

1 EVIDENCE

Research on the role of contact farmers demonstrates how to increase the adoption of new agricultural practices. Recent evidence on land tenure reform shows it can encourage investments in land, especially benefiting women.

12 BASELINE IN ACTION

How a baseline survey of 4,000 households in Ethiopia had immediate impact on policies to improve women's access to new agricultural technologies.

15 YOUR NEEDS

We have arranged the references used in this update in an easy to use list based on the most popular questions researchers and project managers raise. Give it a try and explore the topics that interest you most.

27 EXPERTISE

Meet the experts who are leading impact evaluations on agriculture and land interventions in Sub-Saharan Africa.

Africa Impact Evaluation Update Team: David Evans (Team Leader), Daniel Kirkwood, Mapi Buitano, and Beatrice Berman, with contributions from Markus Goldstein, Florence Kondylis, Maria Jones, and Michael O'Sullivan. Questions: devans2@worldbank.org.

UPFRONT

policy

PICK UP LINES

“ Having a land title won't get you a loan in the credit market if there isn't a credit market.”

“ If you want to teach a farmer, teach a farmer kind of like her. ”

“ Diamonds aren't a girl's best friend: Try a land title.”

THINGS WE FIND

Funny

p7

If you invite a farmer out and he won't leave the house, consider getting him a LAND TITLE or a security guard!

p1

Peer farmers can be contact farmers and lead farmers can be contact farmers but lead farmers CANNOT be peer farmers. We think.

p12

Female farmers spend 600% more time than men on cleaning and childcare, and we wonder why they talk to extension workers less!

THINGS YOU'LL KNOW HOW TO DO AFTER READING THIS ISSUE

IDENTIFY THE BEST FARMERS FOR SHARING NEW AGRICULTURAL METHODS WITH ALL THE OTHER FARMERS

WHEN TO WORK WITH CUSTOMARY LAND SYSTEMS AND WHEN TO IMPLEMENT FORMAL TITLING

USE A BASELINE SURVEY TO ILLUMINATE IMMEDIATE OPPORTUNITIES FOR POLICY ACTION

IF

YOU HAVEN'T *had enough*

OUR HANDY RESEARCH-TO-OPERATIONS DICTIONARY IS ON

p15

IF YOU'RE LOOKING FOR SOME SOOTHING BEDTIME READING, WE HAVE 51 RECOMMENDED ARTICLES LISTED

p16

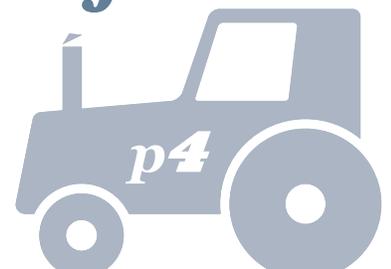
Worth Learning

Farmers are more likely to learn from farmers similar to themselves.

Agricultural extension can work! Major technology adoption happened in Mozambique, Malawi, & Ethiopia!

Land titling in Rwanda doubled soil conservation investments, and effects for women farmers were double those for men.

farmers TEACHING *farmers*



COUNTERINTUITIVE

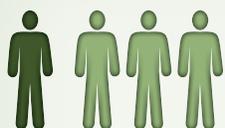
Land titling may increase perceived insecurity before reducing it

p9

Peer learning among farmers in Mozambique

Strengthening the role of contact farmers, especially women, increases the adoption of new agricultural practices.

THE ISSUE



25 PERCENT
OF MOZAMBIQUE'S
FARMERS KNOW
THE MICRO-BASINS
TECHNIQUE.

The low adoption of improved agricultural techniques is associated with low agricultural productivity in Sub-Saharan Africa. Lack of information contributes to this market failure.

THE PROJECT

The goal of Mozambique's Market-led Smallholders Development in the Zambezi Valley Project (MSDVP) was to increase the uptake of new agricultural practices by promoting peer learning among farmers. This was done by boosting the role of local contact farmers (CFs) who facilitated the transfer of information from extension agents to other farmers in the community.

Strengthening the role of CFs included:

- Specialized training,
- Demonstration plots on their farms, and
- Performance-based incentives.

THE RESULTS

For contact farmers:

- Male CFs reported learning significantly more techniques, especially mulching (although the increase wasn't reflected in exam results).
- Male CFs adopted the techniques that they self-reported as having learned on their demonstration plots. The increase in use of these techniques was greater in the group that included women CFs relative to the group with only male CFs (e.g., 44% versus 35% for micro-basin adoption).
- Male CFs adopted mulching and micro-basins on plots other than their main farming plot. This may be for purposes of risk reduction (i.e., adopting new techniques on less important plots).

For other farmers:

- Farmers seem to benefit more from CF visits than from going to see the CF's demonstration plot.
- Farmers' knowledge of mulching and micro-basins increased more for farmers who were served by both female and male CFs than for those who were only served by male CFs.
- There is a large and positive impact on adoption across the two treatment groups for one technique (micro-basins) but not for another (mulching). Contact farming can indeed be effective.

THE IMPLICATIONS

- Training CFs can provide an effective way of addressing information supply as a market failure and increasing the adoption of new agricultural practices.
- Including women in CF training can bring more benefits and reach more farmers: this appears to result not only from a quantitative increase in training, but also from complementarities between male and female CFs.

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Link:

<http://tinyurl.com/np77fjs>

HOW IT WORKED

The MSDVP was part of a larger national agricultural reform to rebuild the agricultural extension network in five districts of the Zambezi Valley.

Objectives:

- Increase smallholder farmer incomes, and
- Decrease land degradation and improve the resilience of ecosystems to climate change.

While CFs are commonly used, their ability to supply information is limited by the lack of a clearly defined role or compensation. The absence of women as CFs could also impede peer learning by female farmers. This project was an innovative effort to improve adoption of improved agricultural techniques in the face of these challenges.

The project included:

- **Specialized sustainable land management training to extension agents and CFs,**
- **Assignment of demonstration plots to CFs,**
- **Provision of performance-based incentives to CFs, and**
- **Specific inclusion of training for female CFs in one of the treatment groups.**

More on the training :

- Training for extension agents consisted of a three-day course in sustainable land management techniques, evenly split between class lectures and practical plot demonstrations.
- Eight techniques were covered in training: Mulching, Crop Rotation, Intercropping, Reduced Tillage, Micro-basins, Contour Farming, Row Planting, and Improved Fallowing.
- The extension agents then taught the same course to the CFs.
- CFs received a toolkit that included a bicycle and tools to plow the land, and had the autonomy to disseminate the techniques they deemed most appropriate for their village.

