

## Utilizing agricultural research to stimulate growth

Em. Prof. dr. ir. Patrick Van  
Damme

Faculty of Tropical AgriSciences,  
CZU, Prague, Czech Republic

---

Board chair International  
Foundation for Science (IFS)  
([www.ifs.se](http://www.ifs.se))

agricultural research is slow magic..  
so: make no mistakes...

---

- Introductory ideas
- Costs and Benefits of Agricultural Research: BCR as a proxy for growth
- CGIAR/One CG centres and NARSs: their roles and how to pimp NARSs
- Recommendations...

‘The most important single factor in economic growth in the United States may be its high percentage of national income devoted to research and development’

- [RAYMOND H. EWELL \(1955\)](#)



assumptions

## **investment in agricultural research**

---

saves lives and livelihoods for/of the poorest of the poor around the world, and

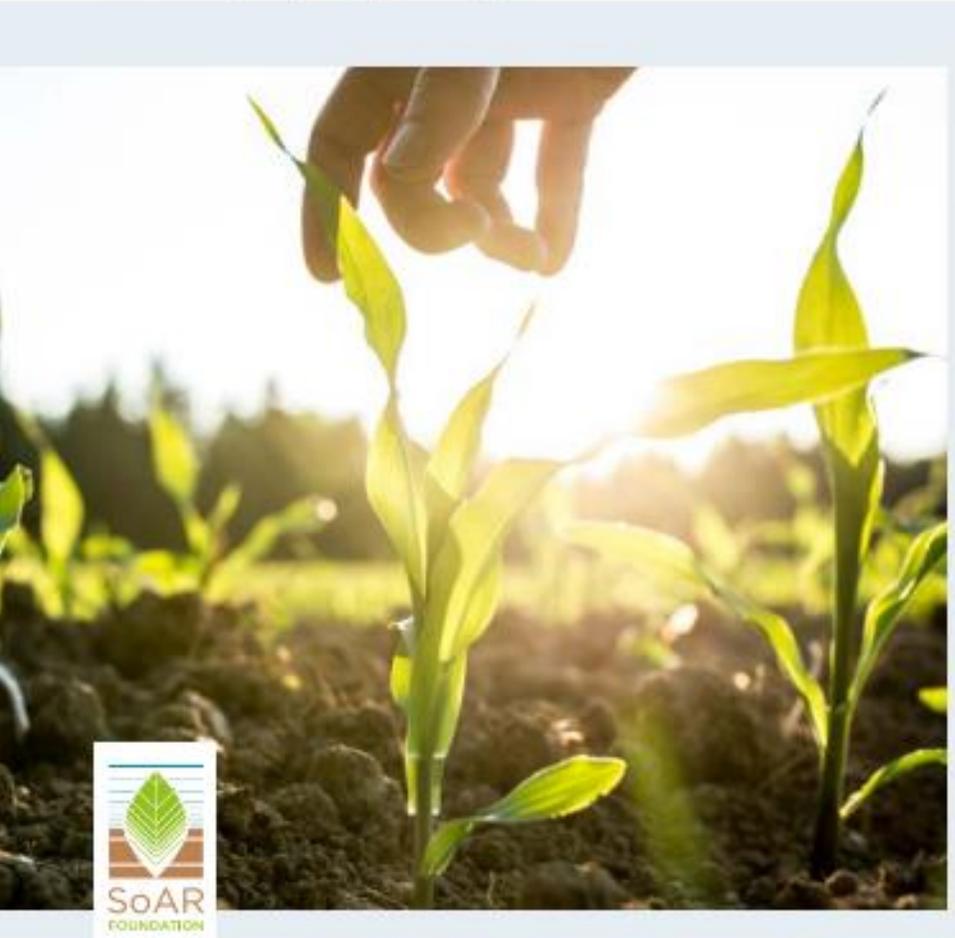
reduces pressures on the natural resource base

