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Operational Details of the 2008 Fertilizer Subsidy in Ghana—Preliminary Report

Afua Branoah Banful

Ghana Strategy Support Program (GSSP)

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Ghana Strategy Support Program
Postal Address:
c/o International Water Management Institute (IWMI)
PMB CT 112, Cantonments, Accra, Ghana
Local Address:
CSIR Campus (Opposite Chinese Embassy)
Airport Residential Area
Tel: +233-(0)21-780716
Fax: +233-(0)21-784752
<http://www.ifpri.org/themes/gssp/gssp.htm>

For further information:

Shashi Kolavalli, Senior Research Fellow and Program
Leader
s.kolavalli@cqi.org

IFPRI HEADQUARTERS

Postal Address:
2033 K Street NW
Washington, DC 20006-1002 USA

Tel: +1-202-862-5600
Fax: +1-202-467-4439

www.ifpri.org

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Operational Details of the 2008 Fertilizer Subsidy in Ghana—Preliminary Report

By Afua Branoah Banful
Development Strategy and Governance Division, IFPRI, USA

Acronyms

AEA	Agricultural Extension Agents
FAO	Food and Agriculture Organization of the United Nations
GH	Ghana cedis
ha	hectare
kg	kilogram
MoFA	Ministry of Food and Agriculture
NPK	nitrogen-phosphorous-potassium

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Summary

In July 2008, the government of Ghana instituted a country-wide subsidy on 50Kg bags of four types of fertilizer in an effort to mitigate the effect of rising energy and food prices. Farmers received the subsidy in the form of fertilizer- and region-specific vouchers distributed by agricultural extension agents. This descriptive report details the operational design of the subsidy program and offers preliminary observations of its implementation.

The fertilizer subsidy was a unique example of a public-private partnership in which the government consulted heavily with fertilizer importers in the design stage and relied exclusively on the existing private distribution system to deliver fertilizer to farmers. While this structure offers clear benefits, initial observations suggest scope for improvement in both the system design and implementation. Poor timing, shortage of fertilizer and a small network of fertilizer retailers participating in the program prevented fertilizer use from increasing as much as was possible within the program budget and may have disadvantaged smaller retailers. Amidst such constraints, less than 50 percent of the vouchers country-wide had been redeemed by the end of the planting seasons.

1. Introduction

On July 2, 2008, the government of Ghana announced details of a fertilizer subsidy to be instituted through the end of 2008 in response to dramatic increases in food and fertilizer prices. Between May 2007 and May 2008, the price of maize in Accra and Tamale rose by an average of 77 percent. In the same period in 2006 - 07 it fell 2.2 percent.¹ The prices of other staples such as rice and wheat also spiked as a result of shocks in the global food market and skyrocketing energy costs. The price of nitrogen-phosphorous-potassium (NPK) 15:15:15, the most widely used food crop fertilizer in Ghana increased from Ghana cedis (GH) ¢26 to GH¢35 per 50 kilogram (kg) bag between June 2007 and March 2008 (Ministry of Food and Agriculture, 2008).²

The presumed goal of the subsidy program was to encourage fertilizer use so that food crop output in 2008 would not be drastically reduced below 2007 levels due to the soaring cost of fertilizer. The program entailed a country-wide subsidy on four specific types of fertilizers: NPK 15:15:15, NPK 23:10:05, urea, and sulphate of ammonia.

Farmers were to receive the subsidy in the form of fertilizer-specific and region-specific vouchers distributed by agricultural extension agents and were free to purchase fertilizer from any retailer within their region who was willing to accept the vouchers. The subsidy level was chosen with two objectives: 1) to return the price farmers paid for fertilizer to the levels prevailing in July 2007, and 2) to create pan-territorial pricing for fertilizer.

Ghana's fertilizer sector is liberalized, and ordinarily fertilizer prices are set by fertilizer retailers. However, for the subsidy program, the government and the private fertilizer importers negotiated the price per 50kg bag in each regional capital. The vouchers had face values of approximately 50 percent of these negotiated prices.

The planned total number of vouchers for the duration of the program was 600,000 covering 30,000 metric tons of fertilizer, with the total value of subsidy offered amounting to about US\$15 million. However, the total number of vouchers printed was actually 1,140,850. By the end of the planting seasons, less than 50 percent of the vouchers had been redeemed. There was significant regional variation in the voucher redemption rates with regions in northern Ghana achieving higher rates.

This descriptive report details the operational design of the subsidy program and offers preliminary observations of its implementation. Among other recent fertilizer interventions in Africa, Ghana's fertilizer subsidy program was unique in the extent to which the government engaged and utilized the private sector. The government consulted heavily with fertilizer

¹ Calculated as an average of consumer price index (CPI)-deflated prices in Accra and Tamale markets as reported by "Ghana food price tracking database".

² GH¢1 was approximately equal to US\$1 at that time.

importers in the design of the program and relied exclusively on the existing private sector fertilizer stock and distribution system to deliver fertilizer to farmers.

