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Key Issues In Achieving Sustainable Rapid Growth Of Fertilizer Use In Rwanda

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KEY ISSSUES IN ACHIEVING SUSTAINABLE RAPID GROWTH OF FERTILIZER USE IN RWANDA

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KEY ISSSUES IN ACHIEVING SUSTAINABLE RAPID GROWTH OF FERTILIZER USE IN RWANDA

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Rwanda's Ministry of Agriculture, Livestock Resources and Forestry (MINAGRI)) held a *Policy Workshop on Fertiliser Use and Marketing* on 22nd and 23rd February 2001 to develop a strategy and an action plan to promote rapid growth of fertiliser use. The papers presented and discussed in the workshop assessed the scope for growth of fertilizer use, identified difficulties in raising the present level of use, examined alternative ways to overcome critical bottlenecks, and reviewed experiences of other developing countries to draw lessons useful to Rwanda. The consensus generated among a range of policy-makers and informed technicians, partners and economic operators formed the basis for the recommended strategy and action plan for sustainable rapid growth of fertiliser use in Rwanda. However, they remained unimplemented. Even though the strategy was considered conceptually sound, the action plan was found to be insufficiently detailed to be implemented.

Readily available evidence suggests that there was no significant acceleration in growth of fertilizer use in 2001. This was despite three favorable conditions: (1) vast scope for profitable fertilizer use, (2) progress in fertilizer-related activities under Agriculture and Rural Market Development Project (ARMDP), and (3) growth in the number of private small-scale operators in fertilizer import and marketing systems, and a positive attitude towards fertilizers among farmers and functionaries on the supply side. Clearly, this is an anomaly. This paper identifies main factors responsible for this anomaly through examination of evidence from ground level realities. Thus, it arrives at the central issue that requires the Government of Rwanda's (GOR) urgent attention, and identifies the single most important action to implement the strategy developed in the workshop.

The paper begins with a recapitulation of the strategy. It then presents an overview of major activities that affect growth of fertilizer use in Rwanda to assess their strengths and weaknesses. This exercise reveals that the policy changes in 1999 and 2000, and the deliberations of the 2001 Workshop (especially on the importance of small-scale fertilizer import system) have resulted into many positive developments in the private sector activities in fertilizer imports and distribution. However, their dynamic role in rapid growth of Rwanda's fertilizer consumption remains constrained due to small volume of fertilizer demand, and virtual absence of vigorous activities that convert profitable fertilizer potential into farmers' *effective* demand for fertilizers. The final section identifies an instrument to organize public efforts in this direction along with the other recommendations made in the 2001 Workshop.

I STRATEGY DEVELOPED IN THE WORKSHOP: A RECAPITULATION

The strategy aimed at raising total fertilizer consumption from about 8,000 tons in 2000 to about 25,000 tons over a period of three years. Such a big push was recommended to break the low level equilibrium in total fertilizer consumption resulting from three mutually reinforcing conditions: (1) fertilizer adoption by only about 5 percent of farmers by 2000, and hence a very low volume fertilizer demand, (2) severely underdeveloped fertilizer distribution system and (3) persistent skepticism about the size of fertilizer market among importers. An annual increment of about 5,000 tons in fertilizer consumption for three consecutive years would set in motion dynamic forces to change these initial conditions.

Such increments in fertilizer consumption were considered feasible because of the vast potential of profitable fertilizer use estimated by Kelly, Mpyisi, Murekezi and Neven in their workshop paper. Even with a cut-off point of VCR of 3, the potential was estimated at about 23,000 tons of fertilizers. (VCR is the ratio of the value of additional crop production resulting from fertilizer use to cost of fertilizers.) This is a very conservative estimate because of three reasons. First, it is based on a high cut-off point for profitable fertilizer use. Theoretically, VCR > 1 means fertilizer use is profitable. The general convention is to use VCR of 2 or more to identify situations of profitable fertilizer use. The estimate of 23,000 tons represents situations where the value of additional crop production is at least *thrice* the cost of fertilizers. Second, the estimate relates to only 16 percent of the area under seven crops for which the authors had the data to study fertilizer responses and calculate VCRs. High profitability of fertilizer use on some of the remaining 84 percent of the area should not be ruled out. Third, apart from the 84% area under seven crops, all area under several other crops (including rice, tea and coffee) was completely excluded from the estimate of 23,000 tons due to data constraints. According to OCIR-Thé and OCIR-Café total fertilizer requirements of the two crops exceed 40,000 tons.

Thus, it was thus clear that:

- Total fertilizer consumption in 2000 (about 8,000 tons inclusive of tea and coffee) was a small fraction of the profitable potential of fertilizer use.

- Furthermore, rapid growth was possible *without* fertilizer subsidies since VCR of 3 or more implies enviably high profitability of fertilizer use.

The strategy developed in the workshop aimed at rapidly converting the unexploited profitable fertilizer potential into farmers' demand for this input, *and* fertilizer distribution and import systems meeting this demand without delay. It was to be implemented through simultaneous and well-coordinated thrusts on both fertilizer demand and supply sides. For this purpose, four principal instruments were recommended:

- A program of fertilizer demonstrations,

- Creation of an enabling environment to expand the distribution networks and to facilitate required growth of fertilizer imports,

- Training programs for functionaries in fertilizer distribution and import systems, and

- Leadership role of the government in sound and sustainable development of a market-oriented fertilizer system.

The program of fertilizer demonstrations should have two objectives: (1) to rapidly covert the profitable potential (already identified by Kelly, Mpyisi, Murekezi and Neven) into farmers' effective demand for fertilizers. (2) To convince local shopkeepers, input dealers, farmers' associations and regional wholesalers about the potential size of the fertilizer markets. The second objective is important to ensure that demonstrations not only expand farmers' demand but also lead to *actual* fertilizer use.

The workshop strongly advocated further development of the import system that had come into existence through initiative and enterprise of small entrepreneurs in response to policy changes and dramatic growth in fertilizer demand of Irish potatoes growers. To facilitate accomplish this expansion, the workshop recommended: (1) extension of the ARMDP's Line of Credit facility to these small-scale operators, and (2) avoidance of excessive regulations of legitimate operations small-scale importers. Additionally, it recommended that the three-year exemption of fertilizers from VAT and customs duty should be made permanent to remove uncertainty from the minds of *all* importers, and to keep farmers' fertilizer prices at a lower level.

Two types of training programs were recommended:

- One for the ground-level functionaries like retailers, regional dealers, and farmers' associations, and

- Another for fertilizer wholesalers and importers, and officials of commercial banks at the national level.

The program for ground-level functionaries should be coordinated with the program of fertilizer demonstrations, and designed to train these functionaries in the basics of chemical fertilizers, nature of the fertilizer business (including inventory management), and in the use of credit facilities to enlarge the volume of business. The program at the national level should emphasize the role of importers and wholesalers in geographical expansion of the distribution network, working-capital management (including the use of the Line of Credit facility under ARMDP), and scanning the opportunities for regional collaboration in fertilizer imports to maximize economies of scale.

Training in the use of credit facilities was stressed because working capital requirements will increase due to the positive impact of fertilizer demonstrations on the spread of fertilizer use to non-cash crops and consequent growth in the volume of fertilizer business. The participation of commercial banks will facilitate meaningful interactions between credit institutions and fertilizer suppliers. Both training programs should use case studies based on experiences in Rwanda.

Finally, a leadership role of the government was envisaged in implementing the strategy even though private sector was to dominate the supply side activities. This was because of the importance of fertilizers in the intensification and commercialization of Rwanda's agriculture, and also because of the rudimentary nature of the fertilizer systems. The prime task in the government's role should be to ensure simultaneous and well-coordinate progress in various activities on fertilizer demand and supply sides through instruments described above. A Fertilizer Division should be set up in the Department of Marketing Services (DMS) in the Ministry of Agriculture to monitor the progress, identify problem areas. and propose remedial actions. This information should be used for timely actions through appropriate mechanisms (e.g., coordination committees, liaison with the private sector etc.).

II AN OVERVIEW OF FERTILIZER SECTOR ACTIVITIES

This overview is based on readily available information that pertains to recent years. It is compiled from sources listed in Appendix 1. A substantial proportion of this information is based on field visits/surveys carried out in 2000, 2001 and 2002. Thus the information used here reflects ground level realities including concerns of farmers and fertilizer-sector functionaries *after* GOR introduced the strategy of intensification and commercialization in agriculture and took some important decisions to facilitate its implementation.

The following paragraphs summarize the state of affairs in three major domains of the fertilizer sector in Rwanda. ARMDP is covered separately in the next section because of its importance in the strategy for intensification and commercialization. What follows is not a comprehensive review of each domain. Our purpose is to develop a broad-brush picture with sharp focus on most recent years. These domains are used to organize vast amount of *factual* information to develop an understanding of the strengths and weakness in fertilizer sector activities. This understanding is considered crucial to identify actions required to remove weaknesses and to build on the strengths of the fertilizer-related activities for sustainable rapid growth in the use an input that would decide the prospects of transforming Rwanda's agriculture.

Fertilizer Imports

Between late 1999 and May 2000, GOR took two decisions that changed the policy environment on the fertilizer-supply side. First, it passed a law that required the government's approval for all free distribution of fertilizers. This was in response to private traders' complaints against free or subsidized distribution of fertilizers by donors and NGOs. Second, fertilizers were exempted from ICHA (15%) and entry (5%) taxes making it possible for importers to lower fertilizer prices. Then, in late 2000, GOR launched ARMDP, which included activities to promote the use of modern farm inputs.