## **not investing in agricultural research**

will make it harder for farmers to produce the ((g)loc/bal) food needed, while continuing to meet the challenges posed by climate change, pests/diseases, political strife, policy risk and market risk

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



## However, recent trends and geopolitical patterns in research investment are troubling

---

high-income countries have **scaled back their investments** in agricultural R&D, both at home and through the CGIAR

although middle-income countries have developed national capacity in agricultural research, the same is not true for many **low-income countries** still heavily dependent on agriculture for livelihoods and food security

in particular, **research investment in sub-Saharan Africa lags significantly, and the gap has grown over time**

PN-ARM-262  
LSN = 89340

62

Consultative Group on International Agricultural Research

**Costs and Benefits of Agricultural Research:  
State of the Art, and Implications for the C.G.I.A.R.**

October 1978

G. Edward Schuh and Helio Tollini

## However, recent trends and geopolitical patterns in research investment are troubling

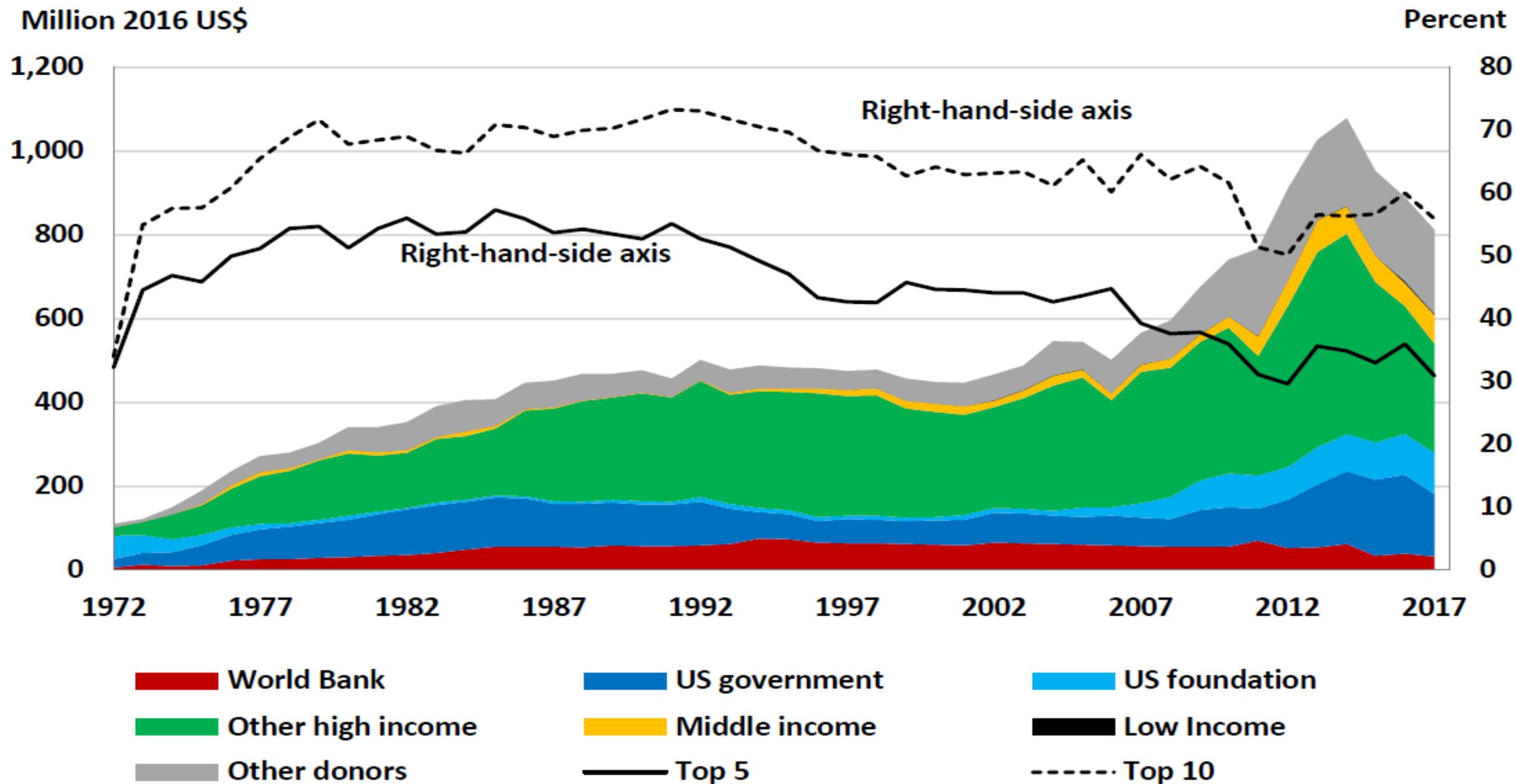
---

some African governments are losing ground in their efforts to apply science and technology to current and future agricultural challenges, including climate change:

- one-third of the NARSs spent less in 2015 than in 2000, after adjustment for inflation

CGIAR's research focus has appropriately shifted toward low-capacity, low-income countries, and/but partnerships there are still much needed (and should be truly multistakeholder-driven and -oriented)

# High-income countries continue to provide the bulk of CGIAR funds



# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



the good news ...

---

meta-analysis yields a median estimated BCR of approximately **10:1** for both global-mandate CGIAR and developing-country NARS research; i.e. on average, 1 \$ invested today brings a future return equivalent in (present) value to 10 \$ today.

this is a high BCR: any ratio over the threshold of 1:1 justifies investment

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |

Julian M. Alston, Philip G. Pardey, and Xudong Rao

**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020)**

Finally, policy attention has long focused on agriculture's traditional role to provide food, create jobs, earn export income, generate savings and funds for investment, and produce primary commodities for expanding industries. But the role of agriculture often goes beyond these direct, market-mediated contributions. Agriculture plays also an important role in providing indirect non-commodity contributions that are public goods, social service benefits and