THE POLITICAL ECONOMY OF THE FERTILIZER SUBSIDY REFORM IN RWANDA AND BURUNDI

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Résumé

L'année 2013 constitue une date importante dans les efforts du Rwanda et du Burundi pour accomplir leur révolution verte. Après des années d'implication de l'État, la chaine de distribution des engrais a été entièrement privatisée, et le programme de subvention revu. Cette réforme a remplacé un programme de subvention qui servait, de manière différente, des intérêts politiques établis. Au Burundi, un système corrompu de subvention d'engrais permettait la capture centralisée de rentes par l'élite. Au Rwanda, le programme était un outil politique pour accroitre l'acception du Programme d'Intensification Cultural (CIP : Crop Intensification Program) à travers des subventions généreuses et la provision aux cultivateurs de crédits non seulement gratuits mais aussi peu remboursés. Malgré cela, la réforme du secteur des fertilisants peut être considérée, jusqu'ici, comme un succès. Elle a permis le maintien au Rwanda et l'accroissement au Burundi de la demande d'engrais tout en développant le rôle du secteur privé.

Le but de cet article est d'identifier les facteurs de transformation et d'évaluer les défis du nouveau programme de subvention des engrais dans les deux pays. La réforme au Burundi a été possible parce que les bailleurs ont été capables d'identifier et d'exploiter la fenêtre d'opportunité constituée par les prochaines élections et la prise de conscience de la faible performance agricole du pays. Au Rwanda, la privatisation a été conduite avant tout par le gouvernement. Elle a été dictée par le trop grand poids fiscal de l'ancien programme de subvention ainsi que par la diminution des aides au Rwanda en 2012.

Cette réforme est révélatrice du modèle de développement de chaque pays. Au Rwanda, le développement est fortement étatique, conçu et mis en œuvre depuis le haut. Bien que ce modèle ait produit d'importants résultats, sa soutenabilité est questionnable quand l'État se retire et que le secteur privé est impliqué. Au Burundi, la réforme de 2013 est aussi typique du modèle de développement du pays. Le rôle des bailleurs y est clé pour initier les réformes, les mettre en œuvre et les financer.

1. INTRODUCTION

Fertilizer subsidy programs in Rwanda and Burundi constitute a key effort towards the vital task of increasing agricultural productivity in both countries. The majority of the poor lives in rural areas and the agricultural sector represents more than 88% of employment[1]. Raising productivity is consequently the first step toward poverty reduction. In addition, Rwanda and Burundi are respectively the first and second most densely populated countries in continental Africa. As a result, the average surface of cultivated land per household is extremely small (0.59ha in Rwanda, 0.28 in Burundi)[2]

[1] 88.8% in Rwanda, 88.7% in Burundi in 2013. Source: FAO, FAOSTAT, accessed on March 24, 2014.

[2] National Institute of Statistics, *EICV Thematic Report: Agriculture*, Republic of Rwanda, 2012, p. 3; République du Burundi, *ENAB 2011-2012- Volume 1 : Résultats de la campagne agricole*, 2013, p. 10. Although the average cultivated area per household is 0.28 ha in Burundi,

and barely enough to sustain a family. The situation is even more pressing in Burundi, where food production has grown less rapidly than the population (1.8% against 3.45% per year on average from 2005 to 2011)[3], thus driving up inflation and resulting in malnutrition. Unsurprisingly, increasing productivity is a national commitment according to Rwanda and Burundi's post-conflict "visions".[4] It is also an international commitment: both counties have signed the Comprehensive African Agriculture Development Program (CAADP), which aims to raise agricultural productivity by at least 6% per year.

Fertilizer consumption is an essential tool to reach Rwanda and Burundi's commitments to a "green revolution". Use of fertilizers is indeed historically among the lowest in the world, and lower than the Sub-Saharan African average. They were about 4kg/ha in Rwanda before 2008, and about 6kg/ha in Burundi in 2010, against 12kg/ha in sub-Saharan Africa and 124kg/ha in the world on average in 2010[5].

The year 2013 was a milestone for Rwanda and Burundi's endeavours to promote fertilizer use. The subsidy program has been modified and, after years of state involvement, the fertilizer value chain has been entirely privatized in both countries. This marks the first step of the "exit strategy" out of the subsidy program, whereby the role of the state is gradually restrained, operationally and financially, letting a fully market-driven fertilizer sector to develop.

The goal of this article is twofold. First, it aims to provide an appraisal of the new fertilizer subsidy system in Rwanda and Burundi. Second, it seeks to understand the drivers of the successful transformation of fertilizer subsidy programs in both countries in 2013.

First, to provide an appraisal of the new fertilizer subsidy system in Rwanda and Burundi, although this article is written only a year after the reform, preliminary trends can already be observed. It is beyond the scope of this article to deal with the impact of fertilizer on agricultural production and poverty reduction or to engage in a cost/benefit analysis at the macro-level. To provide a first assessment of the new subsidy programs, I will limit myself to

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the average size of a farm is 0.52 (including grazing areas etc.). The Rwandan EICV does not make the difference explicit. Nevertheless, all data points toward an average plot size below 0.6 ha.

[3] Author's analysis based on World Bank, World Development Indicators. The average presented here is the compounded annual growth rate. This data is based on models and can vary according to the sources, but it is generally recognized that agricultural production increases less rapidly than the population in Burundi. See for instance République du Burundi, *Stratégie pour l'utilisation des engrais chimiques*, Ministère de l'Agriculture et de l'Élevage, 2010, p. 2.

[4] Government of Rwanda, *Vision 2020,* Kigali, MINECOFIN, 2000. Gouvernement du Burundi, *Vision Burundi 2025*, Bujumbura, UNDP/Ministère du Plan et du Développement Communal, 2011.

[5] Source: IFDC, *Analysis of Fertilizer Consumption by Farmers in Rwanda: 2005-2010 Period*, 2012, p. 9; République du Burundi, *Stratégie pour l'utilisation des engrais chimiques*, Ministère de l'Agriculture et de l'Élevage, 2010, p. 2; World Bank, World Development Indicators.

distinguishing between 3 levels of performance:

1. the capacity of the program to increase fertilizer use among farmers;

2. the capacity to build a functioning, sustainable and competitive private sector;

3. the capacity of the program in Rwanda to comply with its own targeting criteria. A comparison of performance with Burundi on this final aspect is impossible since, unlike Rwanda, Burundi does not direct subsidies toward specific crops. However, this aspect must be considered because, as I will show, it impacts the sustainability of the reform in Rwanda. I will also discuss the opportunity for Burundi to adopt such targeting criteria in the future.

Secondly, and more importantly, this article aims to understand the drivers of the successful transformation of fertilizer subsidy programs in both countries in 2013. Both reforms can be deemed as successful so far, even more so in the case of Burundi, despite different starting points. In Burundi, privatization has been the occasion to reshape the system entirely: a voucher system has replaced a corrupt and inefficient system of universal subsidy, where nearly all fertilizers were distributed by the state. This is all the more surprising as the fertilizer sector was an important site of rent capture serving entrenched political interests. In Rwanda, privatization is the evolution of an existing fertilizer subsidy scheme already based on vouchers. Interestingly, the full privatization of the fertilizer supply chain has been relatively more timid in comparison to its neighbour, with the state involvement greater than being in Burundi, despite an a-priori more conducive environment for reform.

