## C. Narrative Description

### 1. The high cost of uninsured risks for smallholder farmers: a recurrent problem and past experience with insurance

Bangladeshi farmers and rural inhabitants are exposed to high production risks due in particular to recurrent floods and droughts (Quisumbing, 2007). They are also exposed to health and disability risks. These **uninsured risks** take a heavy toll on welfare, productivity, income, and asset ownership. They are a main cause of impoverishment when shocks occur and they keep people in chronic poverty due to the high cost of self-insurance (Santos et al., 2011).

With high uninsured production risks, crop insurance should have an important role to play. It is well known that indemnity-based crop insurance has proven to be very difficult if not impossible to implement in smallholder agriculture (Hazell, 1992). For this reason, **index-based weather insurance** has been explored as an appealing risk-transfer instrument (Carter, 2011). It has however proved difficult to promote among farmers due to incomplete coverage of risk (so-called basis risk), high cost due to insurance company loadings, lack of trust in insurance providers, and lack of willingness to insure as a well-known behavioral trait. While some success stories are starting to emerge (Mobarak and Rosenzweig, 2012; Cole et al., 2013; Janzen and Carter, 2014; Karlan et al., 2014) they remain limited and usually associated with high subsidies.

A promising hypothesis is that: (1) Traditional financial products (transfers, savings, and credit) delivered by micro-finance institutions can be adapted to farmers' and rural inhabitants' demands for risk management and risk coping services. For this, financial products need to be made more flexible, without compromising clients' willingness and ability to save and repay loans. Financial products also need to be made contingent on exposure to verifiable health and weather shocks. (2) Financial products and technological innovations can be combined in optimum risk-handling portfolios of instruments corresponding to the specific types of risks and the specific circumstances under which agents operate.

In this project, we propose to explore with our BRAC and IRRI partners in Bangladesh how to design and offer a portfolio of risk-handling instruments to smallholder farmers and rural inhabitants. Lessons will be derived from experimentation with index-based weather insurance under the Basis-I4 project to develop index-based risk-handling savings and credit instruments. Of additional interest is to combine risk-reducing technological innovations (specifically new drought tolerant rice varieties) with risk-handling financial instruments (specifically flexible dedicated savings and indexed contingent pre-approved lines of credit).

### 2. Financial products: financial credit and savings

Access to **flexible lines of credit** provided by microfinance institutions has become increasingly available to clients with high credit scores (Laureti and Hamp, 2011). Examples are BRAC's Good Borrower Loan Program, the SafeSave microfinance institution, and NABARD's Kisan Credit Card in India. Experience with these loans is that they tend to be fully drawn out by those who qualify. This is particularly the case when these lines of credit are offered at comparatively low interest rates (e.g., 7% in the case of the Kisan Credit Card). The Good Borrower Loan Program has similarly been used mainly to obtain flexible top-off loans within on-going loans. It helps borrowers better manage liquidity as an investment project evolves, minimizing the holding of costly idle cash. SafeSave savings have been used for emergencies and lump sum expenditures, but loans have mainly been used for investment projects. In all cases (Good Borrower Loan, SafeSave, and Kisan credit card) repayment rates have been very high, showing convincingly that

flexibility can be achieved without sacrificing discipline in MFI lending. Flexibility has however been used to more accurately manage liquidity needs and enhance repayment capacity rather than as options to face up to uninsured shocks and manage uninsured risks.

To effectively serve as a low-priced shock-coping instrument, access to **flexible credit** should come with conditions attached. The most effective way of doing this is to tie access to a credit line to a **trigger** such as an index for covariate weather shocks or a verifiable event for idiosyncratic shocks such as a medical expenditure. Weather indices that could be used for this purpose have been explored for Bangladesh by Clarke et al. (2012). For drought, they suggested more than 60 consecutive days without rain measured at the nearest weather station. For floods, they suggested 30 or 75 days (depending on location) with river height above a specified threshold. A weather index can also be defined by an area yield index eventually measured through satellite imagery of vegetation density (Carter, 2008). Health triggers can include hospital costs for procedures preapproved by certified doctors. For borrowers with high credit scores, access to emergency contingent credit would thus be triggered by these indexes and events. These indices and events need to be carefully reviewed and calibrated in particular to correspond to the level of covariate risks BRAC is willing to assume without re-insurance.

