of the Funding Strategy target, as indicated in Article 18 of the International Treaty, should take into account the Global Plan of Action (GPA) for PGRFA. The “Cost-Based” methodology for the overall Funding Strategy target first estimates the current level of resources invested globally by different sources that are contributing to the implementation of the

International Treaty. Then, the financial gap between the current level of resources and what is needed to ensure the implementation of the Second Global Plan of Action is calculated.

Specifically, the average annual cost over a five-year period is estimated for the implementation at a global level of the 18 priority activities of the Second GPA. The overall Funding Strategy target is calculated by summing up the current flow of resources addressing the International Treaty and the financial gap.

An approximate figure of the current global investments in the areas under of the Treaty has been calculated at **12 - 14 US\$ billion per year**. This estimate assumes no double-counting of funds and no under-reporting of bilateral funding and aid assistance. It does not include the important contribution of farmers to the use, development, and maintenance of genetic resources in natural settings.

Once the estimated current flow of resources was calculated, the distance between the “*actual level*” and the “*desired level*” of implementation of the Second Plan of Action (as indicated by the Second GPA monitoring framework) constitutes the financial gap to close in the next five years.

Based on preliminary estimates discussed with PGRFA experts through an informal consultation, different scenarios, merely for illustrative purposes, have been developed, that consider a range of desired levels of implementation of the Second GPA.

Scenario	Desired level of implementation	Current level of resources invested (2017 US\$ Billion)	Target (2017 US\$ Billion)	Gap (5 years) (2017 US\$ Billion)	Gap (5 years, Per year) (2017 US\$ Billion)	Multilateral and bilateral source (per year US\$ Billion)
1	Medium -	[12-14]	[15-18] (5 years target)	[3.05-3.56]	[0.61-0.71]	[0.14-0.16]
2	Medium +	[12-14]	[18-22] (5 years target)	[6.7-7.8]	[1.3-1.6]	[0.31-0.36]
3	High +	[12-14]	[26-31] (10 years target)	[7.1-8.3]	[1.4-1.7]	[0.33-0.38]

Table e1. Overall funding targets associated with different scenarios.

The operational steps for target identification as well as their assumptions and limitations are carefully described in sections 3 and 4 of this draft. Briefly, the main limitation of the methodology is the need to estimate some of the key parameters of the current flow of resources within the areas and programmes of the Treaty. The availability of more data, especially concerning the national level funding, and other validation exercises may overcome this limitation in the future.

Once the costs to meet the needs for implementation of the Second Global Plan of Action have been estimated, the target for the BSF can be identified following an integrated approach that employs in parallel and in a synergistic way two methodologies:

- a) Needs-based approach;
- b) Supply-based methodology.

The approach employed is described in detail in Section 5 of this draft. The needs-based approach identifies the needs (cost estimates) required for carrying out a selection of activities within the Second GPA priorities and quantifies the specific contribution of the BSF to the overall funding strategy target of the Treaty. The supply-based methodology reflects the cost estimates coming from the needs-based approach on the current funding environment and its future trends, ensuring realism of the target and identifying potential funding sources. The integrated use of the two approaches will provide scenarios characterized by a different level of ambitions (costs estimates) of the contribution that the BSF could make to the overall funding strategy target of the Treaty, and its reflections on the funding trends.

The needs-based approach uses the same costs of the activities and the financial gap of each priority as identified by the “the Cost-Based” methodology for the overall funding strategy target setting process. Given the BSF’s relative contribution and its associated cost, the supply-based methodology will provide a reflection of the costs on the potential funding landscape and trends. Funding landscape will be identified in terms of:

- **A** Voluntary contribution to the BSF over the past five years (and its expected change in the future, expressed in percentage changes);
- **B** Realistic contributions from users and of anticipated user-based payments.
- **C** Additional voluntary contributions from enabling partners, including the food processing industry.

While future trends on **A** and **B** can be projected with a certain degree of uncertainty, **C** represents novel funding sources and its quantification in possible scenario’s development will be expressed as a percentage share of the total resources mobilized by **A** and **B**.

By combining the two methodologies the trade-off between the ambition of the future BSF role in contributing to the overall Funding strategy target and the amount of resources to be mobilized in order to fully achieve the goal is well identified.

Possible scenarios are illustrated in Table e2. Contribution to the Second GPA implementation can include the same priority activities considered by the previous strategic plan of the Treaty (i.e., scenarios 1-3), or a specific sub-selection of priorities as scenarios 4-6 illustrates. More in detail, scenarios 1-3 consider the contribution of the BSF in relation to seven priority activities, considering a “**Medium** –“level of implementation of the Second GPA as target; differently,

scenarios 4-6 focuses on two specific priority activities but aiming to a higher level of implementation (**Medium +**) of the Second GPA. Scenarios 1 and 4 include also the consequence on the funding landscape, assuming the user-based payments the only possible resource for achieving the BSF target (**only B**).

For both targets, the scenarios definition, the identification of the priority activities as well the quantification of the BSF contribution to the overall Funding strategy target, remain an exclusive prerogative of the Committee. To this end, an EXCEL tool will be developed to facilitate the Committee's decision-making process.

Possible Scenarios	Contribution to the overall Funding Strategy target and its costs (Target for the overall funding strategy considers here a " Medium – " level of second GPA implementation).	Resources to be mobilized (Supply-based approach), per year)
1	15% of the bilateral - multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic enhancement, and base-broadening efforts; P11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species; P13. Building and strengthening national programmes; P17. Building and strengthening human resource capacity. - 11-13 US\$ millions per year, for the next 5 years	A (Voluntary contributions) 4-5 US\$ millions (required increase in five years: 0%; +25%) B (User-based payments) 2 -3 US\$ millions (lower bound of the estimate range) C (Add. voluntary contributions) 2-3 US\$ millions (30-40% of A+B) <i>Or</i> Only B (User-based payments) 11-13 US\$ millions (medium - upper bound of the estimate range)
2	25% of the bilateral - multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic enhancement, and base-broadening efforts; P11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species; P13. Building and strengthening national programmes; P17. Building and strengthening human resource capacity. - 18-21 US\$ millions per year, for the next 5 years	A (Voluntary contributions) 6-8 \$ millions (required increase in five years: +50% +100%) B (User-based payments) 5-6 US\$ millions (middle point of the estimate range) C (Add. voluntary contributions) 5-8 US\$ millions (40-60% of A+B)
3	50% of the bilateral – multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic enhancement, and base-broadening efforts; P11. Promoting	A (Voluntary contributions) 10-12 \$ millions (required increase in five years: +150% +200%) B (User-based payments) 12-14 US\$ millions (upper bound of the estimate range)

	development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species; P13 . Building and strengthening national programmes; P17 . Building and strengthening human resource capacity. - 36-42US\$ million, per year, for the next 5 years	C (Add. voluntary contributions) 15-24 US\$ millions (70-80% of A+B)
Possible Scenarios	Contribution to the overall Funding Strategy target and its costs (Target for the overall funding strategy considers here a " Medium + " level of second GPA implementation).	Resources to be mobilized (Supply-based approach), per year
4	30% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species. 9-10\$ million, per year, for the next 5 years	A (Voluntary contributions) 4-5 US\$ millions (required increase in five years: 0%; +25%) B (User-based payments) 2 -3 US\$ millions (lower bound of the estimate range) C (Add. voluntary contributions) 2-3 US\$ millions (30-40% of A+B) <i>Or</i> Only B (User-based payments) 9-10 US\$ millions (medium - upper bound of the estimate range)
5	60% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species 18-22US\$ million, per year, for the next 5 years	A (Voluntary contributions) 6-8 \$ millions (required increase in five years: +50% +100%) B (User-based payments) 5-6 US\$ millions (middle point of the estimate range) C (Add. voluntary contributions) 5-8 US\$ millions (45-55% of A+B)
6	90% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species. 28-32US\$ million, per year, for the next 5 years	A (Voluntary contributions) 8-9 \$ millions (required increase in five years: +100%; +125%) B (User-based payments) 12-14 US\$ millions (upper bound of the estimate range) C (Add. voluntary contributions)-8-10 US\$ millions (45-55% of A+B)

Table e2. BSF funding targets associated with different scenarios.