Such analysis is important in three respects. First, given the amount of money spent and the importance of the subsidy scheme for the economy, it is important to offer an appraisal of each country's program. Second, lessons can be drawn from this successful reform, especially in the Burundian case where it bucks the otherwise increasing trend of corruption and elite predatory behaviour. Thirdly, although fertilizer promotion is vital for the future of both countries, extremely little is known about the political economy of this sector, notably in comparison to other countries in the region[6].

This article will be interested only in fertilizer subsidy programs aiming at raising the productivity of food crops. It will not tackle the use of fertilizer for cash crops such as tea or coffee, which is relatively insignificant[7].

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[6] For instance CHINSINGA, B., *The Political Economy of Agricultural Policy processes in Malawi: A case study of the fertilizer subsidy programme*, FAC Working Paper 39, Brighton, Future Agricultures Consortium, 2012; PAN, L., CHRISTIANSEN, L., "Who is Vouching for the Input Voucher? Decentralized Targeting and Elite Capture in Tanzania", *World Development*, vol. 40, no. 8, August 2012, pp. 1619-1663; BANFUL, A. B., "Old problems in the new solutions? Politically motivated allocation of program benefits and the "new" fertilizer subsidies", *World Development*, vol. 39, no. 7, 2011, pp. 1166-1176.

[7] For instance, in Rwanda fertilizer consumption for cash crops is down to about 2,500 MT. MINAGRI, *The Business Case for Investing in the Import and Distribution of Fertilizer in*

In the first part of this article, I present a history of fertilizer subsidy programs in Rwanda and Burundi until 2013, focusing on the political economy of the sector just before full privatization. Part two aims to describe and assess the new subsidy program in each country for the two first seasons (2014A and B)[8]. In the third part I discuss the determinants of the successful reform of the fertilizer sector. I conclude in part 4 by showing how the reform is revealing of the current development model of each country.

The findings presented in this paper are based on fieldwork in Rwanda and Burundi that took place between March 2013 and April 2014 (with some interruptions) combining formal interviews with local (all outside Kigali or Bujumbura: 9) and central government officials (10), fertilizer importers and distributors (6), international partners and NGOs (10), as well as numerous informal exchanges. In Rwanda, participation in meetings at the Ministry of Agriculture and direct observations in rural areas of the *imihigo* (government performance contract) evaluation were also used.

2. A HISTORY OF FERTILIZER SUBSIDY PROGRAMS IN RWANDA AND BURUNDI

2.1. The timid attempt to promote fertilizer until genocide in Rwanda and the war in Burundi

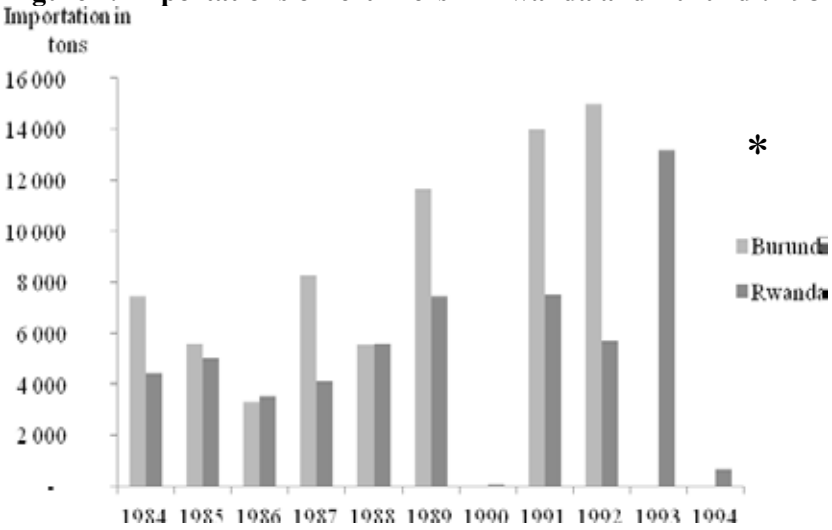
Until the late 1980s, fertilizer use in Rwanda and Burundi was low. The situation was however not uniform across both countries. Burundi was more effective than Rwanda in promoting fertilizer use (figure 1)[9], mainly because of the modernizing ambitions of the state regarding the agricultural sector.

Rwanda, May 2012, prepared by Monitor Group, pp. 9 and 26.

[8] Rwanda and Burundi have two main agricultural seasons: season A from September to January and season B from February to June. 2014A is from September 2013 to January 2014.

[9] Fertilizer importations are the only comparable data on Rwanda and Burundi for this period. Since fertilizers are used only for agricultural purposes (except in Rwanda in 1993), importations are a good indicator of fertilizer use. Data does not distinguish between food and cash crop use.

Figure 1. Importations of fertilizers in Rwanda and Burundi: 1984-1994



Source: Burundi: SMITH, B., *Facteur influençant l'utilisation d'engrais au Burundi*, Bujumbura, ISABU, 1992;
Rwanda: DESAI, M., *Key Issues In Achieving Sustainable Rapid Growth Of Fertilizer Use In Rwanda*, Agricultural Policy Development Project Research Report No. 16, Prepared for USAID, ABT Associates, August 2002.
No bars indicates missing data.

*: Fertilizer probably imported for military purposes in 1993 (DESAI, *op. cit.*, p. 26).

Until the late 1980s, the government of Rwanda had little interest in increasing fertilizer use. The ideology of the Habyarimana regime centred on self-sufficiency[10] and hampered the promotion of mineral fertilizers. The natural fertility of the soil was considered rich enough to attain the objective of self-sufficiency, without the need to engage in expensive importations[11]. Use of fertilizers was limited mainly to donor programs. However, decrease in productivity in the 1980s spurred the Ministry of Agriculture (MINAGRI) to promote fertilizer imports. In 1984 the Project for the Support of the Input National Program (APNI), backed by partners, started financing importations of fertilizer in Rwanda.[12] The important volumes of fertilizer (mainly ammonium and nitrate products) imported in 1993 were probably used for

[10] On the ideology of the Habyarimana regime, see VERWIMP, P., "Development ideology, the peasantry and genocide: Rwanda represented in Habyarimana's speeches" *Journal of Genocide Research*, 2000, vol. 2, n° 3, p. 325-361.
[11] KELLY, V., MPYISI, E., MUREKIZI, A., NEUVEN D., *Fertilizer Consumption in Rwanda: Past Trends, Future Potential, and Determinants*, Rwanda, February 2001, p. 1.
[12] UWAMARYA, L., FABIOLA H., ZALIA T., *Étude sur les Engrais Minéraux et les Pesticides au Rwanda*, Kigali, Ministère de l'Agriculture, de l'Élevage et des Forêts, Division des statistiques agricoles, juillet 1990, p. 4-5.

military and not agricultural purposes[13].