**Individual savings** held for precaution need to be both motivated and protected from other uses. If individuals were rational and disciplined, they should have no withdrawal restrictions. However, experience has shown that rationality tends not to prevail in decisions to save, and that most people recognize this and seek help to better help themselves (Della Vigna, 2012). As explored by Dupas and Robinson (2013) in Kenya, savings committed to health emergencies can usefully be restricted to verifiable emergency conditions in order to create an incentive not to dis-save for other motives. In their case, earmarking for health emergencies proved desirable to clients in helping them resist unplanned expenditures such as transfers to friends and relatives and spending on luxury goods. For agriculture, dis-saving for emergency conditions can be linked to a weather index. Restrictions on dis-saving can be complemented by incentives to deposit in savings accounts, in particular through availability of dedicated savings accounts for emergency conditions, frequent reminders (as with daily visits of collectors at SafeSave; see below), lotteries with participation proportional to savings deposits (as in several Asian banks; see Laureti and Hamp, 2011), and links to regular payments such as debt servicing (as in Guatemala; see Atkinson et al., 2013). There is in this perspective symmetry and complementarity between savings and credit for the management of risk. Both are committed to predetermined purposes and both are conditional on verifiable events.

As well established in theory (Deaton, 1991), **savings and credit** should be jointly managed for precaution and response to shocks. The optimal pattern of use of the two instruments is however affected by behavioral issues discussed above and by the high differential interest rate on deposits and credit. With the new instruments, savings are accumulated for precaution with no restrictions on withdrawal else than the agreed-upon emergency purpose. When shocks exceed savings, pre-approved loans are immediately available to good borrowers. Once extraordinary expenditures have been incurred, we expect to show that loans should be repaid and savings simultaneously rebuilt with the assistance of disciplinary devices to restore a precautionary buffer.

### 3. Technology: flood and drought tolerant rice

Uninsured risks can be reduced using **technological innovations**. Because of the relative ease of adopting technological innovations compared to subscribing to financial products, risk-reducing technology has proven to be broadly effective (Dar et al., 2013). For farmers in Bangladesh, rice is by far the most important crop. New flood and drought tolerant rice varieties have recently

been released. When tolerance is obtained at no penalty on yield in good years, risk reduction can be achieved through technological innovations, reducing the need to use financial products for risk management. When there are yield tradeoffs between good and bad years, risk management may be obtained through one or the other, or more likely a combination, of technological and financial instruments. The project will principally focus on drought resistance through introduction of the new rice variety BRRI dhan 56 against the counterfactual of other short duration varieties. Details on how technology will enter in the risk reduction experiment will be elaborated later. It will be developed by analogy with work successfully done in collaboration with IRRI in similar agro-ecological contexts in the Indian states of West Bengal, Orissa, and Jharkhand.

**4. Multiple Risk Retention Instruments**

We propose here to expand on what Carter (2008) coined as the "risk retention layer" in overall risk management by introducing specific financial instruments of contingent credit and savings and technological instruments of stress resistant varieties. Figure 1 shows the existing and proposed instruments in the context of the targeted population of BRAC clients.

**Figure 1. Financial and technological instruments to reduce uninsured risks**

| **Instrument** | **BRAC and IRRI programs and suggested modifications** |
|---|---|
| Weather index-based credit for good clients | Good Borrower Loan, SafeSave credit line. Modify for contingency |
| Medical expenditure loans | Medical Loan. Add pre-approval |
| Individual contingent savings accounts: index-based, verifiable emergencies | Modify existing product for contingency |
| Individual unrestricted savings accounts | Exist at BRAC Bank. Add incentives to save |
| Risk reducing technological innovations | New flood and drought resistant rice varieties released by IRRI: promote adoption |

**D. Research proposal: Design and evaluate a new risk-handling portfolio of instruments for BRAC programs in Bangladesh**

The research will proceed in three steps: theory, ex-post empirical analysis of existing products, and design and experimentation with new products.

**1. Theory of risk layering and complementarities between savings, credit, and insurance for given household fundamentals**

The project will work on the theory of risk layering using savings, credit, and insurance. New flexible financial products and complementarities between these products will be assessed in the context of this theory. Several existing papers look at decisions regarding savings, credit, and the holding of productive asset in rural economies. For example, Behrman et al. (1997) build a dynamic structural model where farmers choose saving, credit, productive investment, and labor force behavior in a context of uncertain agricultural production. The model is estimated using data from rural Pakistan. They find that savings and borrowing behavior depend on access to formal banks and on whether income is anticipated or not. More recently, Lee and Sawada (2010) theoretically model savings, credit, and assets in Pakistan, with a goal of estimating precautionary savings through consumption growth. The interrelationship of consumption, credit, and insurance was also modeled by Eswaran and Kotwal (1989). They explore how consumption credit can

serve as a form of self-insurance and how in general insurance would be preferable to the farmer. They speculate, however, that the lower information requirements of credit may explain its dominance over insurance in rural economies, an argument that resonates well for Bangladesh where credit is broadly preferred over insurance for risk protection.