1. Introduction

The Governing Body through Resolution 3/2017 (the Resolution) decided to reconvene the *Ad Hoc* Advisory Committee on the Funding Strategy and Resource Mobilization (the Committee) with a mandate, *inter alia*, to establish targets for the overall Funding Strategy and for the Benefit-sharing fund (BSF).²

The Annotated Outline of the Updated Funding Strategy, which is annexed to the Resolution,³ also indicates that “under the programmatic approach, targets for the Funding Strategy will be set for a given timeframe and reviewed periodically” and that “setting the initial target requires that baseline information is gathered and thereafter kept updated.” Furthermore, the Resolution states that “the Secretary will develop a methodology for gathering and updating such information”, indicating a number of potential data sources, including studies undertaken by the Secretary.

The Secretariat presented methodology options for the identification of targets for the overall Funding Strategy and the BSF⁴ at the tenth meeting of the Committee. The Committee recommended⁵ undertaking the “Cost-based” methodology described to estimate the costs related to the implementation of the Treaty, in particular, to meet the needs for implementation of the Second Global Plan of Action.⁶

This document uses the “Cost-based” methodology for the targets for the overall Funding Strategy and the BSF. As indicated by the Committee, the objective of the exercise is to improve understanding of total cost of needs and the financial gap.

This document begins by describing the previous studies that were undertaken to estimate the global finances needed for the areas related to the conservation and sustainable use of PGRFA. Estimates of the current investments within the different areas of the Treaty are shown in Section 3, while Section 4 presents the methodology for costing the Second GPA implementation and its application for calculating the target for the overall Funding Strategy. Section 5 illustrates the application of the needs-based approach of the Benefit-sharing Fund target and the supply-based methodology which has complemented it.

²IT/GB-7/17/Res3, para. 7.

³IT/GB-7/17/Res3, annex, para. 20.

⁴IT/GB-8/ACFSRM-10/18/Inf.3

⁵IT/ACFSRM-10/18/Report.

⁶Moreover the “Cost-based” methodology should be complemented with the information arising from the Funding Tools listed in the Matrix, drawing upon existing needs assessments of relevance to the International Treaty. The methodology should take into account the need to implement the International Treaty to support the achievement of the Sustainable Development Goals and climate change action.

This document should not be considered exhaustive but a further development in the target setting process and could be further expanded on and enriched through the outcomes of the forthcoming discussions by the Committee.

2. Overview of some relevant past estimates

Although a singular, simple or direct method to estimate the magnitude of the financial resources needed for PGRFA may not exist, several estimates have been carried out in the recent past⁷. This section reviews such studies, particularly those undertaking the estimates of the required global financing that are directly or indirectly relevant for the conservation and sustainable use of PGRFA and that cover or include some of the areas set out in the Results Framework of the Funding Strategy. Estimates refer to different and sometimes broader domains such as climate change adaptation or biodiversity conservation and moreover, the calculation varies according to several factors, such as:

- the specific target to achieve (i.e., zero hunger, implementation of GPA, achievement of SDGs),
- the way to measure the target (i.e., current flow of resources invested, the desirable amount of investments, additional resources to invest for target achievement),
- type of expenditure accounted for (national governments, internationally through multilateral organizations, bilateral and regional sources),
- regional coverage (i.e., only developing countries, all countries), and
- the period considered (i.e., per year, over a specific time period).

Although the above variables make the outcome of the reviews not directly comparable, this section aims to identify the broad orders of magnitude of the monetary resources at stake and to understand the main factors behind the difference that are indeed reported in the different estimates.

The table below summarizes this exercise, indicating the number of estimates as reported in the original documents (Table 1).

⁷As an example, for illustrating the complexity of defining financial needs in the PGRFA area, the following paragraph referring to estimates of funding needs of global biodiversity efforts (para 5., CBD, 2007) is textually reported: *“During the negotiations for the Convention on Biological Diversity, many estimates of funding needs were circulated. In its address to the negotiators at the first day of the fourth negotiating session in 1991, Dr. Mostafa K. Tolba, the then Executive Director of the United Nations Environment Programme, informed the Intergovernmental Negotiating Committee that the World Bank had estimated that the cost of biodiversity conservation ranged from \$500 million to \$50 billion per year. These figures were based on the experience which the GEF had in biological diversity conservation projects.”*

Estimate	Target	Methodology	Note	Reference
From US\$150 million to 455 million US\$ per year for a ten-year period, at 1996 costs (mainly from multilateral and bilateral sources).	Needs Assessment for the implementation of the First GPA.	Cost-Based methodology on the achievement of the First GPA.	Costs by the international community including costs of implementing activities in developing countries. "It also includes activities undertaken largely for the global benefit, regardless of their location. Such costs might be expected to account for a higher proportion of the total costs for conservation activities, and for other "public good" activities such as genetic enhancement, than for other types of utilization activities"	CGRFA-Ex2/96/3; CGRFA-7/97/4 Annex.
US\$ 2,900 million per year average for 2015-2030 (in \$ 2013).	Climate adaptation investment needs for agriculture and food security, within SDGs.	Review and adaptation in a consistent and rigorous manner of previous studies.	Calculations are based on UNFCCC. 2007. Investment and Financial Flows to Address Climate Change. Bonn, Germany: United Nations Framework Convention on Climate Change.	Schmidt-Traub, G., & Shah, A. (2015). <i>Investment needs to achieve the Sustainable Development Goals</i> . Paris and New York: Sustainable Development Solutions Network.
From US\$ 589 million per year to US\$1,000 (in \$ 2012)	Aichi Goals and Targets – Investment Needs Assessment	Costs of selected investments provided by experts meeting, including both what might be provided through the replenishment of the GEF trust fund for the biodiversity focal area, as well as the additional funds leveraged through the financial mechanism to meet the incremental cost reasoning.	Costs of the following targets have been considered: 1: Awareness raising; 2: Biodiversity values; 4: Sustainable production/consumption; 7: Sustainable Agriculture, Aquaculture and Forestry; 13: Genetic Diversity 14: Ecosystem Services; 17: National biodiversity strategies and action plans; 18: Traditional Knowledge; 19: Science base and technology	CBD (2012). <i>Full assessment of the amount of funds needed for the implementation of the convention for the sixth replenishment period of the trust fund of the global environment facility</i> .
US\$ 921 million per year in \$2013.	Additional rural investments required in "Preservation/improvement of crop genetic resources" for sustainably ending hunger by 2030 (average level of undernourishment in the developing world equal to 2.9 percent of the population by 2025.	Estimate the extent to which the average dietary energy supply (DES, in kcal per person per day) needs to be raised by 2025 thanks to the incremental income generated by the investment in agriculture.	"This would support international and national activities necessary to conserve, evaluate, make available and enhance the use of plant genetic resources, providing the basis for yield increases through crop breeding and better on-farm management of genetic resources."	Achieving Zero Hunger The critical role of investments in social protection and agriculture, Rome, FAO. 2015 page 17; Investing towards a world free of hunger: lowering vulnerability and enhancing resilience. In A. Prakash, ed. <i>Safeguarding food security in volatile global markets</i> , pp. 543–569. Rome, FAO. 2010. Investing in food security page 528

Table 1. Review of previous studies calculating global financial needs including PGRFA conservation and sustainable-use domains.

The different estimates reported in Table 1 can be compared by converting the calculated amounts to the same reference period (US\$ 2017).⁸ Accordingly, the implementation of the priorities of the first GPA has been estimated to cost from US\$ 222 million to US\$ 673 million per annum. These figures include on-purpose-only costs supported by the international community, while the general running costs of national programmes and other domestic sources of funds were not captured.

A specific study concerning the investment needs to achieve the sustainable development goals, calculated an investment need of US\$ 3,164 million per annum for fostering climate adaptation for the agricultural sector (Schmidt-Traub & Shah, 2015). Climate adaptation is a much wider domain than PGRFA, and even if PGRFA can be considered as one the strategic elements needed in mitigation of and adaptation to the consequences of climate change (FAO, 2015), the calculated value includes part of the PGRFA needs but also a different and much wider range of activities (Table A1).

The costing exercise carried out in 2012 for estimating the investment needs for achieving selected Aichi Goals and Targets proposed that a financial need ranging from US\$ 638 million per annum to US\$ 1,084 million per annum is required, depending on the degree of achievement of the targets (CBD, 2012) (Table A2).