In Burundi, although low in comparison to international standards, use of fertilizers before the war was higher than in Rwanda. Fertilizer imports were not constrained by an official ideology of self-sufficiency. On the contrary, they benefited from a political commitment to modernize agriculture, especially under President Jean-Baptiste Bagaza, through, for instance, the set-up of the technocratic SRD (Regional Development Companies), which were parastatal organizations in charge of providing integrated extension services and agricultural inputs for cash crops and, in a lesser extent, food crops[14]. Until 1992, the state entirely dominated the fertilizer distribution by playing the role of importer and distributor. Importations were subcontracted at an agreed price to private actors. Fertilizers were distributed through two channels: by the state through SRD, or other parastatal organizations such as the Coffee Board of Burundi (OCIBU), and through different international projects.

Progress was significant: whereas 2% of farmers used fertilizer in 1979, 30% were apparently using them in 1992[15]. Nevertheless, the use of fertilizer remained generally low because of inadequate extension services, the lack of proper demand forecasts, and the lack of market structures in the fertilizer sectors[16]. This said, importations were on average double than those of Rwanda in the 1984-1992 period.

Under the pressure of the World Bank's structural adjustment program, Burundi liberalized the sector in 1992: private actors were authorized to import and distribute fertilizer parallel to the state. Interestingly, it seems that importations were little affected by the embargo on the country (1996-1999) decided by the international community as a response to the coup of Pierre Buyoya[17]. While neighbouring countries limited importations of many goods to Burundi, notably petrol, imports of fertilizers seem to have been generally allowed, at least informally [18]. It is only when the war intensified around 2000 that importations dropped.

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[13] DESAI, M., *op. cit.*, p. 26.

[14] CHRÉTIEN, J.-P., LE JEUNE, G., "Développement rural et démocratie paysanne, un dilemme ? L'exemple du Burundi", *Politique africaine*, n° 11, septembre 1983, p. 50-53.

[15] SMITH, B., *op. cit.,* p. 1.

[16] World Bank, *Structural Adjustment and Development Issues*, Report 6754-Bu, p. 39, quoted in SMITH, B., *op. cit.*, p. 1.

[17] I could not find data on the importation of fertilizer during the war but interviews with 2 former importers reveals that imports amounted to approximately to 14,000 MT until the early 2000s.

[18] Interview, former fertilizer importer, Bujumbura, March 2014.

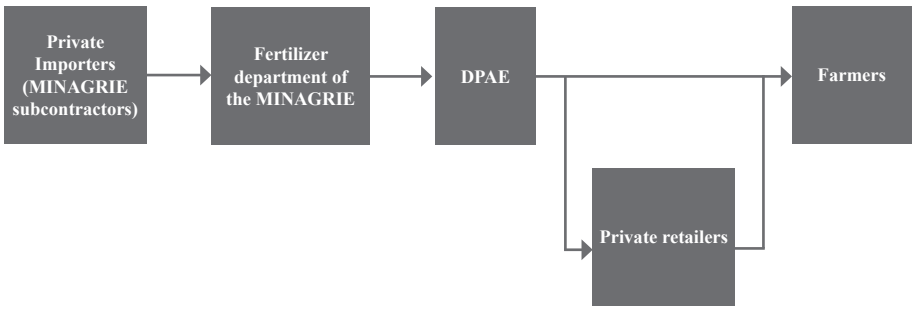
2.2. The post-conflict period before the 2013 privatization

2.2.1. Burundi: fertilizer subsidies as institutionalised corruption

The fertilizer distribution system until 2013 was broadly speaking the same as in 1992, when the sector was liberalized. Under this system, two channels, one public and one private, co-existed: the private sector was free to import and sell parallel to the state. However, the private sector, which sold unsubsidized fertilizers, was greatly hindered by the unfair competition represented by the subsidised fertilizers sold by the state. As a result, the public sector had a quasi monopoly on distribution. The private sector limited its role mainly to one of importers on behalf of the state as subcontractors[19].

The state distribution channel worked as follows (figure 2): private actors imported on behalf of the state that then distributed the subsidised fertilizers to the farmers locally through the Ministry of Agriculture's DPAE (Livestock and Agriculture Provincial Departments). The DPAE could sell directly to farmers or use local private retailers.

Figure 2. Subsidised fertilizer value chain before 2013 in Burundi

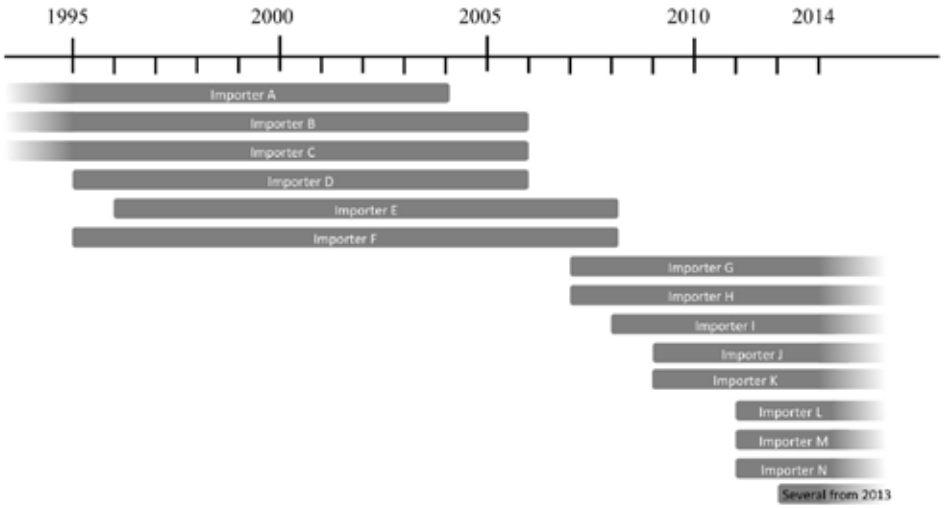


This system was, "in short, a corrupt system"[20] as it offered many occasions of rent capture. The selection of importers was opaque. Often, importers had to have close ties to the CNDD-FDD ruling party and/or be able to pay kickbacks to individuals and the party, which drove up importation costs[21]. Although this is difficult to demonstrate beyond anecdotal evidence given in interviews, the political factors in the selection of importers can be observed by the analysis of importers in business overtime. In figure 3, each line represents the period a fertilizer importer has been in business. Only the

[19] Various interviews with MINAGRIE officials, consultants, and donors. See also MINAGRIE, *Programme national de subvention des engrais au Burundi : note de présentation de concept*, Bujumbura, 2012, p. 7.
[20] Interview with a donor, Bujumbura, August 2013.
[21] Various interviews with importers and donors, Bujumbura.

main importers have been selected, i.e. those who have been in business for more than one year, but not necessarily consecutively. The method used to identify importers is a triangulation based on interviews with actors of the fertilizer sector, and documentary analysis (Annual Reports from the National Directorate for the Control of Public Procurement and private communications from the Ministry of Agriculture and Livestock (MINAGRIE)). As shown by figure 3, the political transition from the Tutsi-dominated UPRONA to the Hutu-dominated FRODEBU in 2003, and then from FRODEBU to the Hutu-dominated CNDD-FDD exactly corresponded with the emergence of a "new breed" of importers and the vanishing of the old guard.

Figure 3. Main fertilizer importers in business overtime in Burundi



Source: author's analysis based on interviews, private communications from the MINAGRIE, and analysis of the Annual Reports from the National Directorate for the Control of Public Procurement (2009-2012), Ministry of Finance.