These developments stepped up total fertilizer imports to 6,494 tons in 2000. This was 36% higher than the previous peak since 1994 -- 4,780 tons in 1998. The BNR data-based estimate of 6,494 tons for 2000 does not include imports through the Cyanika border post. Cook estimated these imports at about 2,000 tons. Inclusive of this, the volume of imports in 2000 goes up to about 8,500 tons. This was 78% higher than in the volume of imports in 1998.

Total fertilizer imports in 2001, according to BNR data, were 7,258 tons (12% higher than the comparable estimate for 2000). Inclusive of the imports through the border post, however, it was only about 2% higher than in 2000. Thus, whether total fertilizer imports in 2001 was significantly higher than in 2000, or about the same depends on the accuracy of the estimates of imports through the border post during the two years. For the non-beverage crops, however, the volume of imports for non-beverage crops was substantially higher in 2001 than in 2000 because imports by tea and coffee parastatals were 2500 tons lower in 2001 than in 2000. (Incidentally, this indicates the need to address the problems in the two export crops.)

Three conclusions emerge from this brief review:

- First, irrespective of all above caveats, it is clear that substantially larger annual increments are needed to raise Rwanda's fertilizer consumption to about 25,000 tons in three years (as proposed in the 2001 workshop).

- Second, at the same time, note that the volume of imports in 2000 and 2001, in the wake of policy changes from 1999, was by no means inconsequential. This becomes clear from the trends since mid-1980s. (Table 1).

- Third, about two-thirds of total imports in 2001 were for crops other than tea and coffee. This was considerably larger than in earlier years.

Hence, the pertinent question is not *whether* these policy changes were effective, but *what* is required to make them even more effective. The rest of the overview helps in answering this question.

Fertilizer Import and Distribution Systems

The policy changes in 1999 and 2000 had profound effects on the development of a *market-oriented* fertilizer import and distribution systems. The single most important effect was the emergence of a small-scale system in the private sector to import fertilizers from neighboring countries to meet demand of Irish potato growers. These entrepreneurs not only import fertilizers but also act as wholesalers and retailers -- a practice also followed by some of the established fertilizer importers. Over time, the nascent small-scale system has expanded, and a competitive fertilizer supply system appears to be emerging, especially in the Northwest region.

Yet another noteworthy development has been the state of flux in the composition of importers. Mukamana reports that some established importers (e.g., Agrotech and Agrophar) have stopped fertilizer imports; some new firms have emerged in a dominant manner; and some seem to be operating on an *ad hoc* basis. Furthermore, her data indicate that old firms had much lower volume of fertilizer sales in 2001 than the firms that entered fertilizer business in 1999 and 2000. The single most important factor behind all these features was widely different perceptions of different importers about the prospects of growth in farmers' fertilizer demand reported by Mukamana.

The field surveys carried out by Josepha Mukamana in 24 districts of 6 Provinces (Gisenyi, Ruhengeri, Byumba, Gikongoro, Butare, and Kigali), and by Jean-Pierre Rucakibungo in 5 zones (of Gisenyi plus Ruhengeri) suggest that fertilizers were available to farmers at competitive prices. Mukamana found that farmers associations were a very important source of supply to farmers. Many associations had formed "inter-groupments" to procure fertilizers. Outside the potato growing areas of the Northwest, over 90% of supply to farmers was from farmers' associations. In the Northwest, they accounted for 40%, and retailers accounted for 60% of supply to farmers. In the potato producing areas, there was over *five-fold* increase in the number of retailers since 1999 in places like Ruhengeri and Gisenyi. At the same time, such dramatic growth in the number of retailers has also resulted into a hesitant attitude towards entering retail fertilizer trade among many potential entrants.

This phenomenon indicates that once there is substantial expansion in farmers' fertilizer demand, retailers quickly enter fertilizer business -- even where farmers' associations dominate. This reduces the distance farmers have to travel to get fertilizers. Conversely, in the absence of dramatic growth in fertilizer demand, farmers' associations will continue to dominate in fertilizer supply to farmers in most parts of Rwanda outside the potato growing Northwest region. This is stressed because many farmers' associations have emerged as a result of the foreign aid-funded projects. Their present operations in fertilizer distribution should not be taken for granted. Rapid growth in farmers' fertilizer demand is the single most important factor in preventing the likely disruption to downstream flows in the fertilizer distribution system. The enlargement of the volume of fertilizer business resulting sustained growth in farmers' demand will not only attract local shopkeepers to fertilizer retailing but it will also raise incentives of farmers' associations to continue their operations in fertilizer procurement and distribution.

Rucakibungo also found that inter-group societies were quite common in retail distribution. In spite of this private retailers were operating in all 5 zones of Gisenyi and Ruhengeri. There was also a vast variation across zones in the number of wholesale supply sources. The overall availability of NPK fertilizer was satisfactory. However, DAP was not available in 2 out of 5 zones, and Urea was not available in 4 out of 5 zones. Despite variation in the level of development in the distribution system across the 5 zones, there was not much variation in NPK prices.

The above findings clearly demonstrate the high capability of Rwanda's private sector to respond to policy changes, and to *meet* farmers' demand for fertilizers despite many difficulties. Mukanama's study emphasizes poor physical infrastructure, working capital

constraints, and training needs of functionaries. Note that a desire for even "rudimentary" training was expressed by *all* wholesalers and their employees interviewed by her. It is also clearly evident from the feedback received from the participants of the USAID sponsored workshop on Agribusiness Training for Fertilizer-sector Professionals organized by Abt Associates Inc., in February 2002.

However, the demonstrated strength of the supply side systems should not be confused with their ability to *generate* rapid growth in farmers' demand for this input. In both functions of importing and marketing fertilizers, the private sector's performance must raise faith in its capability to *respond* to farmers' fertilizer demand in a competitive manner. But *generating* rapid growth in farmers' demand is an altogether different matter, and clearly beyond the capability of private sector operators. This is not unique to Rwanda. The evidence from virtually all developing countries leads to the same conclusion, especially in the early stages of growth in fertilizer use. This should not be surprising because it makes a perfect sense: The volume of business for individual operators is just too small to invest in efforts required to undertake the task of demand creation. Everywhere that task has been the responsibility of a publicly funded agricultural extension system.

To build on the demonstrated strength of the supply side systems, of course it is important to address their problems mentioned above. Successful efforts in that direction would surely increase their efficiency in *meeting* farmers' *effective* demand. And this *is* important. But it would be a big mistake to expect that it would have a huge impact on the total volume of *effective* fertilizer demand. To accomplish this, it is crucial to *demonstrate* profitability of fertilizer use on many crops to growing number of farmers. That will *convert* the profitable fertilizer potential into farmers' effective demand for fertilizers. Without sustained rapid progress in that direction, the dynamism in private sector operations in both fertilizer imports and distribution observed during recent years would most likely be lost; and total fertilizer consumption and imports will remain in low level equilibrium. The reasons for withdrawing from fertilizer business given by importers and retailers to Mukamana clearly point in that direction.

Fertilizer Use Pattern

The paper by Kelly, Mpyisi, Murekezi and Neven for the 2001 Workshop provides a profile of fertilizer use in 2000A season by crops and prefectures. The following findings are highlighted. (For details, see Table 2.) Note that these findings are based on a random sample survey conducted by DSA/FSRP -- the only source of nationwide data on the ground level realities of *actual* fertilizer use in a recent year.

- Only 5% of farmers used fertilizer and/or lime on just 3% of Rwanda's cultivated land.

- Only 7 crops accounted for 88% of total fertilizer consumption (Irish potatoes 42%, coffee 21%, rice 6%, vegetables 6%, tea 5%, beans 4%, and banana 4%). Note that these were fertilizer responsive and/or cash crops.

- Even on these crops, fertilizer use had spread to a small fraction of area under them (e.g., rice 29%, Irish potatoes 21%, vegetables 19%, and coffee just 3%).

- Geographically, only 4 prefectures accounted for 88% of total consumption (Gisenyi 56%, Byumba 18%, Gitarama 7%, and Cyangugu 7%).

- Notwithstanding such heavy concentration, fertilizer use is clearly indicated on a few *major* crops other than the 7 mentioned above (e.g., sorghum in Gisenyi, maize in Byumba and Butare, soyabeans in Umutara, cassava in Gitarama, and sweet potatoes in Byumba, Gisenyi, Cyangugu, Umutara). This is stressed to point out that even at such an early stage, fertilizer use was *not* restricted to high value cash crops. The 5% of fertilizer users deemed it worth their while to use fertilizer on some low value crops grown mainly for domestic consumption.

For the period after 2000, Mukamana reports growth in the number of fertilizer users. But the geographical concentration in use persists. According to importers and wholesalers she interviewed, 50 to 60% of their orders were for the Northwest region, 30 to 40% were for Gikongoro, Byumba, Gitarama, North Kigali, and 10% for the remaining areas. The use pattern by crops in different provinces she found is shown in Table 3. In his survey of 5 zones of Gisenyi and Ruhengeri, Rucakibungo also reports that fertilizers were commonly used on Irish potatoes, sugarcane, climbing beans, tea and coffee. The use was not as common on maize and vegetables. And it was virtually nonexistent on beans, sweet potatoes, sorghum, wheat, bananas and other fruits, cassava, soya, and pyrethrum.

All these findings reveal that fertilizer use has begun to spread at a few locations on many more crops besides the few that account for bulk of the total consumption. And this is true not just in the Northwest provinces. At the same time, the small volume of total fertilizer consumption as well as the fact of less than 10% of farmers using fertilizers stress both the need and scope to speed up diffusion of fertilizer use -– both among farmers and on areas under several crops – to *broaden* the base of effective demand for fertilizers.