Finally, FAO (2015) indicated that US\$ 977 million per year of additional rural investments in developing areas would be required for activities related to “*Preservation/improvement of crop genetic resources*” for sustainably ending hunger by 2030. The latter estimates, however, focus explicitly on rural areas of developing countries (Table A3).

⁸ More specifically, the GDP deflator in terms of annual growth rate of the GDP provided by the World Bank was used to consider price inflation with respect to the 2017 year (NY.GDP.DEFL.KD.ZG.AD series).

3. The current flow of resources invested in PGRFA

The “cost-based” methodology aims to assess the costs for the implementation of the Second Global Plan of Action and the financial gap. In order to identify the latter, the identification of the current flow of resources invested within the areas and programmes of the Treaty as set out in the Results Framework is needed. This exercise follows the indications of the Committee indicating that the cost-based methodology should be complemented with the information arising from the Funding Tools listed in the Matrix. The figure below illustrates the relationship between the current flow, the total costs for the second GPA and the financial gap for the second GPA achievement (Figure 1).

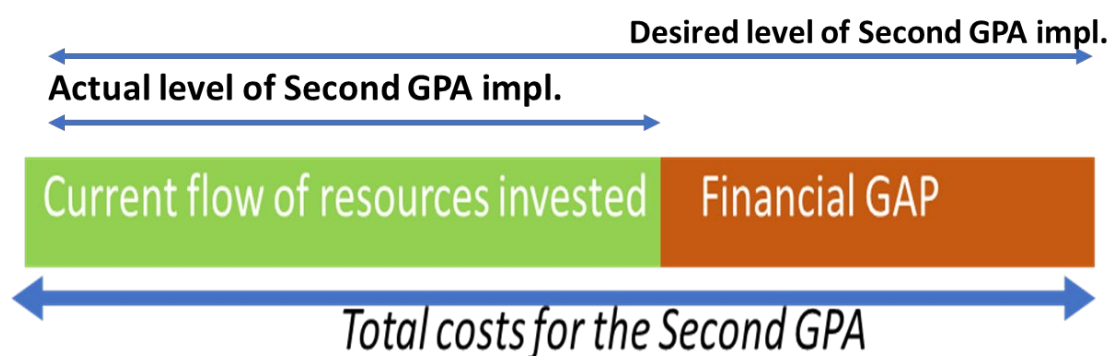


Figure 1. The relation between the current flow, the total costs for the second GPA and the financial gap for the second GPA implementation.

3.1 National-level public funding

Data on national-level funding by public entities can be very difficult to account for. Even if a separate process conducted by the Secretary has been launched through a specific reporting framework⁹, some figures can be given considering the Agricultural Science and Technology Indicators (ASTI) data for both the expenditure and human resource capacity in agricultural research and development at the national level.

ASTI¹⁰ provides data on agricultural research systems carried out at government, nonprofit, and higher education agencies mainly across the developing world, including a total of 88 low and middle-income countries. Overall, the 88 countries involved in the ASTI account for US\$ 14.1

⁹ <http://www.fao.org/plant-treaty/notifications/detail-events/en/c/1171088/>

¹⁰ Led by the International Food Policy Research Institute (IFPRI) within the portfolio of the CGIAR Research Program on Policies, Institutions, and Markets (PIM), ASTI works with a large network of national collaborators to collect, compile, and disseminate information on financial, human, and institutional resources at both country and regional levels across government, higher education, nonprofit, and (where possible) private for-profit agricultural research agencies. More information is available on <https://www.asti.cgiar.org/>.

billion per year of expenditure in research and development in agricultural subjects (last available year, 2017 US\$), each spending 0.94% of their total agricultural GDP¹¹ on average. However, only a fraction of investments in research and development in agriculture focuses on the activities related to PGRFA conservation and sustainable use. To identify this specific fraction of the resources, ASTI data on the human capacity in agricultural research can be used. The latter report the full-time equivalent (FTE) researchers per country involved in different areas/disciplines of agricultural research. In detail, three areas of agricultural research can be considered more related to the PGRFA conservation and sustainable use:

i. plant breeding/genetics including biotechnology (10.4% of the total FTE), ii. seed science and technology (2.4% of the FTE), and iii. biodiversity conservation (1.6% of the total FTE).

These three areas account on average for 14.5% of total full-time equivalent (FTE) researchers. In other words, given 100 national researchers working in agricultural research and development, more than 14 are involved in the different areas and programmes of the International Treaty. This proportion can be considered a proxy of the national public resources invested in PGRFA area, given the total country investments in agricultural R&D. Therefore, by multiplying US\$ 14.1 billion per year per this share, an amount of US\$ 2.05 billion per year can be obtained. This value accounts for 0.14% of the total agricultural GDP. Since not all the countries are included in the ASTI, by extending the ratio of 0.14% of the total agricultural GDP to the countries that are not included in ASTI and multiplying it by their agricultural GDP (*source*: World Bank), an overall value close to **US\$ 4.4 billion** per year¹² can be estimated.

The US\$ 4.4 billion per year estimate, however, does not include public investments on agricultural extension services that also should be considered for supporting some of the “on-farm conservation” and “sustainable use” areas of the Second GPA. However, as highlighted by Piesse and Thirtle (2010), a widespread lack of data exists on the extension, and moreover, the budget is often allocated mainly on salaries, and not on farm visits. Thus, the US\$ 4.4 billion estimate should be considered as a conservative estimate of the overall national public investments in the different Areas and Programmes of the International Treaty.

3.2 *Bilateral funding and assistance*

Concerning the bilateral funding and assistance that includes aid, development assistance, and other international finance flow at the level of individual countries, some figures can be taken

¹¹ This value is close to those reported by the World Bank’s “Research and development expenditure (% of GDP)” which is equal to 0.81%; it represents the percentage of GDP that is spent overall by these countries on research (in all sectors, including agriculture).

¹² Pardey et al. (2006) provided a similar result for public investments to R&D. Authors reported that overall public investments in agricultural R&D did not change from 1990 to 2000. In 2000, these are accounted for by the amount of \$US 31.8 billion (2017 costs). If we apply the 14.5% to this value (PGRFA share), an amount of US\$ 4.6 billion can be obtained. Estimates from Pardey have been subsequently cited by Piesse and Thirtle (2010) and Naseem et al. (2010).

from The FAO Development Flows to Agriculture (DFA) database¹³ that is based on OECD DAC, harvested from the Creditor Reporting System (CRS) database. The same approach was followed by the study on funding flows to areas under the Areas and Programmes under the International Treaty. Indeed, by considering the eight CRS sectors relevant to the implementation of the Treaty (Treaty, 2018), namely, “Agricultural inputs”, “Food crop production”, “Industrial crops/export crops”, “Agricultural alternative development”, “Agricultural extension”, “Agricultural education/training”, “Agricultural research” and “Agricultural development” sectors, a value ranging from US\$ 1.5 to 2.25 billion per year in aid flows can be calculated (2014, 2015, 2016 average values). The estimate has been computed assuming a role for the PGRFA for the different OECD DAC keywords ranging from 20% to 30%, except for “Agricultural inputs” wherein PGRFA has a much larger relevance (around the 60%) (Table 2).

OECD DAC keyword	2014/2015/2016 average, US\$ million per year	US\$ million per year for PGRFA domain
Agricultural Alternative Development	155	30-50
Agricultural education/training	167	30-50
Agricultural extension	191	40-60
Agricultural inputs	416	210-300
Agricultural research	686	140-210
Food crop production	836	170-250
Industrial crops/export crops	896	180-270
Agricultural development	3,452	690-1,035
Total (OECD DAC)	6,799	1,500-2,250
Total (inc. excluded agencies)		2,500 – 3,000

Table 2. Bilateral funding (including aid, development assistance and other international finance flows at the level of individual countries)

¹³ The FAO Development Flows to Agriculture (DFA) consists of data series from 1973 onwards for all ODA-eligible countries. The DFA database is composed of Official Development Assistance (ODA) flows, Other Official Flows (OOFs) and Private Grant/Flows reported by donor countries, multinational organizations and private entities to OECD DAC Directorate. The objective of the DFA database is to provide a set of readily available basic data that enables analysis on where aid goes and what purposes it serves with special emphasis on agriculture and its related sectors, and environmental protection. Source: <http://www.fao.org/faostat/en/#data/EA>

By considering that many donors involved in areas close to the PGRFA domains are not actually included (i.e., philanthropic agencies) in the Creditor Reporting System (CRS) database, a more comprehensive estimate is probably closer to values ranging from US\$ **2.5 to 3.0** billion per year¹⁴.

