Impact assessment of the FaRMAf project in Burkina Faso: a tentative framework

FARMAF Working Paper

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FaRMAf project in Burkina Faso aims at 1) making risk management tools (RMT) available to farmers and 2) evaluating both RMT adoption and returns that are associated to adoption.

Three RMT that are likely to be implemented in Burkina have been identified:

1- a warrantage scheme based on a warehouse receipt system (WRS);
2- a weather index-based insurance;
3- a market information system (MIS).

This note presents recent advances made both on the implementation side and the methodological side (impact assessment).

1. Development and implementation of three RMT

a. A warrantage scheme based on WRS

This RMT seems to be the most promising in terms of adoption. Our partner, the Confédération Paysanne du Faso (CPF), expressed a particular interest in this tool. Moreover, impact assessment in this case is likely to be properly done using a quasi-experimental approach (see next section).

CPF is willing to enhance the access of farmers to WRS, through the renovation of existing warehouses and the construction of additional ones.

Our next field mission is aimed at understanding FOs needs in terms of WRS. More specifically, it will help us in 1) locating existing warehouses that are currently unusable and need to be fixed; 2) spotting on the map zones without warehouses that are potential candidates for the project; 3) delimitating the entire zone of the study, which will include zones with warehouse and zones without warehouse. This field mission will be made between May 28 and June 8, and will cover 4 different regions, namely Nord, Boucle du Mouhoun, Grands Bassins et Cascades.

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On the microfinance side, we consider a partnership with the Réseau des Caisses Populaires du Burkina (which has also participated in the EU Food Facility project for 2 years).

Maintenance and operating costs of the warehouses will be covered by users who pay the FOs for it (they will be charged a fee of 100 FCFA/ month per each bag stored).

b. A weather index-based insurance

The work on indexed insurance within the FARMAF project could be done following various scenarios:

1- Collaboration with an on-going project run by Planet Guarantee to enhance farmers access to indexed insurance. Planet Guarantee is PlaNet Finance's subsidiary dedicated to micro-insurance. The project counts with the participation of Bertrand Muller from CIRAD and has been implemented since 2011 and will go on during 2012 and 2013. It aims to reach 10,000 maize producers in 2012.
2- Implementation of indexed insurances tools mobilizing a different design than the one proposed by PlaNet Guarantee. The differences could be on partners (micro finance institution, different insurance company, different weather data provider), on crops targeted (sorghum, millet), and on indexes used (rainfall)
3- Instead of implementing weather index insurances just as in options 1 and 2, testing the relevance of such a tool for farmers, using experimental games.
4- These options need to be further investigated.

c. An MIS

There are currently three MIS in Burkina, run by a public body, the Société Nationale de Gestion du Stock de Sécurité Alimentaire (SONAGESS), and two associative bodies, Afrique verte, and CPF.

At this stage, it is unclear whether the FaRMAf project should focus on the CPF MIS, which seems very poorly organized and relies on information boards mainly (whereas MIS diffusion generally relies on radio programs or SMS). There is an ongoing initiative to implement a national platform with second generation: Afrique Verte is receiving funds to settle such a platform. Next step will include meeting SONAGESS and Afrique Verte in order to check with them what kind of support is needed.

2. <u>Impact assessment of the RMT</u>

a. The impact of what on what?

Once the RMT is operational, we will make it available to some farmers that are called treated groups. Treated groups will be compared with farmers who will not be offered to use the RMT (control groups).

In practice, this means that we will propose an insurance product or a WRS in some zones but not in others.[4] The selection of zones could be made randomly (see below). By doing so, we will be able to assess the impact of being an RMT user, and also the impact of having access to the RMT (see next section). Moreover, we will be able to characterize users by comparing them to non-users inside treated zones.

[4] We focus on zones rather than individuals, because we cannot prevent access to the warehouse or to the insurance office to people within a zone where RMT are available.

