Detailed country-by-country access plan for P and other agro-minerals

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N2Africa

Putting nitrogen fixation to work for smallholder farmers in Africa

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1 Introduction

Phosphorus is an essential element required for legume growth and nitrogen fixation (Giller, 2001). As many African soils are old and highly-weathered, P fertilizers are required virtually everywhere for all crops. Legumes tend to have a stronger requirement for P than cereals due to their less-branched and less fibrous root systems. Crop legumes are all (with the exception of lupin) dependent on arbuscular mycorrhiza for efficient uptake of P from the soil, and these mycorrhizas are ubiquitous in the soil. P tends to be particularly in short supply in coarse-textured sandy soils and in acid, heavy clay soils (oxisols). In all cases the best strategy for managing P fertilizer additions is a little-but-often approach – using small rates of P (typically 15-30 kg P ha^{-1}) on each legume crop (Buresh et al., 1997). This ensures most efficient crop recovery of P. Typical recovery efficiencies for P are 20-25% in the first crop and 2-3% in a second, subsequent crop (Janssen et al., 1987). If P fertilizers are added regularly the residual P effect builds up. Addition of P with organic manures can enhance P availability by reducing the fixation of phosphate ions onto clay surfaces. In sandy soils over-supply of P can exacerbate incipient deficiencies of Zn, but these problems can be avoided if animal manures are used (Zingore et al., 2008). In addition to small amounts of P, small amounts of lime may be required to supply Ca (or in the case of dolomitic lime Ca and Mg), and this is readily available in all of the countries in which we will work. Fertilizer blends with micronutrients are available in some countries (e.g. Mavuno in Kenya) and will be targeted to problem soils.

Access to P and other agro-minerals will be an essential component for achieving the impact goals of the N2Africa project since most grain legumes show a response to P on low P soils, both in terms of grain yield and in terms of BNF, and since soils in a substantial part of the impact zones of the project are marginally to severely deficient in P. Other, probably more site-specific constraints (e.g., micro-nutrient deficiencies, acidity control) may require the use of other agro-minerals. Following the project indicators, the area under improved legume management will increase as detailed in Table 1 (and Annex 1). In principle, in those areas, sufficient inputs would need to be applied to reach the required increases in legume grain yield and BNF.

Table 1: Estimated areas under specific legumes for each of the regions

Region	Legume	Year 1 [ha]	Year 2 [ha]	Year 3 [ha]	Year 4 [ha]
West	Cowpea	1,200	2,800	6,200	15,000
	Groundnut	200	482	1102	2750
	Soybean	300	770	1860	4875
East/Central	Bush beans	300	700	1550	3750
	Climbing beans	300	700	1550	3750
	Soybean	90	389	1259	4007
Southern	Groundnut	200	481	1096	2727
	Bush beans	100	272	689	1875
	Soybean	65	319	1076	3496

Assuming relatively low required P application rates per target legume as detailed in Table 2, the project would need to leverage about 700 ton of P fertilizer by year 4 (Table 2 It is obvious that the project cannot afford to handle the logistics of moving 699 tons of fertilizer P (i.e. about 3,300 tons of fertilizer), or fully subsidize this P fertilizer and that there is need for a strategy to have participating farmers and farmer associations gradually cover the cost of the P fertilizer. In some countries where farmers are not accustomed to free hand-outs of inputs we should strive for farmer purchase of inputs from the start.

Table 2: Estimated fertilizer P needs to cover the estimated areas under legumes

Region	Legume	P rates	Total P needs (tons)			
			Year 1	Year 2	Year 3	Year 4
West	Cowpea	10	12	28	62	150
	Groundnut	10	2	5	11	28
	Soybean	20	6	15	37	98
East/Central	Bush beans	20	6	14	31	75
	Climbing beans	30	9	21	47	113
	Soybean	30	3	12	38	120
Southern	Groundnut	10	2	5	11	27
	Bush beans	10	1	3	7	19
	Soybean	20	1	6	22	70
			42	**109**	**265**	**699**

This implementation plan describes in detail how the need for specific inputs will be determined, which would be the optimal rate, and how these inputs will be deployed on a country by country basis following the logic of Table 1. Although there are no specific indicators related to the deployment of P and other inputs, except for having this implementation plan, it is understood that such inputs are critical to achieve the impact indicators of N2Africa. Evaluation of progress with implementing the plan should be an integral part of the M&E process developed for N2Africa. This plan is related to Milestone 1.2.4. of the project.

2 Objectives

The implementation plan has the following objectives:

I. To determine the specific needs of P and other inputs for the targeted legumes and impact zones, including optimal rates.

II. To establish country-specific plans on how to facilitate access to the required inputs at the required rates.

III. To integrate these plans within the country-specific dissemination strategy.

IV. To set progress checks and specific responsibilities to achieve the above objectives in each country.

The overall aim of the plan is to ensure sustainability of access to P and other inputs by integrating their costs in the targeted legume enterprises.

3 Country-specific situation

3.1 Availability

This section describes the situation of the P and input supply sector for the different target countries. In most countries, some P-containing fertilizer is available (Table 3) though sole P, legume-specific fertilizer blends are only available in less than half of the target countries. In DRC, any fertilizer is hardly available. Lime and gypsum appears to be mainly commercially available in Zimbabwe. Though most countries have some form of rock phosphate deposits, only in Nigeria and Kenya are these commercialized with prices not being substantially lower than those of P fertilizer (Table 4).