3.3 *Multilateral organizations*

Main figures on the role of **multilateral organizations**, including Crop Trust, FAO, CGIAR, IFAD, World Bank, and GEF are provided by the study on funding flows to areas under Areas and Programmes under the International Treaty that reviews the funding landscape relevant to the Treaty by gathering data populating the Matrix of Funding Tools (Treaty, 2018¹⁵).

More in detail, the study estimates that the overall financial resources coming from the main multilateral organizations, as identified by the Matrix, range from US\$ **1.4 billion to 1.8 billion** per year. For the bilateral funding, the on-going work within the Matrix of funding tools will provide a better estimate of flow in the next months.

3.4 *Private sector*

Concerning the private sector, reliable recent estimates of their investments on research and development in the different areas and programmes under the Treaty are not available in the literature. A preliminary and indirect estimation can be achieved by associating previous estimates to the global seed market value. For instance, Piesse and Thirtle (2010) reported, for 2006, private R&D investment for seed and biotechnology to be US\$ 2.37 billion (2006 costs) (Table 3).

Area	Agricultural R&D in 2006 (billion US\$)
Big '6' - agricultural chemical-seed- biotechnology companies	2.03 (chemicals) 1.57 (seed and biotechnology)
Other agriculture chemicals	0.62
Other seed	0.63
Other agriculture biotech	0.17
Farm machinery	1.21
Animal and aquaculture genetics	0.26
animal health	1.58
Fertilizer	0.45
Animal feed	0.5
Total	9.02

Table 3. Private sector firms and R&D expenditures by type of activity, from Piesse and Thirtle (2010)

¹⁴ Even if no data on the under-reporting issue and on philanthropic agencies' efforts is currently available, the initial estimate range has been increased by 33% for reasonably taking into account these sources of further uncertainty.

¹⁵ International Treaty (2018) Report on progress: funding strategy matrix of funding tools analysis. IT/GB-8/ACFSRM-10/18/Inf.4/Rev1 <http://www.fao.org/3/CA1169EN/ca1169en.pdf>.

At that time, the global commercial seed market was assessed to be around \$US 30 billion¹⁶. Assuming the proportion of the value of global seed market invested in R&D (as obtained in 2006 and equal to 7.9%) to be constant, it is possible to project the actual amount of R&D investment. The latter is around **\$US 4 billion**, considering that the actual estimate of the commercial seed market is around \$US 50 billion¹⁷.

3.5 *Summing up*

By considering the four previously calculated amounts, assuming no double-counting of funds and no underreporting for national-level public funding and bilateral funding and assistance in particular, an approximate figure of the current global investments in the area under of the Treaty ranges from **\$US 12 to 14 billion** per year (Table 4).

Type of Flow	Estimate range (billion US\$)
Multilateral Organizations	[1.4-1.8]
Bilateral flow – Aid assistance	[2.5-3.0]
National level public funding	[4.2-4.6]
Private sector	[3.8-4.2]
Total	[12-14]

Table 4. R&D annual expenditures in the area under the Treaty (per year).

This estimate does not include the important contribution of farmers to the use, development, and maintenance of genetic resources in natural settings. The obtained range has to be considered a preliminary estimate, while future progress made towards populating the Matrix of funding tools will identify in more detail the flow of resources, in particular, within bilateral funding and assistance, and at the national level, taking into account both double-counting and underreporting issues.

¹⁶ ISF (2006)

¹⁷ IT/OWG-EFMLS-6/17/Inf.4

4. Costing the Second GPA implementation

Once the current flow of resources invested within the areas and programmes of the Treaty have been identified, the “Cost-Based” methodology will assess the costs needed for the implementation of the Second Global Plan of Action and the financial gap from the current flow of invested resources.

To assess the costs of the implementation, in line with the methodology adopted in the Treaty’s Strategic Plan 2009-2014, the average annual cost over a five-year period for the implementation of the 18 priority activities of the Second GPA at the global level can be estimated for setting the overall Funding Strategy target.

Each priority activity covers a specific area of PGRFA and contributes to one of the following three mutually supportive targets:

Target 1 - PGRFA Conservation. By 2020, an increasing proportion of the genetic diversity of cultivated plants and their wild relatives, as well as of wild food plant species is maintained in situ, on farm and ex-situ in a complementary manner;

Target 2 - PGRFA Sustainable Use: By 2020, there has been an increased use of plant genetic resources for food and agriculture to improve sustainable crop production intensification and livelihoods while reducing the genetic vulnerability of crops and cropping systems; and

Target 3 - PGRFA Institutional and Human Capacities: By 2020, many more people are aware of the values of plant genetic resources for food and agriculture and institutional and human capacities are strengthened to conserve and use them sustainably while minimizing genetic erosion and safeguarding their genetic diversity.

In particular, priority activities 1 to 7 of the Second GPA contribute to Target 1, priority activities 8-12 to Target 2, and priority activities 13-18 to Target 3 (Table 5).

Target 1. PGRFA Conservation	Target 2. PGRFA Sustainable Use	Target 3 PGRFA Institutional and Human Capacities
P1. Surveying and inventorying plant genetic resources for food and agriculture	P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use	P13. Building and strengthening national programmes
P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture	P9. Supporting plant breeding, genetic enhancement and base-broadening efforts	P14. Promoting and strengthening networks for plant genetic resources for food and agriculture
P3. Assisting farmers in disaster situations to restore crop systems	P10. Promoting diversification of crop production and broadening crop diversity for sustainable agriculture	P15. Constructing and strengthening comprehensive information systems for plant genetic resources for food and agriculture
P4. Promoting in situ conservation and management of crop wild relatives and wild food plants	PA11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species	P16. Developing and strengthening systems for monitoring and safeguarding genetic diversity and minimizing genetic erosion of plant genetic resources for food and agriculture
P5. Supporting targeted collecting of plant genetic resources for food and agriculture	P12. Supporting seed production and distribution	P17. Building and strengthening human resource capacity
P6. Sustaining and expanding ex situ conservation of germplasm		P18. Promoting and strengthening public awareness of the importance of plant genetic resources for food and agriculture
P7. Regenerating and multiplying ex situ accessions		

Table 5. Second GPA Targets and priority activities.

Progress in the implementation of each priority activity of the Second GPA is currently assessed at the country and global levels through a set of 63 quantitatively defined and measurable indicators adopted by the Commission¹⁸. The indicators represent the basis of qualitative scores given by National Focal Point (NFP) about each country performance and progress over time on each indicator and the level of achievement of each priority activity (Figure 2).

¹⁸ <http://www.fao.org/wiews/data/domains/monitoring-framework/en/>

Scores – (Priorities and Composite Indices)	Indicator level of implementation
1.00 - 1.99	Low-
2.00 - 2.99	Low
3.00 - 3.99	Low+
4.00 - 4.99	Medium-
5.00 - 5.99	Medium+
6.00 - 6.99	High-
7.00 - 8.00	High+

Figure 2. Scores and categories indicating the degree of implementation of the Second GPA.

Second GPA Scores of the priority activities can be used for the costing exercise through the following three phase process:

1st phase – Baseline Setting consists of calculating the “*actual level*” of implementation of the Second GPA at the global level using the indicators reported by the countries and the relative expert judgement of the NFPs (for each of the 18 priorities and for the three targets). The “*actual level*” will be considered as the most up-to-date state of implementation of the second GPA given the current flow of per year investments as estimated in the previous section of the study and adjusted through the “*validation exercise*” (see sub-section 4.2) by a group of experts if discrepancies are found.

2nd phase – Scenarios Development consists of developing different scenarios of the second GPA implementation based on the “*desired level*” of implementation of the Second GPA. The latter can be the same (i.e., medium +) or different (i.e., priorities 1: “high –”, priorities 2: “medium +”) for each of the 18 priorities.

3rd phase – Costing the GAP consists of costing the GAP between the “*actual level*” of implementation of the second GPA and the “*desired level*” of implementation. The distance can also be expressed in terms of the number of activities to be funded per year worldwide.