Interviews reveal that this corresponds to the will of the new regime to favour politically aligned actors, or at least those that are the least hostile, for this lucrative business. The idea was to replace an old generation of importers, however experienced and perhaps even in business for decades, but seen as generally sympathetic with the UPRONA. The primacy of political connections in market attribution and the lack of experience of new importers meant that the quality of fertilizer became an issue after 2005[22].

At the level of distribution, rent capture was also common. The high demand for fertilizer in comparison to importations encouraged some MINAGRIE local officials to engage in speculation, selling the fertilizer

[22] Various interviews, Bujumbura.

higher than the official price. Although subsidised fertilizers should have had the same price everywhere, regional variations existed, reflecting local speculation. In contrast, at the same time, Rwanda has apparently been more effective in curtailing local speculation. As recalled by a Burundian formerly involved in the fertilizer sector: "I went to Rwanda 3 years ago. We visited several places with the Minister of Agriculture. […] What I really liked is that prices of [subsidised] fertilizers are the same everywhere. Each DPAE [actually Rwandan districts] does what is necessary for that. "[23]

This inefficient and corrupt system discouraged financial support from donors and the development of private distribution channels that could have increased the quantity of fertilizer imported and distributed[24]. As a result, quantities of fertilizer remained low in Burundi. Five years after the end of the war, the system barely allowed the country to reach similar levels of fertilizer importation as the pre-war period[25]. The political economy of the system, rather than directed to efficiency, served private interests that captured centralized rents through importation contracts, and decentralized rents through the speculation on fertilizers at local level.

2.2.2. Rwanda: fertilizer subsidies key to the country's post-genocide vision

Use of fertilizers became a priority in post-genocide Rwanda following the government's vision to transform subsistence agriculture into a commercial sector. Rwanda's *Vision 2020* even states that "contrary to conventional wisdom, the most important issue retarding Rwanda's agricultural development is not land size, but low productivity associated with traditional peasant-based subsistence farming"[26]. In this respect, the contrast with pre-1994 ideology is obvious, as Vision 2020 calls for "mov[ing] beyond past delusions of viable subsistence-based agriculture"[27].

Immediately after the genocide, in an emergency context, donors and NGOs were in charge of the procurement of fertilizers. From 1995 to 1998, fertilizers were imported in the country by a European Union program and distributed at a subsidised price to NGOs. Fertilizers were then retailed often

[23] Interview, Bujumbura, July 2013.

[24] Various interviews, Bujumbura. See also SMITH, B. *Conséquences Malheureuses ; Intentions Nobles, La Politique sur les Engrais au Burundi*, Presentation for the GSADR, IFDC, June 2011.

[25] Although difficult to demonstrate, it seems that the fertilizer sector was less corrupt before than after the war (interviews with former fertilizer importers and a foreign technical consultant who worked in Burundi before the war).

[26] GOVERNMENT OF RWANDA, *Vision 2020*, Kigali, MINECOFIN, 2000, p. 17.

[27] *Ibidem*.

for free or heavily subsidised[28]. In an effort to boost fertilizer consumption, the government fully privatized the fertilizer supply chain in 1999: private actors were allowed to import fertilizers as well. Fertilizers became exempted from entry tax and tax on revenue and in 2000, fertilizer importers were able to access credit at a lower rate[29]. Results were however limited since between 1998 and 2005, imports were on average 6,380 MT per year[30].

The rolling out in 2007 of the ambitious Crop Intensification Program (CIP), the government's main tool to reach its vision of a food-secure Rwanda out of subsistence agriculture, gave the state a preeminent role in the fertilizer sector. Discussions on the CIP started in 2002 but it took 5 years to agree on the policy and overcome resistance within the state to its introduction. Some officials were especially concerned about the feasibility of the land use consolidation[31]. The CIP relies on 4 main pillars. First, land use is consolidated in order to promote economy of scale, easy allocation and use of inputs, and market access: farmers with plots next to each other grow crops in a synchronized manner. Second, farmers in consolidated areas are limited to only growing certain crops. Third, farmers access subsidised inputs (fertilizers and improved seeds). Fourth, special attention is given to the improvement of post harvest handling and storage.

Under the CIP, the Rwandan fertilizer subsidy program follows the model of smart subsidies now in vogue in many African countries. Such programs often involve vouchers as in Rwanda. They differ from the universal subsidies of the past in three main respects.[32] First, smart programs often target particular beneficiaries (for instance the poorer or the one growing a particular crop) to maximize their effect. Second, they are market-based: they aim to build a private sector, which is often in charge of distribution under such programs. Thirdly, they normally include an exit strategy whereby the role of the state is meant to decrease overtime. In the case of Rwanda, the system follows a triple logic: promotion of fertilizer use, poverty alleviation and promotion of priority crops. The beneficiaries are farmers that have consolidated the use of their land and grow selected crops, in accordance with the CIP. The amount of subsidised fertilizer they receive is (in theory) limited, for instance 50kg of DAP (diammonium phosphate) and 25kg of urea, i.e. enough for 0.5 ha of maize. Even though anyone is eligible to receive fertilizers, the goal is to

[28] KELLY, V., MPYISI, E., MUREKIZI, A., NEUVEN, D., *op. cit.*, p. 2.
[29] *Ibidem*, p. 3.
[30] IFDC, *Crop Intensification Program (2008-2009) Evaluation Report to Rwanda Ministry of Agriculture and Animal Resources*, March 2010, p. 9.
[31] Interview with MINAGRI senior official, Kigali, April 2014.
[32] BALTZER, K., HANSEN, H., *Agricultural input subsidies in Sub-Saharan Africa*, Copenhagen, Ministry of Foreign Affairs of Denmark, DANIDA, 2011, p. 2-3. For a discussion on smart fertilizer subsidies, see also DORWARD, A., *Rethinking Agricultural Input Subsidy Programmes in a Changing World*, London, SOAS, 2009.

maximize the impact for the poorest (i.e. those with a plot of 0.5 ha or below) while limiting the fiscal burden of the program.

In terms of selection of beneficiaries, sector agronomists, helped by cell-level IDPs (Integrated Development Program officer, i.e. officials in charge of development)[33] and chief of site (one of the farmers from a CIP consolidated site), draw up the list of farmers who want fertilizers. Farmers will get vouchers from a printing team dispatched from Kigali, and retrieve their bag of fertilizer from local agro-dealers against the voucher and 50% of the price in cash. The subsidy was in reality even higher than 50% since the government also covered the international transportation cost of the fertilizers to Kigali. It is on the base of the fertilizer total price minus international transportation cost that the 50% subsidy was calculated. Farmers often could receive credit for the cash balance, which they would have to pay back after harvest. On the supply side, the government imported fertilizers and assigned distributors and their network of agro-dealers monopoly over a given region. Distributors and agro-dealers' selling prices are set by the government.

Figure 4. Subsidised fertilizer value chain before 2013 in Rwanda

The political economy of the fertilizer sector under the CIP in Rwanda contrasts sharply with the situation in Burundi before the 2013 reform: the government tried to curtail any undue rent creation. While the level of corruption or embezzlement is difficult to assess, at least the *commitment* of the government to limit it is, unlike in Burundi, visible in Rwanda.

