Economics
The Open-Access, Open-Assessment E-Journal

Discussion Paper
No. 2018-73 | October 09, 2018 | http://www.economics-ejournal.org/economics/discussionpapers/2018-73

Financing "a sustainable food future": some thoughts for the G20

Eugenio Diaz-Bonilla

Abstract
Achieving a "sustainable food future" (the title of one of the three priorities identify by the government of Argentina for the 2018 G20 presidency) requires building food systems that, in line with the related Sustainable Development Goals (SDGs), support growth and employment, ensure social inclusiveness and equity, promote climate resilience and environmental sustainability, protect biodiversity, and generate healthy diets for all. Many policy, institutional, technological and investment innovations are needed to build such food systems. This paper focuses on the financing of the utilization of adequate technologies and innovations in agricultural production, including the ones related to soils, land, water, ecosystems, and, in general, those that have been called Climate Smart Agriculture (CSA) or Climate-friendly Sustainable Agriculture (CFSA). It explores several options to mobilize financial resources to support investments in those technologies and sustainable food systems at the scale needed to have some meaningful global impact. In particular, it argues that the creation of a project preparation and financial structuring facility of appropriate scale would help leverage scarce public-sector funds to mobilize the much larger pool of private financial funds that may be interested in participating in these investments but now lack adequately structured projects and investment vehicles to do so.

(Submitted as Global Solutions Paper)

JEL F3 F35 G2 H5 O13
Keywords International finance; foreign aid; financial institutions and services; national government expenditures; agriculture; food systems; Climate Smart Agriculture (CSA)

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This paper draws on Díaz-Bonilla, E., Loboguerrero, A. M., Verchot, L., Viglizzo, L. and Mirzabaev, A. (2018). Financing "A Sustainable Food Future". CIPPEC.; Díaz-Bonilla, E. (2018). El financiamiento de 'Un futuro alimentario sostenible': Algunas reflexiones para el G20. Agenda Internacional, no. 40: 24.; and Díaz-Bonilla E. and V. Callaway (forthcoming). The G20, Global Trade and Investment Regimes, and a Sustainable Food Future, chapter in "From Crisis Management to Vision and Leadership? The G20, Global Trade, and Sustainable Development" ICTSD. Geneva.

Citation Eugenio Diaz-Bonilla (2018). Financing "a sustainable food future": some thoughts for the G20. Economics Discussion Papers, No 2018-73, Kiel Institute for the World Economy. http://www.economics-ejournal.org/economics/discussionpapers/2018-73

Received September 25, 2018 **Accepted as Economics Discussion Paper** September 27, 2017
Published October 9, 2018

INTRODUCTION

Argentina has defined three main priorities for its 2018 Presidency of the G20: "The future of work"; "Infrastructure for development"; and "A sustainable food future." This article focuses on the latter topic. Within it, the Argentine authorities have highlighted the issue of "improving soils and increasing productivity." Here, the important challenge related to soils and productivity is placed within the broader framework of the development and utilization of the adequate technologies and innovations, related to land,[1] water, ecosystems, and, in general, those that have been called Climate Smart Agriculture (CSA) or Climate-friendly Sustainable Agriculture (CFSA). This article also recognizes that the development and utilization of the adequate technologies and innovations are only a component (although a very important one) of a variety of activities needed to achieve the third priority highlighted by Argentina. Within that context, this article looks at options to finance the activities needed to scale up the utilization of CSA/CFSA technologies.

What follows is divided into four sections. First, there is a brief discussion of the broader aspects related to the challenge of building a "sustainable food future." Then, it follows a brief discussion of some estimates of the different costs to build such future. The third section, which is the focus of this article, discusses alternatives to mobilize the financial resources to support investments in those technologies and sustainable food systems at the scale needed to have some meaningful global impact on productivity, incomes, and sustainability. In that sense, the challenge is similar to the second proposal presented by the Argentinean Presidency regarding the need to mobilize financial resources for investments in sustainable infrastructure. The fourth section concludes.

THE CHALLENGE[2]

Soil and land

The global deterioration of soils, land and ecosystems poses a significant threat to poverty reduction, sustainable food production, and the adaptation to, and mitigation of, climate change.

About 52 percent of the land used for agriculture is moderately or severely affected by soil degradation, affecting more than 1.5 billion people globally. Due to drought and desertification, 12 million hectares of productive land are lost annually. Soil erosion is the most serious form of land degradation, with between 24 and 74 billion tons of soil lost every year. Due to population pressure and overuse of agricultural lands with limited input application, soil nutrient depletion is another serious land degradation problem in many parts of the world (see for example, Nkonya, E., A. Mirzabaev and J. von Braun, 2016).

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[1] Land means the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system (IPBES, 2015).

[2] Based on Díaz-Bonilla, Verchot, Loboguerrero, Viglizzo and Mirzabaev, 2018.