Table 3: Availability of P and other agro-minerals in the target countries

Country	Type	Supplier	Unit sold	Cost per unit (50 kg bag)
Kenya	DAP	MEA limited	50 kg	USD 35
	Mavuno, Mazao	Athi River mining Company	50 kg	USD37
	SSP, TSP	CONAGRA, USA	2, 5, 10, 50 kg	USD 32
Rwanda	NPK 17.17.17; NPK 20.10.10; NPK 20.5.5	Premium Agro Chemical; Yala Chapameli; Export Trading; gift from JICA	50 kg	USD 33
	DAP		50 kg	USD 27
	Urea		50 kg	USD 23
DR Congo	NPK	COOCENKI	50kg	USD 65
	DAP	COOCENKI	50kg	USD 60
	TSP	COOCENKI	50kg	USD 50
Nigeria	SSP	Federal Superphosphate Company, Kaduna	50kg	USD 20
	Crystalizer super fertilizer	Crystal Talc Nig Ltd	50kg	USD 18
	DAP	Golden Fertilizers Nig. Ltd; TAK continental Nig Ltd	ton	USD 733
Ghana	TSP	Yara, Chemico, Dizengoff, Wienco, Bogos Gold, Agrimat, Atoune, Bulgaria NV, Gh., Galli Ltd	50 kg	USD 55
Malawi	Nitro-phosphate	Yara, Optichem,SFRF,ARO	50kg	USD 46
	NPK	ATC, Yara, SFRF, ARO, Farmers world and Kulima Gold,	5,10, 50kg	USD 33
	DAP	Optichem, Yara, SFRF, ARO	50kg	USD 46
	TSP	Optichem, Yara, SFRF, ARO	50kg	USD 52
Zimba-bwe	Compound D (7:14:7:4 N:P205:K20:S + B)	ZFC, Windmill, Omnia	50kg	USD 29
	SSP	ZFC, Zimphos	50kg	USD 12
	Dolomitic lime	Early Worm Mine,G and W, ZFC	ton	USD 90-100
	Gypsum	Zimphos	50kg	USD 6
	Compound L (5:17:10:8:0.25 N:P205:K20:S:B)			

Mozam-bique	SSP	AgriFocus, Agrochemico	50kg	USD 65
	TSP	AgriFocus, Agrochemico	50kg	USD 65

Table 4: Availability of rock phosphate (RP) and other local amendments in the target countries

Country	Type	Quality issues?	Commercialized by whom?	Package units	Cost per unit
Kenya	Minjingu [powder and granulated] (imported from Tanzania)	Regulated (KEBS); should be OK	Kondola Enterprises Ltd, Nakuru	50 kg	USD 26
Rwanda	Lime and Travertine	Uncertain	Local traders	25kg; 50kg	USD 1.42 for 25 kg bag; USD 2.84 for 50 kg
DR Congo	Lime	Yes ; not regulated	Private	25 kg and 50 kg	USD 0,12/kg
Nigeria	Sokoto rock phosphate	QA hardly enforced	Crystal Talc Nig Ltd, Kaduna	50 kg	USD 23/kg
Ghana	Togo RP; Burkina RP; Mali RP; Senegal RP; Morrocco RP	Non regulation	Weinco, Sadalco, Chemico, Yara	30 kg	USD22/
Malawi	Tundulu RP	Not regulated	Not yet	N/A	N/A
	Limestone	Not regulated	Not yet	N/A	N/A
Zimba-bwe	Dorowa RP	Igneous and unreactive P deposit. Not suitable for direct application	Zimphos	50 kg	Unsure
Mozam-bique	Local RP	The P content unknown	Not commercialized	Not available on the market	N/A

3.2 Quality

In terms of quality of the P fertilizer and other inputs, although some quality control mechanisms do exist in nearly all countries, inputs of sub-standard quality is an important issue, except perhaps in Zimbabwe and Kenya, necessitating the need to link farmer associations to inputs from reliable sources (Tables 5 and 6). Quality decline happens in most countries through inappropriate repackaging or adulteration of inputs.

Table 5: Quality control of inputs and risk of occurrence of below quality inputs

Country	Quality control by government?	Risk of occurrence of below quality inputs?
Kenya	Yes, KEBS	- Limited risk
Rwanda	Certificate of origin, certificate of analysis checked by Rwanda Bureau of Standard at entry point; seasonal at local level with input	- Limited risk

	dealers stores	
DR Congo	None	- Risk is low since there is very little use of fertilizer
Nigeria	Standards Organization of Nigeria (SON) has specifications for fertilizer.	- The nutrient analysis on fertilizer bags often does not match its content - Regulatory agencies have inadequate capacity in terms of number of staff as well as facilities and this leads to quality assurance in fertilizer industry being poorly enforced leading to the importation and production of poor quality fertilizers
Ghana	Ghana Standards Board	Adulteration could occur at the ports through repackaging; enforcement of standards is inadequate.
Malawi	Malawi bureau of standards; Department of Agricultural Research Services	- Roles are not clearly defined, hence danger that it may not be conducted
Zimba-bwe	Yes	- Minimal
Mozam-bique	INOQ (National Standards Bureau	- Fertilizers imported mainly from South Africa in 50kg bags so risk of adulteration is low they as they are sold as is

Table 6: Occurrence of repackaging and adulteration in the target countries

Country	Issue	Occurrence?	Risk of occurrence?
Kenya	Repackaging?	Yes but mainly by the main producers	Minimal
	Adulteration?	Minimal	Minimal
Rwanda	Repackaging?	None	NA
	Adulteration?	Steeling on bags during transport; opened bags	Frequent with Chapameli supplier
DR Congo	Repackaging?	Yes	Minimal
	Adulteration?	None	Could happen once more farmers use fertilizer
Nigeria	Repackaging?	Problems frequently reported	Under application through lower grades
	Adulteration?	Adulterated fertilizers due to inadequate enforcement	Under application /misapplication of input in desired quantity and quality
Ghana	Repackaging?	Yes at the ports and in the markets	High
	Adulteration?	Highly probable	Moderate to high
Malawi	Repackaging?	Only done by Agricultural Trading corporation (5 and10 kg packs for fertilizers only)	No production or inadequate quantities produced due to less demand
	Adulteration?	May occur, though no incidence related to approved suppliers	Selfish traders may take advantage, hence poor quality fertilizers
Zimba-bwe	Repackaging?	Yes	Minimal
	Adulteration?	No	None
Mozam-bique	Repackaging?	Can happen where bags are opened and sold in small quantities	Probable when imported in large packages
	Adulteration?	Not known	Less likely

3.3 Input supply networks and bottlenecks

The density of input supply networks for fertilizer varies between quite dense (Kenya) to inexistent (DR Congo) (Table 7). Main bottlenecks are related to the late supply, the limited quantities available, difficult transportation, and lack of decentralized storage facilities (Table 8).