Lessons:

In practice, it was difficult to implement social and material performance-based incentives for CFs in the first year. The team learned that:

There needed to be an effort to generate awareness of performance incentives among participants.	The lottery system may have been perceived as being unfair.
It can be tricky to set the targets at the right level, so that a suitable number of CFs could meet them.	Weak capacity and governance issues may have meant that few prizes were actually delivered.

Impact evaluation:

The impact evaluation of the MSDVP was a randomized controlled trial and was a joint effort between researchers at the International Food Policy Research Institute and the World Bank. The impact evaluation compared one control group and two treatment groups:

The control communities all had a male CF who did not receive sustainable land management training or a demonstration plot.	The first group of treatment communities had a male CF who did receive training and a demonstration plot.
The second group of treatment communities had both a male and female CF who received training and a demonstration plot.	Social and material performance-based incentives were distributed to half the CFs in the treatment groups.

What Else You Need to Know about Agricultural Extension

The following section highlights the results of recent impact evaluations. Along with other research (highlighted on page 15), these studies suggest the following implications for policy-makers:

- Lack of information is a critical barrier to the adoption of new agricultural techniques.
- Social networks of farmers who share similar characteristics can be more cost effective for disseminating information than formal extension services – especially once a core group of farmers have adopted the technology.
- Small, time-limited discounts on agricultural inputs may offer a more efficient solution to low input use than either heavy subsidies or doing nothing.
- Different farmers will benefit from different investments, depending on their constraints. In some cases, a road will be more helpful than improved seed varieties.
- Policies aimed at mitigating risks for poor farmers (e.g., insurance or drought resistant varieties) could help increase the use of expensive productive inputs, such as fertilizer.

Initial data for the *Agricultural Development Programme Support Project in Malawi* suggested that lack of information was the most important reason for non-adoption of new agricultural techniques. Yishay and Mobarak (2013) then used a randomized controlled trial to test how three different models of agricultural extension affect the transmission of information related to agricultural techniques.

FIRST MODEL	SECOND MODEL	THIRD MODEL
 <p>This model entails only using an AGRICULTURAL EXTENSION OFFICER.</p>	 <p>This model supports the EXTENSION OFFICER with a LEAD FARMER, a contact farmer selected by the extension officer together with community leaders, and who tends to be more educated than the average farmer.</p>	 <p>This model supports the EXTENSION OFFICER with FIVE PEER FARMERS, contact farmers selected by a community focus group, and who are more representative of the average farmer.</p>

The aim of the study is to test which of these three models is the most effective way to deliver information to farmers on agricultural techniques and to see whether leveraging the social networks provided by PFs and LFs is an effective model. The study also tests whether offering incentives improves the transmission of information to farmers.

The two techniques supported by the project were pit planting and a form of composting. In each of the three models, the extension officer received three days of training (including class-based and practical training). In the two models with contact farmers, the extension officer then provided training to the LF or PFs. Half of communicators (the extension officer, LF, or PF) in each of the three models were given incentives based on the knowledge scores and adoption rates of the farmers they were assigned to support.

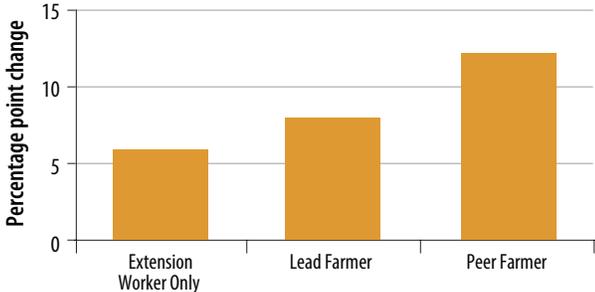
Findings:

Without incentives, the extension officer-only model appears to be the most effective (at both increasing farmer knowledge and farmer adoption of new technologies). In that context, PFs do not even effectively learn about pit planting and composting, and so are not able to pass on information to other farmers. However, when provided with a small incentive (a bag of seeds), peer farmers represent the most effective model for passing on information and convincing other farmers to adopt these techniques. With incentives:

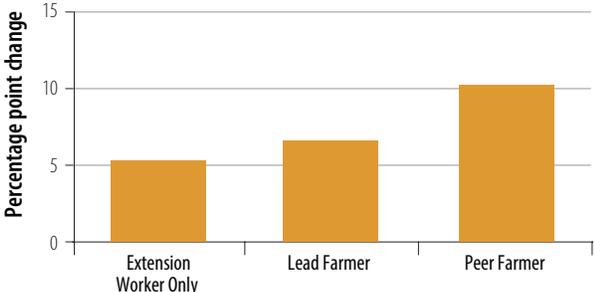
<p>PFs increase their knowledge by 19-20 percentage points. This compares to an increase of just 7 percentage points for LFs.</p>	<p>PFs are the communicators most likely to hold extension activities.</p>
<p>Recipient farmers increase their knowledge levels more in PF villages (12 percentage points) than in LF (8 percentage points) or extension worker-only (6 percentage points) villages.</p>	<p>Adoption of pit planting increases more in PF villages (10.2 percentage points compared to a mean of 1.7 percent), than in LF (6.3) or extension working-only (5.5) villages. The same pattern is observed for the on-farm monitoring of adoption: It is estimated that the PF model would increase yields by 113 percent.</p>

The results of the study suggest that peer farmers communicate more effectively with farmers that have farms of similar size and common input use. Social proximity and status are less important. The authors estimate a benefit/cost ratio for the PF model of 4.5:1. So, with a shortage of extension staff in Malawi and with only 18 percent of farmers reporting any kind of extension activity, leveraging the social networks of peer farmers could prove a cost-effective way of radically expanding extension coverage and effectiveness.

Impact on recipient farmers' knowledge by village treatment type



Impact on the adoption of pit planting by village treatment type

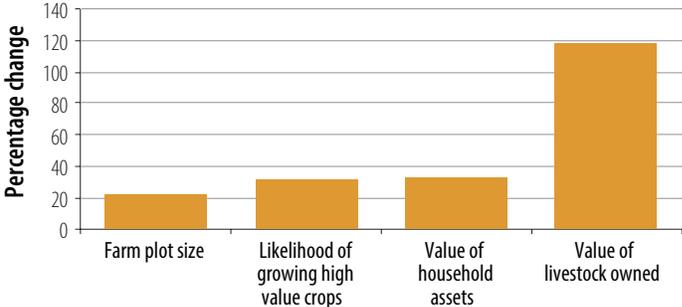


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The Government of Ethiopia launched the **Rural Capacity Building Project** (RCBP) to strengthen extension services by making them more responsive to the needs of smallholder farmers, with a focus on economically viable and environmentally sustainable agricultural techniques. The RCBP included support to various activities related to extension training and equipment.