Land degradation is also a poverty issue, with a large percent of the poor directly affected by those problems. It also has adverse implications for nutrition. Currently, about 2 billion people are estimated to suffer from different micronutrient deficiencies (Development Initiatives, 2017) and soils have a role to play in this problem. Most essential nutrients and minerals (e.g. zinc, iron, iodine) cannot be derived from biosynthesis and must be obtained by plants from soils and acquired by humans through the foods they consume. Therefore, local mineral deficiencies in soils produce deficiencies in local food systems, which clinically impacts populations.

The goal the international community should be to increase the area of healthy soils that provide adequate nutritious food, produce adequate fiber and other products, and support agroecosystems in providing other important ecosystem services through a biological approach to soil management. Achieving this goal requires enhanced awareness of the biological aspects of soil health and improved mechanistic and quantitative understanding of the relationships between soil health, climate change, and resilience of agricultural production systems.

Beyond soils and land

While, as noted, in 2018 the Argentine presidency of the G20 focused on soils, the previous year, with the German presidency, the emphasis was on water. The latter is indeed an essential element for life, directly as potable water, or indirectly, as a crucial input for food production. Water is also widely used in energy production (from hydroelectricity to the production of shale gas), and, in mining and industry. Climate change and the water cycle are also closely interrelated, with complex direct and feedback interactions. Intelligence analyses (such as the study of the US Office of the Director of National Intelligence, ODNI, 2012) envision water scarcity as a major source of conflict and turmoil in different developing regions, with very negative global repercussions (war, forced migrations, failed states, and terrorist threats). The report considers that this is already happening in several areas of Middle East, the Horn of Africa and other parts of Sub Saharan Africa, and, less acutely, in other regions of the world, including Central America and Haiti. Floods are also leading to major disasters with human and property losses. The ODNI report suggests that the window of opportunity to address these issues before they get out of control is not more than a decade or so.

More generally, all the problems discussed are part of the more complex interaction between agriculture, climate change, poverty, food security, and environmental sustainability, with multiple reciprocal relationships among all these aspects. On the one hand, climate change affects the availability of water, promotes the development of more pests and diseases, and is generating extreme events (droughts, floods, hurricanes) with negative impacts on rural populations, especially the poorest and most vulnerable, and on food security. On the other hand, agriculture and related practices, such as deforestation, generate a significant percentage of global greenhouse gas (GHG) emissions. Therefore, these problems need to be addressed with a comprehensive vision, which includes not only soils, land, and water, but also other aspects of the wider context of the bio-economy and ecosystems.

On the positive side, there is an increasing stock of knowledge about best management practices and technologies that have proved to have the triple impact of improving productivity and

income of producers, facilitating adaptation to climate change, and reducing GHG emissions.3 While science has been making progress in understanding what can and should be done, much more is needed in terms of developing and adapting technologies to the Earth's varied agroecological regions.

The continuous generation and adaptation of the needed technologies require reinforcing national and international systems related to research, development and innovation (R&D&I). While the private sector continues to invest in new agricultural technologies, many of the multiple-win innovations required have characteristics more related to public goods and require a strong and continuous involvement by national and international public institutions.

National research institutes working on the technological aspects of the challenges identified above, would benefit from increased levels of funding for agricultural R&D&I. Table 1 shows the number of developing countries divided into those spending more of 2%; those between 1% and 2%; and those below 1%.

More than three fourths of the developing countries in the sample spend less than 1% of their agricultural value added (average 0.5% and median 0.4%). Developing countries should try to invest at least 1% of their agricultural GDP in agricultural R&D&I, and, even better, try to achieve 2%.

At the international level it seems important to maintain and increase the levels of financial support for public global institutions such as the Consultative Group on International Agricultural Research (CGIAR) system (see Box), in order to expand the work on technologies related to rehabilitation of degraded land, small irrigation projects, and other CSA/CFSA practices, and to strengthen the integration of the international work with national systems.

TABLE 1. Spending on Agricultural R&D (as a share of Agricultural GDP, %)

	Number of Countries	Average	Median
Above 2%	9	4.4	3.1
More than 1% and less 2%	11	1.3	1.3
Less than 1%	68	0.5	0.4

Source: author calculations from ASTI/ IFPRI database.

3 See for example, the 2016 annual report of the program Climate Change, Agriculture, and Food Security (CCAFS, https://cgspace.cgiar.org/rest/bitstreams/118452/retrieve) which includes all the Centers of the CGIAR, and it is led by the Centro Internacional de Agricultura Tropical (CIAT), along with IFPRI and other international centers and partner organizations (see www.ccafs.cgiar.org).

BOX: The CGIAR System

The CGIAR is the main international organization working on these topics in a variety of continents and countries in close collaboration with hundreds of partners, including governments, national and regional research agencies, civil society organizations, academia, development organizations, and the private sector. It includes 15 centers: AfricaRice, Bioversity International, Center for International Forestry Research (CIFOR), International Center for Agricultural Research in the Dry Areas (ICARDA), International Center for Tropical Agriculture (CIAT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Food Policy Research Institute (IFPRI), International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), International Maize and Wheat Improvement Center (CIMMYT), International Potato Center (CIP), International Rice Research Institute (IRRI), International Water Management Institute (IWMI), World Agroforestry Centre (ICRAF), and WorldFish.