Table 7: Input Supply networks in the target countries

Country	Mandate area	Large importers?	Agro-dealer density?	Input subsidy schemes?	AGRA investments on input supply?
Kenya	All	Hydra-Hydra chapa Meli MEA Ltd	High in both urban and rural centres	Limited to tea and sugarcane farmers	Agro-dealer training (through CNFA)
Rwanda	All	RADA is the only authorized importer for fertilizers	Subcontracted privates at the district level, on a seasonal basis	50% subsidy by the government on all imported fertilizers	Agro-dealer training (through IFDC)
DR Congo	All	COOCENKI [30-50 ton/season]	Very low	None; collective buying is needed	None
Nigeria	Guinea savanna	Largely commissioned by Government.	Major dealers domiciled in cities, retailers in villages	Especially for fertilizers but does not reach target beneficiary	Linking farmers to input dealers, credit providers and agro-processors
Malawi	All	SFRF, YARA, OPTICHEM, ARO	Farmers world, Kulima Gold (Rab processors)	Present- through ADMARC	None
Zimba-bwe	All	Omnia, Windmill Fertilizers	5 per district	ZFU-EU fertilizer scheme, Grain Marketing Board	None
Mozam-bique	Angonia	Agrifocus Agri-Quimico, from Malaw	IKURU	None	None
	Manica	Agrifocus and Agri-Quimico	Dengo Comercial	None	Don't know
	Zambe-zia	Agrifocus and Agri-Quimico	IKURU	None	Don'tknow

Table 8: Input supply bottlenecks in the target countries

Country	Bottleneck?	Risk of bottleneck?	Risk management strategy?
Kenya	High cost	Medium to high	Credit facilities; focus on improving fertilizer use efficiency
Rwanda	Repayment of loan	Moderate	Service providers (NGOs) to follow up and mobilize the communities
	Illicit selling to neighboring countries	Moderate	Crop Intensification Program to monitor and evaluate the fertilizer use and storage
	Exchanging of labeling with the content of bags	Low	Quality control mechanisms
	Reluctance of farmers to use	High	Demonstration trials with volunteer farmers

	fertilizer		
	Unskilled distributors with no accurate knowledge on fertilizer	High	Training of dealers on fertilizer handling; quality control mechanisms
DR Congo	Resistance to fertilizer use	High	Awareness creation campaigns
	Taxes	High	Lobbying and informing policy
	Lack of knowledge on use	High	Demonstration trials; awareness creation at the academic, political, local, religious, etc level
Nigeria	Lack of credit	low	Creation of credit facilities
	Not available on time	moderate	Direct linkage to input dealers
	Under-bagging	Low	Enforcement of standards
	Adulteration and misbranding	Moderate - high	Enforcement of standards
	Insufficient quantities available	moderate	Organise farmers into cooperatives
Ghana	Poor financing of agrodealers; Poor access roads; Poor knowledge of agrodealers; Poor warehousing and storage	Moderate – High	Extend credit facilities to small agro-dealers; improve access roads; train agro-dealers in handling, usage, application, warehousing; enforce standards.
Malawi	Short supply of P fertilizers	High	Establish demand
	Transportation problems (during rainy season)	Moderate – High	Supply the local markets before rainy season
	Lack of warehousing facilities	Moderate –	Supply directly to farmers clubs
Zimba-bwe	Late supply of inputs	Moderate	Timely purchase of inputs
	Shortage of fertilizer	Moderate	Imports
	Poor pricing of fertilizer	Moderate	Pricing policy for inputs
Mozam-bique	--Transportation problem	--moderate to high	--Supply local market before the rain

3.4 Major constraints to legume production and availability of recommendations

Following expert knowledge, the major constraints to legume production are low soil P and occurrence of drought with soil acidity as a limitation in some countries (Table 9).

Table 9: Major constraints for legume production in the target countries

Country	Mandate area	Presence of P deficiency?	Presence of soil acidity constraints?	Presence of other constraints?	Presence of drought [between and within season]?
Kenya	All	Widespread	Localised in all district of Western Kenya	Limited K and S deficiencies	Most common within-season drought nearer to the Lake Victoria Basin
Rwanda	All	Widespread	Mainly in Gakenke District	All but most severe in Burera and Gakenke Districts	Most common in Bugesera and Kayonza Districts
DR	All	High	In some	Minimal	Limited

Congo			areas		
Nigeria	NGS	Widespread	Limited	Limited	At the beginning and towards end of season
Ghana	All	Widespread	Localized	Low N, low SOM, plinthite, erosion	Yes for all mandate areas
Malawi	All	Moderate	Moderate risk	Low N and P	Occasionally
Zimba-bwe	Wedza	High	High risk		Moderate
	Murehwa	High	High risk		Moderate
	Makoni	High	High risk		Moderate
	Buhera	High	High risk	Low rainfall	Moderate
	Bindura	Moderate	Low risk		Moderate
	Chegutu	Moderate	Low risk		Moderate
Mozam-bique	Zambesia	None	Moderate risk in some areas	rainfall fairly reliable	Short drought spells occur
	Manica	Some areas with moderate P	Moderate risk in some areas	Low rainfall in some years	Occasional drought
	Angonia, Tete	Some areas with moderate P	Some areas have low pH	None	Drought spells occur
	Nampula	Local along the coast	Moderat along the coast	None	Frequent drought spells occur

Recommendations for input use on legumes do exist for P in most countries and for lime in some (Table 10).

Table 10: Summary of existing recommendations for legume production in the target countries