A World Bank impact evaluation of the project (Buehren et al. forthcoming) assessed the impact of the training of delivery agents and the upgrading of farmer training systems on productivity. The results showed that the program significantly expanded the scale of agricultural activities of beneficiary farmers and also increased the focus on higher value crops and cattle.

Impacts of RCBP on farmers



Specific results included the following.

Impacts on types of crops grown:

- An increase of 31 percent of the likelihood of growing high value crops
- An increase of 49 percent of the likelihood of selling high value crops
- An increase of 105 percent in the share of cultivated land under cultivation for high value crops

Impacts on livestock:

- A 119 percent increase in both the value of all livestock and the value of non-poultry livestock

Impacts on farm size:

- An increase of 23 percent in average total plot size
- An increase of 23 percent in the number of people contributing to household income
- An increase of 11 percent in the number of people who work on the household farm

Impacts on assets:

- An increase of 53 percent in the likelihood of having access to electricity
- An increase of 13 percent in the number of outbuildings
- An increase of 33 percent in the value of household assets

The gender dimension of impacts:

- With the exception of the impact on assets, the program showed equal impacts for male and female farmers.

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Lessons from land tenure reform in Rwanda

Land Tenure Reform can encourage greater investment in land, with especially large benefits for women.

THE ISSUE



4 ON A **5**

POINT SCALE IS HOW
RWANDA'S
LAND OWNERS
RATED THEIR
PERCEIVED RISK OF
EXPROPRIATION

Weak land tenure security dampens investment in land and ultimately leads to lower agricultural productivity, especially for women.

THE PROJECT

Rwanda's Land Tenure Reform (LTR) pilot program aimed to clarify existing land rights as a first step to enabling their eventual formalization with title certificates. Parcel boundaries were identified and formally registered as eligible for a formal land certificate if no objections were raised within 2 weeks of the information being made publicly available. An impact evaluation tested LTR's short term impacts.

THE RESULTS

- The project resulted in no significant decrease in the perceived risk of expropriation: This may be because knowledge of the policy is limited
- Households benefiting from the program are almost 10 percentage points more likely to make or maintain soil conservation investments, which is double the change in investment over time for non-beneficiary households.
- For female headed households, the program results in a 19 percentage point increase in the likelihood of soil conversion investments - twice the increase for male headed households
- For cohabiting women who are not legally married there was an 8 percentage point reduction in the probability of having documented land ownership, compared to a 17 percentage point increase for those who are legally married (which is about 70% of couples).
- Greater certainty on inheritance benefits children and gender equality: Children are 13 percentage points more likely to inherit the land, with both sexes benefiting equally.
- Contrary to concerns, LTR does not cause households who lack access to credit and insurance to panic-sell their land below its market

THE IMPLICATIONS

- LTR can effectively increase investment in land, even before land titles are issued.
- Special attention should be paid to improving land rights for women who are not legally married.
- Ensuring that beneficiaries are knowledgeable about their rights is critical.

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HOW IT WORKED

1. SETTING THE PRECONDITIONS

- The legal preconditions for the LTR program were established by Rwanda's 1999 inheritance law and its 2005 organic land law which aimed to eliminate gender discrimination in land access and to establish a single statutory system of land tenure to replace the former dual customary/formal tenure system.

2. PILOTING THE APPROACH

- The government decided to start with a pilot due to the dearth of previous successful programs from which to learn lessons and the need to fine-tune the approach to the specific needs of different parts of the country.

3. IMPLEMENTING THE PROGRAM

- The program employed local para-surveyors to identify land parcel boundaries and to record these boundaries with aerial photos and claim-receipts signed by all adjoining neighbors. To ensure transparency, these activities were all carried out in the presence of the land owners and all adjoining neighbors.
- Parcel details were transferred to a public register (hard and digital copies).
- Parcels were formally registered as eligible for a formal land certificate if no objections were raised within 2 weeks of the information being made publicly available.

4. EVALUATING THE IMPACT

- Using an impact evaluation to generate rigorous evidence was critical given the lack of previous successful programs from which lessons could be drawn. These lessons were then used by the government as they rolled out the program nationally.
- The impact evaluation compared changes in administrative regions that received the program with changes in those that did not.

What Else You Need to Know About Land Titling

The following section highlights the results of recent impact evaluations. Along with other research (see page 20), these studies suggest the following implications for policy-makers:

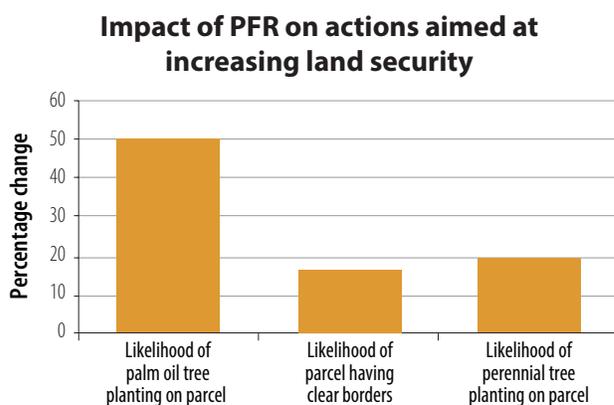
- In mapping land claims, employ a transparent and participatory process – formalization programs can be exploited by the strong and politically connected.
- Land titling cannot be a complete solution in the absence of other policy features, such as a functioning credit market and an enabling regulatory framework for land registration.

- Local context matters – formal titling is not always the key and it may sometimes be better and more cost-effective to work within the customary framework.
- Perceived and de facto tenure security may be more important than formal de jure security. However, some long-term investments (like letting land lie fallow) may require more formal security.
- Information technology can be used to reduce the costs of registering transactions (for owners) and accessing borrower information (for lenders).
- Rural land titling:
 - Land titling programs may cause an initial increase in perceived insecurity as claims to land parcels are publicly discussed and verified.
 - While increased rural tenure security may allow greater investment in land, the relationship may also run the other way, with farmers making certain investments in order to increase their claims to the land.
- Urban land titling:
 - Encourages investment in residential infrastructure.
 - Allows owners to engage in more work outside of (and further from) the home by transferring the responsibility for protecting their land to the state.
 - Can reduce poverty in the long term through increased human and physical capital investment.

The Plan Foncier Rural (PFR) in Benin enabled producers to formalize the security of rights obtained under customary arrangements in rural areas. The government-implemented program included: (1) awareness raising; (2) a socio-legal survey of land claims; (3) mapping of rights for each land parcel; (3) a public review which provided the opportunity for any claims to be contested; (4) final validation of claims upon no-objection; and (5) the delivery of final land use certificates.