environmental services not captured by markets. Agriculture thus contributes to (i) environmental services such as soil conservation, watershed services, biodiversity, and carbon sequestration; (ii) poverty reduction; (iii) food security; (iv) agriculture as a social safety net or buffer in times of crisis, and (v) social viability<sup>137</sup>. A review of 11 case-studies by FAO revealed that these indirect contributions are not well understood, seldom analyzed in the context of development, and rarely reflected in national and rural development policy formulation. This may be due to the fact that the market signals are missing and policy signals are wrong and the lack of information concerning the sector's evolving market and non-market roles. The study underlines the strong interdependence between agriculture and other sectors, as well as the

- responsive to climate change

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020)**

---

same is true of agricultural R&D undertaken by U.S. land grant universities

- *caveat*: mainly concerns Green Revolution-like research (and does not count socio-economic costs that may set off more technical benefits – see criticism of GR interventions...)
- also **does not count** substantial benefits accruing in high-income countries, the so-called **spillover benefits** to high-income countries, including donor countries “doing well by doing good” (Tribe 1991)

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020) – in both north and south**

---

Pardey et al. (1996) estimated substantial benefits attributable to CG breeders from adoption of improved wheat and rice varieties in the USA, based on releases from CGIAR centers, sufficient to cover all costs of the entire CGIAR system.

likewise, Brennan (1989) and Brennan and Fox (1995) found large impacts in Australia from adoption of CGIAR-based wheat varieties

first step in a sequence: it can take many years for the investment to pay off, from R & D to farmers applying new practices, planting new crop varieties and adopting new technology: add-on cost of extension

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020)**

---

CGIAR/precursor centers were conceived to play a **critical role**, working in **concert** with the national agricultural research systems (NARSs) in low- and middle-income countries, to develop farm technologies that would help stave off a global food crisis - they succeeded

but: the issues persist, and new challenges have emerged; many commentators express **concerns about the ability** of the NARSs in low-income countries, especially in Africa, to **meet food security targets** while also addressing the global environmental agenda confronting agriculture – CG system could potentially play a pivotal role in supporting that effort...