First, in comparison to Burundi where public contracting was used for corruption, Rwanda has been committed to limit undue profits for distributors and agro-dealers. For instance, whereas the selection of distributors was initially done through simple actions, the discovery in 2009 that distributors were colluding with each other not to bid for high prices when competing to buy the MINAGRI's fertilizer stocks led the government to introduce an electronic auction system. This is supported when one analyses distributors' gross margins (i.e. the difference between the distributor's buying and selling price). The auction system worked as follows. The government set a floor price from which each actor can bid to get a fertilizer lot (i.e. part of the government stock to be distributed on a given area). MINAGRI however indicates a ceiling price, at which farmers will buy fertilizers (voucher value

[33] The cell is a local government entity, sub-level of the sector.

included). So each bid reduced the margin of the distributor and of its agro-dealers. From 2008 to 2012, the maximum margin set by the government (i.e. the difference between the floor and ceiling price) stayed the same in absolute terms (65 Rwf/kg for a distributor, which include a 15RWF/kg for an agro-dealer). However, the increase over the year of the floor price meant that the potential maximum gross margin for distributors in proportion fell from 17.3% in 2008 to 15.3% in 2012. This represents a loss of 8.8% over 4 years for distributors and agro-dealers.[34]

Second, the maximum margins along the value chain, as set by the MINAGRI, were so tight that distributors and agro-dealers could hardly make a profit. For instance, a study by the International Fertilizer Development Center (IFDC) in 2011 shows that from 4 distributors surveyed, even though their situation is heterogeneous, the average net margin on fertilizer sales, was close to 0%. The situation was worse for agro-dealers: among the 10 visited, all suffered a loss[35]. As we will see, the margins will be increased after the 2013 reform to sustain the private sector.

The political economy of fertilizer in Rwanda did not serve central rent extraction as in Burundi. The government endeavoured to limit profit from private actors in the sector. Rather, embezzlement is decentralized, resulting from the difficulty of the state to track down each fertilizer bags at local level. Fieldwork revealed for instance that some agro-dealers might buy fertilizers back from a farmer in order to sell them out of official selling period, at a higher price. This is especially true for NPK (nitrogen, phosphorus, potassium) fertilizer, which is used with Irish potatoes, a particularly profitable crop in Rwanda that can be grown all-year long. Smuggling of fertilizer to neighbouring countries where prices are higher constitutes the other main venue for small-scale embezzlement. Overall, embezzlement is merely the result from local private actors profiting from loops in the system, and not public actors as in Burundi who subverted a system they were supposed to enforce.

Besides the check put on rent creation on the distribution side, the other dimension of the political economy of the fertilizer sector in Rwanda until 2013 lies in the large provision by the state, in addition to a generous subsidy, of free credit to farmers and its weak capacity to enforce repayment. This will prove a key determinant for privatization.

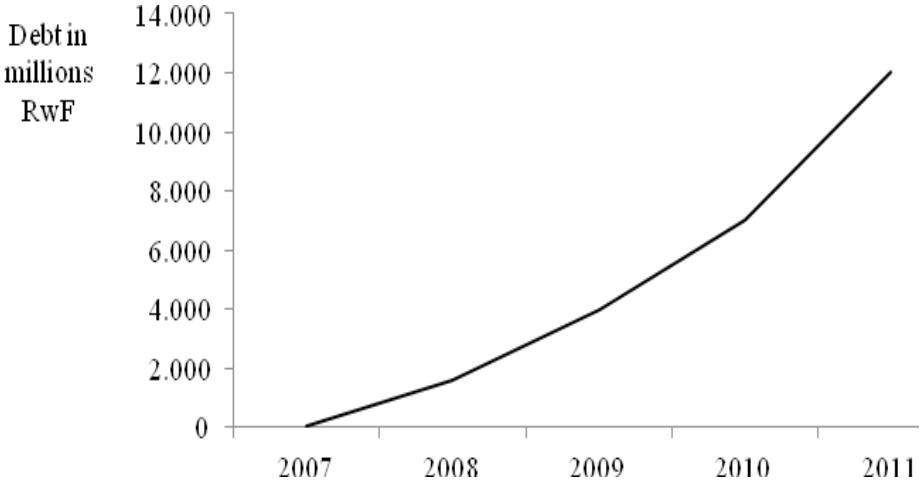
As explained, until 2013, farmers could pay cash due to agro-dealers after the harvest. The agro-dealer in turn would pay back the distributor, which would finally pay MINAGRI. As no actor was required to engage collateral for the credits, the incentive to pay back was weak. Since the start of the CIP,

[34] IFDC, *Cost and Margins Analysis in the Fertilizer Distribution Chains in Rwanda: Progress report*, 10 October 2012, Kigali.

[35] *Ibidem*. Agro-dealers were able to 'survive' because fertilizer distribution was not a full time activity, and often district lend them premises.

the non-repayment by farmers has been a recurrent problem (figure 5). As of September 2011, more than 13.14 billion of Rwanda Francs (about 22 million USD at the time) worth of fertilizer credit were outstanding to MINAGRI. As a way of comparison, this represented more than 38% of MINAGRI internal budget this year[36].

Figure 5. Unpaid fertilizer credit to MINAGRI



Source: Private communication, author's analysis.

The importance of the debt is surprising given the usual effectiveness of the Rwandan state about collecting a myriad of financial contributions at local level. As summarized by a MINAGRI official "the farmers have to pay *mutuelles* [community-based health insurance], security, street cleaning etc. it is a lot of money. The fertilizers are expensive but they have not paid them fully historically."[37] How can we explain that the state has allowed such a debt to build up?

First, agro-dealers and distributors had an incentive to sell fertilizers with little regard to the solvability of farmers, since MINAGRI would be the ultimate guarantor of their debt. In addition, it was not rare that agro-dealers and distributors alleged not to have been paid by farmers, even though it was not true, to benefit from free credits[38]. From the local state point of view, agents of local governments (agronomist of sectors, and IDP of cells) as well as local agents of the MINAGRI had a strong incentive to promote sales of fertilizers because fertilizer use is often part of their *imihigo* performance contracts. As a result, local officials played on the fact that the state wouldn't be adamant

[36] MINAGRI internal budget was 34.2 billion RWF for 2011/12. MINAGRI, *Annual Report FY 2011-2012*, Kigali, p. 91.
[37] Interview, staff of the MINAGRI, Kigali, January 2013.
[38] Interview with staff from the credit recovery team, Kigali, January 2013.

in forcing farmers to repay their debts to increase fertilizer consumption. As explained by a consultant of MINAGRI on fertilizers, some "agronomists say [to the farmer] 'add some fertilizer, it's nearly free, so why go without it?'"[39]

Secondly, there have been no real sanctions in case of non-payment of credits. This was a somewhat deliberate policy in order to limit the resentment regarding the regionalization of culture and monocropping promoted by the CIP. Especially in the first years of the CIP, the market structure did not allow the full sale of the surplus production of maize, thus limiting its profitability. In addition, farmers have seen monocropping as extremely risky in case of bad harvest. [40] As explained by a former high official in MINAGRI, "from the start, MINAGRI was in a bad position [to recover debts]. Farmers said: 'why do you want to force a credit on me while I can't grow the crop I want?'" As a consequence, the government adopted a lenient stance toward debt recovery. An agent of MINAGRI working in the South of the country maintained that "sector agronomists and the IDP received instructions from MINALOC [Ministry of Local Government] not to be strict regarding repayment. […] It was not a written instruction, it was merely an oral one. There was no willingness to get the money back"[41]. It appears that the 2010 presidential election also played a role in that stance: as explained by a former staff member of MINAGRI "[the soft approach to credit recovery] was especially true in 2010 for the elections. The word [passed around among officials] was "no one touch the peasants."[42]

Fertilizer subsidies and easy access to credit acted as a social contract between farmers and the state. In exchange of going along with the unpopular, but government's flagship, CIP, farmers could benefit from heavily subsidised fertilizer and free credit. This helps to understand why debt on fertilizer has kept rising, despite early concerns by international partners[43] or even other state agencies such as the Office of the Auditor General[44]. It was the price to pay for promoting the CIP and preventing social agitation. This analysis reveals that the fertilizer sector in Rwanda served also important interests, although in a very different and less obvious manner than in Burundi.

