BASIS BRIEF

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DISSEMINATING INNOVATIVE RESOURCES AND TECHNOLOGIES TO SMALLHOLDERS IN GHANA

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CHRONIC UNDERINVESTMENT AND LOW YIELDS

Roughly half the 25,000,000 people living in Ghana are formally or informally engaged in agriculture, with agriculture accounting for over 30 percent of GDP. In Ghana's Northern Region, smallholder farmers cultivate rainfed crops, face significant risk of weather shocks, under-invest in input technologies, achieve just a fraction of potential yields, maintain limited liquid savings and may be food insecure. These farmers chronically under-invest in productive agricultural technologies, including fertilizer, high-yield seeds and farming equipment. Recent work estimates that total crop yields achieve only 30 percent of their potential.

Research has shown that intensified application of fertilizer is highly profitable, yet most farmers in northern Ghana apply low levels of inputs per acre. Smallholder farmers face significant obstacles to increasing their use of productive inputs, including vulnerability to risk, inadequate knowledge, and lack of timely access to inputs. In recognition of these constraints, additional research began in 2008 to investigate the impact of risk mitigating rainfall index insurance on farm investment. This research has also shown a dramatic response of farm investment to rainfall index insurance, in the form of increased cultivation, land preparation, chemical input purchases and household labor. However, most farmers expanded the scale of their production rather than increasing the intensity of cultivation or investing in productive technologies (such as high-yield seeds or farming equipment). Furthermore, while there is strong demand for rainfall index insurance (more than two-thirds of farmers purchased insurance at actuarially-fair prices), no evidence of technological transformation, intensification or high returns to these additional investments was found. In other words, increased investment did not lead to higher farm profits.

Why aren't smallholder farmers adopting intensified cultiva-

KEY POINTS

Researchers hypothesize that insurance allows smallholder farmers to increase farm investment, and that complementary extension services and input technology access will permit these farmers to adopt intensified cultivation practices and thus improve production and profitability.

From January 2014 to December 2015 DIRTS will implement and evaluate three innovative, potentially scalable programs:

(1) improved information flows through Community Extension Agents with support from mobile phone-based extension applications,

(2) improved-yield input technology packages at varying prices and,

(3) commercial drought index insurance.

tion practices and risk management tools and what can be done to encourage take up? In a country dependent on agricultural production, it is imperative to understand economic barriers to input intensification, higher agricultural production, farm employment income, and household consumption and resilience. The Disseminating Innovative Resources and Technologies to Smallholders (DIRTS) project seeks to understand the barriers that stand between these farmers and more profitable investments. The DIRTS project hypothesizes that insurance allows smallholder farmers to increase farm investment, and that complementary extension services and input technology access will permit these farmers to adopt intensified cultivation practices and thus improve production and per-acre profitability.

ADDRESSING OBSTACLES TO PROFITABILITY

The DIRTS project focuses on three major obstacles to increased profitability amongst subsistence farmers in sub-Saharan Africa: lack of knowledge; input availability and cost; and excessive risk. From January 2014 to December 2015 DIRTS will implement and evaluate three innovative, potentially scalable programs: (1) improved information flows through Community Extension Agents with support from Android-based extension applications, (2) improved-yield input technology packages at varying prices and, (3) commercial drought index insurance.

The extension program

Communities receiving the intensive monitoring and extension treatment will be visited for interactive, group-level trainings on farming best practices conducted by Ghana Ministry of Food and Agriculture (MoFA)- employed agricultural extension agents (AEAs). This is standard practice for communities receiving extension services from MoFA. Additional Community Extension Agents (CEAs) will be trained to supplement AEA training using Android phone extension applications and undertake farmer monitoring responsibilities. CEAs will be community residents and compensated per farmer interaction. CEAs will visit randomly selected farmers weekly to provide supplementary assistance or trainings on field selection, land clearing and preparation, creation and application of organic matter, seed varieties, planting methodology, application of organic and inorganic fertilizers, weeding and field maintenance. Together, the AEAs and CEAs will provide a full package of training, including advice on optimal timing of key farming activities in the growing season. AEAs, CEAs and MoFA and DIRTS staff will also be connected by an innovative, two-way messaging application using both SMS and data channels.

Input availability and cost

Prior to land preparation, randomly selected communities will receive an opportunity to purchase commercial inorganic fertilizers and improved maize seed that will be delivered to farmers ahead of planting time. During the pilot study it was observed that farmers who received fertilizer preferred to invest in the combination of inorganic fertilizer and Obatampa seeds, an improved-yield, open-pollinated, local variety of maize seed. Commercial input supplies have been identified that have the capacity to procure and deliver both fertilizers and seeds on schedule, using Community-Based Marketers, selected and trained with our assistance to collect orders for input delivery. Inputs will be sold at varying prices, randomized at the community level—at two initially low prices, and at increased prices during the second year—to allow investigators to establish a viable demand curve for commercial input technologies and to provide insight into the profit potential for value chain actors in the region. At the first year harvest, when most farmers have cash on hand, farmers will have the option to purchase vouchers for commercial inorganic fertilizer, to be redeemed during land preparation the following year.

Insuring risk

Outside pure control communities, farmers will have the opportunity to purchase rainfall index insurance at individually-randomized prices. This is a commercially viable drought index insurance product, designed by the Ghana Agricultural Insurance Programme (GAIP)

with input from IPA, which is managed by the Ghana Insurers Association. Demand for the GAIP insurance was strong in communities where farmers had experience with the product, but our 2013 pilot experience with the introduction of the GAIP insurance product into new communities found that first-year demand was extremely low. Therefore, the insurance product will be offered to all farmers living in randomly selected DIRTS communities, at either a fair-market premium, or as a free introductory offer of insurance for five acres. Randomly varying the premium at the farmer level (via the introductory offer) will allow investigators to explore how insurance take-up interacts with other treatments. The design will also allow investigators to measure the role of social networking in take-up in year 2.