The World Bank conducted an impact evaluation which tested the short-run impact of the program (i.e., prior to the final issuance of land use certificates). Key results from the evaluation include:

- A 4 percentage point increase in perceived tenure insecurity, which is perhaps to be expected in the short term with increased attention on potentially competing land claims
- A significant reduction in land conflicts for land controlled by female-headed households
- Increased land investments such as a 17 percent increase in the likelihood of a parcel having clear borders and a 20 percent increase in overall perennial tree planting, including a 50 percent increase in oil palm planting
- An increase in women's short-term investment in land, but mixed signs on empowerment:
 - A slight shift in male land managers' inheritance plans away from sons and towards daughters
 - An 18 percent increase in women having a say in household land decisions
 - A 47 percent increase in the use of fertilizer on female-managed plots
 - An 11 percent increase in women reporting no spousal conflict over the past 12 months
 - A reduction in the share of female household heads with a position of responsibility in village land management, despite an overall 150 percent increase across all households



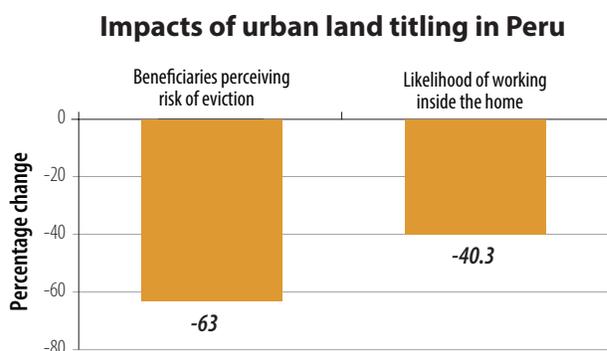
Overall, given that the program’s short-term impact included increased perceived land insecurity, the identification of long-term investments in land may suggest that owners’ invest in their land in order to increase tenure security – though this does not preclude the possibility that increased tenure security may also encourage certain types of long-term investment.

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Between 1996 and 2003, ***an urban land titling program implemented by the Peruvian government*** radically reduced the length and cost of the land title acquisition process. Erica Field conducted an impact evaluation of the program, finding significant positive impacts on employment hours and employment outside of the home, and negative impacts on child labor. These impacts resulted from increased tenure security, which allowed households to shift the role of property protection from the household and community members to the state.

Specific highlights of the evaluation results include:

- Recent titling beneficiaries reported the same perceived risk of eviction as citizens who had titles before the program, which is one third of the risk reported by squatters yet to benefit from titling
- An increase of 12.2 hours of employment per week per household 2 years after receiving a formal title, increasing to 32 hours after 4 years
- The vast majority of additional employment hours are accounted for by men. The increase for women is insignificant.
- A 40.3 percent drop in the likelihood of working inside the home.
- A 4 percentage point increase in the proportion of households that include a worker who commutes more than 2 hours each way.
- A four-hour per week reduction in child labor for households with fewer than four working-age members.
- A cost-benefit analysis suggests that the increase in employment income would far exceed the relatively low cost of the intervention: \$66 per title (20% of which was recovered from user fees) and minimal additional costs to main the property registry.



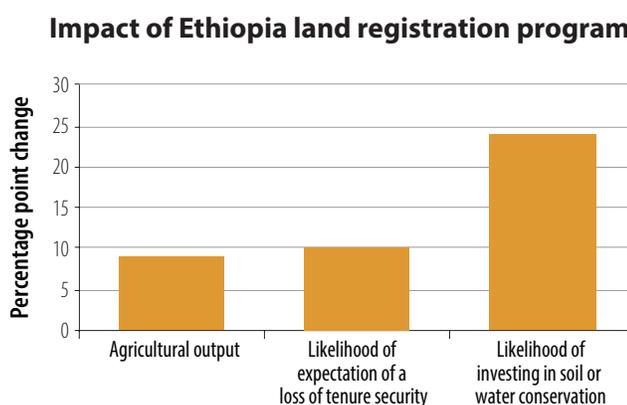
Overall, the results of the evaluation suggest that land titling can be a cost-effective policy in an urban setting, allowing households to devote more efforts to productive activities outside of the home.

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A **World Bank study in Ethiopia (Deininger, Ali, and Alemu, 2011)** found **significant short-term impacts of a government-implemented land registration program** on tenure security, land-related investment, and rental market participation. The Government of Ethiopia officially owns all land, so the program provided farmers with non-alienable use-right certificates, rather than full titles. The intervention started with an information campaign, to increase awareness of the program among targeted beneficiaries. The program then used a participatory community approach to identify land parcels and displayed mapping decisions in public, providing community members with an opportunity to contest any decisions before they were officially recorded. The program was innovative in that it provided for joint land ownership by spouses, thus addressing the issue of gender equality.

Some key results of the program include:

- A 10 percentage point decrease in fear of loss of land
- A 20-30 percentage point increase in propensity to invest in soil or water conservation
- An increase in agricultural output of 9 percentage points (\$5.80-\$9/hectare)
- A 9 percentage point increase in the propensity to rent out land
- Impacts do not appear to vary by wealth or gender



Significantly, the costs of implementing the program - \$1 per parcel - were not only low relative to the \$20 to \$60 per plot incurred by many previous titling projects, but were also lower than the increased output of \$5.80-\$9 per hectare. Significantly, over 80% of participating households indicated that they would be willing to cover these costs, suggesting that the program could be highly sustainable.

The analysis generates some interesting policy implications:

- Increased tenure security can lead to increased investments that are related to greater productivity
- Given the significant benefits, low implementation costs, and the willingness of participants to cover implementation costs, the program could inform a viable, sustainable approach for some African governments.

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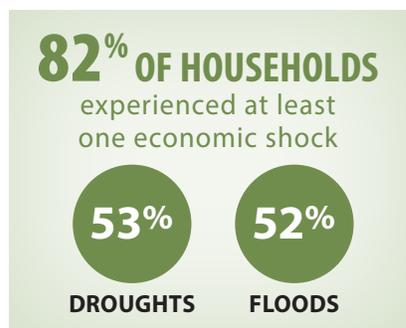
BASELINE IN ACTION

WHAT'S IN A BASELINE?

Baseline surveys provide immediate insights for policy action

The Government of Ethiopia is currently implementing the World Bank-financed **Ethiopian Nile Irrigation and Drainage Project**. The project aims to support agricultural income growth and to mitigate the risks posed by climate variability through investments in expanded and improved irrigation.

A key element of the World Bank's impact evaluation of the project was a baseline survey of 4,000 households in the Ribb and the Megech project areas. The survey was not only critical from a purely statistical point of view; it was also important in its own right and was instrumental in convincing the government to pilot strategies for improving women's access to and take-up of new agricultural technologies.