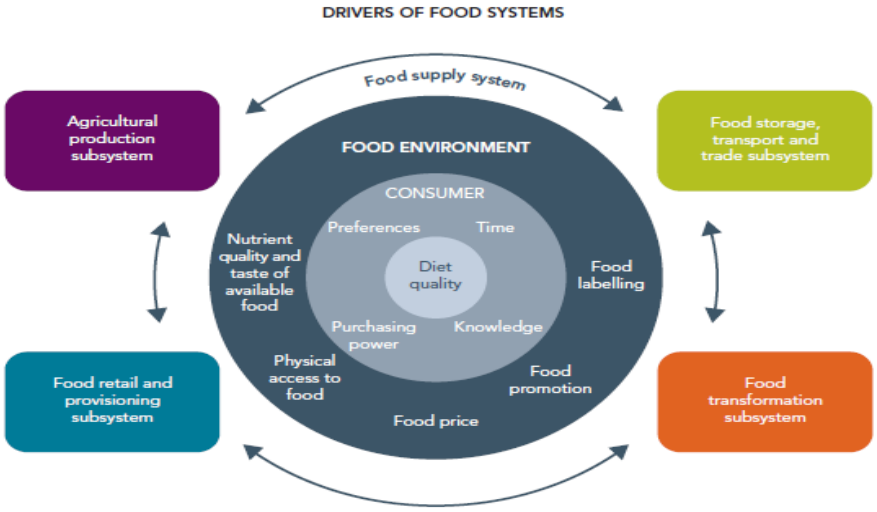
All 15 Research Centers are independent, non-profit, international organizations, employing more than 8,000 scientists, researchers, technicians, and support staff worldwide, which are recruited from around the world. The work of the CGIAR is organized into thematic programs that leverage the knowledge of a large number of partner institutions in developing and developed countries. The CGIAR Integrated Research Programs include: Program on Climate Change, Agriculture and Food Security; Program on Forests, Trees and Agroforestry; Program on Water, Land and Ecosystems; Program on Integrated Systems for the Humid Tropics; Program on Aquatic Agricultural Systems; Program on Dryland Systems; Program on Policies, Institutions, and Markets; Program on Agriculture for Nutrition and Health; Program on Dryland Cereals; Program on Grain Legumes; Program on Livestock and Fish; Program on Maize; Program on Rice; Program on Roots, Tubers and Bananas; Program on Wheat; and Program for Managing and Sustaining Crop Collections. These institutes have a long and recognized track record of working around the world focusing on the analysis of policies, investments, institutions and appropriate technologies and practices with the aim

Food Systems

However, achieving a "sustainable food future" requires not only the development and utilization of appropriate technologies and innovations. Food systems include a variety of components that need to be considered. Figure 1 shows the complexity of food systems with a focus on nutrition, in which the primary agricultural component is only one aspect of the whole system. The analysis of the implications for poverty alleviation, employment, environmental sustainability and health requires the consideration of the whole value chain, plus different components of the consumer environment and consumer's behavior.

In fact achieving a "sustainable food future" implies reaching a variety of Sustainable Development Goals (SDGs): for example reducing poverty (SDG 1); eliminating malnutrition and improving agricultural productivity (SDG 2); leading to better health (SDG 3); facilitating gender equality (SDG 5); reducing inequality in general (SDG 10); promoting sustainable production and consumption systems (SDG 12); helping with the mitigation of climate change (SDG 13); ensuring the sustainability of fisheries (SDG 14); and managing forests sustainably, combating desertification and land degradation and protecting biodiversity (SDG 15), among other things.

FIGURE 1. Food Systems, Diets and Nutrition.



Source: Global Panel on Agriculture and Food Systems for Nutrition

Building agro-food systems that deliver these results requires many political, institutional, technological and investment efforts and innovations. This article considers only some aspects of that general challenge, focusing on the mobilization of financial resources to build a "sustainable food future," and, in particular, to support investments in CSA/CFSA by small and family farms at the scale needed to have some significant global impact.

Although just a component of the whole food system this more limited focus is still important. Of the some 500–600 million farms that operate at the world level, about 90 percent can be considered family farms that control about 70 percent of the world's land[4] (Lowder, Skoet, and Singh, 2014). Primary agriculture alone employs almost 1 billion people (while the agricultural-based food and non-food systems in their entirety, including a variety of small, mid-sized and large enterprises related to agri-food in inputs, equipment, processing, transportation, and retail, may employ nearly 1.8 billion people, or half of worldwide employment) (Díaz-Bonilla and Callaway, forthcoming). At the same time, the world food system (from agricultural production and land use changes to all processing, transportation, retail, and consumption activities) is estimated to generate some 30 percent of global greenhouse gas (GHG) emissions (Vermeulen, Campbell, and Ingram 2012), with some 2/3 of that total coming from agriculture, forestry, and other land use (considering emissions minus offsets, according to EPA in https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data).