Note that, contrary to other tools, MIS impact is not likely to be assessed using econometric approaches. For example, in the case of radio-based MIS or information board MIS, it seems impossible to find (or even create) a group without access to the MIS (everyone can access the radio program, even indirectly).

We aim to measure the impact of RMT on several outcomes:

1- Level of production (millet, corn, sorghum),
2- Level of yields,
3- Fertilizer use,
4- Investment in productive assets (plough, livestock),
5- food insecurity,
6- Agricultural income.

In the case of the WRS, we expect that users, who store and pledge crops will use credit they receive in turn to invest in productive assets and inputs, which will make them able to increase their production and thus their income; we moreover expect that they will benefit from better prices when selling their crops later. Farmers can either sell the crop immediately after (or even before) which give them cash. If they can afford to wait, they can either store the grain themselves, or in the designated warehouse (which costs Fcfa 100/month/bag). If they chose to use the warehouse, this enables them to sell the grain more easily (as quality is maintained and certified (?)), and it can serve as collateral for credit. They may use this credit facility, but will only do so when this is more attractive than selling the grain. Hence, this use of credit will be relevant for those who are not able to sell the grain easily, including traders who make their money by selling later in the season. The motives for using the WRS therefore differ, and some research is needed to find out the main motivation, and hence the main expected possible impact. In the case of the weather index-based insurance, we expect that farmers who face lower harvest uncertainty will be encouraged to invest more in productive assets and inputs, which will make them able to increase their production and increase their income. It depends however on the modalities of the insurance. Important are the basis risk (correlation between farmer's yields and the index), the pay-out (which is in cash, and can be to the farmer but also to the credit provider),and the fee to be paid. If the insurance is taken only to get the credit, the benefits of the insurance cannot be assessed separately from the credit, unless experiments are run that make the separation. Supply of credit may also be a possible response to insurance provision. In this case, it might be that all such additional credit and its impact on hhs can be attributed to the insurance being offered.

We thus expect that both RMT (WRS and insurance) will affect the same types of outcomes – although more specific variables can be found in each case. Moreover, it may be interesting to study mechanisms by which the RMT are likely to reduce food insecurity in some cases (this aspect remains to be investigated from a theoretically point of view).

b. The methodology

i. Identification

As discussed with Kees before, it seems feasible to adopt a quasi-experimental approach, using a matching procedure to compare farmers in treated zones with similar (matched) counterparts in control zones[5].

[5] This comparison assumes that the control group is not affected by the intervention in the treatment group. Indeed, the validity of this method may be threatened by market equilibrium effects: if the treatment is effective, users in treated zones may alter the quantities they sell thus altering the overall market price and thereby changing the prices paid to and thus production level of non-users farmers of the treated zone and

Because the RMT are not available yet, there is room for a baseline survey, which will help controlling for selection bias. Indeed, in order to properly apply matching methods, we need to control for factors that are likely to drive both outcome levels and decision to use the tool. Such factors have to be observed *before* the implementation of the tool. Note also that, by collecting outcome levels in the baseline survey, we may also be able to control for *unobservable* sources of bias, applying difference-in-difference matching.

The approach therefore comprises two elements: one is that we need to measure adoption of the RMT in the treated group; the other is the comparison of the treatment group and the control group. Degree of adoption of the tools can be measured directly. Other adoption rates, say of credit, or of grain storage, can be measured by group-wise comparison of the treatment group and the control group. These are good measures of success of the tools.

The treatment group consists of adopters and non-adopters. While for the whole set of hhs in the treatment group a good matching with hhs in the control group can be applied, this does not immediately hold for the adopters among the hhs in the treatment group (or the non-adopters for that matter). There are likely to be quite some unobservable characteristics that made hhs in the treatment group adopt or not. Not all these unobservables are eliminated by a dif-in-dif approach, as this only accounts for the time-invariant hh-specific elements.