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[39] Interview, Kigali, January 2013.

[40] Various interviews. See also HUGGINS, C., "Agricultural Policies and Local Grievances in Rural Rwanda", *Peace Review*: *A Journal of Social Justice*, vol. 21, no. 3, 2009, pp. 296–303: pp. 300-301.

[41] Interview, Kigali, January 2013.

[42] Interview, staff of the MINAGRI, Kigali, January 2013. This point was made by several other informants.

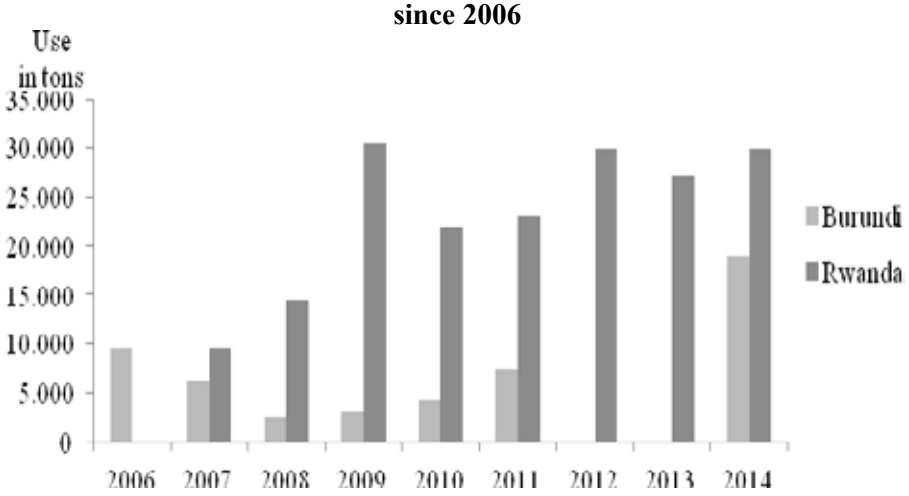
[43] For instance see IFDC, *Crop Intensification Program (2008-2009): Evaluation Report to Rwanda Ministry of Agriculture and Animal Resources*, Kigali, March 2010, p. 37.

[44] Office of the Auditor General, *Value for Money Audit Report on Management of Agriculture Inputs Utilised Within Crop Intensification Programme by RADA. Period August 2007 – April 2010*, Kigali, 2010.

3. THE FERTILIZER SUBSIDY SYSTEM AFTER THE 2013 REFORM

The 2013 full privatization had the effect of beginning to bridging the gap between Rwanda and Burundi in terms of fertilizer promotion policies (figure 6).

Figure 6. Fertilizer use for food crops in Rwanda and Burundi since 2006



Source: Rwanda, IFDC; Burundi, MINAGRIE. Missing bars means missing data.

Before turning to the determinants of the reform, I will present and assess the new fertilizer system in both countries. They are not only close in theory (table 1, see next page) but also in terms of results.

The value chain is similar (figure 7) across both countries. Importers/ distributors are selected by the state according to the price of the fertilizer they will sell and their capacity for distribution. They import and distribute fertilizers to a network of agro-dealers. The subsidy to the farmer is delivered as a voucher with which farmers buy fertilizers. Each importer has the monopoly of distribution on a given area of the country.

Figure 7. Current subsidised fertilizer value chain in Rwanda and Burundi

There exist however two fundamental differences between both countries. First, Rwanda has a targeting policy, in line with the CIP: voucher recipients in theory have to grow certain crops and can receive a limited quantity of subsidised fertilizer. This targeting is altogether absent in Burundi. Second, Rwanda farmers pay for fertilizers when they receive their bag, whereas in Burundi, they have to give a non-refundable deposit of 10% about a month in advance of the season.

Table 1. Comparison of the subsidy program in Rwanda and Burundi (season 14A & B)

	RWANDA	BURUNDI
TARGETING		
Beneficiaries selection	Chief of CIP site (farmers), IDP (cell officer) and sector agronomist	Elected hill committee
Targeting criteria	Farmers with consolidated land growing certain crops (rice, Irish potatoes, maize and wheat)	none
Package size	75kg max. for maize and wheat	none
Amount of the subsidy	50% for maize and wheat, flat rate (105 RWF, ~16%) for rice and Irish potato	40%
DELIVERY		
Supply	Selected importers: 2	Call of tender: 7 importers in 14A, 6 in 14B
Financial backing	50% of the cost for the biggest importer guaranteed by the state	none
Retail	Network of agro-dealers	Network of agro-dealers
Fertilizer payment by farmers	At the moment of fertilizer retrieval	10% few months prior to the seasons, the rest at the retrieval of fertilizer
OUTCOME		
Metric tons distributed	18 773	13 197
Season14A only	30 000	18 493
14A and 14B		

Source: multiple sources, author's compilation. Format inspired by BALTZER, K., HANSEN, H., *op. cit.*

3.1. Rwanda: an effective, and slightly hypocritical, system?

The 2013 reform in Rwanda is less dramatic than in Burundi as it largely draws on the voucher system already in place. The main change is that it is now private actors that import fertilizers and bear the risk of non-payment. Unsold

quantities cannot be returned to the state. Credits made to farmers are not guaranteed by the state anymore. Another consequence of privatization is the decrease of the subsidy, as the state does not cover international transportation cost anymore.

How to assess the subsidy system in Rwanda? Following the framework presented in the introduction, I first turn my attention to its capacity to promote fertilizer use. The reform of 2013 draws on the success of the CIP evoked above. Overall, the fertilizer subsidy program in Rwanda has been a success in terms of fertilizer use, especially in comparison to Burundi, as shown by figure 6: since the start of the CIP, fertilizer use increased by 211%, jumping from 9 633 metric tons to 30 000 metric tons in 2014. It has been done with an effort to curb centralized rent capture behaviour. The 2013 reform understandably did not trigger a dramatic increase of fertilizer use since subsidies decreased and credits to farmers were supressed. However, the demand was maintained, and even slightly increased in 2014. This is a very positive sign: it means that the CIP has succeeded in convincing farmers of the importance of fertilizer.