1.1 Methodology

A combination of quantitative and qualitative data collection methods was used to provide data for this report. The author undertook a three-week field trip to Ghana while the subsidy program was still in effect. From mid October through early November 2008, interviews were conducted with stakeholders in the voucher program at the national level. In addition, the author took field visits to seven districts in the country. Additional data was collected up to November 17, 2008.

The author interviewed commercial directors of the fertilizer importing companies, Yara Ghana Ltd, Weinco Ghana Ltd, Dizengoff Ghana Ltd, Golden Stork, and Chemico, Ltd. The author also interviewed the accountant in charge of managing the voucher program and the stock keeper in charge of receiving and disbursing vouchers at the Ministry of Food and Agriculture. The choice of districts visited was based on an opportunistic selection of districts that could be accessed from the main trunk road traversing the country. The particular districts visited were however made with consideration for variation in geography, ecological zone, and level of urbanization in the sample.

Figure 1: District capitals visited



The capitals of the districts visited are labeled in Figure 1. The towns visited were; Suhum, the capital of Suhum Kraboa Coal Tar District in Eastern Region; Koforidua, the capital of New Juaben District in Eastern Region; Konongo, the capital of Asante Akim North District in Ashanti Region; Kumasi, the capital of Kumasi District in the Ashanti Region; Sunyani, the capital of Sunyani District in Brong Ahafo Region; Tamale, the capital of Tamale District in the Northern

Region; and Tolon, the capital of Tolon Kumbugu District in the Northern Region.³ During the field visits, the author conducted interviews with seven district agricultural directors; two extension agents in each district; the regional agricultural director for Brong Ahafo region; four farmers and 14 fertilizer retailers.

1.2 Organization of Report

Section 2 provides a background to the fertilizer subsidy program. It contains a brief narrative of fertilizer use in Ghana and a description of the fertilizer sector. The timeline of implementation of the subsidy program is also provided to show how timing of the price intervention fit with farmers requirements for fertilizer. Section 3 presents the operational design of the subsidy program. This section aids in setting expectations for the impact of the program by describing the details of the planned implementation process. Observations of the actual implementation of the subsidy program are also presented in this section. Regional-level data on the number of vouchers printed, issued, and redeemed is reported. Also shown is a description of the distribution of vouchers at the district- and extension agent-level in the districts visited. This section also provides what is likely a nationally representative narrative of experiences of the actors in the voucher program. In Section 4, the implications of the design and implementation of the subsidy program are discussed. Section 5 concludes with a discussion of possible further evaluation studies.

³ The correct names for Kumasi District, Sunyani District and Tamale District are Kumasi Metropolitan Area, Sunyani Municipal Area, and Tamale Metropolitan Area respectively.

2. Background

2.1 Fertilizer in Ghana

Fertilizer use in Ghana is 8kg per hectare (ha), representing one of the lowest rates in Sub-Saharan Africa, which is already the lowest consumer of fertilizer in the world (MOFA, 2007). In Ghana, fertilizer is primarily used on cash crops like cotton, palm oil, and cocoa. Maize accounts for about 40 percent of non cash-crop fertilizer use (FAO, 2005). There is little data on past rates of fertilizer use in Ghana but it appears that the level has always been low. During the 1970s and early 1980s, fertilizer consumption in Ghana rose rapidly with various agricultural support programs including fertilizer subsidies (FAO, 2005). However, between the late 1980s and the 1990s, there was a substantial decrease in fertilizer consumption, likely due to the withdrawal of subsidies beginning in 1987, economic hardship, and the depreciation of the cedi. Fertilizer consumption began to increase again in the late 1990s as the national economic situation improved but fell again due to depreciation of the cedi. It began to recover once more with improvement in the national economy and by 2002 fertilizer consumption was again at 1980 levels. Nonetheless, present per hectare application rates are at half the level of Sub-Saharan Africa and at a quarter of the level of Africa as a whole (FAO, 2005).

Ghana is divided into 12 ecological zones which can be re-categorized into the broader groups of Savannah, Transitional, and Forest zones.⁴ In the southern areas of the country, there are two rainy seasons; the major season from March to July and a minor season from August to November. In the Northern Savannah, there is one rainy season from May to September. Agriculture is almost entirely rain-fed and so planting of virtually all types of annual crops occurs a few weeks after the beginning of the rainy season. The recommended times for fertilizer application across the country is a “basal dressing” at planting and a second “top dressing” application four to six weeks after planting (Kombiok 2008). This puts the periods of highest fertilizer use each year approximately at April, June, September, and October in the southern areas of the country, and, May and August in the northern areas.

All inorganic fertilizer in the country is imported ready-for-use by private importers. Four private companies import essentially 100 percent of the fertilizers on the market. These importers in order of market size are Yara Ghana Ltd (subsidiary of Yara International ASA) and its partner cocoa fertilizer company Wienco Ghana Ltd; Golden Stork (subsidiary of SCPA Sivex International); Dizengoff Ghana Ltd (subsidiary of Balton CP Ltd); and Chemico Ltd. Chemico Ltd is the only large importer which does not have an international parent company.

