U.S. Investments in Innovation:
IMPACTS AROUND THE WORLD

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3 Key Issues in Impact Analysis (more of course)

• **Attribution** of innovation to initiative i.e. research area, policy analysis, nutrition efficacy studies…*investment leading to outcomes*

• Demonstrable **welfare improvement** to humanity as clarified through a counterfactual… *Incremental benefit to society*

• **Scale** of effect e.g. geography, population…*beneficiaries*

…Leading to analysis of the relative benefits and costs
Genetic enhancement peanut: Evidentiary basis

• Registration illustrated multiple institutions involved
  • Peanut CRSP
  • Governments of Malawi and Uganda
  • ICRISAT

Registration of ICG 12991 peanut germplasm line

C.M. Deom, T. Kapewa, C.M. Busolo-Bulafu, R.A. Naidu, A.J. Chiyembekeza and F.M. Kimmins


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https://www.crops.org/publications/cs
Evidentiary basis of impact on income and poverty

- Increases household income by US$130-254
- Decreases poverty incidence (headcount) by 7-9%
  - Even greater for the poorest of the poor
  - Pathway out of poverty
  - Market constraints for broader gains
- Clear attribution.
- Clear benefit estimation.
- At measurable scale.

World Development
Volume 39, Issue 10, October 2011, Pages 1784-1795

Agricultural Technology, Crop Income, and Poverty Alleviation in Uganda
Menale Kassie, Bekele Shiferaw, Geoffrey Moricho
Show more
http://dx.doi.org/10.1016/j.worlddev.2011.04.023

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Protecting investments in genetic gains

• Weeds adapt to control strategies
• Diseases and insects develop resistance to biochemical control
• All are only “a plane ride away”

• Consider: Global networks allow for rapid response
Protecting investments

► **INNOVATION**: Papaya Mealybug control ◄

*(IPM Innovation Lab)*

Net economic benefits of bio-control of papaya mealybug in southern India

<table>
<thead>
<tr>
<th>Crop</th>
<th>First year benefit (US$) (000s)</th>
<th>Net present value (US$) over 5 years (000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papaya</td>
<td>14,427</td>
<td>62,514</td>
</tr>
<tr>
<td>Mulberry</td>
<td>27,924</td>
<td>120,928</td>
</tr>
<tr>
<td>Cassava</td>
<td>221,937</td>
<td>960,737</td>
</tr>
<tr>
<td>Tomato</td>
<td>27,553</td>
<td>119,374</td>
</tr>
<tr>
<td>Eggplant</td>
<td>17,745</td>
<td>76,877</td>
</tr>
<tr>
<td>Total</td>
<td>309,586</td>
<td>1,340,430</td>
</tr>
</tbody>
</table>

Source: Myrick et al., 2014

**IMPACT**: Netted more than $1.3 billion of economic benefits in southern India alone
Rigorous and regular studies on IPM delivered
Accessing the value of genetic treasures in U.S.

- Center of genetic origin
  - Central America – corn, melons
  - South America – potato, tomato, cotton
  - Middle East – wheat, alfalfa
  - Ethiopia – sorghum, hard wheat, sesame
  - India – rice, citrus, sugar cane

- Consider: None of our staple crops originated in the U.S.
Accessing genetic treasures

• Accessing genetic resources is essential for global productivity
  • Global germplasm harbors defensive traits

• International exchange and collaborative research key to fighting new pests and diseases that arrive in U.S.

IMPACT: Greenbug resistance benefit in 1980s estimated at $750 million (in $2016) ...sugarcane aphid resistance may be similar.
Accessing genetic treasures

2015 Sugarcane Aphid, *Melanaphis sacchari*, Occurrence on Sorghum
September 30, 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>States</th>
<th>Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>2014</td>
<td>12</td>
<td>312</td>
</tr>
<tr>
<td>2015</td>
<td>17</td>
<td>417</td>
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Investing in Innovation: Known Unknowns on Impact

• **Water management:** Merry, 2015

  • “Too much missing data to make credible claims… despite $800 million in investment in the CGIAR since 1990.”
Investing in Innovation: Known Unknowns on Impact

- **Livestock research in CGIAR**: Jutzi and Rich 2016
  - Few studies, limited rigor, only 12 of 31 qualified as ex-post IA
  - “Of the 12 studies available, none offers evidence that justifies the investment in livestock research in the CGIAR…”
  - $1 billion invested since 1990 or $50 million per year
  - “…This does not mean that there is no impact, nor does it imply that investments in animal agriculture are unjustified…”
  - There are no studies that can show impact.
Investing in Innovation: Known Unknowns

• **Policy research**: Renkow, 2015
  
  • “CGIAR research in policy-oriented research exceeds $1 billion since 1990 or about 15-20% of CGIAR expenditures.”
  
  • “A distinct lull ….in the production of ex post impact assessments of POR within the CGIAR”
    
    • Perhaps resulting from an attribution problem
    
    • Identifying and measuring welfare effects against a plausible counterfactual
Investing in Innovation: Known Unknowns

- **Crop and natural resource management - an ongoing effort through 2017**
  - 175 claims across 37 outcome areas
  - Difficulty in attributing public goods to CGIAR centers
  - Unclear counterfactual for evaluation—non-existent benchmarks

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<td>Marine Resource Management</td>
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Investing in Innovation: Known Unknowns

- **Crop and natural resource management - an ongoing effort through 2017 (cont.)**
  - Limited geographic and demographic scale of interventions limiting impact - site specific nature
  - Requires a significant amount of financial resources to capture environmental impact
  - Specialized impact assessment skills needed especially on environmental issues - this is not work for generalists

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Criteria for reflection: What is required?

- Plausible impact pathway
- Reliable and representative data on adoption, yields, incomes, environmental and other outcomes
- Rigorous benefit-cost analysis
- Sound attribution of benefits to research or influence on policy
- Transparent and reasonable assumptions
FEED THE FUTURE
The U.S. Government’s Global Hunger & Food Security Initiative