The latter phase is the most crucial step to identify the funding target and is based on the following rationale: the distance between the “*actual level*” and the “*desired level*” of implementation is calculated and monetized independently for each of the 18 priorities. The distance between the scores is computed in monetary terms considering the current allocation of resources in percentage terms to the specific priority activity in relation to the other activities.

Once monetized, then the overall GAP is calculated by summing the GAP identified for the 18 priorities.

More formally, the following calculations can be used to calculate the GAP_i for the i -th priority and the overall five-year Funding Strategy target (*Target*):

$$Target = E_0 + \sum_{i=1}^{18} GAP_i \quad [\text{eq. 1}]$$

$$GAP_i = \frac{S_i^d - S_i^a}{S_i^{a-1}} \times \left(\frac{E_0 R_i}{100} \right) \quad [\text{eq. 2}]$$

The calculation is straightforward given the estimate of the actual flow of resources per year invested within the areas and programmes of the Treaty (E_0), the “actual level” (S_i^a) and the “desired level” of implementation of the second GPA at the global level for the i -th priority activity and finally, the percentage relevance (R_i) of each i -th priority activity in the actual flow of resources.

GAP_i represents the distance in monetary terms between the actual level of implementation and the desired level of implementation of the i -th priority. The overall *Target* is then calculated as simply the sum of the GAP_i for the 18 priorities and the actual flow of resources invested E_0 . GAP_i can be interpreted also in terms of numbers of activities (N_i) to be carried-out within each i -th priority activity at a global level as:

$$N_i = GAP_i / Costs_i \quad [\text{eq. 3}]$$

where $Costs_i$ represents the average unit costs of structured interventions involving the specific priority. Eq. 1 simply may become:

$$Target = E_0 + \sum_{i=1}^{18} N_i \times Costs_i \quad [\text{eq. 4}]$$

4.1 A numerical example.

As previously illustrated, to obtain the overall target, the gap for each of the 18 priorities has to be independently calculated. It is important to emphasize that while the proposed methodology does not intend to assess independent targets for each priority or provide priorities of interventions among priority activities of the Second GPA, the calculation of the gap for a single priority is instrumental to achieve the overall Target.

As a numerical example, let us calculate the gap of priority 1 (*Surveying and inventorying plant genetic resources for food and agriculture*), assuming that this priority represents 2% of the total investments per year (R) and E_0 equal to US\$ 13 billion.

Actual level of Implementation (S_i^a)		Desired Level of Implementation (S_i^d)		
Score	Category	Score	Category	R
3.83	Low +	4.99	Medium-	2%

Table 6. Parameters used for calculating the financial GAP for priority 1

$$GAP_i = \frac{S_i^d - S_i^a}{S_i^a - 1} \times \left(\frac{E_0 R_i}{100} \right)$$

$$GAP_i = \frac{4.99 - 3.83}{3.83 - 1} \times \left(\frac{13 \times 2}{100} \right) \sim \text{US\$ 100 million per year to reach in a 5-year period.}$$

By assuming the average cost of one year of structured activity $Costs_i \sim 50,000$ US\$, the gap can be closed by financing $N \sim 400$ structured activities per year worldwide.

4.2 Validation.

To calculate the Target as illustrated in the previous section, the only actual observed values are S_i^d and S_i^a while E_0 , R_i and $Costs$ can be included in the equation as estimates. Prior estimates of E_0 are based on calculations illustrated in Section 3. Prior estimates for R_i and $Costs_i$ can be obtained from the budget data provided by the NFP in support of the country activities for the GPA implementation and collected by FAO and the Commission on Genetic Resources for Food and Agriculture (CGRFA). In particular, more than 4,000 interventions were monitored by CGRFA; using this source of data, the information on average unit costs of past projects involving the different priorities and the share of the overall budget allocated to each priority activity can be easily calculated.

A validation exercise involving a group of PGRFA experts is indeed necessary to best validate prior estimates of these important parameters. First estimates have been discussed with PGRFA experts through an informal consultation held on 23 – 24 January 2019, with the purpose to peer-review and appraise the cost-based methodology and prior estimates on the parameters E_0 , R_i and $Costs$.

In detail, the validation exercise has been performed through a mini-Delphi approach, supported by prior estimates, and through four expert sessions, one for each of the four domains of the Second GPA (in situ, ex situ, sustainable use and institutional and human capacities). The mini-Delphi session was organized to collect anonymous judgements and insights on the current global flow of resources within the areas and programmes of the Treaty and the current allocation of resources to the specific Second GPA priorities with the aim to interactively converge expert opinion towards the "correct" estimate of the parameters. The four expert sessions were carried out to identify the range of average costs of one work package (structured activity) per year involving the different priorities (Table A4).

4.3 Target for the Overall Funding Strategy.

Based on the first phase estimates, and on the different scenarios defined in the second phase, targets for the overall funding strategy can be identified.

The following table reports some examples of scenarios for merely illustrative purposes. The scenarios' definition (second phase) remains, in fact, the prerogative of the Committee.

Scenario	Desired level of implementation	Current level of resources invested (2017 US\$ Billion)	Target (2017 US\$ Billion)	GAP (5 years) (2017 US\$ Billion)	GAP (Per year) (2017 US\$ Billion)	Multilateral and bilateral source (per year US\$ Billion)
1	4.99 (<i>Medium -</i>)	[12-14]	[15-18] (5 years target)	[3.05-3.56]	[0.61-0.71]	[0.14-0.16]
2	5.99 (<i>Medium +</i>)	[12-14]	[18-22] (5 years target)	[6.7-7.8]	[1.3-1.6]	[0.31-0.36]
3	8.00 (<i>High +</i>)	[12-14]	[26-31] (10 years target)	[7.1-8.3]	[1.4-1.7]	[0.33-0.38]

Table 7. Overall funding targets associated with different scenarios.

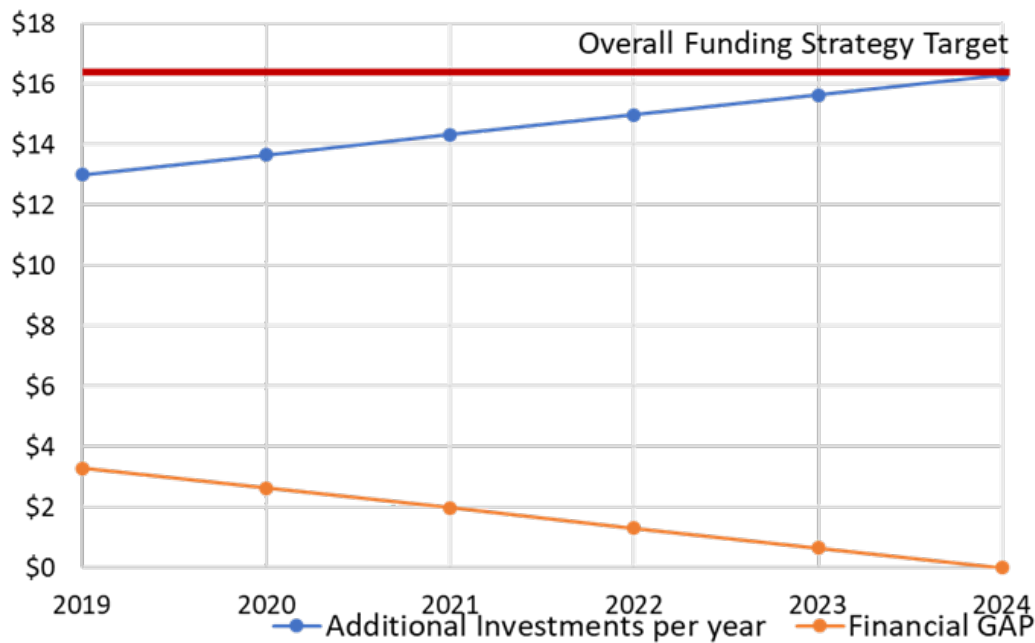


Figure 3. Scenario 1, costing the Second GPA (medium level of achievement), additional investments per year the financial GAP and the target for the Overall Funding Strategy. (US\$ 2017 billion).

Figure 3 shows the estimate of the Target of the Overall funding strategy assuming a Medium medium desired level of implementation (score = 4.99). The costing-based methodology estimates that to achieve that level of implementation, a financial gap of resources between US\$ 3.0 and 3.6 billion should be closed within five years. Put differently, investments on the different areas and programmes under the Treaty should be incremented by around US\$ 0.6-0.7 billion per year within the next five years, increasing from US\$ 13 billion to US\$ 16 billion per year.