Country	**Legume/ Mandate area?**	**Existing recommend-dations for P?**	**Existing recommend-dations for lime?**	**Existing recommend-dations for other inputs?**	**Existing recommend-dations for water harvesting?**
Kenya	All	15-45 kg /ha	2.5 t /ha	40-60 N/ kg N/ha	Ad hoc
Rwanda	All	No official recommendations	No official recommen-dations	No official recommen-dations	No official recommen-dations
DR Congo	All	45 kg P/ha	2000 kg/ha (1 time/year)	18 kg N/ha	None
Nigeria	NGS: Soybean, cowpea	16 kg P/ha broadcast pre-plant or banded	None	10-20 kg N/ha as starter; 8-17 kg K/ha	None
	NGS: Groundnut	24 kg P/ha broadcast pre-plant or banded	None	20 kg K/ha; P source should contain S	None
Ghana	Soybean, cowpea,	30 kg P_2O_5 per ha	None	20-40kg/ha of	None

	groundnut	for cowpea, groundnuts, soybean; Banding		K_2O; Banding	
Malawi	Groundnuts, soybean	21 kg P/ha (banding)	3t/ha (banding)	6t/ha (banding/ incorporation)	As much as possible
	Common beans	30 kg P/ha (banding)			
	Cow peas	20-30 kg P/ha (banding)			
Zimba-we	Wedza, Murehwa Makoni, ,	30 kg/ha P, banding	0.6-0.8 t/ha; broadcasting	Inoculant, slurry method, Gypsum 200-250 kg spot applied	Tied-ridges, pot-holing, planting basins, mulching, infiltration pits
	Buhera	20 kg/ha P, banding			
	Bindura, Chegutu	30 kg/ha P, banding	1-1.2 t/ha; broadcasting		
Mozam-bique	Gurue district – Zambesia, Malema	No official recommendation (20 kg/ha)	No recommen-dation	No recommen-dation	Not available
	Manica province, Angonia	No official recommendation (40 kg/ha)			

3.5 Existing summary scenarios

Condensing all above information, at least 5 scenarios can be identified that will impact on the strategies to use to make P fertilizer and other agro-minerals available to smallholder farmers in the different countries (Table 11). These scenarios cover differences in availability of P-containing or P fertilizer, the risk for sub-optimal quality of these inputs, the presence of agro-input dealer networks, and the existence of P input recommendations. Each country is within reach of large importers of fertilizer (though the cost per unit fertilizer will obviously vary depending on the transport routes available to a specific country).

Table 11: Potential scenarios existing across the target countries

Scenario (country)	**Potential to import**	**Availability of P-containing fertilizer**	**Availability of P fertilizer**	**Presence of good quality inputs**	**Presence of input dealer networks**	**Existence of recommen-dations for P use**
Scenario 1 (Kenya, Zimbabwe and Mozanbique)	Yes	Yes	Yes	Yes	Yes	Yes
Scenario 2 (Nigeria, Ghana, Malawi)	Yes	Yes	Yes	**No**	Yes	Yes
Scenario 3 (None)	Yes	Yes	Yes	Yes	**No**	**No**
Scenario 4 (Rwanda)	Yes	Yes	**No**	Yes	**No**	**No**
Scenario 5 (DR Congo)	Yes	**No**	**No**	**No**	**No**	**No**

4 General principles and scenario-specific strategies

4.1 General principles

The following principles should form the basis of any P/agro-mineral deployment plans:

I. We should use existing resources where possible.

II. We should engage the private sector as early as possible in the implementation plan.

III. We should move towards sustainability (the input cost should be embedded in the targeted legume enterprises).

IV. We should work with other investments where possible (e.g., AGRA investments in the input supply chain).

V. We should start from what is known and available and modify this through experimentation and promotion activities.

VI. We should explore deploying fertilizer together with the inoculant and the improved varieties.

VII. We should have realistic plans that have a certain degree of flexibility.

VIII. We should base the follow through of the plan on feedback from the M&E activities.

4.2 Scenario 1 components

Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Confirm/adapt existing recommendations (adaptive trials)																
Timely delivery of P fertilizer by producers or large importers																
Train agro-dealers on the specific needs for P fertilizer																
Subsidize small amounts during initial dissemination campaigns																
Link agro-dealers to dissemination campaigns during years 2-4																

4.3 Scenario 2 components

Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Confirm/adapt existing recommendations (adaptive trials)																
Identify appropriate sources of P fertilizer and link to N2Africa																
Timely delivery of P fertilizer by producers or large importers																
Train agro-dealers on the specific needs for P fertilizer																
Subsidize small amounts during																

initial dissemination campaigns																
Link agro-dealers to dissemination campaigns during years 2-4																

4.4 Scenario 3 components

Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Develop recommendations (adaptive trials)																
Subsidize small amounts during initial dissemination campaigns																
Source P fertilizer through fertilizer import companies																
Organize associations for bulk purchase around business plans																
Explore links with other initiatives strengthening agro-dealer networks																

4.5 Scenario 4 components

Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Develop recommendations (adaptive trials)																
Subsidize small amounts during initial dissemination campaigns																
Convince importers/government to also avail P fertilizer																
Organize associations for bulk purchase around business plans																
Explore links with other initiatives strengthening agro-dealer networks																

4.6 Scenario 5 components

Activities	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Develop recommendations (adaptive trials)																
Subsidize small amounts during initial dissemination campaigns																
Convince importers/government to also avail P fertilizer																
Ensure quality of fertilizer along the input supply chain																
Organize associations for bulk purchase around business plans																
Explore links with other initiatives strengthening agro-dealer networks																

5 Country-specific P and other agro-mineral deployment plans

This section details the different steps to take towards a self-sustaining input deployment plan for each of the target countries, taking into account the specific situation in each of these, including the presence of complementary projects.

5.1 Kenya

The target areas of the project in Kenya are Western and Nyanza provinces in West Kenya. Both soybean and beans are the target legumes for the complete target area. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

Evaluation of the agronomic results of the VAR-1 and INP-1 adaptive trails and specific observations taken from the various demonstration trials will result in quantitative information on the response of soybean and beans to P application and how this is affected by location and within-farm soil fertility gradients. The relative benefits of using commercially available Minjingu rock phosphate, which is cheaper per unit of P than the soluble P fertilizers, will also be evaluated against the latter. The obtained results will be translated in site-specific recommendations for P use in the target Provinces. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs in West Kenya. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with fertilizer companies to produce these.

II. Training of agro-dealers

In West Kenya, a reasonably dense network of agro-dealers exists. Many of these have been trained in business management skills through AGRA support and other initiatives and some of them have been exposed to ISFM approaches through training workshops and exchange visits organized by TSBF-CIAT. In a first instance, agro-dealers will be identified that cover a substantial area of the target zones. These will be engaged in specific training activities on legume production and inoculant use (see Milestone 5.4.3.) and the cost-benefits of selling inoculants and P fertilizer.