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020)**

---

the measures of payoffs to CGIAR R&D typically reflect the consequences of R&D conducted jointly with NARS partners.

internationally conceived R&D (as then performed by CG/northern institutions) explicitly addresses high-potential gaps in NARSs research, often delivering multinational or global public goods

## **Patents...** (Graff and Pardey, 2019)

---

**patent filings in Africa have grown**, particularly, since the mid-1990s, but at different rates within different African jurisdictions

types of technologies being patented in Africa have remained stable over 30 years, with most in **pharmaceuticals, chemistry, biotechnology, and engineering**

the **majority of patent filings in Africa are from Europe, the United States, and other high income countries**. Yet, in South Africa, between 15% and 20% of patent filings are by residents of South Africa, and 3% are from other developing and emerging economies

only a **small share of inventions globally are made in sub-Saharan Africa**, but for those inventions that do arise in Africa, foreign filings are made widely outside of Africa

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



Society gains **\$10 in benefits**, on average, **per \$1 invested** in international agricultural research and development, according to the **Supporters of Agricultural Research (SoAR) Foundation (2020)**

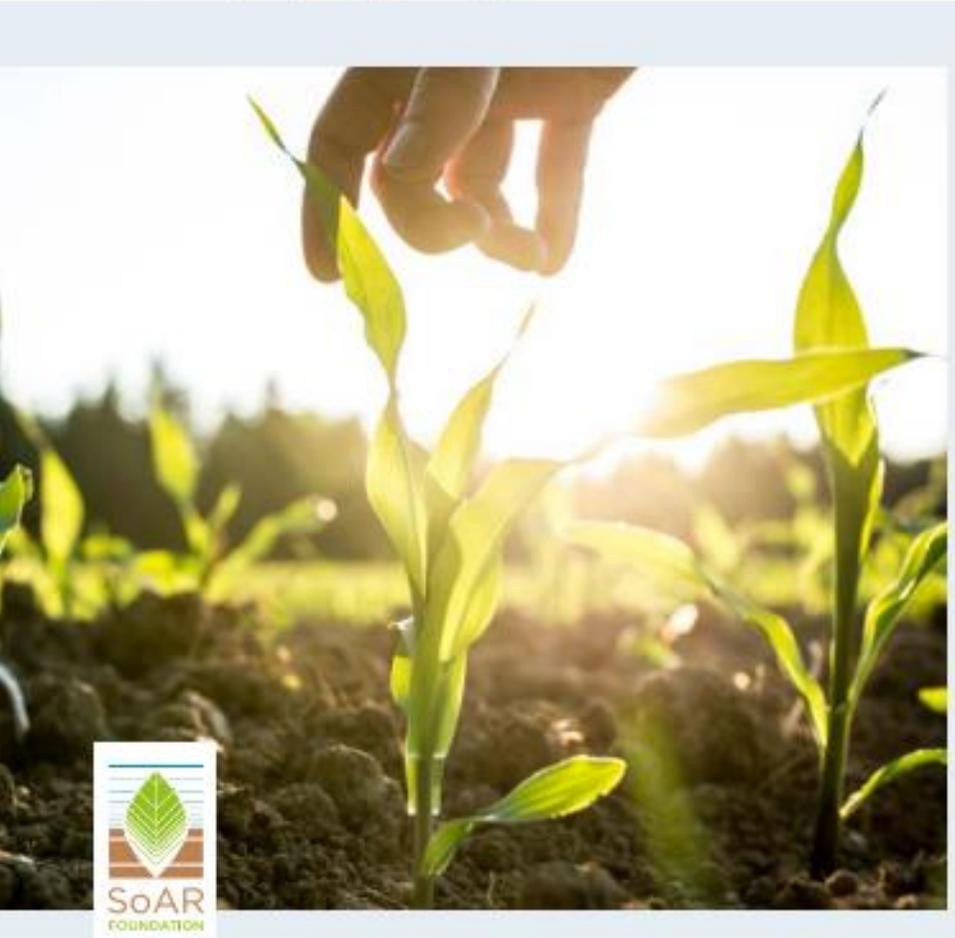
---

unique position of the CGIAR allows to leverage R&D capacity in middle- and high-income countries for the benefit of low-income countries

- internationally conceived R&D outputs and services **complement** those produced in NARSs
- CGIAR centers have comparative advantage in developing **broadly applicable** agricultural technologies.