Two recent papers develop models of productive decision making under the presence of savings, credit, and insurance. Karlan et al. (2012) derive a model of input and saving decisions in the presence of credit constraints, imperfect insurance, and of both constraints simultaneously. Given experimental results, they then model the demand for insurance in a context where credit constraints do not bind and discuss implications where farmers are heterogeneously risk averse, where insurance faces basis risk, and when farmers do not fully trust insurance providers. de Nicola, Hill, and Robles (2012) examine the potential benefits of three financial products--index-based weather insurance, savings accounts, and insured agricultural loans--that could improve a household's ability to manage agricultural risks. They develop a dynamic stochastic model and calibrate it with data from farmers in Ethiopia. They conclude that saving is complementary to insurance in providing an important instrument that mitigates the negative effects of basis risk.

In the models outlined above, borrowing decisions take place before the realization of shocks, which limits the potential of credit as a risk-coping insurance tool. We hypothesize that the joint decision to save, borrow, and insure depends crucially on the ability to borrow in response to realizations of both basis risk and covariate shocks. We propose to extend the de Nicola et al. (2012) modeling to allow for ex-post borrowing as a response to shocks.[1] This will expand the state space of the dynamic program faced by the household to include past borrowing and lending and current access to credit in each period. We suggest that this addition will change complementarities between savings, borrowing, and insurance decisions, and also have different predictions for farmers who are heterogeneous in risk aversion and endowment levels.

At the national level, Clarke and Poulter (2014) use a cost-accounting approach to calculate the minimum cost of insuring post-disaster financial resources combining five financial instruments: risk transfer instruments including insurance, reinsurance, cat swaps, and cat bonds; reserves and ex-ante budget allocations; contingent credit; emergency ex-post budget reallocations; and ex-post direct credit. They show that financing low layers of risk with risk transfer instruments is costly and that reserves and contingent credit are more cost efficient. They also show that reliance on ex-post direct credit is very costly but that it may be the only last resort solution for very high losses as the cost of insurance becomes prohibitive. This approach needs to be completed theoretically to include behavior and applied to the micro-level issues of concern here.

## 2. Empirical analysis of existing financial products

Lessons will be derived from the empirical analysis of the three existing financial products offered by BRAC: microfinance loans, Good Borrower loans, and Safe Save savings and loans. Medical Loans are described, but too recent for analysis. We will use the administrative data from these three sources of loans to analyze clients' savings, dis-savings, borrowing, and repayment decisions in relation to observable shocks in weather, floods, and GDPpc. We would like to see how the use of financial products has been affected by shocks. We note that the culture of insurance is currently very much absent in Bangladesh. Even health insurance among the middle class is a recent development.

[1] Gollier (2003) develops a similar model of saving, credit, and insurance in a non-productive context.

**Microfinance loans**

BRAC has four lines of microfinance lending: for microenterpreneurs (*progoti* loans), for the ultra-poor (*dabi* loans), for landless tenant farmers (*borga* loans), and recently for international migrant workers (migrant loans) (Hossain, 2013). Conditions vary across categories of loans, but the basic principle consists is non-collateralized individual loans with strong community supervision through a Village Organization (VO) consisting of 30 to 40 members. *Dabi* and *Borga* loans are under $800 for one year repaid in weekly or monthly installments in the context of VO meetings. *Progoti* and Migrant loans are $800 to $5,000 loans repaid monthly or seasonally. Interest rates are 18 to 27% on the outstanding balance. These programs are the main economic activities of BRAC, reaching 6 millions VO members with outstanding loans to 4.4 million borrowers disbursed by BRAC in 2,200 branches covering the whole country. The outstanding loan portfolio is $810 million. Repayment rates have been high, with portfolios at risk of 5.1% (*dabi*), 6.5% (*progoti*), and 5.6% (*borga*).

Repayment has been the main concern in product design, and rules have for this purpose been quite rigid. Risk considerations are directed at protecting the loan more than the client. This includes compulsory savings of 5 to 10% of the loan to cover defaults due to shocks, write offs of loans during natural disasters, micro-insurance for the death of the borrower, and top-off loans for good borrowers. Under current design, MFI loans are not used for emergency needs.