Among numerous factors that affect the diffusion processes, profitability of fertilizer use stand out. The research by Kelly, Mpyisi, Murekezi and Neven to estimate profitable potential of fertilizer is based on the identification of area under 7 crops in different Provinces where fertilizer use is highly profitable (VCR > 3). Table 4 shows the profile of their estimated potential of 22,798 tons of fertilizers. A comparison of the actual consumption in 2001A (Table 2) with a very conservative estimates of highly profitable potential for only 7 crops (Table 4) shows vast amount of unexploited, highly profitable, potential. (It may be recalled that the estimates of potential shown in Table 4 cover only 16% of the area under the 7 crops.) Fertilizer promotions efforts, based on this and such other facts of high profitability of fertilizer use on specific crops at selected locations, would be most effective in speeding up diffusion of fertilizer use. The case for such prudence needs no emphasis in the face of Rwanda's vast variation in soil-climatic conditions and readily available analytical results and database.

III ARMDP AND FERTILIZER-RELATED ACTIVITIES

In January 2000, the Government of Rwanda launched the Agriculture and Rural Market Development Project (ARMDP) with support from the World Bank. Since then it has become a very important instrument in the implementation of GOR's strategy of intensification and commercialization in agriculture to increase food security and reduce rural poverty. ARMDP seeks to contribute in these efforts "through identifying policies and institutional mechanisms to raise the use of modern farm inputs by promoting efficient private-sector based, local agricultural input distribution and output marketing systems".

This section focuses on the experience of ARMDP in its input-related component. The two objectives of this component are: (1) to raise the supply of 4 modern inputs (fertilizers, improved seeds, agro-chemicals, and livestock supplies) in a sustainable fashion, and (2) to stimulate demand for inputs by facilitating farmers' access to the inputs. The project seeks to achieve these objectives through three activities:

- Farmers access to seasonal credit for modern farm inputs,
- Advisory services for the adoption of modern inputs and access to credit, and
- Multiplication and distribution of improved seeds.

Our focus is on the first two activities which directly affect fertilizer. The first activity is based on the premise that farmers lack financial resources to buy modern farm inputs and this, in turn, adversely affect the supply side of input activities. This is how ARMDP seeks to influence both the demand and supply sides of modern inputs.

Three instruments have been chosen to ensure farmers' sustained access to credit: (i) Line of Credit (LOC), (ii) Inputs Credit Insurance Facility (ICIF), and (iii) Small Farmer Input Credit Facility (SFICF). A Line of Credit for importers of inputs at an interest rate of 9% (compared to 16% market rate) is intended to provide to them both the necessary resources and also incentives to extend credit sales to farmers. It is also expected to facilitate access to working capital required for imports to a large number of importers, and thus promote competition in the supply of inputs. An Inputs Credit Insurance Facility (ICIF) is created to make term credit available to farmers for the repayment of seasonal input credit in case of productions shortfalls due to weather or other natural calamities. Thus this facility is an "insurance scheme" to protect the input-distribution system from potential shocks that might set back its development. The Small Farmer Input Credit Facility (SFICF) aims at promoting co-operative lending activities for poor farmers and farmer groups in remote areas. This facility would also provide grants to poor farmers through their co-operatives to establish revolving credit funds to finance the acquisition of modern farm inputs.

The second activity in the input component of ARMDP is advisory services to farmers, producer groups, and specialized local organizations (SLOs). Two instruments chosen to implement this activity are training programs and demonstrations to improve farmers' technical know-how in the use of modern inputs. This is expected to raise the

profitability of inputs, and thus encourage their adoption by farmers. The activity also aims at providing support in the access, use, and management of credit for modern farm inputs to reduce repayment risk and sustain access to loans.

In this manner, ARMDP aims to tackle major problem areas on both demand and supply sides of four modern inputs (fertilizer being one of them) to raise their use, and thus implement the new agricultural strategy. A critical review of its experience is considered useful to judge its influence on the fertilizer-sector activities described above, and also to draw lessons for the future.

Table 5 shows the progress of ARMDP in the two input-related activities over the period between October 2000 and March 2002. The following conclusions are drawn.

Line of Credit (LOC)

There was poor response of importers to use this facility -- in *all* six quarters -- despite repeated attempts to promote the use of LOC, and a significantly subsidized rate of interest. Note that there was no *new* loan in 4 out of 6 quarters. Commercial banks were also unenthusiastic about using the LOC in their refinance operations. (See the Quarterly Activities Report for April-June 2001 for instances). They considered 4% margin low. This led to BNR authorizing commercial banks to set their own interest rates from August 2001. But it did not make much difference -- there was no new loan in the first quarter of 2002. By March 2002, the cumulative total of 8 loans (since the inception of LOC in 2000), for imports of <u>all</u> four inputs, was only 33% of the total provision made in ARMDP. This led , the mid-term review of ARMDP to propose a reduction in the LOC provision by $200,000.

Even in so much under-utilization of LOC, importers of agro-chemicals -- not fertilizers -- dominated. Among fertilizer importers, GECI was the only regular client for LOC. The persistent poor response of fertilizer importers should be viewed in the context of relatively high level of imports in 2000 and 2001 (Table 1). Clearly, importers preferred to use their own, or alternative sources of, funding rather than the LOC despite subsidized interest rate. Note that the low utilization of LOC in fertilizer imports was not constraining the growth of total fertilizer consumption. This is indicated by the stability in fertilizer prices, and also by an absence of widespread complaints of fertilizer scarcity during recent years. It is difficult to say definitely why the fertilizer importers were persistently lukewarm towards LOC with subsidized interest rate over a two-year period of historically high levels of imports. However, it is unmistakably clear that the logic to promote fertilizer adoption through the flow of short-term credit to farmers *via* fertilizer importers had virtually failed. To be sure, removal of farmers' credit constraints helps in accelerating adoption of modern inputs. But the experience shows that it is unrealistic to expect private-sector importers of fertilizers to take on this responsibility.

In reflecting on ARMDP's influence on fertilizer-sector activities since 2000, the disappointing performance of the LOC is stressed. This is the most important instrument in input-related activities with a nationwide relevance since the impact of the other two

instruments (Small Farmer Input Credit Facility, and Advisory Service) is confined to locations selected for the implementation of ARMDP.

Inputs Credit Insurance Facility (ICIF)

This facility remained completely unutilized because there was no natural calamity. There were repeated recommendations to transfer some funds from this facility to the Small Farmer Input Credit Facility (SFICF), and ultimately the mid-term review agreed to transfer $100,000 from ICIF to SFICF. The prolonged delay in doing this appears to be due the time required to complete the groundwork to implement SFCIF as shown below.

Small Farmer Input Credit Facility (SFICF)

This facility was established to promote co-operative lending activities for poor farmers and farmer groups to assist them in the adoption of the modern farm inputs. It took about a year to complete various formalities and the groundwork needed before loans could be disbursed in 10 districts (out of 18) covered by ARMDP. This indicates that earmarking sufficient financial resources to enlarge credit flows for poor farmers is far less important than establishing sound modalities of *viable* lending to promote the use of modern inputs.

Advisory Service Activity

This activity is implemented by MINAGRI staff and SLOs only in selected districts. It is implemented through training of lead farmers, traders, management committees of commercial cooperatives etc. The thrust of training is in providing technical know-how in the use of modern inputs, and also in improving farmers' access to and use of input credit. The lead farmers improve the knowledge and skills of other farmers in the use of modern inputs through inter-personal communication and installing demonstration plots.

The groundwork for training programs began in late 2000. It took several months before 20,000 farmers, and many traders, management committee members etc in project districts were trained. The groundwork involved selection of SLOs, development of training materials, training of MINAGRI's field staff, selection of beneficiaries etc. In late 2001, the lead farmers had installed about 2,000 fertilizer demonstration plots on their farms in project districts. Incidentally, demonstrations under ARMDP account for over 90% of the fertilizer demonstrations in the country according to Rucakibungo's Baseline Study on fertilizer demonstrations). A provisional analysis of the data generated by these demonstrations was carried out in early 2002. Before we discuss these results of fertilizer demonstration, two points are highlighted in the context of the present paper:

- The emphasis in ARMDP's advisory service is on providing the know-how in the use of modern inputs to farmers through the training of lead farmers. Thus, it is principally an activity to establish an agricultural extension system through the use of the lead farmer mechanism.

- Fertilizer demonstrations are a relatively minor part of the total efforts under the advisory service activity which, in turn, is confined to 18 project districts. It should not be viewed as a sharply focused, nationwide, program to promote fertilizer use through *convincing* farmers about the profitability of fertilizer use. The direct and immediate impact of training and demonstration is confined to the 18 districts in which the project is implemented.

These two observations are not meant to question the merits of the advisory service activity of ARMDP. Our emphasis is on the design and structural limitations ARMDP in affecting *total* effective demand for fertilizers in Rwanda. Even if ARMDP succeeds in rapidly raising fertilizer use in the 18 districts, certain questions are still pertinent: Can these efforts be replicated in many more districts? Over what time, and at what cost in terms of organizational and financial resources? Wouldn't a straightforward program of fertilizer demonstrations at locations with high VCRs (identified by Kelly, Mpyisi, Murekezi and Neven) be more cost effective and quicker in its impact on total fertilizer demand?

ARMDP Demonstrations

A scrutiny of the provisional results of the ARMDP demonstrations further underscores the importance of asking the above questions. The information on these results pertains to 954 demonstrations on 4 crops (Irish potatoes, beans, soya, and maize) in 13 districts of 6 Provinces (Cyangugu, Gikongoro, Gitarama, Kibungo, Kigali-Rural and Gisenyi). The demonstrations had three different fertilizer treatments: DAP plus Urea, NPK and only DAP. The provisional results include control and treatment yields, fertilizer rates on demonstration plots, and value of additional production due to fertilizer use and total fertilizer cost (at market prices). We have used this information to calculate fertilizer response ratios and VCRs.