Regarding the capacity of the program to sustain the private sector, results are less convincing than in Burundi. First, only two importers were in business in 2014, in comparison to 7 in Burundi. Such small numbers may seem surprising and not the best to foster a competitive private sector. However, it reflects the fear of the government that importers were not solid enough to engage in a market where demand was uncertain, and subsidies decreasing[45]. The two selected importers were consequently the most financially solid, with a good reputation with banks. In addition, a smaller number of actors allowed an increase in importers' absolute margins.

Secondly, although the government was in theory not supposed to act as a last resort guarantor, it did become a guarantor for the bigger of the two importers in 2014A for 50% of the cost of fertilizers. The goal was to ensure he could access loans from banks and import a sufficient quantity of fertilizers on time.

Thirdly, the government still set the margins at each level of the value chain. It however took the occasion of the privatization to increase them to support profitability of the fertilizer distribution business, which was an issue before full privatization. In addition, the government engaged in organizing agro-dealers into cooperatives to make them financially stronger. The hand of the state was thus still quite present, at least more than in Burundi, during the privatization but might have been key in maintaining the level of fertilizer consumption observed in 2014. The fact that Rwanda chose a more gradual approach to privatization than Burundi is however not problematic, as long as it manages in the coming years to open up the market.

The third level of evaluation is the capacity of the program to stick to

[45] Interviews of consultant and MINAGRI officials, Kigali, January 2014.

its targeting criteria. In this respect, however, Rwanda is not very successful in meeting its own objectives of targeting subsidies for certain crops for a maximum quantity. Whereas in theory each household should receive a given quantity of fertilizer, deemed to be enough for 0.5 ha, no mechanisms exist to enforce this measure. Again, the incentive for the local officials to distribute fertilizer, as well as the ease of reselling one's voucher, one's fertilizer bag, or sending its relatives to obtain additional vouchers prevent any control over the limit of the quantity of subsidised fertilizer per household[46]. This is eased by the fact that Rwanda does not have a centralized database of farmers eligible to the program. Crosschecking on whether an individual has already obtained its unique voucher is impossible. This is not an issue at an aggregate level in terms of agricultural production. It means that, in comparison to its intent, the program loses in financial efficiency by increasing the state fiscal burden to the benefit of richer farmers.

The program also has difficulty in enforcing its second targeting criteria regarding crops. Unlike in Burundi, the Rwandan system is designed so that the fertilizers is used on some selected crops only (maize, wheat, rice and Irish potatoes as of 2014). This targeting remains however limited. As already mentioned, officials have a strong incentive to distribute fertilizer and thus won't be very vigilant about where fertilizers actually end up. In addition, no real means of control exist anyway. The case of marshland is an exception: because they all belong to the state, which allows locals to cultivate them, non-use of fertilizer can in theory have consequences for farmers, the worst being evicted from marshland cultivation. Fieldwork reveals that, in any case, the strategy for farmers is often to use part of the fertilizer on designated crops and trying to keep some for non-priority crops, especially vegetables and sorghum. Two informants (a staff member of the Ministry of Agriculture working in the fertilizer program and an agronomist[47]) estimated that about 50% of what is supposed to go to maize ends up elsewhere. Again, this situation is not an important issue for the production at an aggregate level: fertilizers are in the end used somewhere, it just means that the program is not capable of reaching its own objectives.

While targeting is poor in Rwanda, admittedly the bar has been set high, especially in comparison with Burundi. The system is in a sense slightly hypocritical as the state does not have the means (or the will?) to enforce its targeting criteria. But should this targeting of subsidies be maintained anyway in a context of the exit of the state from the fertilizer sector? It seems that it actually should not. Such targeting puts a check on fertilizer consumption. Although this check can be circumvented, it might, if lifted, encourage further

[46] Various interviews with MINAGRI officials and consultants in Kigali, January 2014, and MINAGRI agronomist and IDP, Southern province, March 2014.
[47] Interviews in March 2014, Kigali and Southern Province.

fertilizer demand and help to sustain the new private sector. Interestingly, the MINAGRI seems to realize the contradiction between subsidizing fertilizer for priority, and not always popular, crops, and creating a domestic demand large enough for the young private sector. As of March 2014, discussions were held about the possibility of issuing vouchers regardless of the nature of the crop[48]. This is a possible step toward relaxing the modalities of the CIP, strictness of which has been debated in the literature[49].

3.2. Burundi: an effective, and slightly fragile, system?

After 2 seasons (14A and 14B), the new fertilizer system is, so far, a great success. Regarding the performance of the reform to promote fertilizer use, it allowed Burundi to reach unprecedented levels of fertilizer consumption with 18,493 tons used only on food crops. Of this quantity, 13,197 tons were imported in season A. The poor performance in season B can be explained by the lack of access to finance by farmers: by the time they had to pay the deposit for season B, the harvest of season A was not yet sold. To remedy this problem, from season 15A, farmers will pay the deposit for the 2 seasons at the same time, which is expected to boost demand.

Regarding the second performance criteria of promotion of a private sector, the reform is successful so far. It brought on board 7 importers/distributors that do a better job than under the previous system. The pressure to deliver quality fertilizer on time is much higher. The state did not hesitate to reject an importer failing to do so in 2014B[50]. In addition, corruption has decreased because the channelling of the program money in a new basket fund co-supervised by donors ensured the transparent use of resources. The private sector is also helped by the fact that farmers have to pay a 10% deposit months in advance of the fertilizer's distribution. While it is an obvious limitation to fertilizer demand, this seems however an appropriate solution for now. By forecasting demand, it reduces the uncertainty for the importers/distributors. In a context of privatization of the distribution from scratch, and against the backdrop of past experience of political interference, it is not a luxury.

As mentioned, the third criteria for performance, targeting, is non-existent in Burundi. Would it be desirable though, along the line of the model followed in Rwanda? This is unlikely. First, targeting is hard to achieve as

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[48] Field notes, Agriculture Sector Technical Working Group, MINAGRI, Kigali, 5th February 2014. See also SOIL FERTILITY SUB-WORKING GROUP, *Increasing Yields in 15A: Towards a General Subsidy*, Report prepared by One Acre Fund on behalf of the Soil Fertility SWG, April 2014.

[49] For instance: HUGGINS, C., *op. cit.*; ANSOMS, A., "Striving for growth, bypassing the poor? A critical review of Rwanda's rural sector policies", *The Journal of Modern African Studies*, Vol. 46, No. 1, 2008, pp. 1-32.

[50] Interviews with international consultants and an importer, March 2014, Bujumbura.

demonstrated by the Rwandan case. In addition, given the political saturation of the Burundian local state, one can wonder if tighter targeting mechanisms would not be quickly twisted for political reasons. The risk exists: for instance, cases of local authorities denying fertilizer to individuals for political reasons occurred across the country in season 14A, although they were rare[51]. Second, given the level of food production, malnutrition and inflation, a large targeting is best to ensure in the short term a global increase of production, especially as long as donors are committed to channel resources to the program.

The 2013 reform appears successful in both countries, with nuances: Rwanda has been more successful in promoting fertilizer use because it drew on an already functioning system, but less in terms of encouraging the emergence of the private sector (although this could change rapidly in the future). Reform happens despite the fact that, as shown, the previous subsidy systems served political interest not only in Burundi, but also, and in a less visible way, in Rwanda.