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**Society gains \$10 in benefits, on average, per \$1 invested in international agricultural research and development, according to the Supporters of Agricultural Research (SoAR) Foundation (2020)**

---

BCRs for CGIAR and non-CGIAR research are of similar magnitudes and not statistically distinguishable

however, this does not imply that funding for internationally conceived R&D could be reduced or replaced by investment in the NARSs (although international R&D can mitigate duplication by NARSs, where each country repeats the same kind of work...)



Supporting Early Career Scientists in the Global South  
for 50 Years and Counting

**INTERNATIONAL FOUNDATION FOR SCIENCE**



enter the international Foundation for  
Science – IFS, [www.ifs.se](http://www.ifs.se) !

To our knowledge there exists only one example of funding in developing countries that is directed to individuals based on excellence and high quality new researchers, located in their own country and not necessarily based on North-South partnerships.

It is the experience of the International Foundation for Science (IFS, see above). An important aspect of the success of IFS might have been the fact that the relatively small grants are surrounded by additional activities or funding (equipment, organisation of workshops in specific topics that are interesting a large number of grantees, etc...).

In other words, IFS does not make any assumption that the local socio-economic context will be helpful, thus providing support to its grantees that researchers in Europe would find in their own institutions and social environments.

[wp43.pdf \(ceped.org\)](#) - 2019 paper Observing and Funding African Research:

In your experience, what is unique about the support which IFS provides to grantees?

develop one contacts cases targeted access scientists  
application unique IFS students research projects process  
provides quality important fair IFS provides  
made possible many countries regions unique  
review process help scientists developing countries



Supporting Early Career Scientists  
in the Global South  
for 50 Years and Counting



INTERNATIONAL  
FOUNDATION FOR  
SCIENCE  
FOUNDED IN 1972

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



## What can be improved, and should be addressed ?

---

(based on 7 CG-centre program reviews)  
**extension**, and application of the many R&D results is key to success, but mostly neglected (by CG, and other big players)

in other words: need to **consolidate** and use findings, don't always go for innovations for innovations' sake.. – there is a lot of solutions on the shelf: apply them !

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao

or: co-creation for bigger appropriation and utilization and return on investment



## What can be improved, and should be addressed ?

---

(based on FAO interventions' review) **return on ag R&D investment** (buy-in by target groups) could be increased by increasing **participation in and ownership of agricultural research**

- ❖ **planning** (of research agenda),
- ❖ **definition of research priorities,**
- ❖ **design, implementation, evaluation,... of research**
- ❖ ...

## Green Water Harvesting Techniques

- > A cost effective & adoptable green water use techniques for limited water supply conditions
- > Enhance the crop yields of rain-fed crops up to 30%
- > Demonstrated in fields of Navadh, Navagam & Revaliya villages in Panchmahal District of Gujarat



Conservation Furrow



Stubble Mulch Farming



Paired Row Furrow



Alternate Furrow



Surge Flow



Plough Furrow



Farmers Irrigation Method



Crescent Shaped Bund



V Shaped Micro Catchment



Saucer Shape Bund

... improved, and addressed ?

... come through reconsidering knowledge, e.g. in the field of water uses but also Neglected and orphan crops

... more adapted, better-suited

... cultural research: so... put the fore: millet, sorghum, (view of climate change x spells)

or: co-cr  
appropri  
and retu

10  
Apr  
2022



The Economic Policy Research Centre (EPRC) has completed field work for a study investigating the major constraints and investment opportunities for improving agricultural production and productivity in the country.