**Good Borrower Loans**

Good Borrower Loans are top-off loans that are available to current borrowers with good repayment performance on an on-going loan. The top-off loan can be between 25 and 50% of the on-going loan, at the same 27% interest rate that applies to the on-going loan. Savings have to be in excess of 5% (for *progoti* borrowers, going up to 20% for *dabi* borrowers) of the outstanding loan. The loan is available for 5 to 9 month in case of a current 1-year duration loan, 8 to 15 month in case of a 1.5-year duration loan, and 10 to 20 month in case of a 2-year duration loan. Loan repayments are done in monthly installments and must be completed within the allotted time span of the main loan. This product has been successful and repayment discipline has been very high. As currently structured, Good Borrower loans have not been used for emergency needs.

**SafeSave savings and loans**

SafeSave is an innovative microfinance institution started by Stuart Rutherford in 1996 and incorporated into BRAC in 2013. It has 16,000 clients. It offers unusually flexible financial services and provides incentives to save through 72 women collectors visiting clients on a daily basis to receive savings deposits and loan payments. There are three financial services: passbook savings accounts, long-term savings accounts, and loans.

***Passbook Savings***: A client may deposit as little as one taka ($0.012) when the collector calls at her house each day. Accounts with balances above a minimum level earn 6% annual interest. Clients may withdraw up to $6 at their doorstep or up to $60 per day at the branch office.

***Long Term Savings***: Clients may open a longer-term "commitment savings" account with a higher interest rate than passbook savings. Savers make regular deposit on a monthly basis for a defined term with interests of 7% (3 years), 8% (5 years), 9% (7 years), and 10% (10 years). In case of early closure or withdrawal, clients lose the higher interest rate, which becomes equal to that on the passbook savings account. Clients can borrow a maximum of 80% of their long-term savings balance at a low rate of interest.

***Loans:*** All borrowers start with a credit limit of $65. One loan at a time may be taken per

household. Maximum loan interest is 3% per month on the declining balance (36% per year in nominal terms, or about 30% in real terms). For entry-level loans (of $65) and for all loans as soon as their outstanding balance falls to $65 or below, 2.5% per month is charged. 1/3 of the loan must remain in the passbook saving balance as collateral.

The SafeSave products offer flexibility, and flexibility can be used for risk response. The main element of flexibility is that there are no fixed repayment schedules for outstanding loans. It is up to the client to decide when to repay, with interest charged on the remaining balance. Loans can be taken at an 18% interest rate against long-term savings deposits. However, savings continue to serve as collateral instead of reputation once established, limiting the use of savings for risk response.

**Medical loans**

These loans have recently been introduced in 128 branches in 3 regions. Loans are offered to good borrowers. If ill, a potential borrower gets a slip from a BRAC-approved referral doctor with a cost estimate leading to a corresponding loan of up to $700 at a 27% interest rate on a declining basis, like other MFI loans. Loans can be for up to 6, 12, 18, or 24 months for medical tests and surgery. Referral doctors offer services to BRAC clients at a 50% discount. All good BRAC borrowers qualify upon inspection of their passbooks. Loans are issued within 1 to 3 days of the application. The program currently has 1,100 borrowers and the repayment rate has to this stage been 100%.

A proposed modification of the medical loans instrument would consist of informing good clients that they qualify for a medical loan based on past and current borrower performance and on accumulated savings. Given their score (which could be a 0/1 qualification, such as a star on the passbook as done by an MFI in India) they would qualify for a pre-approved maximum medical loan. Certification by an approved doctor would set the amount they can apply for. In this way, clients can have the certainty of their right to a medical loan, helping them manage risk under full information.

## 3. Experimentation with new products

**Design of new products**

The design and implementation of flexible financial products and risk-reducing technological innovations to reduce uninsured risks will be done in collaboration with the BRAC microfinance team and the IRRI-Bangladesh team. Experimentation with new products will be done in collaboration with BRAC's Research and Evaluation Department (RED). The experiment will build maximally on existing BRAC financial products. This includes the Good Borrower Loan Program, the Medical Loan Program, the SafeSave microfinance institution, and BRAC Bank savings accounts.