Although, as noted, many policy, institutional, technological, and investment innovations will be needed at the global, national, and local levels to build more dynamic, equitable, nutrition-

[4] The authors consider by family farms most of the world's smaller and medium-sized farms, but they include some larger farms as well to the extent that they are operated by individual families and not corporations. Non-family (or corporate) farms are, on average, larger than family farms, representing about 10 percent of the world's farms and occupying 30 percent of the world's farmland (Lowder, Skoet, and Singh, 2014).

oriented and sustainable agri-food systems, here the focus is on some specific policies related to mobilizing financial resources, which are likely to require collective action on behalf of G20 countries through the appropriate working groups (see also Díaz-Bonilla and Callaway, forthcoming).

ESTIMATED COSTS

Focusing only on irrigation, a study by IFPRI (Ringler, 2017) has estimated that to meet the expected expansion of food demand by 2030, about 7.9 billion dollars of annual investments will be needed in developing countries to expand irrigation and other systems, and an additional 2.4 billion dollars would be needed annually to make current systems more efficient. The IFPRI report highlights that sub-Saharan Africa and Latin America and the Caribbean (LAC) are the regions with the greatest opportunities to invest in expanding and improving irrigation productivity.

A recent study by IFPRI and the University of Bonn Center for Development Research (ZEF) (Nkonya, Mirzabaev and von Braun (eds.), 2016), has estimated that the annual cost of land degradation due to "land use and cover change" (LUCC) and the use of land-degrading management practices on static crop and grazing land is about 300 billion dollars (not including all costs related to deterioration of all ecosystem services, which may increase the estimates significantly; see for instance ELD Initiative, 2015). The authors estimate that the cost of completely rehabilitating lands degraded due to LUCC worldwide would be about 4.6 trillion dollars over 6 years,—and if action is not taken to rehabilitate degraded lands during this same period, the world will incur a loss of 14 trillion dollars, which suggests that such investments have a very positive return.

Considering other CSA interventions, the investment requirements are significantly higher (see for instance the World Bank's study by Sadler et al, 2016).

More generally, typical estimates of the costs to achieve the Sustainable Development Goals (SDGs) needed to build food systems that deliver growth and employment, social inclusiveness, climate resilience, environmental sustainability, and healthy diets for all, fall in the range of 1.5–2.5 trillion dollars per year of additional investments in developing countries (Schmidt-Traub. 2015). Even recognizing the methodological limitations of these types of estimates (Devarajan, 2015), taking the possible interventions and investments to scale and achieving significant impacts globally requires a non-trivial effort to mobilize the public and private resources needed.

OPTIONS FOR FINANCING THE ACTIVITIES AND INVESTMENTS NEEDED

How can the world finance these investments and activities? There are several options, including traditional bilateral development assistance; multilateral lending; public budgets in developing countries (including better controls on corruption, illegal financial flows, and tax

evasion to expand fiscal resources); domestic banking systems; unconventional monetary policies; and finally, private financial markets, including impact investors and socially oriented investors. This paper briefly discusses some of them, and then develops further the last option (as discussed in Díaz-Bonilla, Verchot, Loboguerrero, Viglizzo and Mirzabaev, 2018).

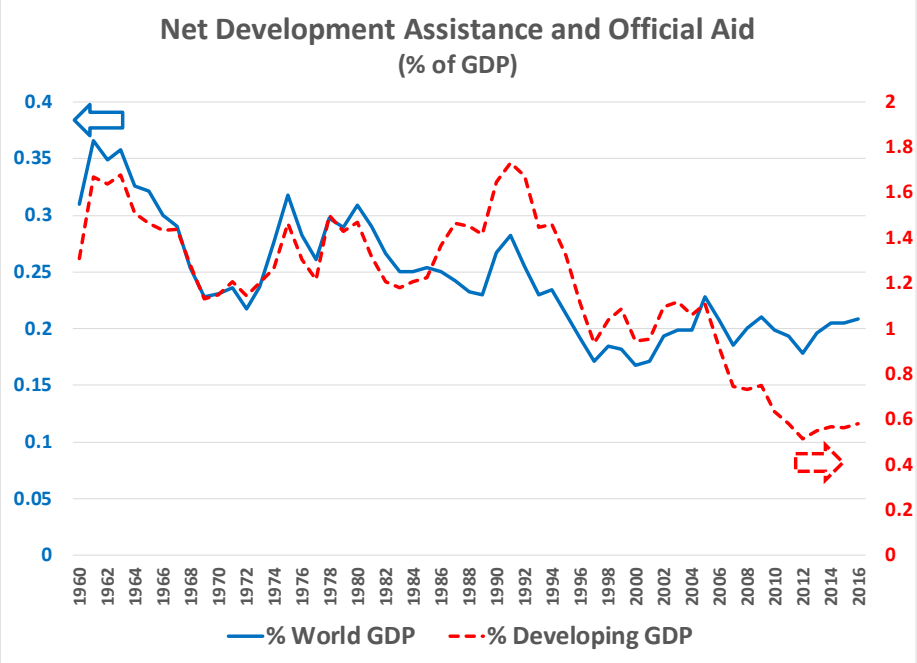
Bilateral aid for development and development banks

At present, the bilateral development aid traditionally provided by the richest countries is limited by budgetary and political reasons. In nominal terms, it reached a maximum of close to 150 billion dollars (constant US dollars of 2010) in 2014 and decreased to somewhat more than 140 billion dollars in 2015 and 2016 (estimated by the author from World Development Indicators/World Bank, 2018). Figure 2 shows that aid over time, as a percentage of world GDP (left axis from the reader) and GDP of developing countries (right axis).