First, the results of the survey confirmed the need for the project: 82% of households experienced at least one economic shock

in the previous year and the most common shocks were droughts (53%) and floods (52%).

Second, the survey influenced government policy right away by shining a light on some important gender disparities. Female-headed households were only half as likely as male-headed households to have access to extension services, with a consistent gender gap across all areas of advice. While 45% of all households accessed any extension services, only 29% of female members had accessed any services, and the figures for male and female-headed households were 49% and 25%. The survey also provided insight into why women have lower access to extension services: Female household members above age 12 allocated around 600% more time than men to cleaning and childcare!

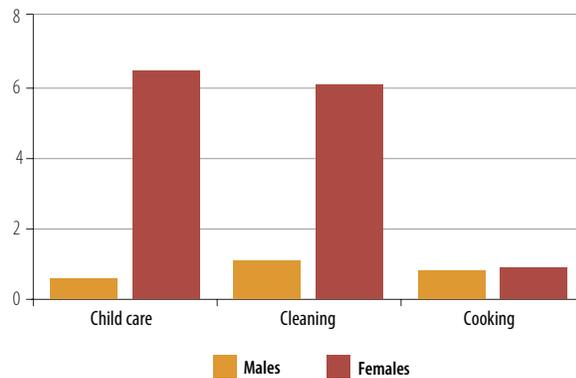
WHY DO A BASELINE?

A baseline survey is a key component of a rigorous impact evaluation, as it allows the evaluation team to measure key indicators before the project is delivered. They can then verify that treatment and comparison groups are sufficiently similar, so the evaluation team can ensure that changes observed after the project can be attributed to project activities.

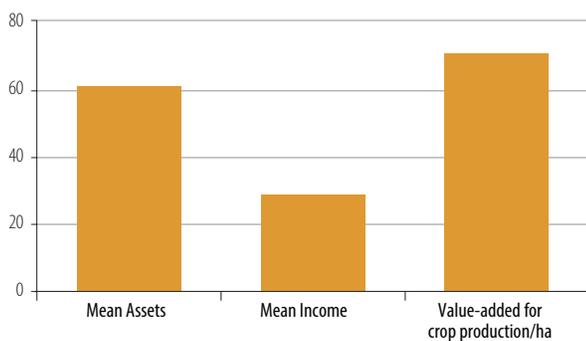
Conducting a baseline survey has a number of other advantages: The results of a baseline survey can be used to (1) ensure that the project is going to reach the intended beneficiaries; (2) test whether the project has differential impacts on sub-groups with different initial conditions (such rich versus poor); (3) increase the certainty of estimates if the treatment and control groups are small; (4) provide crucial data for policy decision making before the project even starts.

Not surprisingly, given their lower access to extension services and greater time poverty, the survey showed that female headed-households lag male headed-households with regard to technology adoption, agricultural yields, assets, and income. Despite growing broadly similar crops, the ratio of female-headed households to male-headed households for net value added in production per hectare, value of assets owned, and income are only 70%, 60%, and 30%.

Mean hours per week (for household members aged 12 and above)



Ratios of values for female headed households vs. male headed households



As a result of the analysis of the baseline data, the government agreed to pilot strategies for improving women’s access to and take-up of new agricultural technologies. These strategies include gender quotas for the selection of lead farmers (combined with social incentives for those selected), and the introduction of a farmer-based monitoring system for extension workers. These approaches will be piloted in 2014, with plans to scale up the most successful ones.

FINDING WHAT YOU NEED

RESEARCH-TO-OPERATIONS DICTIONARY

Agricultural Extension

If you want information on this...	...then take a look at these references below					
The relative importance of extension versus social learning for technology adoption	1	4	9			
The relative importance of extension versus social learning for technology adoption	11					
Social learning and technology adoption	3	5	12	13	14	18
Risk and technology adoption	7	10				
Promoting export production	1					
Improving health and infrastructure to promote productivity	6					
The relative importance of traditional inputs versus extension for productivity	2					
Targeting incentives for increased input use	8					
The differences in impacts of agricultural extension for more vs. less productive and richer vs. poorer farmers	1	9	12	17		

References

1

Ashraf, N., X. Giné, and D. Karlan. (2009). "Finding missing markets (and a disturbing epilogue): Evidence from an export crop adoption and marketing intervention in Kenya." *American Journal of Agricultural Economics* 91(4): pp. 973-990.

- The project brought an increase in the production of export crops and farmer income.
- Middle-income farmers more likely to participate than high or low income farmers.
- First-time growers of export crops more likely to benefit.
- Offering credit along with other services increases participation, but not benefits.
- Take away: Export promotion programs can have significant benefits and should focus on middle-income farmers who have not previously grown export crops.

2

Asrat, S., G. Berhane, G. Getachew, J. Hoddinott, F. Nisrane, and A. S. Taffesse. 2011. "Sources of Inefficiency and Growth in Agricultural Output in Subsistence Agriculture: A Stochastic Frontier Analysis". Working paper, Development Strategy and Governance Division, International Food Policy Research Institute Ethiopia Strategy Support Program II (ESSP II).

- increase in output over the study period was mostly attributable to the increased use of traditional inputs (rain, area and quality of land, labor/human capital, cattle/hoes).
- Fertilizer use and participation in the extension program contributed the least to output increases.
- Take away: There should be sufficient focus on ensuring that the specific extension services provided are those most useful to farmers.

3

Bandiera, O., and I. Rasul. 2006. "Social Networks and Technology Adoption in Northern Mozambique". *Economic Journal* 116: pp. 869–902.

- There is a U-shaped relationship between adoption of a new technology by an individual and adoption by that individual's social network, which suggests an incentive to delay adoption and free ride on the knowledge acquired by others when a large portion of one's social network adopts a new technology.
- Take away: Encouraging too many farmers to adopt a new technology may reduce the incentives for remaining farmers in the same social networks to quickly adopt that technology.

4

Buehren, N., Goldstein, M., Ketema, T., Molina, E., and Teklu, A., forthcoming. "Agricultural Extension in Ethiopia The Evaluation of the Rural Capacity Building Project".

- Take away: Cost-effective and environmentally sustainable approaches can significantly improve agricultural activity, even without a reduction in farmer contact with extension agents

5

Conley, T., and C. Udry. 2010. "Learning about a New Technology: Pineapple in Ghana". *American Economic Review* 100: pp. 35–69.

- Farmers are more responsive to the success or failure of their "information neighbors" when they are novices to a particular crop, if their information neighbor is more experienced, and if their information neighbor has a wealth level similar to their own.
- Farmers may consider information availability when forming information neighbor relationships.
- Take away: Social learning is an important channel for technology adoption, so policy-makers should

6

Croppenstedt, A., Demeke, M. and Meschi, M. 2003. "Technology adoption in the presence of constraints: The case of fertilizer demand in Ethiopia." *Review of Development Economics* 7: pp. 58-70.