III. Initial demonstration campaigns

Since the number of households that are involved during the initial demonstration campaigns is rather limited, fertilizer has been subsidized by a Kenya-based fertilizer company MEA Limited. The same company also supplied the inoculants free of charge. Since the initial phase of the demonstrations is to prove the concept and expose farming communities to inoculant x P fertilizer effects on legume productivity, it is normal that inputs are subsidized to reduce risk for the participating farmer families.

IV. Follow-up demonstration campaigns

During follow-up demonstration campaigns, as the number of participating households increases, full subsidy of the required fertilizers will be impossible. By then, farming families should have been exposed to the beneficial effects of inoculant x P fertilizer on legume productivity so interesting them in purchasing the inputs directly could be justified. The unit price of the inputs and the method of procurement would need to be developed depending on the capacity of the participating associations for collective purchasing and marketing of inputs and produce. Since purchasing inputs, even inoculant, is always going to require some capital, successful deployment of P fertilizer will only happen if those same associations are linked to profitable output markets that would generate the required cash. Access to micro-credit schemes could be explored in the Kenyan context (e.g., Equity Bank, loan guarantees initiatives through AGRA). Linkages between projects, supported by AGRA and other investors, aiming at facilitating smallholder farmers to access fertilizer will be explored and where feasible, overlapping target areas will be considered. We should consider one means of engagement with fertilizer importers to ensure delivery of inputs on time would be for us to use project funds as guarantees up-front with companies so they deliver to suppliers in areas we are working in advance of the season.

5.2 DR Congo

The target areas of the project in DR Congo are the Walungu, Kabare, and Kalehe Territories of South-Kivu Province. Both soybean and beans are the target legumes for the complete target area. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

Evaluation of the agronomic results of the VAR-2 and INP-2 adaptive trails and the INO-1 demonstration trials will result in quantitative information on the response of soybean and beans to P application and how this is affected by location and within-farm soil fertility gradients. The obtained results will be translated in site-specific recommendations for P use in the target territories. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs in East DR Congo. The final outcome towards the end of the project should be the establishment of legume-specific blends and engagement with importers to import these into DR Congo. For soils that have a limited P fixing capacity we will investigate the impact of focusing fertilizers on other crops in the rotation (e.g. maize) so that the legumes benefits from the residual P. In countries like DR Congo where there is very limited capacity to buy fertilizer this could be the most sensible choice for farmers.

II. Initial demonstration campaigns

Since the number of households that are involved during the initial demonstration campaigns is rather limited, fertilizer has been subsidized by a Kenya-based fertilizer company MEA Limited. The same company also supplied the inoculants free of charge. Since the initial phase of the demonstrations is to prove the concept and expose farming communities to

inoculant x P fertilizer effects on legume productivity, it is normal that inputs are subsidized to reduce risk for the participating farmer families.

III. Convince importers/government to avail P fertilizer

In DR Congo, only relatively small quantities of NPK fertilizer are currently available. The CATALIST program managed by IFDC has been able to convince the Congolese government to remove import duties on fertilizer but interest of the private sector in importing inputs has been limited. We need to convince CATALIST that P fertilizers should be part of the package of inputs they are dealing with. We should consider one means of engagement with fertilizer importers to ensure delivery of inputs on time would be for us to use project funds as guarantees up-front with companies so they deliver to suppliers in areas we are working in advance of the season.

IV. Ensure quality of fertilizer along the input supply chain

Since there is no functional quality control scheme in DR Congo, efforts would be required to ensure that the fertilizer to be used in the follow-up demonstration cycles is of original quality and that repackaging of large amounts of fertilizer is centralized following tight procedures. Alternatively, MEA Limited is also interested in commercializing fertilizer in small packages in East-DR Congo through their office in Kigali, Rwanda. Obviously, cross-border movement of fertilizer would require administrative procedures to be followed and simplified.

V. Organize associations for bulk purchase around business plans during follow-up demonstration campaigns

During follow-up demonstration campaigns, as the number of participating households increase, full subsidy of the required fertilizers will be impossible. By then, farming families should have been exposed to the beneficial effects of inoculant x P fertilizer on legume productivity so interesting them in purchasing the inputs directly could be justified. In absence of a functional agro-dealer network in East DR Congo, it will be important for participating associations to purchase P fertilizer in bulk to reduce transport costs and ensure timely availability of fertilizer. Such efforts would need to go hand in hand with profitable links to output markets and setting up some credit and savings schemes. Various organizations in Sud-Kivu are engaged in such activities and linkages with these would need to be sought since N2Africa itself does not have the funding to train associations in that respect. The unit price of the inputs and the method of procurement would need to be developed depending on the capacity of the participating associations for collective purchasing and marketing of inputs and produce. Since purchasing inputs, even inoculant, is always going to require some capital, successful deployment of P fertilizer will only happen if those same associations are linked to profitable output markets that would generate the required cash.

VI. Explore links with other initiatives strengthening agro-dealer networks

The earlier-mentioned CATALIST program is setting up activities to interest the private sector in commercializing agricultural inputs through business training and awareness creation.

5.3 Rwanda

The target areas of the project in Rwanda are in first instance the Burera (climbing beans), Gakenke (climbing beans), Kamonyi (soybean), Bugesera (soybean and bush beans), and Kayonza (soybean) districts in the Northern, Southern, and Eastern Provinces of Rwanda. The target legumes for each of the districts are given between brackets. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

Evaluation of the agronomic results of the VAR-2 and INP-2 adaptive trails and the INO-1 demonstration trials will result in quantitative information on the response of soybean and beans to P application and how this is affected by location and within-farm soil fertility gradients. The obtained results will be translated in site-specific recommendations for P use in the target Districts. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs in Rwanda. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with importers and government agencies to import these into Rwanda. For soils that have a limited P fixing capacity we can investigate the impact of focusing fertilizers on other crops in the rotation (e.g. maize) so that the legumes gets the residual P. In countries like Rwanda where there is very limited capacity to buy fertilizer this could be the most sensible choice for farmers.

II. Initial demonstration campaigns

Since the number of households that are involved during the initial demonstration campaigns is rather limited, fertilizer has been subsidized by a Kenya-based fertilizer company MEA Limited. The same company also supplied the inoculants free of charge. Since the initial phase of the demonstrations is to ‘prove the concept’ and to expose farming communities to inoculant x P fertilizer effects on legume productivity, it is normal that inputs are subsidized to reduce risk for the participating farmer families.