Net development assistance and official aid has fallen from around 0.35% of the world GDP and 1.5% of the GDP of the developing countries in the 1960s, to 0.2% and 0.6%, respectively, at present.

Non-concessional loans (i.e. those that do not have highly subsidized interest rates and very long terms), which are the majority of World Bank and Regional Bank loans for middle-income

FIGURE 2



Source: Author calculations from World Development Indicators, World Bank

countries, represent even lower net[5] flows: in 2015–2016, counting all the multilateral development banks (i.e. World Bank plus Regional Banks) the net flow was between 21–24 billion dollars (author estimates from World Development Indicators/World Bank). The possibility of expanding the net flow is limited by the capital base (which was increased during the 2008–2009 crisis), and by excessively restrictive financial policies in several cases. The recent capital increase of the World Bank (April 2018) may extend in part the lending capacity of this institution but it has come with significant limitations in the possibility of lending to middle-income countries (which undermines the medium-term financial sustainability of these institutions).

In summary, the available levels of concessional aid and non-concessional lending, bilateral and multilateral, although relevant, seem constrained and must cover different priorities; therefore, they are not enough to finance the needed investments to achieve a sustainable food future. However, they can be utilized more strategically to leverage and mobilize the three sources of funding discussed immediately.

Public budgets in developing countries

Government spending in emerging and developing countries (as an average of the current decade in nominal terms) reached around 8.5 trillion dollars (while developed countries have a public expenditure of around 18.5 trillion dollars) (estimated by the author from the database WEO/IMF).

A central question is how those resources are spent. In particular, if the focus is the creation of agri-food systems with the characteristics discussed above, an initial question would be how much is spent in the agricultural sector. An important indicator is the percentage of spending in relation to the importance of the agricultural sector in the economy. Figure 3 shows that indicator, called the Agricultural Orientation Index (AOI) of expenditures, which is the percentage of agricultural spending on total spending, divided by the percentage of agricultural GDP over total GDP.[6] Figure 3, based on FAO data, compares the situation of developing countries with that of developed countries, using the average and the median.

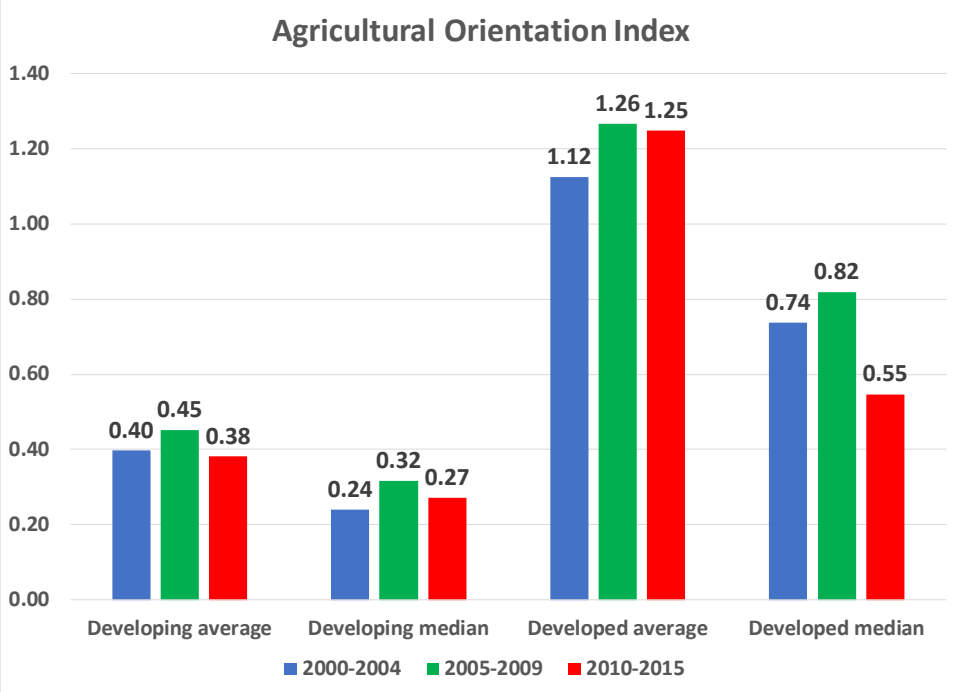
Clearly, developing countries spend less on the agricultural sector than their importance on GDP, and far less than developed countries.

An important component of expenditure in the agricultural sector is that allocated to research, development, and innovation. As noted before a significant number of developing countries have very low levels of public spending on agricultural R&D&I as a percentage of the GDP of

[5] Disbursements minus repayments of capital.

[6] Therefore, a value of 1 indicates that the agricultural sector receives as a percentage of public expenditure the same percentage that it has in total GDP (if it were less (more) than 1, it receives less (more) than its percentage of GDP). Of course, this is just a comparative indicator and cannot be interpreted as suggesting that it is more efficient or equitable that the sector must receive its share of the GDP.