The differences-in-differences specification that can be used is:

$$y_{ij} = \alpha + \beta X_{ij} + \delta RMT_j + \gamma RMT_j * USE_{ij} + \mu_j + \varepsilon_{ij}$$

where y_{ij} is the outcome for hh *i* in village *j* (for example the selling price)*;* USE_{ij} is a binary variable indicating whether the hh *i* in village *j* has adopted the RMT; RMT_j is a binary variable indicating whether the village *j* is a treated village (i.e. a village where hh can find an RMT). X_{ij} is a set of hh-specific controls, μ_j is a village fixed effect and ε_{ij} is an error term. The coefficient of interest is γ, being an estimate of the impact of adoption. Note that the coefficient δ gives the impact of being a non-user living in a treated village, which is an estimate of spillovers within treated villages.

Xij is a vector of variables likely to create bias. Such variables are:

- Total arable land
- Area covered by main crop
- Labor force
- Rainfall (in case the study covers a very large geographic area)
- Capital (livestock, plough)
- Initial levels of outcomes (see previous section)

Because production decisions may not be separated from consumption decisions, we may also add:

- Family size

Note that these variables can be seen as determinants of adoption too. The statistical problem lies in the correlation between RMT and ε.

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potentially of the untreated zone, meaning contamination of the control group. However, because we do not expect the number of users to be large, it is unlikely that the market consequences of the introduction of the tool will be noticeable, i.e. we do not expect to find large price changes because of the introduction of the tool.

It should be acknowledged that – in most cases – the RMT makes only a small contribution to the outcomes of hh activities. It may help in selling some grain, or obtaining credit more easily, and without the RMT the hh can almost always still sell its grain and get credit. There are likely to be some marginal hhs that just moved into selling grain at all, or into getting credit at all, because of the RMT. The relative size of this group is important to know, as many other users are likely to be affected even less. These other users consist of those that would do the activity (selling grain, taking credit) anyway, and those that would not do this anyway. Hence it is advisable to choose outcome variables that comes close to where the tool affects the hhs. An overall measure of the hh such as income, however relevant this may be, is not particularly suitable, as changes in this variable are very difficult to attribute to a single intervention variable.

Less often acknowledged, the measurement of the RMT variable is also a point of concern. Do we measure for example "yes/no crop insurance can be taken by this hh at a cost of 10%" or "yes/no crop insurance is possible in this region" (but hh can be screened) or "average basis risk of yield vs. index in this region is x" (showing some measure of attractiveness of the policy) or "yes/no credit-cum-insurance is offered to farmers in this region" (as insurance triggered this supply). It makes some difference for the interpretation of the outcomes.

ii. Design

In the case of the WRS, we may consider the possibility to randomly select, at least partly, zones that will be treated. Obviously, zones that already have a warehouse (to be fixed) will be automatically assigned to the treated group. However, we have the opportunity to randomly select zones where the warehouse needs to be entirely constructed. By doing so, we would increase our chances to have similar farmers in both groups (treated and controls). In this case, the best comparison would be between regions where the warehouses are newly constructed, and those where they are not yet constructed. The "old" regions with warehouses are less useful for comparisons, as the length of time of their existence may have affected other institutions.

In the case of the weather index-based insurance, the design remains unclear for now because we do not know yet *how* the RMT will be offered to people. Theoretically however, we may consider applying the same design we made for the WRS: we first select communities where the insurance product will be offered to people; then we compare users from treated communities with their matched counterparts located in untreated communities.