Table 6 shows the analytical results for 40 "situations". Three attributes are used to differentiate these situations: district, crop and fertilizer treatment. The 40 situations are arranged in descending order of VCRs. Wherever possible, we have also identified whether fertilizer use was strongly recommended (1), or not recommended (2) on the specific crop in that district by Kelly and Murekezi in their study Fertilizer Response and Profitability in Rwanda, A Synthesis of Findings from MINAGI Studies Conducted by FSRP and the FAO Soil Fertility Initiative. The last column of Table 6 shows these recommendations. Tables 7, based on Table 6, shows the distribution of districts and demonstrations by crops and fertilizer treatments across four categories of profitability on fertilizer use: (1) VCR 3 or higher -- very highly profitable, (2) VCR 2.0 to 2.9 – highly profitable, (3) VCR 1.1 to 1.9 – moderately profitable, and (4) VCR 0 to 1.0 – not profitable.

Four major conclusions emerge from these tables:

- Fertilizer use was profitable (VCR > 1.0) in only 22 out of 40 situations. In the remaining 45% of the situations the value of additional production was not high enough to cover the cost of fertilizers. It was very highly profitable in only 5 situations, highly profitable in 6 situations, and moderately profitable in the remaining 11 situations.

- In the case of Irish potatoes, fertilizer was profitable in *all* situations. Furthermore, the VCRs were higher than 2.0 in nearly 80% of the situations. Note that *all* these locations were outside the Northwest region. This establishes that promoting fertilizer use on crop like potato (which responds very well to fertilizers) can be taken up on a nationwide scale.

- In other three crops, fertilizer use was *not* profitable in about half to two-thirds of the situations. It was moderate to highly profitable (VCR 1.1 to 2.9) in most of the remaining situations. There were only two situations of very high profitability in these three crops, and both were for maize. Note that VCRs in the case of maize ranged from less than 1.0 (66% of situations) to higher than 3.0 (17% of situations). These findings show that unlike crops like potato, it is very important to carefully select locations for fertilizer promotion efforts.

- Out of 40 situations, 22 had DAP + Urea treatment, 15 had NPK treatment, and 3 had only DAP treatment. The percentage of situations in which fertilizer use was not profitable was much higher (60%) in NPK than in DAP + Urea (36%) treatments. Additionally, the percentage of VCR of 2 or more was lower (20%) in NPK than in DAP + Urea (32%). The VCR in the 3 situations of only DAP ranged from 0 to 2.2 with soya being the crop at both extremes. These findings highlight the importance of demarcating situations for judicious promotion of different types of fertilizers.

Note that these conclusions emerge from an analysis based on only those ARMDP demonstrations for which results were available by March 2002. Nonetheless, they clearly suggest that, at best, these demonstrations could have only a limited impact in *convincing* farmers to adopt fertilizer use.

It is difficult to say whether widespread poor profitability of fertilizer use was due to implementation failures in demonstrations. A much higher percentage of demonstrations with NPK had lower VCRs than DAP + Urea. This suggests that the issue of choosing between these two fertilizer treatments might not have received the attention it deserves. At the same time, it is unlikely that an implementation failure was the principal reason behind so many cases of non-profitability of fertilizer use. This is indicated by the last column in Table 6. Fertilizer use was *not* recommended by Kelly and Murekezi after studying fertilizer responses in many situations in ARMDP districts. Similarly, Table 8 points out that fertilizer use was strongly recommended at locations which accounted for only 30 to 35 percent of ARMDP demonstrations on beans, soya and maize. All this clearly suggests that many ARMDP districts are *not* the ideal locations to *demonstrate* profitability of fertilizer to farmers.

ARMDP and Fertilizer-related Activities: A Summing Up

ARMDP's input-related component has sought to raise the use of fertilizer and other modern inputs through developing mechanisms to remove three major bottlenecks: low imports of inputs, widespread credit constraints, and farmers' poor know-how of modern inputs. Yet, it is unmistakably clear that it had negligible impact on the fertilizer sector activities -- on demand as well as supply sides -- in both 2000 and 2001; and 2002 is unlikely

to be any different. This is stressed to because of the importance of fertilizer in tackling the widespread problem of low and declining soil fertility to promote sustainable intensification in agriculture. All evidence suggests that ARMDP's ineffectiveness in this regard was more due to major shortcomings in the project's design rather than implementation failures.

ARMDP is designed to address two important constraints in rapid growth of fertilizer use, namely farmers' credit needs and their poor know-how about the use of modern inputs. (Note that even LOC for importers is primarily a mechanism to provide short-term input credit to farmers.) To be sure, these are important problem to tackle in generating rapid growth in fertilizer use. ARMDP's ineffectiveness in addressing them is due to two major reasons.

- First, the nationwide impact of the LOC facility in tackling farmers' credit constraints did not materialize because of the lukewarm response of fertilizer importers to this facility. With hindsight, it is clear that it was unrealistic to expect private-sector importers to act as intermediaries in extending credit to farmers.

- Second, the impact of other ARMDP activities (Small Farmer Input Credit Facility and Advisory Services) in raising fertilizer use was confined to the 18 project districts. Furthermore, given the evidence on fertilizer demonstrations, there are reasons to doubt if the impact would be substantial even in project districts.

Therefore, to rapidly increase fertilizer use, it would be a mistake to expand ARMDP activities, or focus on their more vigorous implementation in the future. The real value of the ARMDP experience lies in correctly understanding why it has not been effective in speeding up fertilizer use, and using that understanding to draw lessons for the future.

IV KEY ISSUES IN PUBLIC POLICIES AND EFFORTS

Be Positive

All conceivable difficulties overwhelm mind when one thinks of *rapid* growth of fertilizer use in Rwanda. Yet, after studying Rwanda's fertilizer scene over a period of five years, this author is more positive about it than ever before. There are four main reasons:

- First, there is a widespread recognition -- from farmers to foreign aid donors -- of the urgent need to promote fertilizer use to combat widespread soil fertility constraints. Compare this with the long period when fertilizer use was discouraged.

- Second, GOR's strategy of intensification and commercialization to increase food security and reduce rural poverty –- the two overarching national objectives –- has fundamentally altered the mindset of those who influence and make policies. One does not hear *whether* fertilizer is relevant. Now the common questions are *how* to raise fertilizer use, and *can* Rwanda raise it rapidly

- Third, recent research has shown that there is a vast, highly profitable, potential of fertilizer use that is as yet unexploited because of severely underdeveloped fertilizer systems, and lack of focus in fertilizer policy and efforts.

- Finally, the ground level realities clearly indicate the private sector's capabilities to quickly respond to policy changes despite its many difficulties.

How can one be anything but positive?

The case for being steadfastly positive about rapid growth of fertilizer use is most persuasively spelled out by John Mellor by drawing attention to the interrelationships between broad-based agricultural growth, rapid expansion in employment opportunities, and reduction in poverty in Rwanda. See his two papers: "Rapid employment Growth and Poverty Reduction: Sectoral Policies and Implementation in Rwanda" (June 2001), and "How Much Employment Can Rapid Agricultural Growth Generate? Sectoral Policies for Maximum Impact in Rwanda" (July 2002).

Focus and Priorities in Fertilizer-related Public Policies and Efforts

The above reasons, however, do not guarantee rapid growth of fertilizer use. Without well-focused fertilizer policy and vigorous public efforts, total fertilizer consumption is unlikely to grow rapidly. The need for public initiative and efforts is not in dispute. It is the confusion resulting from a plethora of difficulties that seems to be obstructing a high degree of GOR's commitment to fertilizer, and sharp focus in public efforts to raise its use rapidly.

This is unfortunate. It is not necessary to tackle *all* difficulties to raise fertilizer use rapidly. Many of these difficulties originate from the typical circumstances of a developing country. Therefore, it is futile, perhaps even counter-productive, to think of removing all difficulties to generate broad-based rapid agricultural growth (like the one proposed by Mellor). Not a single successful case of rapid growth in fertilizer use is based on solving all difficulties in fertilizer use. On the other hand, virtually all successful cases are those where the most binding constraint was expeditiously removed with an eye on other less severe, but still quite important, difficulties in fertilizer use.

The Most Binding Constraint in Rwanda

This time-tested experience leads to two questions for Rwanda: First, what is the most binding constraint to rapid growth of fertilizer use in the next 3-5 years? Second, what is required to remove it effectively in a cost-effective manner, and in ways which do not completely ignore other major difficulties? Of course, this approach does not yield a comprehensive prescription to tackle all fertilizer-related problems. But asking these questions is crucial to develop a thrust and prudent priorities in fertilizer-related public policies and efforts. This is crucial in getting rapid growth in fertilizer use going, especially if it is complemented with the recommendations made in the 2001 Workshop.

Viewed thus, in the short-run, the small size of the volume of farmers' fertilizer demand stands out as the most binding constraint. The volume of fertilizer imports and the geographical spread of the distribution networks are determined by the pace and prospects of growth in farmers' fertilizer demand rather than the other way round. The performance of the supply side, at both national and regional levels, point in this direction. So do the concerns about the volume business expressed by importers, wholesalers, and retailers. The supply-side difficulties in some districts are also due to persistent small volume of business in them. Surely, addressing important difficulties on the supply-side (e.g., the training needs of functionaries, and working capital constraints) is important and should be addressed in ways discussed in the first section of this paper. But none of supply-side difficulties is a more serious obstacle to rapid growth in fertilizer use than small volume of total fertilizer demand. Hence, in the short-run, the highest priority in public policies and efforts should be to generate sustained growth in farmers' demand for fertilizers. In fact, that would be the single most important step since 1999 (when fertilizers were exempted from VAT and customs duty) in creating an enabling environment for the supply-side operators.