III. Convince importers/government to avail P fertilizer

In Rwanda, the government has recently invested in crop-specific subsidies for specific fertilizers, mainly NPK and DAP. Through continued dialogue with the Crop Intensification Program and the Ministry of Agriculture, we can certainly create interest in availing P fertilizer. MEA is going to set up a commercial outlet for its small packages of specific fertilizers in Kigali, Rwanda, so at least one company is going to supply legume-specific fertilizers and inoculants. Interest through private importers that have successfully applied to government bids for importing fertilizer – as is the current procedure – can certainly be extended to bulk purchases of P fertilizer. We should consider one means of engagement with fertilizer importers to ensure delivery of inputs on time would be for us to use project funds as guarantees up-front with companies so they deliver to suppliers in areas we are working in advance of the season.

IV. Organize associations for bulk purchase around business plans

During follow-up demonstration campaigns, as the number of participating households increases, full subsidy of the required fertilizers will be impossible. By then, farming families should have been exposed to the beneficial effects of inoculant x P fertilizer on legume productivity so interesting them in purchasing the inputs directly could be justified. The unit price of the inputs and the method of procurement would need to be developed depending on the capacity of the participating associations for collective purchasing and marketing of inputs and produce. Since purchasing inputs, even inoculant, is always going to require some capital, successful deployment of P fertilizer will only happen if those same associations are linked to profitable output markets that would generate the required cash. Access to micro-credit schemes could be explored since there are a number of micro-credit schemes in Rwanda. Linkages between projects, supported by AGRA and other investors, aiming at facilitating smallholder farmers to access fertilizer will be explored and where feasible, overlapping target areas will be considered.

V. Explore links with other initiatives strengthening agro-dealer networks

The CATALIST project, supported by AGRA, is starting a set of activities around strengthening agro-dealer networks. N2Africa needs to interact with CATALIST in order to ensure that inoculant and P fertilizer use in the context of legume production is included in specific training activities.

5.4 Nigeria

The mandate areas of the project in Nigeria are Kaduna and Kano States. Cowpea, groundnut and soybean are the mandate crops in the mandate areas. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

There are existing P fertiliser recommendations for cowpea, groundnut and soybean in the mandate areas. However, these recommendations appear too generalised and obsolete and therefore require a review. Evaluation of the agronomic results of the VAR-1 and INP-1 adaptive trails and specific observations taken from the various demonstration trials will result in quantitative information on the response of the three crops to P application and how this is affected by location and within-farm soil fertility gradients. Single superphosphate (SSP), which is the commonest P fertiliser available in the market, will be used for the trials. The relative benefits of using commercially available Sokoto rock phosphate, which is marketed as Crystallizer, will also be evaluated against the latter. The obtained results will be translated in site-specific recommendations for P use in the target areas. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs in both Kaduna and Kano States. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with fertilizer companies to produce these. Already, the Managing Director of Crystallizer Company Ltd has given his personal assurance to closely collaborate with the project and to be responsive to the needs of farmers as recommended by the project in terms of blends and mini packs.

II. Training of agro-dealers

Large concentrations of agro-dealer networks exist within or in close proximity to the action sites in both Kaduna and Kano States. Many of these have been trained in business management skills through the support and initiatives of the International Fertilizer Development Centre (IFDC) and have formed regional organisations. The North Western Agro Input Dealers Association (NOWAIDA), which is the umbrella body for input dealers in both Kaduna and Kano States, is a key partner of the N2Africa project. Many of its members participated in the Nigeria National Planning Meeting and made very useful suggestions and are willing to organise trainings for farmers in the action sites on input handling and application. In the first instance, agro-dealers that cover a substantial area of the target zones will be engaged in specific training activities on legume production and inoculant use and the cost-benefits of selling inoculants and P fertilizer.

III. Initial demonstration campaigns

Farmers in the Guinea savanna of Nigeria are generally not used to the culture of applying fertiliser to legumes. Additionally, no farmers currently use inoculants. Since the initial phase of the demonstrations is to prove the concept and expose farming communities to inoculant x P fertilizer effects on legume productivity, inputs will be subsidized to reduce risk for the participating farmer families. Each participating farmer will be given a one–off package consisting of 1 kg of P fertiliser, 1 kg of improved seeds and inoculant packet. In return, the farmer is expected to give back 2 kg of seeds after harvest.

IV. Follow-up demonstration campaigns

During follow-up demonstration campaigns, new farmers may also be given one-off subsidised inputs but, as the number of households increases and the benefit of P x inoculation becomes obvious; farmers will be expected to purchase their inputs. The unit price of the inputs and the method of procurement would need to be developed depending on the capacity of the participating associations for collective purchasing and marketing of inputs and produce. Since purchasing inputs, even inoculant, is always going to require some capital, successful deployment of P fertilizer will only happen if those same associations are linked to profitable output markets that would generate the required cash. The existing fertiliser voucher subsidy scheme in Kano State and micro-credit schemes will be leveraged to help farmer access to inputs. Linkages between projects, supported by AGRA and other investors, aiming at facilitating smallholder farmers to access fertilizer will be explored and where feasible, overlapping target areas will be considered. One way of engaging with fertilizer importers to ensure timely delivery of inputs would be to use project funds as guarantee up-front with the companies so that they deliver to suppliers in areas we are working in advance of the season.

5.5 Ghana

The mandate area of the project in Ghana is northern Ghana, which is made up of 3 regions, namely Northern, Upper East and Upper West Regions. Cowpea, groundnut and soybean are the mandate crops in the mandate area. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

The existing P fertiliser recommendations in the mandate areas for cowpea, groundnut and soybean (as well as other crops) are blanket recommendations that have been in place since the early 1970s. Trials are currently underway by the Soil Research Institute (SRI), in collaboration with Crop Research Institute (CRI) and Savanna Agricultural Research Institute (SARI) to update current recommendations. All of these institutes are partners in the N2Africa project. There are, therefore, strong opportunities for the project to make significant inputs into and leverage from these efforts to update current P fertiliser recommendations. Evaluation of the agronomic results of the VAR-1 and INP-1 adaptive trails and specific observations taken from the various demonstration trials in the 3 regions will result in quantitative information on the response of the three crops to P application and how this is affected by location and within-farm soil fertility gradients. Both single superphosphate (SSP) and triple superphosphate are available in the market within the mandate areas. TSP will be used for the trials. The results obtained will be translated into site-specific recommendations for P use in the target areas. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs in the mandate areas. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with fertilizer companies to produce these.