The study covers five selected commodity value chains: maize, millet, cassava, goats, and coffee.

The Centre interacted with extension workers, input dealers and district agriculture teams were asked to identify and rank the most pressing investment gaps to agricultural transformation across eight (8) investment priority areas including; breed, fertiliser, mechanisation, irrigation, extension, research and development, roads and electrification.

The field work, conducted between April 3 and 14, 2022, focused on one commodity per district in five districts identified through a policy prioritization analysis. These included Kibaale for Goats, Soroti for Millet, Lira for Cassava, Serere for Maize, and Masaka for Coffee.

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao

**or: co-creation for bigger  
appropriation and utilization  
and return on investment**



## What can be improved, and should be addressed ?

---

also: when developing new plant materials, or techniques, consider the ethical aspects and thus links with/influence of ‘big-industry’ ... (see golden rice story, Monsanto/Bayer x GMOs, patents, killer genes,...)) – so: go for public goods

talking about GMOs: what with generatively versus vegetatively propagated crops ? and addressing breeder/patent rights ?

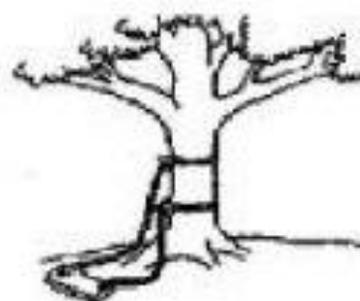
also: address impact of multinationals on the whole production column (providers of seeds, fertilizers, pesticides,...)



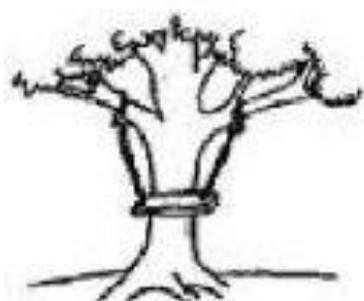
**As proposed  
by the project  
sponsor.**



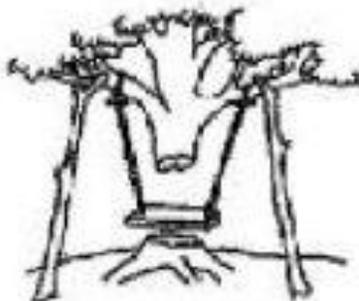
**As specified  
in the project  
request.**



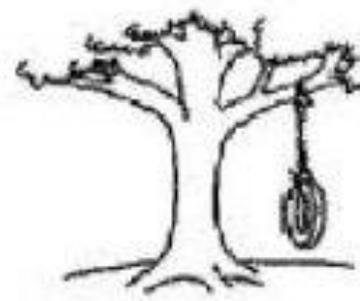
**As designed  
by the senior  
architect.**



**As produced  
by the  
engineers.**



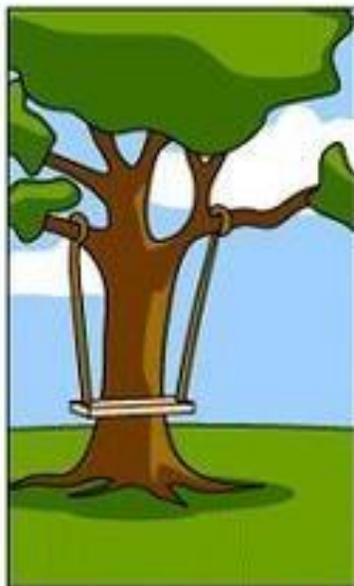
**As installed at  
the user's  
site.**