How to Accelerate Growth in Farmers' Demand for Fertilizers?

Total volume of farmers' fertilizer demand in any year depends on their *three* decisions: Whether to use fertilizer? Which crops to fertilize? At what rates of application? The pace of growth in this volume over time depends on the speed with which:

- increasing number of farmers *adopts* fertilizer use,
- *diffuse* (that is, spread) fertilizer use on different crops they grow, and
- raise *rate*s of fertilizer application.

In the early stages, the first two processes account for most of the growth in total fertilizer demand. Among numerous factors that affect these processes, profitability of fertilizer use stands out.

Less than 10% of farmers in Rwanda have *ever* used fertilizer. This means that a vast majority of farmers simply do not know how profitable it is to use fertilizer on crops they grow in districts where their own farms are located. This is fundamentally different from farmers having heard about fertilizer, or about its profitability in general terms. That is why there is a vast gap between farmers' total demand for fertilizers and total *profitable* fertilizer potential (e.g., the estimate of 22,798 tons made by Kelly et. al.). Such gap could persist for many years in the absence of public efforts *to convince* farmers about the profitability of fertilizer use. In this scenario, many farmers will miss the opportunities to raise their income through fertilizer use, year after year. No less importantly, vast amount of cultivated land will continue to remain unfertilized, despite economic viability of fertilizer use, and this will further aggravate depletion of soil fertility.

The research on profitable fertilizer potential is usually based on an economic evaluation of *actual* fertilizer response on various crops in different agro-climatic regions.

Therefore, it is an invaluable aid in developing programs to *convince* farmers about profitability of fertilizer use in their own agro-climatic environments. Such programs make a *decisive* impact on farmers' fertilizer use decisions that accelerate the adoption and diffusion processes. This is *how* sustainable rapid growth in farmers' total demand for fertilizer has be generated in many countries, especially in the early stages when there is a vast gap between actual fertilizer consumption and profitable potential.

The historical experience also reveals that fertilizer demonstrations have been more effective than either fertilizer subsidy or credit programs in rapidly converting the unexploited profitable potential into farmers' *effective* demand for fertilizer. Of course, lower fertilizer prices and easy access to credit are helpful. But, by themselves, they cannot be very effective in generating rapid growth in total fertilizer demand when a vast majority of farmers have neither direct experience of, nor any exposure to, the profitability of fertilizer use in their own agro-climatic environments. Hence, a carefully designed program of fertilizer demonstrations is the most effective tool to influence their fertilizer use decisions.

The experience also reveals that there is no substitute for *public* efforts in undertaking fertilizer demonstrations. This task is beyond the capability of fertilizer supply-side systems, especially when these systems themselves are severely underdeveloped. At this stage, their principal role has been to *meet* growth in farmers' demand through raising the volume of fertilizer imports and through geographical expansion of the distribution networks.

Therefore, there is a clear urgent need in Rwanda for a National Fertilizer Demonstration Program (NFDP) to accelerate fertilizer adoption and diffusion processes, and thus generate sustainable rapid growth in the volume of fertilizer demand. Its simple and unambiguous mandate should be to *demonstrate* to farmers that fertilizer use is indeed profitable on many crops under their own circumstances.

To carry out this mandate, the program must be based on carefully compiled information on situations (crop-district/region) in which high profitability of fertilizer use has been already established by research. Substantial amount of this information is already available from research carried out by Kelly and Murekezi. Thus, for instance, the estimate of 22,798 tons of profitable fertilizer potential is based on the identification of specific areas under 7 crops on which the value of additional crop production is thrice the cost of fertilizers. There must be such other highly profitable situations in areas and crops not covered by the estimate of 22,798 tons. These situations should be identified from existing research to enlarge the information base already developed by Kelly and Murekezi. Fertilizer demonstrations under NFDP should be conducted in *these* carefully identified situations of high profitability.

Note that NFDP is fundamentally different from the activity of demonstrations under ARMDP, or other rural development projects. The foremost objective of NFDP is not to test whether fertilizer use is profitable. Nor it is to improve farmers' know-how in fertilizer use. It is to make a *quick* and *decisive* impact on farmers' effective demand for fertilizers, and thus facilitate rapid growth of fertilizer use in Rwanda. Therefore, a careful choice of situations to conduct demonstrations cannot be overemphasized. It is also important to expose fertilizer supply-side operators to NFDP demonstrations to improve availability of fertilizers in districts

where the demonstrations are conducted. It will change their perceptions of the volume of fertilizer business. This, in turn, will encourage growth in fertilizer imports. That is *how* market-oriented (as opposed to centrally planned and controlled) fertilizer-sector activities develop in a developing country.

One could argue that NFDP will not suffice to generate *rapid* growth in farmers' effective fertilizer demand because of their cash constraints. This is an exaggerated fear that often leads to non-sustainable rural credit programs. Fertilizer demonstrations under NFDP will be in situations where fertilizer use is *highly* profitable. This will induce most farmers to *somehow* generate the cash they require initially to buy fertilizers – from past savings, non-farm income, and borrowings from such sources as relatives, friends, traders/moneylenders, farmers' associations etc., -- like the Irish potato growers in the Northwest region. Small farmers' cash constraints and inadequacy or rural credit are common in the developing world. Yet rapid growth in fertilizer use *has* indeed occurred wherever farmers were convinced about high profitability of fertilizer use. There is no dearth of opportunities of profitable fertilizer use in Rwanda. NFDP is designed to *demonstrate* these opportunities to farmers.

None of these arguments is meant to downplay the need for developing viable rural credit systems. The use farmers' associations for credit flows offer substantial scope, and must be deliberately exploited. However, neither farmer's cash constraints nor the amount of time needed to expand viable credit flows to rural areas should delay the implementation of NFDP. Nor should it be used to underestimate the potential of NFDP in accelerating growth in farmers' effective demand for fertilizers. In fact, NFDP will facilitate the development of a rural credit system in Rwanda, just as it will promote sustainable growth of market-oriented fertilizer supply systems.

To maximize NFDP's impact on effective fertilizer demand in an environment of farmers' cash constraints, fertilizer demonstrations in different situations (crop-districts) should be judiciously planned and sequenced. The scope for this is indicated by the following illustrative categories:

- Irish potatoes, sugarcane, climbing beans, and selected vegetables – (crops with very fertilizer high fertilizer responsive, and largely grown for market),

- Industrial crops like tea and coffee (Only 3% of coffee are is fertilized. Even in the case of tea, there is scope of raising rates of fertilizer application),

- Rice grown on recovered swampland for market (a crop with high fertilizer response)

- Areas where sorghum and perhaps banana are grown for market (especially commercial production of beer, and urban consumption)

- Areas with high fertilizer response under commonly grown crops for domestic consumption (e.g., sorghum, maize, wheat, sweet potatoes and cassava).

The experience of several developing countries reveals that after a farmer adopts fertilizer for using it on the most profitable crop he grows for market; he usually spreads the use to other crops (including those grown for domestic consumption). A careful selection of the "lead" crop for demonstrations at different locations will speed up fertilizer adoption by farmers. This should be complemented by demonstration on a few, other commonly grown crops (on which existing research has established profitability of fertilizer use). This will accelerate the on-farm diffusion process. There should not be a uniform set of crops for fertilizer demonstration at different locations. Nor should the selection of lead and non-lead crops be arbitrary. It should be based on the information base on profitability of fertilizer use developed from existing research. All this is stressed to point out that for the success of NFDP careful planning is as important as vigorous implementation.

Note that NFDP is fundamentally different from on-farm research programs to *study* fertilizer response, and develop recommendations on fertilizer practices. There is a clear case for strengthening research on soil fertility and fertilizer use. However, that should not adversely affect resources required to take up NFDP most expeditiously. Similarly, NFDP should not be viewed as a training program to improve farmers' technical know-how in *all* matters related to fertilizer use. Its objective must remain that of *convincing* farmers about the profitability of fertilizer use to generate rapid growth in effective demand for this input. Accordingly, it should focus only a few, simple and directly relevant matters. It is a common experience that multiple objectives in a program only dilutes its the thrust, and reduces its effectiveness in achieving its principal purpose.

To conclude, NFDP is recommended as the single most important public effort to overcome the constraint to rapid growth of fertilizer use in the short-run, namely, small volume of farmers' effective demand for fertilizers. NDFP, however, is lot more than a typical program of fertilizer demonstrations on a large scale. This is because of three basic reasons:

- First, its rationale lies in (i) the existence and clear identification of a vast unexploited but highly profitable potential of fertilizer use in the face of low and declining soil fertility, and (ii) a careful assessment of the ground level realities of strengths and weaknesses in various activities that affect fertilizer scene in Rwanda.

- Second, it is based an analytical understanding and valid lessons that have emerged from other developing countries' experiences in *how* to mitigate the weaknesses and build on the strengths.

- Third, in the context of other recommendations of the 2001 Workshop, NFDP provides a much-needed thrust and a small set of priorities in fertilizer-related public policies and efforts.

Thus, NFDP is *really* the principal instrument to implement a strategy for rapid and sustainable growth of fertilizer use in Rwanda with a dominant role of the private sector and market-oriented activities. Its potential for quick impact on farmers' income by promoting broad-based agricultural growth in an environment of widespread soil fertility constraints

gives it prime place. How can it not have the highest priority in public efforts on input side to implement the strategy of intensification and commercialization in agriculture?