FIGURE 3



Source: author calculation from FAOSTAT

the sector (note that it is not the same as the previous AOI indicator), usually below the minimum of 1% suggested by international organizations, and much less than the 3–4% that the developed countries invest.

This discussion has so far only focused on the public agricultural budget, but the expenditures that can help improve the conditions of food and nutrition security cover broader issues. It would be important for the G20 to promote an analysis of public expenditures (or "public expenditures reviews", PERs) with an SDG-based approach, expanded to consider other aspects of importance in the construction of agro-food systems with the characteristics discussed at the beginning of this work. For instance, a PER with a SDG-expanded approach would cover at least five blocks of expenditures: agricultural production and value chains; rural and regional development; poverty- and nutrition-based safety nets; health and nutrition interventions; and climate change and natural resources. There are very few examples of PERs conducted with such focus (see an example for Honduras in Díaz-Bonilla and Centurión, 2017).

An important part of building "sustainable food futures" is allocating an adequate level of public resources to that objective, and analyzing the levels, composition, effectiveness and equity of those expenditures. The G20 could encourage PERs focused on sustainable food and agricultural systems (or the related SDGs) to realign priorities and spending in developing countries, but also in developed ones.

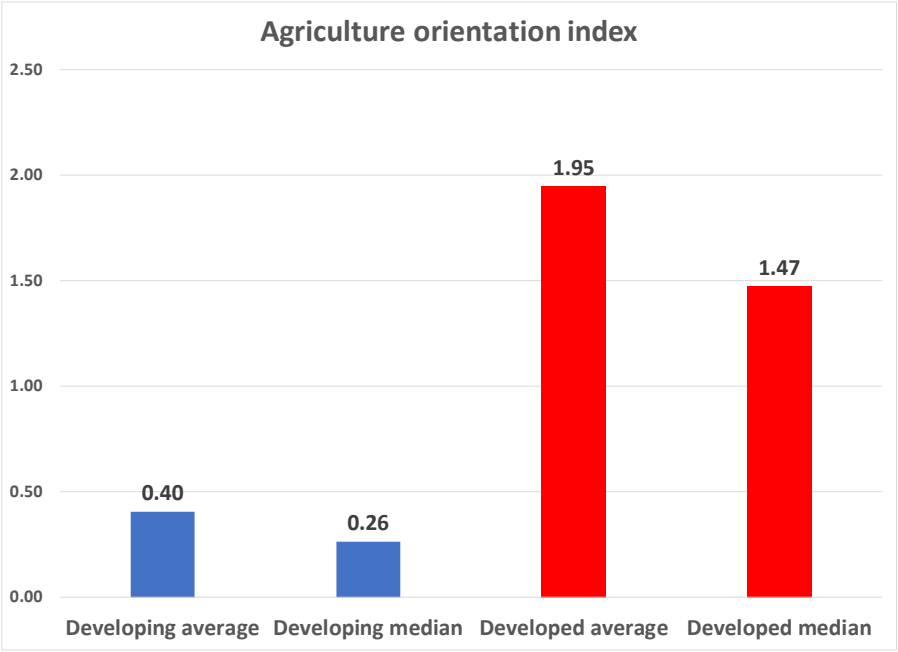
Banking systems and credit markets

Another source of financing for equitable, healthy, and environmentally sustainable investments in the agri-food system is the banking system in developing countries. Credit to the private sector from the banking and financial intermediaries in developing countries (on average during the 2010s) has reached around 20.3 trillion dollars (and approximately 70.1 trillion USD in the developed countries) (author estimates from database World Development Indicators, World Bank). But agricultural credit is only 4.1% of total credit (on average) in developing countries (FAOSTAT).

Figure 4 presents an indicator similar to that of AOI for public expenditures: the percentage of agricultural credit over total credit, divided by the percentage of agricultural GDP over total GDP.[7]

Clearly the agricultural sector in developing countries is receiving a share of credit below their importance in the GDP and far less the equivalent in developed countries. The analysis of the evolution and constraints related to agricultural and rural credit and financial services has received sporadic attention over the years. In the decades of the 1980s and 1990s, different multi-country studies of the financial markets and the rural sector were carried out (Adams,

FIGURE 4



Source: Author calculations from FAOSTAT

[7] The values of 1, more than 1, or less than 1, can be interpreted in the same way as the index applied to public agricultural expenditures.

Graham, and von Pischke, ed. 1984; FAO and German Agency for Technical Cooperation (GTZ) 1998). However, since then there has not been the same level of analytical and policy work on these issues. Although there is currently considerable interest about the issue of financial inclusion, the ongoing studies in the context of the Global Partnership for Financial Inclusion (GPFI) seem more limited to some microeconomic issues (see https://www.gpfi.org/about-gpfi).

