National Fertilizer Policy for Ghana	(draft ï yet to be adopted)	The aim of the fertilizer policy is to develop and disseminate adequate quantity and quality of fertilizer products that are ñtimely, available and accessible to the farming population of Ghana, operating under a supportive public sector and safeguarding the environment. Overall, the goal is to promote a viable agro-industrial economy with this policy, recognizing that agriculture is one of the basis for structural transformation of the economy. The objectives include facilitating the mastering of scientific, technological and organizational capabilities for fertilizer production and its increased utilization in Ghana; and promote the culture of judicious use of fertilizer.

Source: MoFA, 2007; Government of Ghana, 2009; MoFA, 2011

The TAP component for the agriculture sector is set within the broad frameworks of these policy documents which in principle emphasise technology promotion, transfer and diffusion. Two of the prioritised technologies are selected for diffusion in the TAP namely:

i. Integrated Nutrient Management (INM)
ii. Community Based Extension Agents (CBEA).

Both technologies are currently being promoted in Ghana albeit on a limited scale. The Technology Action Plan of Ghana aims at boosting the promotion and adoption of these technologies in the country especially in the rural areas to enhance agricultural production.

There are general barriers to the diffusion to these technologies similar to those in the water sector. There are institutional barriers relating to inefficiencies in institutions set up for the purposes of diffusing these technologies. There are sometimes technical deficiencies on the part of the specialists in the agricultural institutions as well as attitudinal problems. Socio-cultural practices are major barriers in the agriculture sector. A typical example is the practice of bush-burning that deplete soil nutrients in many cases on the arable lands. The economic and financial barriers relate to market inefficiencies and market failures, which deny small-holder farmers sufficient incomes from their produce. The strategies of diffusion of the prioritized technologies will take these general barriers into account.

2.2 Action Plan for Integrated Nutrient Management (INM)

2.2.1 Description of Technology

The Integrated Nutrient Management is also referred to as Integrated Soil Fertility Management (ISFM). The technology aims at making efficient use of both synthetic and natural plant nutrient

(organic) sources to enhance soil fertility towards improving and preserving soil productivity. The success of INM relies on the appropriate application and conservation of nutrients and transfer of knowledge to farmers. The technology enables the adaptation of plant nutrient and soil fertility management within a farming system to site specific characteristics; an important ingredient for climate change adaptation.

Integrated soil fertility management in Ghana, has been widely promoted. There is availability of capacity for effective transfer of the technology to farmers. However the use of the technology is low compared to use of single nutrient sources.

2.2.2 Target for Transfer and Diffusion

This technology targets farmers in all the agro-ecological zones given that soil fertility management is a fundamental challenge for all farmers. The action plan targets about 100,000 farmers nationwide given that the successful adoption of the technology by the beneficiary farmers will have a demonstrable impact on the others. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2013 to 2017.

2.2.3 Barriers against the diffusion of Integrated Nutrient Management

The fundamental problem the INM technology addresses is the inadequate nutrient for crop growth resulting in low productivity and production, low household food security, low income and persistent poverty. As expected, economic or financial barriers as well as non-financial barriers constrain the transfer and diffusion process.

The financial barriers to the promotion and diffusion of this technology are directly linked to the cost of chemical fertilizers, which is a direct result of pricing mechanism of the product. The pricing mechanism is due to government policy of privatization and high cost of credit. Currently, interest rates of most commercial banks in Ghana range from between 25 and 30 per cent despite the fact that the country has been running single digit inflation rates for more than 24 months. Others include low incomes of farmers which is the result of low prices for agricultural produce because of the absence of a sustainable pricing mechanism. The general

free-market economic philosophy of the country appears to impact negatively on the prices of various agricultural commodities.

The institutional barriers were mainly linked to inadequate availability of technical information and low access to extension service to end users of the technology. Closely linked to these are the current structure for extension service provision and the low ratio of extension staff to farmers. These are also as a result of government policy related to employment in the public sector.

Inadequate knowledge of farmers with regards to appropriate use of various sources of plant nutrients was identified as a major barrier. Currently, fertilizer consumption is one of the lowest in the developing world at 11.88 kg per hectare in 2009. This is a result of limited information from the extension service that also is limited in terms of technical capacities brought about by inadequate support from research because of the weak research extension linkages.

Socioï culturally, the main barrier is the misconception about the technology due to low awareness about its potential. Additionally, there is also the non-availability of diversified nutrient sources. The organic and in-organic nutrients need to be sourced appropriately for the different traditional farming systems.