While Scenario 1 and Scenario 2 both identify a “desired level of implementation” of the second GPA to achieve within five years, Scenario 3 was structured to fully achieve the Second GPA within ten years and then defined a five-year target as a middle point to linearly achieve that goal. Both Scenario 2 and Scenario 3 set the five-year overall target equal to US\$ 18-22 billion, identifying the financial gap between US\$ 6.7 and 7.8 billion to close within five years. The last column of Table 7 identifies the contribution of the multilateral and bilateral sources for the target achievement. This amount has been estimated assuming that for the next five years, it is constant to the relative importance of the multilateral and bilateral sources over the other funding sources.

4.4 Further refinements and limitations.

The main limitation of the methodology is represented by the need to estimate some of the key parameters, in particular, the current flow of the resources within the areas and programmes of the Treaty. The availability of more data, especially concerning the national-level funding, and other validation exercises may overcome this limitation in the future.

From a methodological point of view, another limitation consists of the assumption that each priority of the Second GPA is considered as autonomous from the others (independence); thus, financial gaps are calculated independently and investments in one priority do not affect the achievement of other priorities, assuming the absence of synergies among investments in different priority areas. The independence assumption does not allow the use of the costing-based methodology to assess independent targets for each priority or providing priorities of interventions among the Second GPA priority activities¹⁹. Moreover, the target does not include the important contribution of farmers to the use, development, and maintenance of genetic resources in natural settings.

Further refinements of the methodology could provide the overall funding target and financial needs at the regional level since the methodology is basically based on the Second GPA monitoring framework available at country and regional levels²⁰. However, to date, only a subset of countries (approximately 70) has provided enough information for the Second GPA monitoring framework and moreover, the estimates of the current flow of resources from private sectors are currently generated at the global level without any regional discrimination. Thus, even if the methodology theoretically can provide regional targets, data constraints do not currently allow this specific scope.

¹⁹ More detailed data on investment in the second GPA priorities over time are needed in order to identify possible dynamics and interactions among priorities as well as more Second GPA assessments, while at the moment, since only aggregated data are available, this methodology is not able to identify any synergistic contributions among priorities investments.

²⁰ By consulting the WIEWS website, <http://www.fao.org/wiews/data/domains/monitoring-framework/it/>, it is possible to identify the “actual level” of implementation of the Second GPA at country and regional levels (for the countries that have reported information) and therefore the “regional” distance from the “desired level” of the Second GPA implementation.

5. The target for the Benefit Sharing Fund

Once the overall Funding Strategy target has been defined by costing the implementation at the global level of the 18 priority activities of the Second GPA, the target for the BSF can be identified following an integrated approach that employs two methodologies in parallel and in a synergistic way:

- a) Needs-based approach and
- b) Supply-based methodology.

Within the integrated approach for the BSF target definition, the needs-based approach (a) aims to identify the needs (cost estimates) required for carrying out a selection of activities within those Second GPA priorities that the BSF could make a strategic contribution to, and for quantifying the specific contribution of the BSF to the overall Treaty implementation. On the other side, the supply-based methodology (b) reflects the cost estimates coming from the needs-based approach on the current funding environment and its future trends, ensuring the realism of the target and identifying potential funding sources. An integrated approach (a and b) will provide a series of scenarios characterized by different levels of ambitions (costs estimates) of the contribution that BSF could make to the overall funding strategy target and Treaty implementation and its consequences on the BSF funding landscape.

From an operational point of view, the needs-based approach uses the same costs of the activities ($Costs_i$) and the financial gap of each priorities (GAP_i) as identified by the “the Cost-Based methodology” within the overall target setting process of the funding strategy ²¹: the selection of the priorities within those priorities that the BSF could make a strategic contribution to can be made according to the area of comparative advantage of the Treaty following the Matrix of Funding Tools and the Areas and Programmes under the International Treaty and specific indications from the Committee. While GAP_i are mainly determined by the distance from the actual level of implementation of the Second GPA and the desired level of implementation, $Costs_i$ have been computed and corrected through the validation exercise described in the previous section (Table A4).

The BSF contribution on the overall Treaty implementation is expressed in terms of relative effort (in percentage) over the total bilateral and multilateral additional investments for closing the GAP as shown in Table 7²².

Given the BSF relative contribution and its associated cost, the supply-based methodology will provide a reflection of the costs on the potential funding landscape and trends. The funding landscape is divided into:

²¹ For more details, the reader is invited to refer to the previous Section 4.

²² It is worth noting, however, that while calculations in Table 7 refer to all the 18 priorities activities of the Second GPA, the target for the BSF and its relative percentage contribution to the overall Treaty implementation will be calculated over a selection of priorities.

- A. Voluntary contribution to the BSF over the past five years and its expected change in the future,
- B. Realistic contributions from users and of anticipated user-based payments which include previous mandatory payments (art 6.7) but mainly depend on the final structure of the subscription system and its payment rate, and
- C. Additional voluntary contributions from enabling partners including philanthropic organizations and the private sector (i.e., food processing industry). This component will include mobilized financial resources developing synergies between funding sources and partners (i.e., second phase of funding with current BSF donors), capturing upcoming opportunities (i.e., climate finance programmes) and removing potential barriers to funding opportunities (i.e., earmarked).

Concerning the first component (A), the “Report on progress: funding strategy matrix of funding tools analysis”²³ (Treaty, 2018) indicates the detail per year and per donor (Table A5). Since data for 2018 were preliminary (first quarter of 2018), we consider the mean value of the resources per year in the time period 2013-2017 (~ US\$ 4 million, Figure 4) as the baseline level.

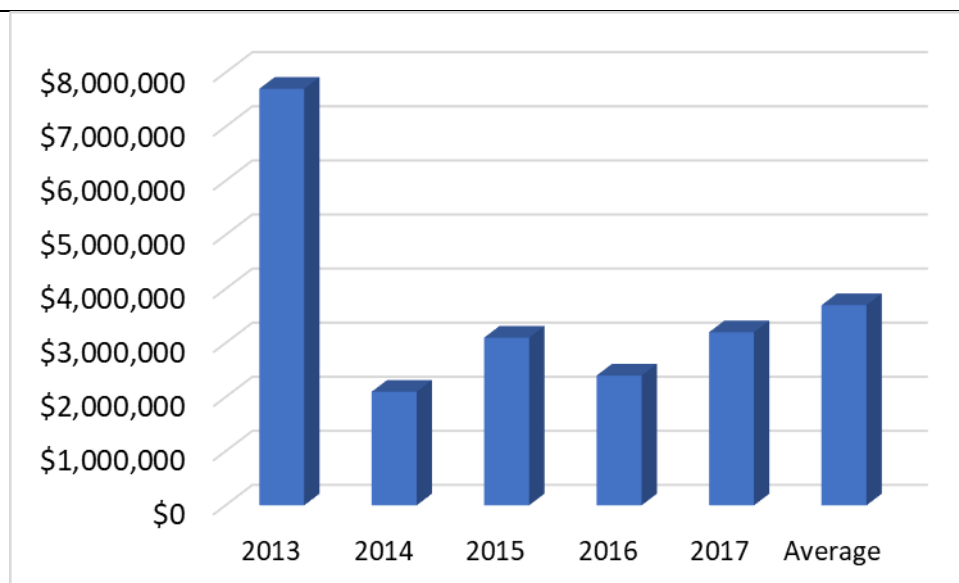


Figure 4. BSF, total contributions received & pledged per year (US\$ dollars) and the average value over the 2013-2017 period.

Concerning the B component, its real quantification mainly depends on the final structure of the subscription system and its payment rate. The preliminary estimate of theoretical total possible annual income projections at different payment rates has been previously carried out for the

²³ IT/GB-8/ACFSRM-10/18/Inf.4/Rev1 <http://www.fao.org/3/CA1169EN/ca1169en.pdf>

Working Group to Enhance the Functioning of the Multilateral System ²⁴. The estimates depend on the magnitude of the global commercial seed market, by the crops involved (Current Annex 1; An expanded Multilateral System or All plant genetic resources for food and agriculture) and by payment rate.