- The most critical factors for improving the likelihood and intensity of fertilizer use are access to credit, household size, formal education, and the value-to-cost ratio.
- Removing subsidies implies a 24 percent reduction in the demand for fertilizer.
- Take away: Government investment in health sector infrastructure could contribute to smallholder productivity, as the availability of labor is an important determinant of fertilizer use in Ethiopia, while fertilizer subsidies could also be a useful policy option.

7

Dercon, S., and L. Christiaensen. 2011. Consumption Risk, Technology Adoption and Poverty Traps: Evidence from Ethiopia. *Journal of Development Economics* 96: 159–173.

- Use of fertilizer entails a downside risk: when harvests are low, the high costs of fertilizer result in lower returns than if it had not been used.
- As a consequence of this risk, poor farmers use less fertilizer than they otherwise would: 16 percent more fertilizer per hectare is used when predicted consumption is increased by one standard deviation.
- Take away: Policies aimed at mitigating risks for poor farmers (e.g. insurance or drought resistant varieties) could increase the use of productive inputs

8

Duflo, E., M. Kremer, and J. Robinson. 2011. "Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya". *American Economic Review* 101: pp. 2350–2390.

- Small time-limited discounts on fertilizer offer a higher-welfare solution to low fertilizer use than laissez faire or heavy subsidies.
- The problem of over-use and high fiscal costs of subsidies could be mitigated by limiting the quantity of subsidized fertilizer available to each farmer.
- Take away: using smart incentives that are well-timed to the behavior of different farmers is essential in ensuring that any input subsidies are as welfare-enhancing as possible.

9

Evenson, R., and G. Mwabu. 2001. "The Effect of Agricultural Extension on Farm Yields in Kenya". *African Development Review* 13: pp. 1–23.

- Productivity gains are greater for farmers with higher yields, suggesting that extension services may enhance unobserved attributes, such as management skills.
- Distance to market centers reduced farm yields, with the high transaction costs reducing farmers' ability to buy productive inputs, such as fertilizer.
- Take away: Policy-makers should ensure that extension services are appropriately designed for different farmers, including those with low yields.

10

Ghadim, A., Pannell, D. and Burton, M. 2005. "Risk, Uncertainty, and Learning in Adoption of Crop innovation". *Agricultural Economics* 33, pp. 1-9.

- Perception of risk and attitude towards risk both play an important role in determining technology adoption
- Take away: Learning plays a critical role in technology adoption by reducing farmers' perceived and actual risk.

11

Krishnan, P. and Patnam, M. 2013. "Neighbors and Extension Agents in Ethiopia: Who Matters More for Technology Adoption?" *American Journal of Agricultural Economics*

- The impact on fertilizer and improved seed adoption of learning from neighbors was three times that of additional extension visits.
- Between 1999-2009, the impact of additional extension visits on seed adoption shrunk massively: Extension services are mainly useful in the early stages of adoption.
- Take away: The focus of the government on targeting extension services more specifically to the context of different farmers and to target farmers' closest spatial neighbors is appropriate.

12

McNiven, S. and Gilligan, D. 2012. "Networks and Constraints on the Diffusion of a Biofortified Agricultural Technology: Evidence from a Partial Population Experiment," *University of California Davis, Working Paper.*

- Non-beneficiaries of the project with just a few treated information neighbors are more likely to give up the technology after trying it than those with many treated information neighbors.
- Treated neighbors relieved information constraints primarily on non-members with above average potential productivity
- Offering a new crop to many households in a few communities is preferable to offering it to fewer households in many communities.
- Take away: Extension programs will maximize impact if they target households with many neighbors – especially those with high potential OSP productivity.

13

Moser, C., and C. Barrett. 2006. "The Complex Dynamics of Smallholder Technology Adoption: The Case of Sri in Madagascar". *Agricultural Economics* 35: pp. 373– 388.

- Highly seasonal labor and income patterns of poorer households reduce their adoption of System of Rice Intensification (a common system for increasing yields), though they benefit from opportunities for employment/lower food costs that result from the use of SRI on larger farms.
- The larger the area of land used in the first year of adoption, the more productive the technique and the greater likelihood of continued adoption.
- Take away: Learning from others is a significant factor in the likelihood of SRI adoption and disadoption.

14

Munshi, K. 2004. "Social learning in a heterogeneous population: Technology diffusion in the Indian Green Revolution." *Journal of Development Economics*, 73(1), pp 185-215

- The weaker social learning of rice farmers is explained by their greater heterogeneity in growing conditions and the greater sensitivity of rice to unobserved farm characteristics.
- Take away: It may be advisable to invest more in concentrated external information programs in a context where social learning is less likely.

15

Shiferaw, B., Kebede, T. and You, L. 2008. "Technology Adoption under Seed Access Constraints and the Economic Impacts of Improved Pigeonpea Varieties in Tanzania". *Agricultural Economics* 39, pp. 309-329.

- Inadequate local supply of seed and agronomic information about the new varieties reduces the likelihood of adoption of disease resistant pigeonpea. Participation in informal seed networks and the participation of women in farming decisions increase the likelihood of adoption.
- Take away: To increase adoption of disease-resistant varieties, programs should strengthen rural institutions in semi-arid areas to overcome seed market failures, and use awareness campaigns to spread information about benefits.

16

Spielman, D., D. Kelemwork, and D. Alemu. 2011. "Seed, Fertilizer, and Agricultural Extension in Ethiopia". *Working paper, Ethiopia Strategy Support Program II (ESSP II), Addis Ababa, Ethiopia.*

- This paper summarizes lessons on policies relating to seed, fertilizer, and extension services.
- Take away: While government intervention is necessary where smallholders have poor access to markets and information and weak purchasing power, longer-term strategies to promote a dynamic private sector are necessary and should allow for greater flexibility in the provision of inputs and more choice for smallholders

17

Suri, T. 2011. "Selection and Comparative Advantage in Technology Adoption". *Econometrica* 79: pp. 159–209.

- Farmers with lower net returns to hybrid maize are less likely to adopt.
- Take away: The group with the highest estimated gross returns to hybrid maize do not adopt because of high costs related to inadequate infrastructure. These farmers would benefit from targeted distribution of inputs and infrastructure improvements, while those with lower gains could benefit from research and development to develop new hybrid strains.