Appendix A

TOWARDS A COMPREHENSIVE ACTION PLAN FOR NFDP

Assumptions made:

1. The Minister is convinced about its merits and potential, and is fully committed to it.

2. MINAGRI's Fertilizer-Sector Policy Committee is also sufficiently persuaded at least to try it out.

Important Considerations

- Make a distinction between (a) Planning and (b) Implementation phases. The first is at least as important as the second. Perfect implementation of a hastily prepared plan does not go very far as countless examples show.

- Also think in terms of a pilot program to implement NFDP -- in the coming season, which begins in 2 months. That experience will yield very valuable lessons both for planning and implementing a full-scale NFDP from the subsequent season. This is crucial in developing the confidence, competence, and the momentum to launch a full-scale NFDP. The lessons on groundwork required for a full-scale NFDP will start emerging from right from the first steps of preparing a plan for NFDP on a small, experimental scale. The lessons on issues involved in implementing such a program of national importance will also start emerging as the implementation of the pilot program begins. In other words, I see no need to wait till next February or March to reflect on the experience of the pilot program to draw lessons. That would result in losing momentum to go towards NFDP on a full scale. In fact, the period between the beginning of the pilot scale NFDP and its completion must be used to prepare the plan for a full-scale NFDP from the subsequent season.

The Pilot Phase of NFDP

1. MINAGRI's Fertilizer-Sector Policy Committee should be made responsible for the first phase of the Pilot NFDP. It must have the mandate as well as the authority for this task. Thus, this committee will become the think tank to reflect on the experience of the pilot NFDP as it proceeds. And this, in turn, would influence efforts to develop and implement a full-scale NFDP.

   The merits of making the Fertilizer-sector Policy Committee responsible for the pilot phase of NFDP lie in (a) its composition, (b) the importance of NFDP in the fertilizer strategy, and (c) the committee's access to the Minister. By getting involved in putting through the initial phase of NFDP, the committee's character and effectiveness in fertilizer-related public efforts will improve substantially. This is absolutely crucial in implementing the strategy of rapid growth of fertilizer use in Rwanda.

2. The Fertilizer-sector Policy Committee should constitute two sub-committees for the pilot scale of NFDP: (a) for Planning, and (b) for Implementing. The two sub-committees should have some overlapping membership. The full Fertilizer-sector Policy Committee should regularly meet to discuss the progress made by the two sub-committees, and simultaneously deliberate on the experience to eventually arrive at a set of recommendations on the organizational set up that would be required to launch a full scale NFDP.

3. The task of the Planning Sub-Committee should be to identify the few locations (say, 5 to 10 but no more than 10), a few crops (say 3 for each location -- not necessarily the same crops for all selected locations), and fertilizers to use in demonstrations (again, not necessarily the same on all crops even at the same location).

   In selecting locations, crops and fertilizers, profitability of fertilizer use must be the final criterion since NFDP's straightforward objective is to convince farmers about this. This selection should be based on readily available research results on profitability of fertilizer use. At the pilot stage, the main source of this database should be the research of Kelly, Mpyisi, Murekezi and Nevan. (In the pilot program of NFDP, other analytical results should be used only if it is absolutely necessary. This is because there is so little time to launch the pilot program.) Therefore, the Planning Sub-committee should be headed by Mpyisi (one of the experienced researchers on profitability of fertilizer use) who is a member of the Fertilizer-sector Policy Committee.

4. The Implementation Sub-committee should address the specific issues and tasks in implementing pilot NFDP like staff required to install demonstrations, a crash training program for them, materials needed in demonstrations etc. Full use of experience gained in ARMDP and other demonstration activities should be made in addressing these issues (e.g., whether "lead farmer" mechanism is possible at sites selected by the Planning Sub-Committee. In addressing these and such other practical aspects, gain it is absolutely essential to repeatedly remind oneself that these demonstrations are to demonstrate the profitability of fertilizer use -- neither to test it nor to improve farmers' technical know-how. This Implementation Sub-Committee should be headed by Semwaga, Director Extension and Marketing. It should also have the ARMDP Project Coordinator.

5. Two points cannot be overemphasized in planning and implementing this phase of NFDP:

   - First, it is to get going with NFDP without losing time to gain the firsthand experience required to develop and implement a full-scale NFDP.

   - Second, the pilot program is not an effort to test if fertilizer use is profitable, or whether NFDP is the right instrument to convince farmers about the profitability of fertilizer use. Both conceptual soundness and worldwide

experience have established that. The sole purpose of the pilot scale effort is to learn lessons relevant to take up full-scale NFDP in Rwanda by carrying out a successful experiment of NFDP on a small-scale.

Thus pilot scale NFDP is similar to what the corporate world does to develop and implement the strategy to promote a new product -- carry out an intense marketing program. In this, the thrust is not whether the product is right with high market potential. That has been established by previous work. The thrust is to learn important lessons in designing large scale marketing efforts before they are taken up.

NFDP is the most appropriate instrument to generate rapid sustainable growth in farmers' effective demand for fertilizers. The pilot NFDP is to learn valuable lessons from direct experience on what is required to use that instrument on a nationwide scale in Rwanda.

Since NFDP is a public effort, direct involvement of the Fertilizer-sector Policy Committee would be most valuable in developing recommendations on (1) an organizational structure, and (2) resource requirements for the large-scale effort.

Appendix B

Selected Sources of Information

- Chemical fertilizer imports for 2001 and 2002 (Personal communication, Cook)
- Rwanda fertilizer importers' activity, 3 June 2002 (Personal communication, Cook)
- Evaluation of the workshop: Agribusiness training for fertilizer-sector professionals. 26-27 February, 2002, Kigali, Rwanda. Organized by Abt Associates Inc. Sponsored by USAID/Rwanda
- Agricultural Demonstrations in Rwanda during Season 2002A: A Baseline Study (Draft). By Jean-Pierre Rucakibungo. Abt Associates Inc.
- The Chemical Fertilizer Market in Rwanda (Draft). By Mrs. Mukamana Josepha. March 2002. Abt Associates Inc./MINAGRI/USAID
- Survey Report on Chemical Fertilizer Use in Ruhengeri and Gisenyi Provinces 11 to 21 April 2001. (Personal communication, Rucakibungo)
- Quarterly Activities Reports (October-December 2000 to January-March 2002) of the Agricultural and Rural Market Development Project (ARMDP). Ministry of Agriculture, Animal Resources and Forestry, Republic of Rwanda.
- Fertilizer Response and Profitability in Rwanda. A synthesis of Findings from MINAGRI Studies Conducted by The Food Security Research Project (FSRP) and The FAO Soil Fertility Initiative. By Valerie Kelly and Anastase Murekezi. February 2000.
- Papers presented in the Fertilizer Use and Marketing Policy Workshop. 22-23 February 2001, Kigali, Rwanda.. Organised by Abt Associates Inc. with assistance from the Food-Security Research Project, Michigan State University. Organized by USAID/Rwanda.
- Rwanda development Indicators. July 2000. Department of statistics, Ministry of Finance and Economic Planning, Republic of Rwanda.
- "Growth of Food Production in Rwanda: Critical Importance of Chemical Fertilizers". By Gunvant M. Desai. Paper presented at the Workshop on Increasing Soil Fertility as the Major component of Intensification of Crop Production in the Context of High Population Density and Limited Land Resources, October 1997, Kigali, Rwanda.

- Author's discussions with policy makers, representatives of donor agencies, ISAR scientists and other researchers, agricultural officers, private-sector importers and dealers, and farmers in Kigali, Butare, and Gikongoro in October 1998; and again in Kigali and Ruhengeri between February 10 and 28, 2001

- "Fertilizer Consumption in Sub-Saharan Africa: An Analysis of Growth and Profile of Use" By Gunvant M Desai and Vasant Gandhi in Tshikala B. Tshibaka and Carlos A. Baanante (eds.) *Fertilizer Policy in Tropical Africa*, (Workshop proceedings, April 1988). International Fertilizer Development Center and International Food Policy Research Institute., Muscle Shoals, Alabama.

- "Converting Potential into Effective Demand for and Use of Fertilizers: A Study of Small farmers in Gazaland District of Zimbabwe" by Vasant Gandhi and Gunvant M. Desai in Sudhir Wanmali and Jonathan M. Zamchiya (eds.) *Service Provision and Its Impact on Agricultural and Rural development in Zimbabwe, A Case Study of Gazaland District*. International Food Policy Research Institute, 1992.Washington D.C.