The Good Borrower Loan program would be modified to offer two lines of credit: top-off loans as currently done, and conditional loans for emergency shocks associated with a verifiable index. Emergency loans would be pre-approved to a set amount (like a line of credit under a credit card, depending on the client's credit score) to maximize reliability and speed in accessing liquidity. Saving accounts at the BRAC Bank would add an option of dedicated accounts for emergency expenditures, with withdrawal voluntarily restricted to verifiable weather and health indicators. Some form of cost-effective motivation may be based on the SafeSave experience. Access to the conditional credits and savings products will be accessible to all good clients. While agricultural

shocks directly affect farmers, they also indirectly affect farm workers and all the sectors linked to agriculture through forward and backward linkages and to the expenditure of farm incomes (such as input providers, merchants, traders, workers in the construction sector, etc.). Catering on a demand-driven basis to the needs of the forward, backward, and final consumption linkages of agriculture will be an innovative aspect of this approach to the use of flexible financial products to reduce uninsured risks.

**Experimental design**

IRRI collaborators have identified nine districts from the Rajshahi, Rangpur, and Khulna divisions that are particularly prone to drought and where the new drought-tolerant technology could make a large difference in yields when drought occurs. BRAC has many branches in these regions. The selection of which branches to use for this experiment is left to be determined together with BRAC, taking into consideration the following criteria: (1) availability of staff for introduction of the new financial products, (2) size of the agricultural loans program (Borga loans), and (3) the extent of irrigation among smallholder farmers so as to have variation along these characteristics.

*Contingent flexible financial products*

For the new contingent credit products (contingent on weather indices and verifiable health shocks), eligibility will be determined ex-ante to any need. That is, credit officers from the branches will submit the list of their clients that they consider to be good borrowers to the staff of the MFI program at the BRAC center office in Dhaka. The center will verify the qualification of borrowers and determine eligibility. Randomization of eligibility will be done at that level. The MFI program has agreed to randomize eligibility at the village level for those borrowers whose past performances qualify them as good borrowers. The idea of having eligibility defined at the center is attractive to BRAC because the MFI program finds it difficult to obtain agreement from credit officers to be open to extending credit in case of shocks while at the same time being responsible and rewarded in relation to repayment performance.

The offering of contingent savings products will also be randomized at the village level, but there will be no constraint on which clients can access this service.

The standard savings and good loan products will remain available everywhere as they now are. Eligibility for the good loan products will be shifted to the center to ensure procedures comparable with contingent loans, but without any randomization.

At this stage of the discussion with BRAC collaborators, the experimental design will be a standard RCT with three treatments as follows:

Offer of the contingent savings products
Offer of the contingent credit products
Offer of both products,

in addition to a control arm. Finalization of the experimental design will be done in January 2015. Training of the credit officers for the new products and implementation of the experiment are planned for February-March 2015.

*Drought tolerant rice technology*

The experimental design for this part of the study will be very similar to what we have implemented with IRRI in the states of Jharkhand and Orissa in India. The objective is to obtain a

rapid diffusion of the drought resistant seed in selected villages. We use the standard technique of giving out small amounts of seeds (2kg) to 10-15 randomly selected farmers in the selected villages with the explicit objective of multiplication and diffusion. In India, we are currently testing three alternative village entry points for the new seed: the Self-Help Group (exclusively women), the farmers' club (almost exclusively men), and the body of democratically elected officials. In Bangladesh, there is also the possibility of engaging the BRAC agricultural groups. This remains to be defined. Seed distribution will take place in May 2015 for the Aman season. These seeds will produce more than enough seeds to provide all farmers in the village that want to plant this variety in the 2016 season. We are also currently testing in India means of accelerating diffusion via demonstration plots and market days. Results from this experiment will be applied to Bangladesh in November 2015 (for demonstration) or February 2016 (for market days). The current plan is to distribute seeds in half of the villages in each of the arms of the financial products experiment.

We do not currently have in hand all the elements needed for power calculations, but there is no shortage of units, and implementation of the experiment is easily scalable. We will thus choose the size of the experiment after some preliminary work.

## 4. Capacity building and outreach

This proposal is well-situated to inform policy directly. BRAC, our partner, currently provides financial services to 5.5 million borrowers, educational services to 1.14 million children, sanitation services to 25 million people, all in 11 countries including 5 Feed the Future Countries (Bangladesh, Haiti, Liberia, Tanzania, and Uganda). By far its largest office, in Bangladesh, is located in a Feed the Future Country. As such, any identified successes have the potential to be immediately promoted at scale.

In addition, our collaboration with BRAC allows for substantive capacity-building opportunities with BRAC researchers, who we will be working with closely. Our commitment to building capacity within BRAC's research team is highlighted by a current member of RED in the PhD program in ARE and by an annual flow of four BRAC professionals remaining at Berkeley each for a six month period.