It would be very helpful if G20 countries decide to promote updated studies on agricultural and rural financial markets, to improve macroeconomic, regulatory and institutional policies that can lead to financial inclusion and can overcome the limitations that restrict funding for food and nutrition security and the achievement of the SDGs. To do that it would be necessary to expand the ongoing work of the G20 on financial inclusion by analyzing the experiences in developing countries on the following levels: 1) macroeconomic conditions and the flow of funds, 2) regulatory aspects; 3) institutions; 4) instruments; 5) delivery modes; and 6) farmers' constraints and behavior.[8]

Impact investors and socially oriented investors

This section focuses on the last option related to private financial markets and suggests the need to use the same approach for sustainable infrastructure presented by the Argentinean Presidency.

The Argentinean document argues that there is a large gap in the investments required to build the needed global infrastructure from now to the year 2035, and that, at the same time, "institutional investors around the world have USD 80 trillion in assets under management, typically offering low returns." Therefore, the document states, "mobilizing private investment toward infrastructure is crucial to closing the global infrastructure gap…." And the approach suggested is "to develop infrastructure as an asset class by improving project preparation, addressing data gaps on their financial performance, improving the instruments designed to fund infrastructure projects, and seeking greater homogeneity among them…" The same approach can be applied to develop the mechanisms and financial structures needed to attract private and public financing to scale up investments in sustainable food systems.

The proposal discussed here considers that, as in the case of the suggestion of the Argentine government to develop infrastructure into an asset class, a) studies on the profitability of projects related to rehabilitation of degraded land, small irrigation projects, and other CSA/CFSA practices, show positive results;[9] b) that funding for those projects has been

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[8] There are other options to be considered such as some updated version of the non-conventional monetary policies that sustained the development of agro-food activities in the decades of the 1960s and 1970s, with the role of what was called "development central banks". This is a broader topic that cannot be developed here (see Díaz-Bonilla, 2015, for a discussion).

[9] See Nkonya, Mirzabaev and von Braun (eds.), 2016, for land aspects. A study by Dobbs et al. (2011) estimates that among the 15 greatest opportunities to increase productivity in water use (with the positive income result), five relate to food, land and agriculture, including "improving irrigation techniques" and "increasing yields on small farms". Other studies have identified a variety of CSA practices with very favorable Cost/Benefit ratios (see for instance, the annual report, already mentioned, of the program Climate Change, Agriculture, and Food Security (CCAFS).

relatively low (Sadler et al, 2016); c) that in the world there is ample liquidity; and d) that there is not an adequate pipeline of projects and financial vehicles through which that liquidity can be invested with an adequate balance of risk/reward by investors looking for stable and long-term returns in activities while supporting socially and environmentally sustainable food production by small and family farms.[10]

Table 2 presents the levels of private wealth at a global level, and the levels of stocks and flows of operations with social, environmental, or governance concerns, in general. Only in "green bonds" in 2016 there were issues for 81,000 million dollars.

The issue is how to mobilize these resources for investments in a "sustainable food future."

As the Camdessus Report “Financing Water for All” (2003) points out, water-related projects, especially in irrigation, are complex and difficult to structure. This also applies to land restoration/rehabilitation and CSA/CFSA practices in general. These small- and medium-scale projects, involving small and family farms tend to be very site-specific; operate with local communities that have a variety of social and productive profiles; require considering complex issues of water rights and environmental sustainability; and need other services and infrastructure support to produce and market the incremental production, among other challenges. Furthermore, involving private investors would necessitate structuring the investment opportunities (as projects but also other type of investable vehicles) so as to make

Table 2. Financial Indicators of Private Stocks and Flows	
Total Wealth of Families (2015)	250 trillions
ESG Investments (2015)	12.9 trillions
Impact Investors	
Under Administration (2016)	114,000 millions
Flow of operations (2016)	22,000 millions
Green Bonds (issuance 2016)	81,000 millions

Source: Díaz-Bonilla (2018)

[10] The World Bank document mentioned (Sadler et al, 2016), proposes different measures to increase investment, such as the "design innovative mechanisms and adapt others to tap additional sources of public and private capital that can be directed towards smart climate investments in agriculture," and "new investment vehicles that can attract additional capital through diversification, management and rebalancing of the risk performance profiles of individual investors." On a related note, Nena Stoiljkovic, Vice President, Blended Finance and Partnerships, International Finance Corporation/World Bank, stressed "that funding is not necessarily the problem, but what is needed are country-specific projects that are commercially viable "(World Economic Forum, 2017).

them attractive at reasonable rates of return and with acceptable risk profiles. The proposal below tries to address these challenges.[11]

PROPOSAL[12]

The proposal focuses on a financial and operational mechanism to scale up investments in CSA/CFSA practices, but it is also recognized here that there are other aspects that must be considered to ensure that such scaling up occurs. Among others, two can be mentioned here. First, there must be an adequate policy and institutional environment for the economic agents to undertake the necessary investments with an adequate risk/reward profile (see for instance, Díaz-Bonilla, Orden and Kwieciński, 2014). Second, there must be a steady stream of appropriate technologies. This in turn, requires the reinforcement of the work of the national and international research institutes working on the technological aspects of the challenges identified above, regarding land, water, and climate change and the environment. As noted, this requires efforts at the national and international levels. At the national level, countries should try to achieve levels of funding for agricultural R&D&I of at least 1% and, better, 2% of their agricultural GDP. At the international level, financial support for the CGIAR system and other international initiatives should be maintained, and most likely increased, to expand the work on technologies related to rehabilitation of degraded land, small irrigation projects, and other CSA/CFSA practices, and to strengthen the integration of this work with national systems.