II. Training of agro-dealers

There are inefficiencies and bottlenecks in fertiliser distribution within the mandate areas. These lead to limited access and relatively high costs of the product. Some of the major importers of fertiliser include YARA, Dizengoff, CHEMICO, WIENCO and Golden Stock. These companies have wholesale distribution outlets in the urban areas of the North, such as Tamale, Wa and Bolga. Agro-input dealers supply most of the farming communities that are far away from the major wholesale centres. Although the agro-input dealers in Ghana have an umbrella organisation by name Ghana Agricultural Input Dealers Association (GAIDA), most agro-dealers are not well trained, efficiently coordinated or financially resourced to acquire and cost effectively distribute fertilisers and other inputs at scale. Some agro-input dealers participated in the Ghana National Planning Meeting and made very useful suggestions and are willing to collaborate with N2Africa project to ensure farmers' access to good quality fertiliser. In the first instance, agro-dealers that cover a substantial area of the target zones will be engaged in specific training activities on legume production and inoculant use and the cost-benefits of selling inoculants and P fertilizer. The project will also link with IFDC's agro-dealer programme and AGRA's Soil Health Programme at SARI which are already organising trainings for agro-dealers and farmer groups. This partnership will ensure effective delivery of training and avoid duplications, and thus enable coverage of greater numbers of agro-input dealers and communities in the mandate areas.

III. Initial demonstration campaigns

Farmers in Northern Ghana are generally not used to the culture of applying fertiliser to legumes, with general fertiliser application in the region being less than 8 kg per ha. Additionally, inoculant use among farmers is non-existent. Since the initial phase of the demonstrations is to prove the concept of and expose farming communities to inoculant x P fertilizer effects on legume productivity, inputs will be subsidized to reduce risk for the participating farmer families. Each participating farmer will be given a one–off package consisting of 1 kg of P fertiliser, 1 kg of improved seeds and inoculant packet. In return, the farmer is expected to give back 2 kg of seeds after harvest. We will leverage the input supply component of AGRA's Soil Health Programme that is being implemented by SARI to cover some of the communities.

IV. Follow-up demonstration campaigns

During follow-up demonstration campaigns, new farmers may also be given one-off subsidised inputs but, as the number of households increases and the benefit of P x inoculation becomes obvious; farmers will be expected to purchase their inputs. The unit price of the inputs and the method of procurement would need to be developed depending on the capacity of the participating associations for collective purchasing and marketing of inputs and produce. Since purchasing inputs, even inoculant, is always going to require some capital, successful deployment of P fertilizer will only happen if those same associations are linked to profitable output markets that would generate the required cash. Linkages between projects, supported by AGRA and other investors, aiming at facilitating smallholder farmers to access fertilizer will be explored and where feasible, overlapping target areas will be considered. One way of engaging with fertilizer importers to ensure timely delivery of inputs would be to use project funds as guarantee up-front with the companies so that they deliver to suppliers in areas we are working in advance of the season.

5.6 Malawi

The target areas in Malawi are Salima, Ntcheu, Dowa, Mchinji, Lilongwe and Kasungu districts in the central region. Soybean, groundnut, and bean are the target crop but there will also be activities with cowpea in the Salima. The following activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

There is need for small amounts of P and in several locations Gypsum especially to increase yield of groundnut. However gypsum availability is erratic and the recommendation is bulky (3 t/ha) discouraging utilisation by smallholder farmers. SuperD (10 N: 24 P: 20 K: 6 S: 0.15 Bo) is widely used on legumes. This recommendation was done probably over 20 years ago and it is important for the project to update this recommendation in view of several observations in recent years claiming increase soil acidity and the value of residual fertilizer in maize-legume rotation.

II. Training of agro-dealers

A reasonably good network of agro-dealers exists in Malawi, though most deal with maize and tobacco and less on legumes. Some agro-dealers have participated in trainings by NASFAM, Farmer World, and a few other projects, but emphasis have been placed on maize and tobacco rather than legumes. Farmers are fairly aware of the use of inoculants but the supply side has been erratic. Main source has been the Chitedze research Station. Further discussions are warranted to explore the improvement of the quality of inoculants from this source, sale of inoculants, with appropriate storage and handling, through a wide range of agro-dealers.

III. Initial demonstration campaigns

Inputs for all demonstration campaigns can be purchased from the open market. We should strive for maximum purchase of inputs and minimum subsidy from the outset. Inputs purchased directly by the project will only be needed for larger plots (e.g. demo plots) managed through the project partners.

IV. Follow-up demonstration campaigns

As the project expands the number or areas where it is engaged and the number of participating households increases, attention needs to be given to ensuring the supply chain is operational to provide timely inputs. It is likely that this needs to be linked directly to marketing activities and further initiatives to ensure that sufficient capital is available for purchase of inputs. The use of farmer groups to ensure delivery of inputs on time should be explored.

5.7 Zimbabwe

The target areas in Zimbabwe are Wedza, Murehwa, Makoni, Buhera, Bindura and Chegutu. Emphasis will be placed on soybean and groundnut, but there will also be activities with cowpea and beans across the complete target area. The following activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

V. Appropriate input rates and requirements for legume production

The need for small amounts of P and Dolomitic lime for legume production are well established, though specific recommendations will be refined. Groundnut benefits from application of gypsum at podding to prevent 'pops' in the nutrient deficient sandy soils. Due to problems in accessing SSP and TSP, the cotton fertilizer blends Compound L is often used on legumes. Dorowa rock phosphate is the sole source available in the country, and this is mined and processed into P fertilizer by ZimPhos. It is an unreactive, igneous rock P deposit that is unsuitable for direct application. Dolomitic lime is mined in Zimbabwe by Early Worm Mine and is readily available. Draft recommendations for legume fertilizer rates will be drawn up in consultation with local experts and continuously updated following the generation of new information on the performance of these inputs. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with fertilizer companies to produce these.