18

Yishay, A. and Mobarak, A. 2013. "Communicating with Farmers through Social Networks", *Yale University Economic Growth Center Discussion Paper No. 1030, Yale Economics Department Working Paper No. 121*

- Access to information is a crucial barrier to technological adoption in agriculture
- When provided with incentives, peer farmers who are more similar to the average farmer in a community are able to more effectively pass on information than lead farmers who may have less in common with the average farmer.
- Take away: leveraging the social networks of peer farmers could prove a cost-effective way of radically expanding extension coverage and effectiveness.

Land Titling

If you want information on this...	...then take a look at these references below															
The impact of tenure security on investments	1	3	6	7	8	9	10	13	14	17	18	19	20	21	23	
The impact of tenure security on productivity	5	8	13	20	21											
The impact of tenure security on sales/rental market activity	3	10	12	22												
The gender dimensions of land tenure security	1	2	15	18												
The ecological implications of tenure interventions	1	23														
Differences in land tenure and its impacts for poorer/wealthier and more/less politically powerful farmers	3	7	18	23												
Choosing between formal tenure and working with customary systems and the importance of de facto versus de jure security	4	5	7	9	20	24										
The direction of the relationship between investments and tenure security	6	7	14													
The impact of tenure security on access to credit	11	12	17													
The impact of tenure security on human development	16	17	25													
The cost-benefit ratio of tenure security initiatives	10	11	15	20												
The importance of the broader policy environment beyond land tenure	13															
The impacts of urban land titling interventions	15															

References

1

Ali, D. A., Deininger, K., & Goldstein, M. 2011. "Environmental and gender impacts of land tenure regularization in Africa: pilot evidence from Rwanda". World Bank Policy Research Working Paper 5765.

- Special attention should be paid to improving land rights for women who are not legally married.
- Ensuring that beneficiaries are knowledgeable about their rights is critical.
- Take away: Land tenure reform can effectively increase investment in land, even before land titles are issued.

2

Allendorf, K. 2007. "Do Women's Land Rights Promote Empowerment and Child Health in Nepal?" World Development Vol. 35, No. 11, pp. 1975–1988

- Women's land ownership increases their likelihood of having the final say in household decisions (a measure of empowerment) and reduces the chances of their children being severely underweight.
- Take away: Women's land ownership appears to be as effective a tool of their empowerment as both education and employment, which have received much more attention from policy makers so far.

3

Bandiera, O. 2007. "Land Tenure, Investment Incentives, and the Choice of Techniques: Evidence from Nicaragua". The World Bank Economic Review 21 (3): pp. 487-508

- Ownership and long-term tenant contracts make profitable long-term investments in land more likely.
- But these were only more likely for wealthier land owners, while poor tenants and poor land owners were equally unlikely to invest in trees.
- Take away: Different approaches to land tenure security and incentives for land

4

Barnes, G., and Griffith-Charles, C. 2007. "Assessing the Formal Land Market and Deformalization of Property in St Lucia." Land Use Policy 24(2):494–501.

- The project led to an initial increase in land sales and registered mortgages; however, this process of registration was not sustained and only 26 percent of provisional titles were converted to absolute titles in the 17 years since the project, suggesting land owners do not perceive sufficient benefits.
- Take away: Individualized formalization may not make sense in contexts where communal tenure systems endure.

5

Bellemare, M. 2013. "The Productivity Impacts of Formal and Informal Land Rights: Evidence from Madagascar". Land Economics 89 (2): PP. 272-290.

- Formal land rights (land titles) have no impact on productivity, but some informal rights are important.
- The role of formal land titles is less important in former French colonies compared to former British colonies, which had more success replacing customary systems.
- Take away: If the formal land tenure system is weak, it may be necessary to focus on first improving the legal and policy framework, rather than merely on increasing the use of formal land titles.

6 **Bresley, T. (1995), "Property Rights and Investment Incentives: Theory and Evidence from Ghana". *Journal of Political Economy*, pp. 903-937.**

- Stronger land rights appear to increase investment in trees.
- In some places, however, investments in land may actually lead to a higher perceived right to the land.
- Take away: The relationship between land rights and investment may vary significantly across contexts, even within a country.

7 **Brasselle, A., Gaspart, F. and Platteau, J. 2002. "Land tenure security and investment incentives: puzzling evidence from Burkina Faso". *Journal of Development Economics*, 67(2), pp. 373-418.**

- Land rights are endogenous: certain investments in land increase land tenure security.
- Greater initial land area owned leads to greater tenure security, suggesting that tenure security is impacted by the social status of the owner.
- Take away: Basic use rights are enough to encourage investment, so the basic informal order present in many villages may be sufficient in some contexts.

8 **Chand, S. and Yala, C. 2009. "Land Tenure and Productivity: Farm-Level Evidence from Papua New Guinea". *Land Economics*, 85(3), 442-453.**

- Among tenure systems that better allow scale-up of farms and systems, those that do not include income-sharing arrangements are associated with higher productivity.
- Take away: In order to maximize productivity, land tenure systems should allow for farms to operate at an efficient scale and should ensure that systems do not provide a disincentive to investment through the sharing of farming proceeds.

9 **Deininger, K. and Ali, D. 2008. "Do Overlapping Land Rights Reduce Agricultural Investment? Evidence from Uganda". *American Journal of Agricultural Economics*, 90(4), pp. 869-882**

- Full ownership of land brings large positive and statistically significant impacts on investment.
- Land registration alone does not have an impact on investment.
- The investment impact of legally recognizing occupancy equals only 50-60 percent the impact of granting full ownership.
- Take away: In some contexts, recognition short of ownership delivers far from the same level of benefits.

10 **Deininger, K., Ali, D. A., & Alemu, T. 2011. "Impacts of land certification on tenure security, investment, and land market participation: evidence from Ethiopia". *Land Economics*, 87(2), pp. 312-334.**

- The government-implemented land registration program had significant short-term impacts on tenure security, land-related investment, and rental market participation.
- Take away: Given the significant benefits, low implementation costs, and the willingness of participants to cover implementation costs, the program could inform a viable, sustainable approach for some African governments.

11

Deininger, K. and Goyal, A. 2009. "Going Digital: Computerized Land Registration and Credit Access in India". World Bank Policy Research Paper, No. 5244.

- The computerization of land registry systems across Andhra Pradesh reduced the cost to owners of registering transactions and the cost to lenders of accessing information.
- There was no impact on credit in rural areas but increased credit supply in urban areas.
- Take away: Impacts on credit access depend on the quality of the underlying information, and the degree to which agents are credit constrained and have sufficient illiquid wealth

12

Do, Q. T. and L. Iyer. 2008. "Land Titling and Rural Transition in Vietnam." Economic Development and Cultural Change 56 (3): pp. 531-79.