Acknowledging the need for an adequate enabling environment and for appropriate technologies and innovations, the proposal here focuses on the creation of a project-preparation and support facility (PPSF) to help develop a pipeline of projects for the recovery of degraded and eroded land, small irrigation schemes and water management, and other aspects of climate-smart agriculture practices such as afforestation and reforestation, natural resource management, conservation agriculture, silvopastoral systems, multi-strata agroforestry, and other appropriate technologies and practices.

The PPSF will have four main functions: a) Identify and prepare the projects and potential investments on recovery of degraded and eroded land, small irrigation schemes and water management, and other aspects of CSA/CFSA practices, such as afforestation and reforestation, and natural resource management, working with small and family farms and their communities, and relevant country authorities; b) Identify possible sources of international, private and public investment and financing, and analyze their investment motivations and operational requirements; c) define the financial engineering, legal and regulatory structures, and operational aspects that need to be addressed and solved in order to mobilize the expected resources and implement such projects with economic, social and environmental sustainability;

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[11] Of course, the economic and financial viability of projects promoting soil restoration in agricultural lands, and other CSA approaches, would be enhanced by the development and implementation of mechanism of payments for ecosystem services (PES) provided by restored and sustainably managed agricultural lands. The proposals considered here, however, do not depend on this policy innovation.

[12] Based on the policy brief of Task Force 3 of the T-20 by Díaz-Bonilla et al. (2018).

and d) provide the support for the monitoring and evaluation activities related to that pipeline of projects.

The preparation of those projects requires multidisciplinary work to understand, among other things, the market conditions and the operation of value chains in which producers are, or can be, inserted; the technological and operational challenges of the projects; the legal and regulatory aspects; the constraints and possibilities of the participating producers and communities; the environmental, natural resource, and climate challenges; the objectives and incentives of potential investors, and their risk/reward expectations; and the regulatory, institutional and political framework within which specific projects have to operate.

The size of the PPSF depends on the ambition to scale up investments at the global level. Assuming a cost of preparation per project of between 2–4% of the total project costs, then a PPSF of 100 million dollars, could help mobilize investments for about 2,500–5,000 million dollars. The PPSF can be structured as a revolving facility where the preparation costs are reimbursed to the PPSF, by the appropriate private and/or public partner, upon the implementation of the project.[13] With this mechanism, the PPSF can end up mobilizing funds for specific investments that will be a larger multiple of the values mentioned above.

A possibility is that the PPSF be operated by the CGIAR system and FAO, combining the strengths of both international organizations to provide the economic, financial, technological, and social analytical capabilities to support countries and local communities to prepare those projects and establish the needed financial structures, and adequately serve as nexus with public and private investors. In particular, the PPSF should help apply the large pool of CGIAR's technical expertise also for the preparation and structuring of scalable investment projects in developing countries.

CONCLUSION

Achieving a "sustainable food future" requires building food systems that, in line with the related Sustainable Development Goals (SDGs), support growth and employment, ensure social inclusiveness and equity, promote climate resilience and environmental sustainability, protect biodiversity, and generate healthy diets for all. Many policy, institutional, technological and investment innovations are needed to build such food systems. This brief considers as a necessary foundation the development of adequate technologies and innovations, and an adequate investment climate.

The challenges are significant and addressing them will require the mobilization of funds at the required scale, particularly from the private sector. This paper has discussed several options for the G20 to pursue. First, the G20 could encourage public expenditure reviews focused on sustainable food and agricultural systems (or the related SDGs) to realign priorities and spending in developing countries, but also in developed ones. A second recommendation for

[13] The Camdessus Report suggests a similar mechanism: the report calls for the creation of "a Revolving Fund or funds consisting of grant money to finance the preparation and structuring costs of complex projects." (p.22)

developing countries should be to review rural financial markets and financing of value chains in order to remove some of the obstacles impeding the funding of the required food system transformations. This would entail expanding the work of the Global Partnership for Financial Inclusion to include a more comprehensive view of the macroeconomic, regulatory, institutional and operational topics involved. Together the public sector and the banking system represent the largest source of money available for financing these investments. Finally, a third action item could be the creation of a Project Preparation and Support Facility to develop a pipeline of projects that scale up the use of climate-smart agricultural technologies among small and family farms. The cut in global GHG emissions needed to maintain the world within safe levels while ensuring the additional production required by a larger, wealthier population, will not be achieved without a significant contribution from agriculture. This proposal implies a modest allocation of public funds that can be leveraged to mobilize a much larger pool of private financial funds, which may be interested in scaling up innovative productive practices and technologies that have the triple impact of improving productivity and incomes of producers, facilitating adaptation to climate change, and reducing GHG emissions. It is not an exaggeration to argue that the future of humankind depends on how we address the challenges discussed here, offering practical answers that achieve significant impacts globally.

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