4. THE DETERMINANTS OF THE REFORM OF THE FERTILIZER SECTOR

4.1. Rwanda: a risky, but successful, process

The full privatization, although contemplated for a long time, was carried out mainly for financial reasons. As explained, the Rwandan subsidy system was not only generous, it also produced an enormous debt. The Ministry of Finance had regularly put pressure on MINAGRI about the fertilizer debt. However, the cutback of international aid in 2012 because of the involvement of Rwanda in DRC triggered the sudden privatization process in March 2013, which took donors by surprise[52]. Indeed, even in mid-2012, the government was still contemplating a gradual approach to privatization, with importation to be privatized only in July 2016[53].

Considering the perceived political role given to provision of credit to farmers, the choice of a shock therapy approach was risky for the MINAGRI if it wanted to maintain the level of fertilizer demand. From the supply side, this could lead importers to reduce importation in order to avoid unsold stock. These risks explain why privatization has been more timid in Rwanda, with only 2 importers, one of which was partly financially backed by the MINAGRI. The reform in Rwanda was thus government-driven, and largely triggered by the circumstances: high level of debt coupled with aid-cutbacks.

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[51] Interviews with an importer, March 2014, Bujumbura.

[52] Various interviews with MINAGRI officials and consultants, 2013-2014, Kigali.

[53] IFDC, *Privatization of Rwanda's Fertilizer Import and Distribution System (PREFER) Work Plan: July 1, 2012 to August 31, 2015*, 30 June 2012, p. 10.

4.2. Burundi: a model of reform for the country?

The dynamics behind the reform in Burundi were completely different. The whole process was donor-driven. The IFDC and the Netherlands embassy started spreading the idea among donors of a new fertilizer system in 2011, in the wake of the Food Security Forum organized in Bujumbura this year. They managed to win key state institutions to their cause: the second vice-presidency, in charge of economic and social affairs, the Ministry of Agriculture, and ultimately the Presidency. Three main reasons explained the quick political support from the Burundian government to the reform, despite established political interests in the previous system.

First, the agricultural production in Burundi has been poor with, as mentioned, production increases being slower than population growth. Following the Food Security Forum, there was a generalized understanding that agricultural productivity had to be improved.

Second, donors proposed the idea of a basket fund that would serve to pay for the fertilizer subsidies. This fund is managed by an independent structure, the National Committee for Fertilization and Soil Conditioner (CNFA), with seats reserved for donors. This basket fund, with a very precise objective and transparent management, was able to restore trust among donors who, as a result, provided generous funding. For the seasons 14A and 14B, donors gave 5.86 million Euros, i.e. about two-thirds of the fund[54].

Thirdly, and most importantly, the government quickly realized the electoral benefits of a working subsidy system. The capacity to distribute fertilizer countrywide, at a subsidised price, partly thanks to donor's money and expertise, is timely for the ruling party, the CNDD-FDD. With the 2015 election coming up, fertilizer ensures visibility for the party in rural areas, its traditional stronghold. This was well understood by donors. Despite their leading role in the process, they hid behind the government, which has regularly presented the program as its own on the radio and locally. Interestingly, it is even the local political opposition that sporadically attempted to thwart the first distribution campaign in some regions, in the south notably, by, for instance, broadcasting misleading messages on the radio[55]. Even the opposition understood the political benefit for the ruling party of an effective fertilizer subsidy program.

What this analysis reveals is that this promising fertilizer subsidy system is fragile. If the main driver for its adoption is electoral visibility, what will happen after the elections? Will the old reflexes of the past come back? Given the accelerating deterioration of governance in Burundi recently, it is a real

[54] More than half if the fertilizer stock of MINAGRI sold under the new system is included.
[55] Interviews with an international consultant, March 2014, Bujumbura, and a DPAE director, March 2014.

danger. Two factors however might help to mitigate this risk. Donors can use their financial influence in the fertilizer system to try to keep the program on track. In addition, the popularity of the program might discourage political interference, especially given the CNDD-FDD current efforts to tie its image with the success of the program.

Privatization in Rwanda and Burundi challenged political interests but was possible because of the apparition of greater political concerns: in Burundi, increasing the visibility of the ruling party in a context of coming elections and disappointment over poor economic performance; in Rwanda, the need to quickly stop the financial haemorrhage caused by the non repayment of credits in a context of aid cutbacks.

5. CONCLUSION

The reform of the fertilizer sector in Rwanda and Burundi is so far a success in both countries. Despite different starting points, a comparable result has been achieved, namely an effective system, relying on the private sector, able to increase fertilizer use countrywide. Of course Burundi is still lagging behind Rwanda in terms of quantity of fertilizer consumed, but Rwanda has the advantage of time, adopting its voucher system 6 years before Burundi. The dynamics of the reform are however different. In Rwanda, the privatization is the logical evolution of an existing fertilizer program within the CIP. It has however been greatly hastened by the fiscal burden of the subsidies, in a geopolitical context where aid to Rwanda was decreased. In Burundi, the point of departure was very different: privatization has been the occasion to undermine rent capture and to entirely redesign the system. This has been possible because of a window of opportunity, constituted by the coming elections, which donors have been able to identify and exploit.

The privatization of the fertilizer sector is revealing of each country's development model. In Rwanda, development is a serious business, engineered from the top, heavily state-driven. While this has brought tremendous results, as shown by the increase in agricultural production since the start of the CIP[56], its sustainability is uncertain when the state withdraws. In the case of fertilizers, the challenge is to have farmers buying fertilizers for priority crops that they do not always desire to grow, while subsidies and access to credits are decreasing. This explains the still important role of the state at least during the first year of privatization. However, the Ministry of Agriculture seems to adapt itself to circumstances. Discussions on the possibility of abandoning

[56] For instance, the FAO estimates that since the start of the CIP in 2007, food production increased by 57% by 2011 (FAO through WORLD BANK, World Development Indicators). Even though statistics on agricultural production may have a large margin of error, this nonetheless points to a success of the CIP.

any restrictions to crops eligible to fertilizer subsidies are underway. This case, along with the poor recovery of fertilizer credits before 2013, shows as well that the Rwandan state, although presented very autonomous vis-à-vis its population, especially the rural population[57], is in fact not indifferent to discontent that can result from its bold policies.

In Burundi, the privatization is also typical of the country's development model. The role of donors is central in initiating change, implementing and financing it. This often happens against the backdrop of an adverse political environment. In this respect, the reform of fertilizer can be labelled as best practice for Burundi: donors coordinated, lobbied the government on the reform, and understood how the electoral dynamics couldbe harnessed to align political and development interests. On the other hand, the fertilizer sector has an advantage: fertilizer distribution is a visible act, with quick impact on the population in rural areas, the stronghold of the ruling party. For these reasons, replication in other sectors is not ensured. But it holds important lessons for successful reforms in the Burundian context. Donors should endeavour to map political interests in order to analyse beforehand if a given reform is likely to work or not. In the Burundian politically saturated, resource-scarce environment, pouring money when political interests are unlikely to be aligned with the reform objectives is likely to be futile.

Bujumbura, April 2014

[57] E.g. ANSOMS, A., "Re-engineering Rural Society: the visions and ambitions of the Rwandan elite", *African Affairs*, vol. 108, no. 431, April 2009, pp. 289-309.