**What the  
customer  
really wanted.**



How the customer explained it



How the Project Leader understood it



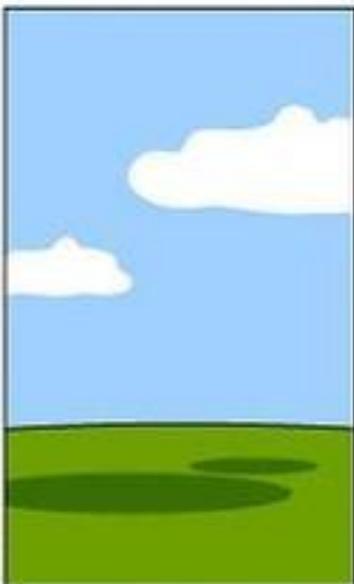
How the Analyst designed it



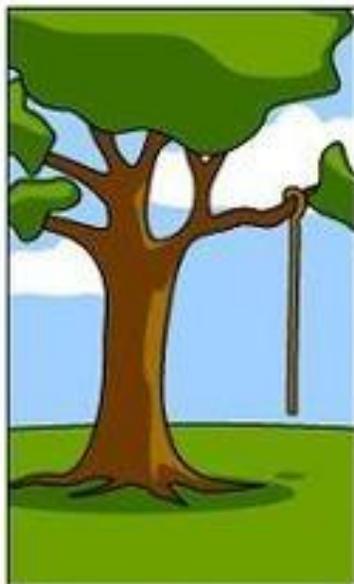
How the Programmer wrote it



How the Business Consultant described it



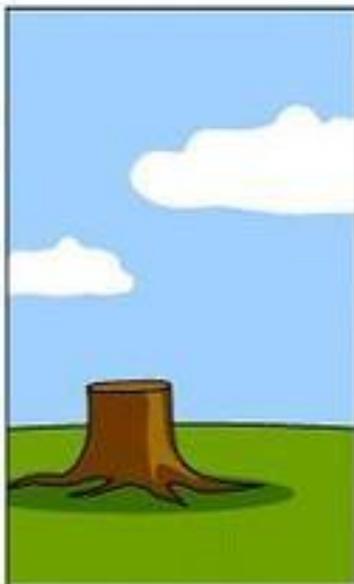
How the project was documented



What operations installed



How the customer was billed



How it was supported



What the customer really needed

# THE PAYOFF TO INVESTING IN CGIAR RESEARCH

October 2020 |  
Julian M. Alston, Philip G. Pardey, and Xudong Rao



**however....**

---

in spite of all this evidence, rather than ramping up funding, in the USA and the other high-income countries, we are seeing a **decline in real funding support** for public agricultural R&D and a **decline in donor funding support for R&D undertaken by the CGIAR**

# recommendations

---



there is a **strong economic investment case** for **funding partners** as they consider future investments in international agriculture research and development

with a strong presence and long-term partnerships in developing countries, CGIAR is **uniquely positioned** (supranational, but... **depatronize ag research...**) to further create and develop needed innovations, but so could be Agrinatura....

# recommendations

---



continued/additional investments in **CGIAR research in conjunction to that in NARSs** would continue to yield dramatic returns on investment and benefits for poor communities, particularly in Africa and South Asia where **smallholder farmers** and local food systems are most vulnerable

# recommendations

---



however, this will need increased co-creation, ownership, buy-in,... at local (farmer organisations), regional (ASARECA,...), international (FARA), global (YPARD) levels, plus: (re)consider role of private sector

maintain/increase support to NARSs

CG centres to assist/engage more in training local PhD students (in tri-angulation with local and developed-countries' universities)

# recommendations

---



lobby/advocate with governments x donors  
at all levels...

and so much more....

**Thanks !**





---

Unleash young scientists potential...

Ministers... people in high position... hidden asset

How to calculate the value of human capital x capacity building

Pilot

RABO bank x capacity training ? X IFS

Depatronizing research

IFS has grants 15000, that produce 3 papers... we support grantees, but through that their families, some other people in the environment... how to count ministers, presidents....

Direct effect through investment in research equipment: spill-overs to other researchers...

# Title Lorem Ipsum

---

Q1

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Q2

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Q3

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Q4

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum

Lorem ipsum et tula lorem ipsum et lorem ipsum