Estimates are reported in figure 5, by assuming that²⁵:

i) all plant genetic resources of the crops considered in each projection are effectively available, ii) the current global commercial seed market is around US\$ 50 billion, and iii) all natural and legal persons commercializing seeds have accepted the Subscription System, and that there are no exemptions from payment.

	World sales (\$)	0.016%	0.04%	0.064%	0.088%	0.112%	0.136%	0.16%
Annex 1 only	32,000,000,000	5,120,000	12,800,000	20,480,000	28,160,000	35,840,000	43,520,000	51,200,000
All crops	47,500,000,000	7,600,000	19,000,000	30,400,000	41,800,000	53,200,000	64,600,000	76,000,000
All crops less maize	25,175,000,000	4,028,000	10,070,000	16,112,000	22,154,000	28,196,000	34,238,000	40,280,000
All crops less maize & soy	14,175,000,000	2,268,000	5,670,000	9,072,000	12,474,000	15,876,000	19,278,000	22,680,000
All crops less maize, soy & Non-Annex 1 Vegetables	9,475,000,000	1,516,000	3,790,000	6,064,000	8,338,000	10,612,000	12,886,000	15,160,000

Figure 5. Payment rate = % of a subscriber's annual seed sales of all crops: 0.016% – 0.16% in steps of 0.024% (Source: IT/OWG-EFMLS-6/17/Inf.4)

By considering a payment rate ranging from 0.016 to its double (0.032) and the different hypotheses on the amount of different crops involved as indicated in figure 5, the total annual income to the Benefit-sharing Fund would be somewhere in the range from US\$ 1.516 million (0.016% - All crops except for maize, soy & Non-Annex I) to US\$ 15.2 million (0.032% - All crops) (Figure 5)²⁶. This uncertainty will be reflected in the BSF target scenarios.

Finally, concerning the **C** component (additional voluntary contributions from enabling partners), no real estimates of future opportunities exist. However, some future expectations of the increasing role of this component over the **A** and **B** components can be formulated in different BSF

²⁴ Second Report from the Friends of the Co-Chairs Group on Access Mechanisms and Payment Rates, Appendix 1, <http://www.fao.org/3/a-br412e.pdf>

²⁵ The same report stressed that "these figures are not in any way real estimates of possible income, and that income would be very much lower" (IT/OWG-EFMLS-6/17/Inf.4, page 12).

²⁶ The values reported in Figure 5 are just calculated as a share of the world sales expressed in the first column; for instance, if 0.016% leads to US\$ 1.516 million, a lower rate equal to 0.010% would lead to US\$ 0.95 million.

target scenarios. Thus, **C** will be expressed in terms of its expected share over the other, more conventional funding sources.

5.1 Some possible scenarios.

As discussed earlier, scenarios will be characterized by different levels of ambition (cost estimates provided by the needs-based approach) of the contribution that BSF could make on the overall second GPA implementation (in percentage terms) and its consequential reflections on the different source of funding (supply-based methodology) in terms of requested changes to **A**, **B** and **C**. Table 8 below shows some possible scenarios.

Possible Scenarios	Contribution to the overall Funding Strategy target and its costs (Target for the overall funding strategy considers here a “ Medium – ” level of second GPA implementation).	Resources to be mobilized (Supply-based approach), per year)
1	15% of the bilateral - multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic enhancement, and base-broadening efforts; P11. Promoting development and commercialization of all varieties, primarily farmers’ varieties/landraces and underutilized species; P13. Building and strengthening national programmes; P17. Building and strengthening human resource capacity. - 11-13 US\$ millions per year, for the next 5 years	<p>A (Voluntary contributions) 4-5 US\$ millions (required increase in five years: 0%; +25%)</p> <p>B (User-based payments) 2 -3 US\$ millions (lower bound of the estimate range)</p> <p>C (Add. voluntary contributions) 2-3 US\$ millions (30-40% of A+B)</p> <p style="text-align: center;"><i>Or</i></p> <p>Only B (User-based payments) 11-13 US\$ millions (medium - upper bound of the estimate range)</p>
2	25% of the bilateral - multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic enhancement, and base-broadening efforts; P11. Promoting development and commercialization of all varieties, primarily farmers’ varieties/landraces and underutilized species; P13. Building and strengthening national programmes; P17. Building and strengthening human resource capacity. - 18-21 US\$ millions per year, for the next 5 years	<p>A (Voluntary contributions) 6-8 \$ millions (required increase in five years: +50% +100%)</p> <p>B (User-based payments) 5-6 US\$ millions (middle point of the estimate range)</p> <p>C (Add. voluntary contributions) 5-8 US\$ millions (40-60% of A+B)</p>
3	50% of the bilateral – multilateral additional effort for the Priorities: P2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use; P9. Supporting plant breeding, genetic	<p>A (Voluntary contributions) 10-12 \$ millions (required increase in five years: +150% +200%)</p> <p>B (User-based payments)</p>

	enhancement, and base-broadening efforts; P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species; P13 . Building and strengthening national programmes; P17 . Building and strengthening human resource capacity. - 36-42US\$ million, per year, for the next 5 years	12-14 US\$ millions (upper bound of the estimate range) C (Add. voluntary contributions) 15-24 US\$ millions (70-80% of A+B)
Possible Scenarios	Contribution to the overall Funding Strategy target and its costs (Target for the overall funding strategy considers here a " Medium + " level of second GPA implementation).	Resources to be mobilized (Supply-based approach), per year
4	30% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species. 9-10\$ million, per year, for the next 5 years	A (Voluntary contributions) 4-5 US\$ millions (required increase in five years: 0%; +25%) B (User-based payments) 2 -3 US\$ millions (lower bound of the estimate range) C (Add. voluntary contributions) 2-3 US\$ millions (30-40% of A+B) <i>Or</i> Only B (User-based payments) 9-10 US\$ millions (medium - upper bound of the estimate range)
5	60% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species 18-22US\$ million, per year, for the next 5 years	A (Voluntary contributions) 6-8 \$ millions (required increase in five years: +50% +100%) B (User-based payments) 5-6 US\$ millions (middle point of the estimate range) C (Add. voluntary contributions) 5-8 US\$ millions (45-55% of A+B)
6	90% of the bilateral - multilateral additional effort for the Priorities: P2 . Supporting on-farm management and improvement of plant genetic resources for food and agriculture; P11 . Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species. 28-32US\$ million, per year, for the next 5 years	A (Voluntary contributions) 8-9 \$ millions (required increase in five years: +100%; +125%) B (User-based payments) 12-14 US\$ millions (upper bound of the estimate range) C (Add. voluntary contributions)-8-10 US\$ millions (45-55% of A+B)

Table 8. BSF funding targets associated with different scenarios.

The selected possible scenarios clearly illustrate the trade-off between the ambition of the future BSF role in the Treaty implementation and the amount of resources to be mobilized in order to fully achieve the goal.

Contribution to the Second GPA implementation can include the same priority activities considered by the previous strategic plan of the Treaty (i.e., scenarios 1-3), or a specific sub-selection of priorities as scenarios 4-6 illustrate. Scenarios 1-3 consider the contribution of the BSF in relation to seven priority activities, considering a “**Medium**” level of implementation of the second GPA as target; on the other hand, scenarios 4-6 focus on two specific priority activities but aim at a higher level of implementation (**Medium +**) of the second GPA. Scenarios 1 and 4 also include the consequence on the funding landscape, assuming the user-based payments are the only possible resource for achieving the BSF target (**only B**).

It is important to highlight that although the two priority activities identified in scenarios 4-6 (namely, P2: supporting on-farm management and improvement of plant genetic resources for food and agriculture and P11: promoting development and commercialization of all varieties, primarily farmers’ varieties/landraces and underutilized species) mainly focus on farmers as beneficiaries, they also include activities concerning the development of institutional and human capacities.

The scenarios’ definition, the identification of the priority activities and the quantification of the BSF contribution to the overall Funding strategy target, remain an exclusive prerogative of the Committee. To this end, an Excel tool will be developed to facilitate the Committee’s decision process.