Table 1: Total Fertilizer Imports in Rwanda, 1984 to 2001 (tonnes)

Year	Imports	Change
1984	4,401	
1985	5,000	599
1986	3,529	-1,471
1987	4,000	471
1988	5,613	1,613
1989	7,463	1,850
1990	90	-7,373
1991	7,490	7,400
1992	5,693	-1,797
1993*	13,192	7,499
1994	647	-12,545
1995	1,344	697
1996	1,173	-171
1997	2,938	1,765
1998	4,780	1,842
1999	2,731	-2,049
2000	6,494	3,763
2000**	8,494	5,763
2001	7,258	764
2001**	8,626	132

Sources: 1984 to 1999: 2001 Workshop paper by Kelly, Mpyisi, Murekezi and Neven.
2000 and 2001: Communication, Andy Cook and Jean-Pierre Rucakibungo

Notes:
* The consensus among knowledgeable persons is that this unusual volume (mainly ammonium and nitrate products) might have been for military, not agricultural, purposes

** BNR (Central Bank) data + imports through Cyanika border post

Table 2: Fertilizer Used During 2000A Season (kilograms)

Crops	Butare	Byumba	Cyangugu	Gikongoro	Gisenyi	Gitarama	Kibungo	Kibuye	Kigali R.	Ruhengeri	Umutara	Rwanda	Share
Beans	11,284	64,232	-	-	-	6,390	-	-	-	-	-	81,906	4%
Peas	-	-	-	4,025	-	-	-	-	-	-	-	4,025	0%
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	0%
Soybeans	-	-	-	-	-	-	-	-	-	-	5,511	5,511	0%
Sorghum	-	-	-	-	25,418	-	-	-	-	-	-	25,418	1%
Maize	4,236	4,565	-	-	-	-	-	-	-	-	-	8,801	0%
Wheat	-	-	-	-	-	-	-	-	-	-	-	-	0%
Eleusine	-	-	-	-	-	-	-	-	-	-	-	-	0%
Rice	-	-	118,078	-	-	-	-	-	1,229	-	-	119,307	6%
Cassava	-	-	-	-	-	11,888	-	-	-	-	-	11,888	1%
Potato	13,541	232,038	-	3,655	563,099	-	-	411	-	6,276	-	819,020	42%
Sw. Potato	564	35,036	1,554	367	9,727	-	-	-	-	-	857	48,105	2%
Colocase	-	-	-	-	-	-	-	-	-	-	-	-	0%
Yam	-	-	-	-	-	-	-	-	-	-	-	-	0%
Vegetables	29,583	435	-	604	84,727	-	-	-	-	-	8,267	123,616	6%
Banana	-	408	-	24,054	-	32,933	-	-	1,175	-	15,493	74,063	4%
Coffee	-	-	21,195	-	304,873	81,315	185	-	-	-	857	408,425	21%
Other food	-	-	-	-	-	8,140	-	-	-	-	-	8,140	0%
Tea/indust.	-	-	395	-	33,891	-	-	60,897	1,229	-	-	96,412	5%
Woodland	-	4,596	-	-	-	-	-	-	-	-	-	4,596	0%
Fallow	-	-	-	34,502	73,517	-	-	-	-	-	-	108,019	6%
													0%
Total (tons)	**59,208**	**341,310**	**141,222**	**67,207**	**1,095,252**	**140,666**	**185**	**61,308**	**3,633**	**6,276**	**30,985**	**1,947,252**	100%
Share	3%	18%	7%	3%	56%	7%	0%	3%	0%	0%	2%	100%	

Source: Analysis of DSA/FSRP 2000A Survey Data – Original table from paper "Fertilizer Consumption in Rwanda: Past Trends, Future Potential and Determinants" by Kelly, Mpyisi, Murekezi and Neven presented in the Fertilizer Use and Marketing Policy Workshop, February 2001, Kigali, Rwanda

Table 3: Fertilizer Use Pattern Reported by Josepha Mukamana

Provinces	Zones	Crops
Gisenyi	Volcanic soils Non volcanic soils (south of the province)	Potatoes, corn, vegetables (cabbage, carrots, and leek) Wheat, vegetables (tomatoes)
Ruhengeri	Volcanic soils Non volcanic soils (south of the province)	Potatoes, corn, and vegetables Vegetables, beans, and potatoes
Byumba	Kisaro Bungwe	Potatoes, wheat, beans, vegetables, maracuja Potatoes and beans
Gikongoro	High altitudes (Mudasomwa, Nshili, Kivu, Muko, Musebeya) Central part of the province	Potatoes, wheat, and beans Vegetables and beans
Butare	The whole province	Vegetables and rice
Rest of the country	Other provinces	Industrial crops (coffee and tea) and cash crops (rice, flowers, and sugar cane)

Source: The Chemical Fertilizer Market in Rwanda (draft) by Josepha Mukamana, Abt Associates, Inc/MINAGRI/USAID

Table 4: Composition of Highly Profitable Fertilizer Potential (22,798 Tons) by Crops and Provinces
(tonnes)

Crop	Kigali-R	Ruhengeri	Gisenyi	Gitarama	Kibungo	Byumba-	Butare	Kibuye	Gikongoro	Cyangugu	Total	%
Irish Potato	67	2,995	2,525	0	160	477	64	981	587	0	7,856	34
Sorghum	4,931	144	0	294	1,362	742	0	0	0	0	7,473	33
Sweet Potato	1,116	65	0	550	127	293	1,123	0	273	0	3,547	16
Climbing Beans	91	936	410	990	45	139	164	0	34	103	2,912	13
Maize	0	0	0	0	0	0	0	0	0	553	553	2
Soybeans	20	0	0	137	5	5	135	0	9	33	344	2
Vegetables	0	0	0	0	0	0	99	0	13	0	112	0
											0	
Total	6,225	4,140	2,935	1,971	1,699	1,657	1,585	981	916	689	22,798	100
% Prefecture	27.3	18.2	12.9	8.6	7.5	7.3	7.0	4.3	4.0	3.0	100	

Source: Developed from Table 6 in the paper "Fertilizer Consumption in Rwanda: Past Trends, Future Potential and Determinants" by Kelly, Mpyisi, Murekezi and Neven presented in the Fertilizer Use and Marketing Policy Workshop, February 2001, Kigali, Rwanda

Notes: These estimates relate to situations where VCR was greater than 3. Because of data constraints, only 7 crops, and there too only 16 percent of the area under these crops were covered. Thus the ranking of crops and Provinces relate to the estimated potential of 22,798 tons.

Table 5 : Progress of Agriculture and Rural Market Development Project (ARMDP) in Inputs-related Activities

The project started in January 2000. The table summarizes the "achievements" of activities in six quarters between October 2000 and March 2002. These activities are (1) Line of Credit (LOC), (2) Inputs Credit Insurance Facility (ICIF), (3) Small Farmer Input Credit Facility (SFICF), and (4) Advisory Services for the Adoption of Modern Inputs and Access to Credit (through training and demonstrations

Activity	Oct-Dec 2000	Jan-Mar 2001	Apr-Jun 2001	July-Sept 2001	Oct-Dec 2001	Jan-Mar 2002
1. LOC	Sensitization meetings., No new loan, Cum Loans (all inputs) $447, 366 (22 % of provision).. Importers not willing to pass on credit to farmers	Advertise LOC & Sensitization efforts No new loan, Cum Loans (all inputs) $447, 366 (22 %)..	No new loan, Cum Loans (all inputs) $447, 366 (22 %).. Concern about stagnation. BNR to investigate why. Com banks use their own funds for lending. Hopes pinned on impact of SFICF & Advisers	New loans BNR changes the policy on margin for Com Banks Sensitization activities. Cum Loans (all inputs) $590,105 (29.5% of total LOC provided)	One new loan Cum Loans (all inputs) $661,037 (33% of total LOC provision)	No new loan Cum Loans (all inputs) $661,037 (33% of total LOC provision Mid-term review of ARMDP proposes to drop gradual reduction in individual loans. Also to reduces LOC provision by $200,000
2. ICIF	No utilization Rec. to enlarge SFICF from LOC repayments	No utilization Rec. to enlarge SFICF from LOC repayments	No utilization Fund grows with repayment of LOC. Rec. to enlarge SFICF from LOC repayments	No utilization Fund grows with repayment of LOC. Rec. to enlarge SFICF from LOC repayments	No utilization Fund grows with repayment of LOC. Rec. to enlarge SFICF from LOC repayments	No utilization The mid-term review agrees to transfer $100,000 to SFICF.
3. SFICF	Not yet implemented	Grwk to implement. To be implemented by BP in 19 districts where SLOs and MINAGRI involved in extension work	Formalities completed to implement through branches of BP.	More formalities completed Sensitization meetings in 18 dists	A meeting of stakeholders to discuss lending probs. Advance of Rwf 28 M to UPBR for 18 dists	By Mar end, Rwf 54.8 million disbursed as loans for inputs in 10 project districts

Activity	Oct-Dec 2000	Jan-Mar 2001	Apr-Jun 2001	July-Sept 2001	Oct-Dec 2001	Jan-Mar 2002
4. Adv. Service: Training	Ground work (6 SLOs : Selected to implement prog. in 14 Communes, Target 15,800 farmers, 280 Traders & Com Coops MINAGRI/TSU Prog., in 10 Communes Target 12,753 farmers, 200 Traders & Com Coops Consultants to train staff selected	6 SLOs' groundwork sensitization, identify beneficiaries, prepare tech packages etc MINAGRI Prog. reduced from 10 to 5 communes Prep of training materials to train field staff + lead farmers	2 Week Training seminar of MINAGRI 17 field staff +, 35 lead farmers from 5 dists 2 day harmonization seminar for SLOs to identify topics for training manual. And finalize training manual. . Extn system details finalized.	Training mats printed. Training of 981 lead farmers by SLOs and MINAGRI in 18 dists Training of management committees completed in 12 dists. Training of traders completed in 5 dists Feedback on training good. Feedback from SLOs sought for 2nd Phase	Training of 20,000 farmers by lead farmers. Training of management committees completed in 17 dists. Training of traders in 14 dists Feedback from SLOs for the 2nd phase of program	Contracts with SLOs for the 2nd phase renewed. Contract to extend the activity to 2 dists of Umutara. Modalities to avoid delays in payment to MINAGRI and SLOs put in place
4. Adv Service: Demons-trations	No demos reported	No demos reported	No demos reported	Lead farmers receive inputs for demos.	Lead farmers install demos	Provisional analysis of demonstration data

Sources: Quarterly Activities Reports submitted by the Project Coordinator to the Minister, of Agriculture, Animal Resources and Forestry.