- Vietnam's 1993 Land Law gave households the right to exchange, transfer, lease, inherit, and mortgage their land use rights.
- Take away: The law liberalizing land use significantly increased the area of land devoted to long-term crops and the amount of labor devoted to non-farm activities, but had no impact on access to credit markets or land market participation.

13

Feder, G., and A. Nishio. 1999. "The Benefits of Land Registration and Titling: Economic and Social Perspectives." Land Use Policy 15(1): pp. 143-69.

- Further research is needed on the equity implications of titling, impacts on land market activity, conflict between modern and customary rights, and the costs of alternative land registration systems
- Take away: Land titling cannot be a complete solution in the absence of other policy features, such as a functioning credit market and an enabling regulatory framework for land registration.

14

Fenske, J. 2011. "Land tenure and investment incentives: Evidence from West Africa." Journal of Development Economics 95 (1): pp. 137-56.

- A review of data from across West Africa shows that while land rights are often enough to encourage investment, the strength of these rights is conditional on use, with land left fallow being vulnerable.
- Tree planting can enhance tenure security but can be affected by the nature of tenure.
- Take away: Short-term investments such as labor and fertilizer are not affected by land rights, so if African agriculture becomes more input-intensive, tenure security will be less important.

15

Field, E. 2007. "Entitled to work: Urban property rights and labor supply in Peru". The Quarterly Journal of Economics, 122(4), pp. 1561-1602.

- An urban land titling program implemented by the Peruvian government radically reduced the length and cost of the land title acquisition process.
- Increased tenure security, allowed households to shift the role of property protection from household and community members to the state.
- Take away: Land titling can be a cost-effective policy in an urban setting, allowing households to devote more efforts to productive activities outside of the home.

16

Galiani, S., and E. Schargrotsky. 2004. "Effects of Land Titling on Child Health." *Economics and Human Biology* 2(3): pp. 353–72.

- In urban Argentina, titling resulted in better short-run health for children, but there is no significant impact on longer-term health indicators, such as height-for-age.
- Take away: Land titling programs should not replace more direct policies for improving child health.

17

Galiani, S. and E. Schargrotsky. 2010. "Property rights for the poor: Effects of land titling." *Journal of Public Economics* 94 (9-10): pp. 700-29.

- Land titling in urban Argentina had, twenty years later, a modest impact on access to mortgage credit and no impact on access to other forms of credit.
- Significant positive impacts on household investment and education of children and a negative impact on household size.
- Take away: Urban land titling can reduce poverty in the long term through increased human and physical capital investment, but is unlikely to be an effective tool to combat poverty in the short-term through access to credit.

18

Goldstein, M. and Udry, C. 2008. "The Profits of Power: Land Rights and Agricultural Investment in Ghana". *Journal of Political Economy*, 116(6), pp. 981-1022.

- Security of tenure depends on a farmer's position in the local political hierarchy.
- Take away 1: Having more secure land rights allows farmers to take the risk of leaving land fallow for longer periods, which is found to be the most important investment in land quality.
- Take away 2: Men's greater political power and consequently more secure land rights enable them to leave land fallow for longer, making them more profitable than women.

19

Jacoby, H. G., G. Li and S. Rozelle. 2002. "Hazards of Expropriation: Tenure Insecurity and Investment in Rural China." *American Economic Review* 92 (5): pp. 1420-47.

- The Chinese system involves local leaders periodically reallocating collectively held land among households in the same village.
- This study finds that higher expropriation risk has a significant negative impact on use of organic fertilizer, depriving soil of the lasting benefits from organic fertilizer.
- Take away: Risk of expropriation reduces the likelihood of long-term soil conservation.

20

Jacoby, H., and B. Minten. 2007. "Is Land Titling in Sub-Saharan Africa Cost Effective? Evidence from Madagascar." *World Bank Economic Review* 21(3): pp. 461–85.

- Land titling had no significant impact on land-related investment and only modest impacts on land productivity and values.
- The existing customary tenure system appears to provide sufficient security.
- The cost of a title would need to fall by a factor of six for it to make economic sense.
- Take away: Formal titling may not be a good option where customary systems provide sufficient security and land plots are small.

21

Kazianga, H., and W.A. Masters. 2006. "Property Rights, Production Technology, and Deforestation: Cocoa in Cameroon." *Agricultural Economics* 35(1): pp. 19–26.

- Improved tenure security over cocoa fields with existing traditional varieties of cocoa increases farmers' welfare, but at the cost of additional deforestation. When improved tenure security is combined with a new, faster-maturing cocoa variety, the impact is increased welfare and a decline in deforestation.
- Take away: in addition to looking at land investments and farmer welfare, land tenure programs should consider potential ecological impacts.

22

Macours, K., A. de Janvry, and E. Sadoulet. 2010. "Insecurity of Property Rights and Social Matching in the Tenancy Market." *European Economic Review* 54(7): pp. 880-899.

- Insecure property rights in the Dominican Republic reduce land rental market activity and increase market segmentation.
- Take away: Simulations suggest that more secure property rights could increase the total area rented to the poor by 63 percent, with most of this gain coming from reducing land conflicts and increasing land protection rather than through formal titling.

23

Meinzen-Dick, R., and E. Mwangi. 2009. "Cutting the Web of Interests: Pitfalls of Formalizing Property Rights." *Land Use Policy* 26(1): pp. 36–43.

- Case studies in Kenya show that the formalization of land rights can benefit the powerful and socially connected and disadvantage those with less wealth and political power, such as women.
- Take away: It is critical to understand the local context and to think through the likely winners and losers of particular formalization programs.

24

Van Gelder, J. 2012. "Then I'll Huff, and I'll Puff, and I'll . . . : A Natural Experiment on Property Titling, Housing Improvement and the Psychology of Tenure Security", *International Journal of Urban and Regional Research*, 37 (2)

- Those who received the land titles in Buenos Aires, Argentina, invested significantly more, despite both groups having high de facto security.
- Take away: the translation of tenure security into behavioral consequences comes via its impact on the perception of security.

25

Vogl, T.S. 2007. "Urban Land Rights and Child Nutritional Status in Peru, 2004." *Economics and Human Biology* 5(2): pp. 302–21.

- More secure rights increase the incidence of obesity, thus weight gain impacts may not signal positive nutritional impact.
- Take away: More secure urban property rights lead to an increase in children's weight, but not in their height which is considered to be an indicator of long-term nutritional impact.

EXPERTISE

IMPACT EVALUATION EXPERTS IN THE AFRICA REGION

Within the World Bank, there are a wide range of experts leading impact evaluations of agriculture and land interventions in Sub-Saharan Africa. Some of these experts sit in the Bank's Africa department, while others work in the research group or provide support from other regions. Below we highlight some of these experts and the countries in which they are leading impact evaluation work.



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