References

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able A1. Incremental investment needs for climate change adaptation and mitigation (US\$ Billion) - Summary

Income group	Mark-up cost for adaptation	Incremental investment needs for climate adaptation (Constant 2013\$)	Incremental investment needs for climate mitigation (Constant 2000\$)	Incremental investment needs for climate mitigation (Constant 2013\$)	Total Incremental investment needs for climate adaptation and mitigation (Constant 2013\$)
Low Income Countries	2%	1.3	4	5	6
Low and Middle-Income Countries	2%	1.6	11	15	16
LICs+LMICs	2%	2.9	35	46	49

Source: Schmidt-Traub, G., & Shah, A. (2015). *Investment needs to achieve the Sustainable Development Goals*. Paris and New York: Sustainable Development Solutions Network, Author(s) calculation based on UNFCCC (2007).

Table A2. Estimated Investment for the GEF 6 period (2014-2018) (2012 US\$ millions per four year period)

Aichi Goals and Targets		
	low estimate ^a	high estimate ^a
GOAL A: Mainstreaming Biodiversity		
Target 1: Awareness raising	127.5	127.5
Target 2: Biodiversity values	4.5	22.5
Target 3: Incentives	35.8	100.8
Target 4: Sustainable production/consumption	51	92
GOAL B: Reduction of Pressure on biodiversity		
Target 5: Reducing habitat loss (forests and wetlands)	2000	5000
Target 6: Fisheries	325	740
Target 7: Sustainable Agriculture, Aquaculture and Forestry (only agriculture)	2000	3250
Target 8: Pollution	250	600
Target 9: Invasive Alien Species	67.5	103.2
Target 10: Coral Reefs	18090	18240
GOAL C: Safeguarding Ecosystems		
Target 11: Protected Areas (only terrestrial)	10791	17050
Target 12: Species conservation	945	1140
Target 13: Genetic Diversity	30	90
GOAL D: Enhancing the Benefits to All		
Target 14: Ecosystem Services	350	700
Target 15: Ecosystem Resilience	30000	45000
Target 16: Access and benefit sharing	46.5	93
GOAL E: Enhancing Implementation		
Target 17: National biodiversity strategies and action plans	7.5	20.5
Target 18: Traditional Knowledge	26.2	78.8
Target 19: Science base	140	410
Target 20: Resource Mobilization	7.5	23.3
Biosafety	170	170
Total (four year)	65965.0	93551.6
Selection of Targets (four year)	2356.7	4001.3
Investment needs per year	589	1000

^aDepending different scenarios (i.e numbers of countries involved)

Table A3. Additional rural investment per investment domain and region (US\$ millions, constant 2013 prices) (US\$ millions, constant 2013 prices)

	East Asia	Latin America and the Caribbean	Near East and North Africa	South Asia	Sub-Saharan Africa	Total	Share (%)	of which public	Share of public over total (%)
Soil conservation	58	24	13	417	3912	4424	3.19	1327	30
Water conservation/ improved irrigation	29	23	58	1855	3177	5141	3.7	1542	30
Preservation/improvement crop genetic resources	31	25	19	154	692	921	0.66	276	30
Preservation/improvement animal genetic resources	24	26	17	117	319	502	0.36	151	30
Preservation/improvement fish genetic resources	129	38	20	288	1428	1903	1.37	571	30
Preservation/improvement forest genetic resources	45	73	21	125	8857	9122	6.57	2737	30
Mechanization	18	28	16	1005	2067	3135	2.26	313	10
Cold and dry storage	16	25	17	695	2721	3474	2.5	695	20
Rural and wholesale market facilities	15	23	24	1114	5542	6718	4.84	3359	50
First-stage processing	36	37	33	1982	7213	9302	6.7	930	10
Rural roads	73	115	55	3768	29057	33067	23.81	29760	90
Rural electrification	36	67	32	1884	14537	16557	11.92	13246	80
Land titling, tenure security	8	28	14	321	3490	3861	2.78	3475	90
Rural finance	36	50	32	1877	12451	14446	10.4	7223	50
Food safety related regulations (including veterinary and pest controls, crop inspections)	7	23	14	378	1549	1971	1.42	1773	90
Research and development (including veterinary and pest)	30	38	24	1254	5251	6597	4.75	5937	90
Extension	45	56	38	1882	15731	17753	12.78	15977	90
Total	462	699	447	19116	117994	138894	100.0		

Source: Achieving Zero Hunger The critical role of investments in social protection and agriculture, Rome, FAO. 2015 page 17; Investing towards a world free of hunger: lowering vulnerability and enhancing resilience. In A. Prakash, ed. Safeguarding food security in volatile global markets, pp. 543–569. Rome, FAO. 2010. Investing in food security page 528

Table A4. Average costs of one work package per year (Range)for the different Second GPA priorities.

Priority description	Average Costs of one Work Package (Structured Activity) per year Experts Opinion (US \$)
PA1. Surveying and inventorying plant genetic resources for food and agriculture	15,000-30,000
PA2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture	50,000-100,000
PA3. Assisting farmers in disaster situations to restore crop systems	200,000 -400,000
PA4. Promoting in situ conservation and management of crop wild relatives and wild food plants	25,000-50,000
PA5. Supporting targeted collecting of plant genetic resources for food and agriculture	15,000-30,000
PA6. Sustaining and expanding ex situ conservation of germplasm	75,000-150,000
PA7. Regenerating and multiplying ex situ accessions	75,000-150,000
PA8. Expanding the characterization, evaluation and further development of specific collection sub-sets to facilitate use	25,000-50,000
PA9. Supporting plant breeding, genetic enhancement and base-broadening efforts	25,000-50,000
PA10. Promoting diversification of crop production and broadening crop diversity for sustainable agriculture	50,000-100,000
PA11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species	100,000-200,000
PA12. Supporting seed production and distribution	50,000-100,000
PA13. Building and strengthening national programmes	25,000-50,000
PA14. Promoting and strengthening networks for plant genetic resources for food and agriculture	25,000-50,000
PA15. Constructing and strengthening comprehensive information systems for plant genetic resources for food and agriculture	50,000-75,000
PA16. Developing and strengthening systems for monitoring and safeguarding genetic diversity and	25,000-50,000
PA17. Building and strengthening human resource capacity	35,000-70,000
PA18. Promoting and strengthening public awareness of the importance of plant genetic resources for food and agriculture	20,000-40,000

Table A5. Analysis of the Benefit-sharing Fund by donor as at the end of quarter 1 2018 (in alphabetical order).

<i>Donor</i>	<i>Year</i>	<i>Amount</i>	<i>Total by donor</i>
Australia	2010	870,000	
Australia	2016	718,815	1,588,814.74
Austria	2014	24,176	24,176.47
Canada	2010	1,190	
Canada	2012	21	
Canada	2014	86	
Canada	2016	885	
Canada	2017	292	2,473.90
Germany	2012	87,435	
Germany	2014	500,461	587,896.46
European Commission	2011	125,119	
European Commission	2015	2,194,927	
European Commission	2017	2,653,804	
European Commission (total funding agreement less received)	2018	575,195	5,549,044.43
European Seed Association	2016	339,751	339,750.84
Groupement National Interprofessionnel des Semences	2018	214,724	214,723.93
IFAD	2012	810,525	
IFAD	2014	689,475	1,500,000.00
Indonesia	2014	100,000	100,000.00
International Seed Federation	2016	49,280	49,280.00
Ireland	2010	659,800	659,800.00
Italy	2008	344,476	
Italy	2009	374,515	
Italy	2010	436,016	
Italy	2011	571,429	
Italy	2012	713,333	
Italy	2012	327,065	
Italy	2013	1,043,395	
Italy	2014	641,348	
Italy	2015	605,714	
Italy	2016	652,285	

Italy	2016	559,910	6,269,486.56
Norway	2009	78,000	
Norway	2010	101,369	
Norway	2011	117,789	
Norway	2012	117,554	
Norway	2013	122,115	
Norway	2013	6,495,062	
Norway	2014	111,351	
Norway	2015	90,000	
Norway	2015	10,246	
Norway	2016	90,332	
Norway	2017	92,290	
Norway	2017	360,665	7,786,773.30
Spain	2009	130,000	
Spain	2010	2,218,935	2,348,935.00
Sweden	2015	98,727	
Sweden	2015	80,368	
Sweden	2016	30,300	
Sweden	2017	35,508	244,902.64
Switzerland	2009	28,612	
Switzerland	2017	107,362	135,974.26
Syngenta	2013	6,416	6,416.00
Total contributions received & pledged		27,408,449	

Source: Report on progress: funding strategy matrix of funding tools analysis