Table 6: Provisional Fertilizer Demonstration Results

District (Prefecture)	Crop	Demons-tration	Rate Kg/ha	Sample Size	Control Yield kg/ha	Fertilizer Response Ratio	Crop Price Rwf/kg	Fert Price Rwf/kg	VCR	VK AM Rec
VCR > 3										
1. Nshili (Gikongoro)	Potatoes	DAP+Urea	90+70	19	8,000	37.5	35	225	5.8	1
2. Musebeya (G'goro)	Potatoes	DAP+Urea	90+70	40	11,200	37.5	35	225	5.8	1
3. Ntongwe (Gitarama)	Maize	DAP+Urea	100+100	34	6,000	11.0	70	220	3.5	1
4. Nyamata (Kigali-R)	Maize	DAP+Urea	150+50	1	2,000	20.0	35	200	3.5	
5. Musebeya (G'goro)	Potatoes	NPK	300	40	11,200	23.3	35	247	3.3	1
VCR 2.0 to 2.9				134						
6. Kamonyi (Gitarama)	Maize	DAP+Urea	100+100	6	1,800	8.0	75	220	2.7	
7. Mudasomwa (G'goro)	Potatoes	DAP+Urea	90+70	52	5,800	16.3	35	225	2.5	1
8. Mudasomwa (G'goro)	Potatoes	NPK	300	52	5,800	8.0	70	247	2.3	1
9. Ntongwe (Gitarama)	Soya	DAP+Urea	100+100	34	1,400	4.0	120	220	2.2	1
10. Ntongwe (Gitarama)	Soya	DAP	100	34	1,400	4.0	120	220	2.2	1
11. Kamonyi (Gitarama)	Maize	NPK	250	6	1,800	6.4	75	240	2.0	
VCR 1.1 to 1.9				184						
12. Mirenge (Kibungo)	Soya	DAP+Urea	100+100	19	800	4.0	110	230	1.9	
13. Nshili (G'goro)	Potatoes	NPK	300	19	8,000	13.3	35	247	1.9	1
14. Ndiza (Gitarama)	Potatoes	NPK	300	34	4,000	10.7	37	240	1.6	
15. Ndiza (Gitarama)	Potatoes	DAP+Urea	100+100	6	4,000	9.0	37	220	1.5	
16. Nyamata (Kigali-R)	Beans	DAP	100	44	1,400	6.0	45	200	1.4	
17. Bicumbi (Kigali-R)	Maize	DAP+Urea	150+50	2	1,600	5.3	50	206.7	1.3	1
18. Bicumbi (Kigali-R)	Beans	DAP+Urea	150+50	63	1,400	6.0	40	205	1.2	1
19. Bicumbi (Kigali-R)	Soya	NPK	200	10	1,400	3.0	90	240	1.1	1
20. Bugarama (Cyangugu)	Beans	DAP+Urea	150+50	16	1,000	3.0	80	220.8	1.1	2
21. Ntenyo (Gitarama)	Soya	DAP+Urea	100+100	17	600	2.0	120	220	1.1	
22. Bugarama (C'gugu)	Maize	DAP+Urea	100+60	19	2,000	3.8	65	221.1	1.1	2
VCR 0 to 1.0				249						
23. Ntenyo (Gitarama)	Maize	DAP+Urea	100+100	17	2,400	3.0	70	220	1.0	
24. Nyamata (Kigali-R)	Soya	NPK	200	3	1,200	3.0	80	240	1.0	
25. Ntenyo (Gitarama)	Soya	NPK	200	17	1,200	2.0	120	250	1.0	
26. Ngenda (Kigali-R)	Soya	NPK	300	23	800	2.0	97	233	0.8	2
27. Bugarama (C'gugu)	Soya	NPK	300	18	800	1.3	140	243	0.8	2
28. Cyanzarwe (Gisenyi)	Beans	DAP+Urea	100+50	64	664	2.2	60	200	0.7	
29. Cyanzarwe (Gisenyi)	Soya	DAP+Urea	100+100	36	600	1.0	130	200	0.7	
30. Bugarama (C'gugu)	Beans	NPK	200	3	800	2.0	80	243	0.7	1
31. Mirenge (Kibungo)	Maize	NPK	250	6	1,800	2.4	73	250	0.7	
32. Ntongwe (Gitarama)	Maize	NPK	250	34	6,000	2.4	70	250	0.7	1
33. Ntenyo (Gitarama)	Maize	NPK	250	17	2,400	2.4	70	250	0.7	
34. Cyanzarwe (Gisenyi)	Maize	DAP+Urea	100+60	23	782	3.5	35	200	0.6	
35. Mirenge (Kibungo)	Beans	DAP+Urea	100+50	21	800	2.7	52	233.3	0.6	
36. Bugarama (Cyangugu)	Maize	NPK	250	3	1,800	2.4	65	243	0.6	2
37. Ngenda (Kigali-R)	Beans	DAP+Urea	100+60	56	800	2.5	45	233	0.5	2
38. Ngenda (Kigali-R)	Maize	DAP+Urea	100+50	34	600	2.7	48	233	0.5	2
39. Ndiza (Gitarama)	Soya	DAP+Urea	100+100	6	600	0.0		220	0.0	
40. Ndiza (Gitarama)	Soya	DAP	100	6	600	0.0		220	0.0	

Source: Quarterly Activity Report No. 01/02 (January - March 2002)

Table 7: Distribution of Districts and Demonstrations according to VCRs by Crops and Fertilizers

	Potatoes			Beans			Soya			Maize			Overall			
	Dists No	Demos No	Demos %	Dists No	Demos No	Demos %	Dists No	Demos No	Demos %	Dists No	Demos No	Demos %	Dists No	Crops No	Demos No	Demos %
VCR > 3																
DAP+Urea	2	59	50.4							2	35	25.7	5	2	94	16.1
NPK	1	40	27.6										1	1	40	14.0
DAP																
All Above		99	37.8								35	17.3	5	2	134	14.0
VCR 2.0 to 2.9																
DAP+Urea	1	52	44.4				1	34	30.4	1	6	4.4	3	3	92	15.7
NPK	1	52	35.9							1	6	9.1	2	2	58	20.4
DAP							1	34	85.0				1	1	34	40.5
All Above		104	39.7					68	30.5		12	5.9	6	3	184	19.3
VCR 1.1 to 1.9																
DAP+Urea	1	6	5.1	2	79	35.9	2	36	32.1	2	21	15.4	5	4	142	24.3
NPK	2	53	36.6				1	10	14.1				3	2	63	22.1
DAP				1	44	100.0							1	1	44	52.4
All Above		59	22.5		123	46.1		46	20.6		21	10.4	7	4	249	26.1
VCR 0 to 1.0																
DAP+Urea				3	141	64.1	2	42	37.5	3	74	54.4	5	3	257	43.9
NPK				1	3	100.0	4	61	85.9	4	60	90.9	6	3	124	43.5
DAP							1	6	15.0				1	1	6	7.1
All Above					144	53.9		109	48.9		134	66.3	7	3	387	40.6
TOTAL																
DAP+Urea	4	117	100.0	5	220	100.0	5	112	100.0	8	136	100.0	13	4	585	100.0
NPK	4	145	100.0	1	3	100.0	5	71	100.0	5	66	100.0	12	4	285	100.0
DAP				1	44	100.0	2	40	100.0				3	2	84	100.0
All Above	4	262	100.0	6	267	100.0	9	223	100.0	9	202	100.0	13	4	954	100.0

Source: Based on Table 6

Table 8: ARMDP Demonstrations by Crops and Locations and Kelly Murekezi Recommendations

Province	District	ABC Zone	I. Potato No Demos	VK-AM Recom	Beans No Demos	VK-AM Recom	Soya No Demos	VK-AM Recom	Maize No Demos	VK-AM Recom	Total No Demos	VK-AM Recom
Cyangugu	Bugarama	1	0	1	19	1	18	2	22	2	59	1, 2
Gikongoro	Nshili	5A	38	1	0	2	0	4	0	4	38	1, 2, 4
	Musebeya	5A	80	1	0	2	0	4	0	4	80	1, 2, 4
	Mudasomwa	5A	104	1	0	2	0	4	0	4	104	1, 2, 4
Gitarama	Ntongwe	4C	0	3	0	1	68	1	68	1	136	1, 3
	Ndiza		40	*	0		12	*	0		52	*
	Ntenyo		0		0		34		34		68	*
	Kamonyi		0		0		0		12		12	*
Kibungo	Mirenge		0		21	*	19	*	6	*	46	*
Kigali-R	Bicumbi	4D	0	2	63	1	10	1	2	1	75	1, 2
	Ngenda	6A	0	2	56	2	23	2	34	2	113	2
	Nyamata	na	0		44	*	3	*	1	*	48	1, 3
Gisenyi	Cyanzarwe	na	0		64	*	36	*	23	*	123	*

Summary	**I. Potato**		**Beans**		**Soya**		**Maize**		**All 4 Crops**	
	No Demos	%	No Demos	%	No Demos	%	No Demos	%	No Demos	%
1 Strongly Recommended	222	84.7	82	30.7	78	35.0	70	34.7	452	47.4
2 Not Recommended			56	21.0	41	18.4	56	27.7	153	16.0
3 Only Targeted Program									0	0.0
4 Research Needed									0	0.0
* Could not be identified	40	15.3	129	48.3	104	46.6	76	37.6	349	36.6
Total	262	100.0	267	100.0	223	100.0	202	100.0	954	100.0

954

Notes:

1. Recommendations shown in table here are based on identification of districts on maps in Fertilizer Response and Profitability in Rwanda
2. Not all ARMDP districts could be identified on maps. Hence, *