ASSESSING PROGRAM EFFECTIVENESS

DIRTS will provide an integrated examination of these three barriers to the adoption of highly profitable fertilizer/seed technology by smallholders in Ghana. DIRTS is planning to randomize a total of 3,200 households in 160 communities into one of four treatment groups: (1) 1,000 control households; (2) 1,000 household receiving insurance and intensified extension through CEAs; (3) 600 households receiving insurance and inputs; and (4) 600 households receiving insurance, intensified extension, and inputs. This design will allow investigators to hone in on the specific barriers that stand between insured farmers and increased productivity.

The greatest statistical challenge faced by researchers will be ensuring that they have adequate take-up to be able to estimate the impact of adoption of intensified cultivation practices on farmer profits. Only a fraction of those offered access to insurance, extension, or improved access to inputs will adopt intensified cultivation practices, and it is this fraction that will provide the data we can use to estimate the impact of intensification on profits and welfare.

In order to reach the level of take-up necessary to detect the effects of the package in our sample— and to test the effect of limited value chain reach and high transportation cost on input demand—we will subsidize marketing and delivery costs and vary the prices of fertilizer and seeds to be competitive with market prices. We assume the government will continue to increase the price of inorganic fertilizer by reducing the national subsidy. We expect to offer inorganic fertilizer at GHS 15.00 (below- government-subsidized price) and GHS 21.00 (government-subsidized price) per bag in the first year. Prices will be increased in the second year. Varying prices will allow us to construct a demand curve for fertilizer when access is assured and transportation is inexpensive, a valuable test for private value chain actors and government subsidy decision makers.

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THE DIRTS IMPACT

DIRTS partners have the opportunity to influence agricultural and financial research, policy-making and privatization on a national level. DIRTS will shed light on the costs, benefits, policy implications and potential scalability of innovative policies and programs designed to alleviate roadblocks to smallholder agricultural profitability, including risk, imperfect agricultural markets and agricultural knowledge gaps. Information collected on index insurance demand, extension information and input technologies—as well as the impact on profitability of each—will also help to inform the potential of privatization and/or scale. Evaluation of the CEA program will provide important information to MoFA and private agricultural services on the value of efforts to expand the reach of conventional agricultural extension.

Policy recommendations & program scale-up strategies
At the end of the study, DIRTS will be in a position to

advise local institutions on whether the insurance, extension and/or input technology programs would be more successful under different policy environments and/or are good candidates for scale. MoFA is especially positioned to advocate for policy change or program scale, considering its responsibility to administer both the national extension and fertilizer subsidy programs. GAIP currently engages IPA as an incubation site for potential marketing models, and non-insurance value chain actors may also decide to test whether offering insurance, extension or input technology programs is likely to improve customer agronomic outcomes and their own bottom lines.

Agricultural insurance

IPA was the first institution to market a rainfall index insurance product in Ghana. IPA made continual efforts to disseminate information about demand curves, marketing protocols and program impact, helping fuel an initiative to launch a commercial agricultural insurance industry in Ghana. In 2011 and 2012, IPA Ghana formally partnered with the newly-formed GAIP, the Ghana Insurers Association and the German Development Agency, Deutsche Gesellschaft für Internationale Zusammenarbeit or GIZ, with the intention of influencing insurance industry regulations through research. Consequently, when GAIP launched their first ever pilot drought index insurance product to banks intended to cover aggregate loan portfolios, GAIP asked IPA to market the product directly to the farmers in their study. Through this partnership, IPA has continued to provide information to stakeholders on product performance, basis risk, farmer behavior and demand for a commercially viable product. This partnership will continue with DIRTS. IPA will continue as an incubation site for scale-up models and to provide information on agricultural microinsurance demand and subsidy need.

Input technologies

Farmers may have difficulty procuring inputs due to lack of liquid savings, lack of rural infrastructure and access to value chain input suppliers, and government delays on input subsidies. The study invests in and measures the impact of a well-functioning value chain by marketing and delivering inputs directly to communities, which may be far from roads and input suppliers, at the appropriate time regardless of subsidy announcement timing. As a result, DIRTS will be in a position to disseminate information about input demand, cost-effectiveness and commercial viability to suppliers and distribution channels.

Extension services

DIRTS will also provide information on agricultural knowledge gaps as a roadblock to intensified cultivation practices and improved production and profitability. In the case that community extension services significantly improve farm production, MoFA will be well-positioned to continue building high-quality content and to test CEA program scale up, through its own institution or through a privatized model.

Capacity building

By working with researchers at the Savannah Agricultural Research Institute (SARI) and University of Development Studies (UDS), DIRTS encourages local researchers who are embedded in academic and government institutions to incorporate evidence-based design and technical tools into their own programs. IPA also builds capacity in SARI, UDS and the Ministry of Food and Agriculture to incorporate monitoring and evaluation components into programs.

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The BASIS AMA Innovation Lab is a virtual institute hosted at the University of California Davis comprised of researchers from around the globe that aims to improve the agricultural competitiveness and quality of life of the rural poor in the developing world through policy-relevant research that is dedicated to improving access to resources and enhancing the operation of markets.

For more information, please contact basis@ucdavis.edu.

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