In many cases, however, the crucial variables of the performance of the tools are the basis risk (correlation between yields and index) and the fees charged or the costs involved in using a warehouse. It seems interesting therefore to investigate the possibility of exogenously varying just these: assure some fixed correlation, apply some variation in storage costs or in insurance premiums, and see how this affects adoption.

iii. Surveys

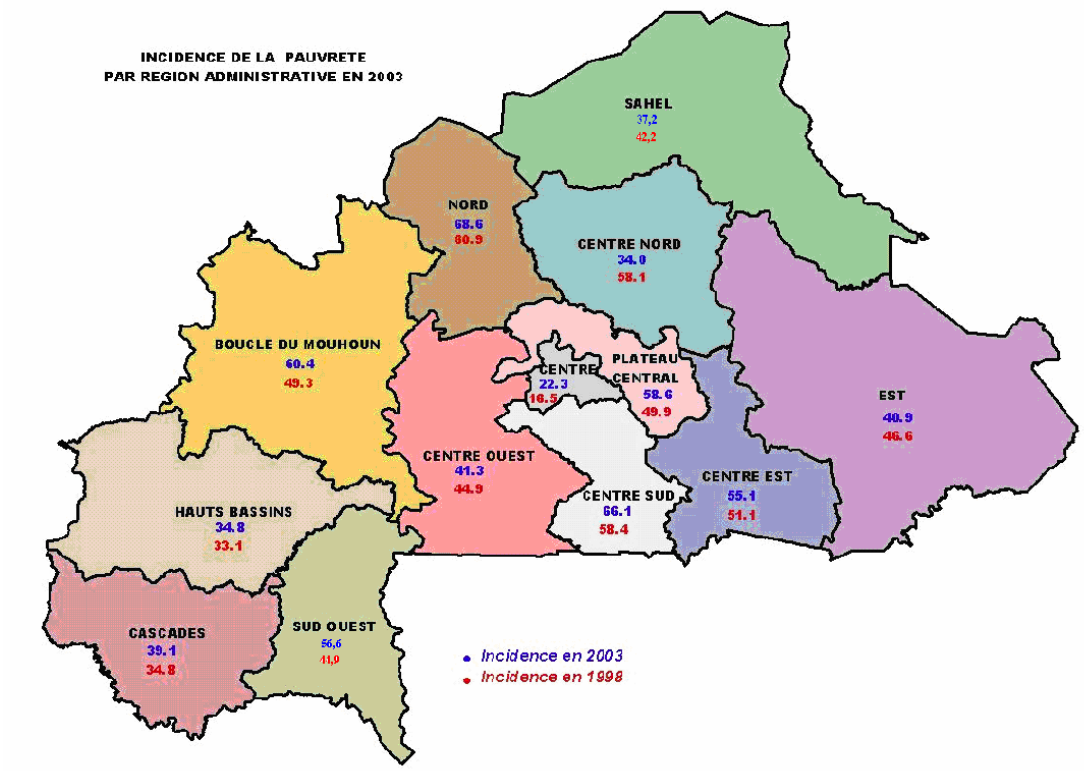
For WRS, we suggest to interview 1,000 farmers ex ante (baseline survey) and ex post (final survey 2015), including:

- 500 who do not use WRS and will never do (the controls);

- 500 who are located in the treated zone and may adopt the RMT in 2013, 2014, and 2015. See above for a comment on how 'treated' zone should be confined to zones where WRS are newly established

We are not clear yet if we are expected to cover a large part of the country or to focus on one specific area. For the impact assessment study, if we cover the 4 regions identified by CPF, we will have something representative of Burkina but it would require including many zones into the project in order to control for geographical environment. If we focus on a single region, we need not to have a large number of zones, nor control for environmental conditions, but the validity of the method may be threatened by market equilibrium effects, as soon as zones are close to each other. The question to be answered is not if the zones are representative for BF in terms of agriculture, but if they are representative in terms of the outcome of the comparison between treatment and control. In that sense often a smaller sample may be sufficient.

Regions of Burkina Faso (from reseau-espaces-volontariats.org)



If we take one region, we have two favorable options: the west zone where the marketed share of production is slightly higher and where we know that some farmers already use WRS and index insurance (Cascades, Hauts Bassins and Boucle du Mouhoun regions), or the North region that is most subject to food insecurity.

Moreover, it may be interesting/necessary to run additional surveys (middle-term surveys).

Note that the control group may be used for the impact assessment of the insurance tool as well.