VI. Training of agro-dealers

A reasonably dense network of agro-dealers exists in Zimbabwe, though few have the capital to invest in maintaining a good stock of inputs. Some agro-dealers have participated in the SOFECSA Learning Centres in Wedza and have therefore good knowledge of ISFM approaches. This does not hold for agro-dealers in the other areas where the project will be active and training workshops and exchange visits will be required. The use of legume inoculants is well-embedded in Zimbabwe, and inoculants are distributed through the local AGRITEX offices from the SPRL, Marondera where they are produced. Further discussions are warranted to explore the sale of inoculants, with appropriate storage and handling, through a wider range of agro-dealers.

VII. Initial demonstration campaigns

Inputs for all demonstration campaigns can be purchased from the open market. We should strive for maximum purchase of inputs and minimum subsidy from the outset. Inputs purchased directly by the project will only be needed for larger plots (e.g. at Learning Centres) managed through the project partners. Windmill Fertilizers have expressed an

interest in working together with N2Africa to improve the functioning of the supply chain. They are already working closely with SOFECSA.

VIII. Follow-up demonstration campaigns

As the project expands the number or areas where it is engaged and the number of participating households increases, attention needs to be given to ensuring the supply chain is operational to provide timely inputs. It is likely that this needs to be linked directly to marketing activities and further initiatives to ensure that sufficient capital is available for purchase of inputs. The dearth of cash in the economy at present is hampering economic activities at all levels. To ensure delivery of inputs on time it may be necessary to use project funds as up-front guarantees with companies so ensure that they deliver to suppliers in areas where N2Africa is working in advance of the season.

5.8 Mozambique

The target areas of the project in Mozambique are Zambesia, Manica, Tete, Nampula, and Niassa provinces. Soybean technologies will be promoted in all the provinces except Nampula; and groundnut activities will mainly focus on Nampula province. The following detailed activities are planned to facilitate profitable access to P fertilizer and other essential agro-minerals.

I. Appropriate input rates and requirements for legume production

Evaluation of the agronomic results of the VAR-1 and INP-1 adaptive trails and specific observations taken from the various demonstration trials will result in quantitative information on the response of soybean and beans to P application and how this is affected by location and within-farm soil fertility gradients. The results will be translated to site-specific recommendations for P use in the target Provinces. The draft recommendations will be continuously updated following the generation of new information on the performance of these inputs. The final outcome towards the end of the project should be the determination of legume-specific blends and engagement with fertilizer companies to produce these.

II. Training of agro-dealers

The main extension partners will be CLUSA and Technoserve who are both based in Nampula. Luis Pereira of Technoserve will lead the dissemination activities and has a business model that involves companies already engaged in contract farming for cotton and other crops. With this business model the main people being trained will be staff of the companies that are doing contract farming. However, we will stay in constant communication with the Foundation's Soybean Value Chain project and train agro dealers as needed. These trainings will focus on legume production and inoculant use (see Milestone 5.4.3.) and the cost-benefits of selling inoculants and P fertilizer.

III. Initial demonstration campaigns

Since the initial phase of the demonstrations is to prove the concept and expose farming communities to inoculant x P fertilizer effects on legume productivity, it is normal that inputs are subsidized to reduce risk for the participating farmer families.

IV. Follow-up demonstration campaigns

It is expected that the number of participating households will increase as more farmers become aware of the project; hence follow-up demonstration campaigns will be implemented. The farmers that are participating in the contract growing system will be provided with inputs through the system organised by the company they are associated with. However, only small quantities of the required fertilizers will be provide to farmers not participating in the contract growing system during their first year of the project. By then, all the farming families should have been exposed to the beneficial effects of inoculant x P fertilizer on legume productivity which may motivate them to purchase the inputs directly. The unit price of the inputs and the method of procurement would be developed. N2Africa will partner with the Soybean Value Chain project to ensure that most of the farmers have access to the required inputs and a market to sell their harvest.

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Appendices

Annex 1: Specific areas under the target legumes in the target countries

Acreage estimates

Nr Households

Region	Legume	Year 1	Year 2	Year 3	Year 4
West	Cowpea	2,000	4,667	10,333	25,000
	Groundnut	2,000	4,667	10,333	25,000
	Soybean	2,000	4,667	10,333	25,000
East/Central	Bush beans	1,500	3,500	7,750	18,750
	Climbing beans	1,500	3,500	7,750	18,750
	Soybean	3,000	7,000	15,500	37,500
Southern	Groundnut	2,000	4,667	10,333	25,000
	Bush beans	2,000	4,667	10,333	25,000
	Soybean	2,000	4,667	10,333	25,000
		18,000	**42,000**	**93,000**	**225,000**

Ha under a specific legume

Region	Legume	Year 1	Year 2	Year 3	Year 4
West	Cowpea	0.600	0.600	0.600	0.600
	Groundnut	0.100	0.103	0.107	0.110
	Soybean	0.150	0.165	0.180	0.195
East/Central	Bush beans	0.200	0.200	0.200	0.200
	Climbing beans	0.200	0.200	0.200	0.200
	Soybean	0.030	0.056	0.081	0.107
Southern	Groundnut	0.100	0.103	0.106	0.109
	Bush beans	0.050	0.058	0.067	0.075
	Soybean	0.033	0.068	0.104	0.140

Ha under improved legume practices

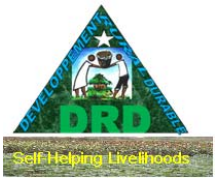
Region	Legume	Year 1	Year 2	Year 3	Year 4
West	Cowpea	1,200	2,800	6,200	15,000
	Groundnut	200	482	1,102	2,750
	Soybean	300	770	1,860	4,875
East/Central	Bush beans	300	700	1,550	3,750
	Climbing beans	300	700	1,550	3,750
	Soybean	90	389	1,259	4,007
Southern	Groundnut	200	481	1,096	2,727
	Bush beans	100	272	689	1,875
	Soybean	65	319	1,076	3,496
		2,756	**6,914**	**16,382**	**42,230**

List of project reports

1. N2Africa Steering Committee Terms of Reference
2. Policy on advanced training grants
3. Rhizobia Strain Isolation and Characterisation Protocol
4. Detailed country-by-country access plan for P and other agro-minerals

Partners involved in the N2Africa project

Diobass



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