2.2.4 Measures to Address Barriers

The review of government policy on pricing of commodities (both local and imported) is a basic necessity for reducing the cost of chemical fertilizers and improving incomes from agriculture produce. However, even as this is addressed in a specific policy initiative, there is the need for a national programme on the transfer and diffusion of INM technology. The other barriers can also be addressed within the programme framework.

Awareness creation and training of farmers using multiple communication tools and approaches are also leading measures under the non-financial measures. It goes to emphasize the point that knowledge and information flow to farmers are the critical measures for improving on their farming activities.

Review of the national policies with regards to extension service structure and staffing was also identified as necessary to enhancing service delivery to rural communities and farmers. The existing policy on the extension service limits the reach of the service to farmers in the remote areas. It is therefore important to review the policies to ensure that there is an increase in staffing levels at the districts such that farmers in the villages would benefit from extension services effectively.

Improvement in research and extension linkages to enable flow of relevant technical information from research to extension was also identified as an important measure. Currently there is some linkages between the agricultural research organizations and the extension system in Ghana particularly the Ministry of Food and Agriculture (MoFA). For example the CSIR-Crops Research Institute has a fairly strong link with MoFA through which it is able to extend its newly improved crop varieties to farmers. However, the linkages with the research organisations in Ghana will have to be strengthened to enhance the adoption of agricultural technologies in general by farmers. In the envisaged action plan for the diffusion of the INM technology, the research stakeholders will work in collaboration with the relevant organisations particularly the ministry and the district assemblies. The summary of the action plan is in Table 2.2.

Table 2.2 Summary of Action Plan for Integrated Nutrient Management (INM) Technology

Action/ Measure	*Why Action*	*Responsible Agents/ Responsibilities*	*Period*	*Cost*	*Source*	*Indicator of Success*	*Challenges*
Strengthening the extension service delivery on Integrated Nutrient Management for 100,000 farmers ï recruitment of staff, budgetary support to participating institutions, logistics (e.g. vehicles, motorbikes and bicycles)	The existing institutional framework is weak especially in relation to INM; soil fertility management has become a major constraint for farmers resulting in decreasing farm productivity	MMDAs in collaboration with MOFA: *MOFA – coordination, oversight of implementation* *MMDAs – implementing project in communities in the districts*	2013 ï 2017	$5,000,000	Government of Ghana, development partners (multi & bilateral agencies),private sector and NGOs	Extension services delivered to at least 50,000 farmers nationwide	Farmersô apathy to technologies; commitment of MOFA and MMDA collaborators; availability of the needed funding.
INM technology adaption for the respective ecosystems and dissemination	Research support is critical for effective INM dissemination	CSIR and universities in collaboration with MOFA directorates and MMDAS: *CSIR & universities – selection & adaption of INM technologies* *MOFA & MMDAs-*	2013 ï 2017	$2,000,000	Government of Ghana, development partners (multi & bilateral agencies), private sector and NGOs	50% of technologies extended to farmers sourced from the national research system.	Weak linkages between the national research system and farmers.

Action/ Measure	*Why Action*	*Responsible Agents/ Responsibilities*	*Period*	*Cost*	*Source*	*Indicator of Success*	*Challenges*
		dissemination					
Capacity building for extension officers and other staff	For effective extension of the technology, the extension staff need capacity building	MOFA technical directorate in collaboration with CSIR and universities and CSOs: *All agents work on capacity building*	2013 ï 2017	$500,000	Government of Ghana, development partners (multi & bilateral agencies), private sector	At least 50% of the extension services personnel trained	The commitment of the agric extension officers.
Training of farmers	Farmersô adoption of depends on the extent to which they are trained in the use of the technology.	MMDAs (extension service) in collaboration with the MOFA directorates, CSOs *All agents work on capacity building*	2013 ï 2017	$800,000	Government of Ghana, development partners (multi & bilateral agencies), private sector	80% of total farmer population reached using improved INM technologies.	Farmers having adequate time to learn the technology and be committed.
Research and Development for new INM innovations	Researchers in the local R&D institutions should support the transfer and diffusion process with continuous research	Research institutions/ universities in collaboration with MOFA Directorates: *Researchers conduct R&D to produce new INM innovations*	2013 ï 2017	$1,000,000	Government of Ghana, development partners (multi & bilateral agencies), private sector	At least 10 new INM technologies generated	Availability of resources for R&D.

Action/ Measure	*Why Action*	*Responsible Agents/ Responsibilities*	*Period*	*Cost*	*Source*	*Indicator of Success*	*Challenges*
Total				$9,300,000			