Finally, our project emphasizes directly two of the three themes identified in the BASIS AMA RFP. We expect to look directly at the interface between technology adoption and risk management schemes, and work on understanding both the role of risk in the technology adoption decision and work on innovating new solutions for risk management which may be complementary with technology adoption. Combined with our potential for scale and capacity building, we hope to make a direct, policy-relevant, and scalable contribution to our understanding of the potential of financial instruments and technology to work in complementarity for shock coping and risk management. We therefore hope to contribute both to the academic literature and the creation of new products with development impact.

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**E. Anticipated outputs**

The project will assess the potential of new risk-reducing technological innovations in rice production (by far the main crop in Bangladesh) and of new flexible financial products associated with savings and credit to reduce the risk that smallholder farmers and rural populations face. This will allow them to reduce the cost of self-insurance in risk management and shock coping. This will be done in partnership with BRAC, the largest NGO in the world. New products will include: drought resistant rice varieties; savings instruments with both flexibility to handle emergencies and dedication to build discipline; credit lines with ex-ante flexibility (indexation on adverse weather events and verifiable health shocks) and full ex-post flexibility for recognized good clients. The main anticipated outputs are the following:
(i) Academic papers that will include a theory paper on the complementarity/ substitutability of savings, flexible credit, and insurance in handling risk; research results on the uptake and benefit of alternative financial products designed for protecting against risk; and research results on the complementarity between stress resistant varieties and financial products.
(ii) A set of guidelines as to how to combine risk-handling technological and financial instruments to be offered in a microfinance program such as BRAC's for its various categories of MFI clients: progoti, dabi, Borga, and migrants.
(iii) Dissemination of results to BRAC managers and program personnel. Dissemination of results in a public conference, in particular for the Basis-AMA program.
(iv) Training of BRAC researchers and UC PhD students

**F. Anticipated impacts**

We expect that the new financial products made available will offer a breakthrough in the capacity of smallholder farmers and rural inhabitants to handle risk. If the new products prove effective, there could be massive diffusion through our partnership with BRAC that works with some 2,200 branches covering all regions of Bangladesh as well as in Haiti, Afghanistan, Pakistan, the Philippines, Sri Lanka, and five Sub-Saharan Africa countries. Measurable indicators will be the uptake of new stress resistant rice varieties and use of flexible financial products to reduce exposure to uninsured risks. Follow-up surveys will help us measure changes in agricultural production practices and welfare gains of beneficiary households. Research will be fully joint between the UC and BRAC teams, with extensive mutual learning. BRAC research personnel will be coming to Berkeley for residencies for the purpose of training and joint research. Close collaboration will also prevail with IRRI, leading to joint publications as was done with the India work. IRRI and its partners in Bangladesh are well placed to massively diffuse results on the risk reduction value of the new drought tolerant technologies.

**G. Timeline**

1. *Empirical analysis of existing programs (component 2) - July 2014-June 2015*
Analysis of the shock coping and risk management value of existing BRAC financial products: SafeSave, Good Borrower Loan, and BRAC MFI programs for micro-entrepreneurs, ultra-poor households, tenant farmers, and international migrants. Access to the MIS data for these four programs has already been secured.

2. *Implementation of flexible financial products and technology experiment (component 3)- July 2014- May 2015)*
Finalization of the research design and sampling Nov 2014-Feb 2015
Finalization of the design of the financial products and of their implementation (Nov 2014-Feb 2015).

Implementation of the financial offering following the experimental design (March-April 2015)
Drought-tolerant seed distribution May 2015

*3. Base line survey (component 3)- March-December 2015*
Baseline survey March - May 2015, with recording of harvest, shocks, borrowing and savings, and welfare indicators for past year.
Analysis of baseline survey July-December 2015

*4. Theory (component 1) - July 2015-June 2016*
Development of a model integrating the use of savings, credit, and insurance to optimally reduce a farm household's exposure to uninsured shocks.

5. *Evaluation of the first year of offering savings and credit products (January –June 2016)*
Case studies on the use of the flexible products and analysis of MIS data

*6. Evaluation of benefits of stress-tolerant rice varieties and complementarity with financial products*
Intervention in February-May 2016 to support diffusion of the drought tolerant variety in the treatment areas.
Follow up survey March - May 2017, with recording of harvest, shocks, borrowing and savings, and welfare indicators.