Almost all fertilizer imports arrive at the Tema port about 16 miles west of the capital, Accra. Some amount also arrives at the Takoradi port about 150 miles west of Accra. The loose fertilizer is bagged into 50kg bags and transported by road to distribution depots around the country. Figure 2 depicts the distribution chain for fertilizer. The importers frequently also

⁴ The twelve zones are Akwapim Togo Mountains, Closed Guinea Savannah, Coastal Savannah, Closed Sudan Savannah, Central Transitional, Deciduous Forest, Eastern Sudan Savannah, Eastern Traditional, Main Transitional, Open Guinea Savannah, Rain Forest and Western Sudan Savannah.

distribute, wholesale, and retail fertilizer as well; they also sell bulk fertilizer to other private retailers who in turn sell to smaller retailers or directly to farmers. The importers operate distribution depots in Tema, Takoradi, Kumasi, and Tamale.

There were four types of fertilizer retailers identified:

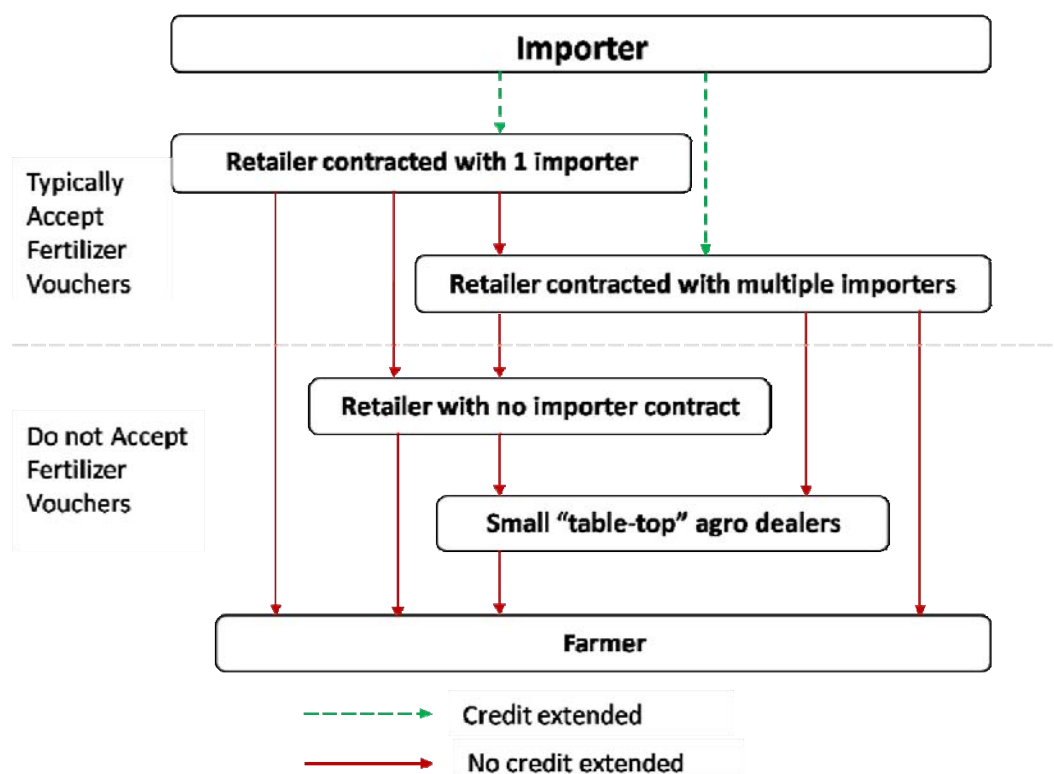
- Type 1. Those that have contracts to sell products from one importer.
- Type 2. Those that have contracts with multiple importers.
- Type 3 Those that have no contracts with any importer.
- Type 4. Small “table-top” retailers who repackage and sell fertilizer sourced from larger retailers.

Type 1 and Type 2 retailers get their supply of fertilizer directly from the importers and are typically sold fertilizer on credit from between 7 and 30 days. They may also receive concessions such as bulk pricing and free transportation. They sell fertilizer in the original 50kg packaging at prices contracted with the importer. Such retailers are typically located in urban centers.

Type 3 and Type 4 retailers get their supply of fertilizer from Type 1 or Type 2 retailers. These types of retailers are typically not extended credit and do not receive any pricing or transportation cost concessions. They are generally located in more rural areas. Type 3 retailers may own store spaces and may sell 50kg bags in addition to repackaging into smaller sale quantities. The Type 4 or “table-top” agrodealers set up semi-permanent retail locations typically consisting of a table on which one or two 50kg bags of fertilizer repackaged into smaller quantities are displayed. They are located in the most rural areas. Type 4 dealers sell exclusively in less than 50kg amounts and serve a rural clientele which generally does not want or cannot afford 50kg bags.

There are about 700 registered agro-inputs dealers in Ghana (FAO, 2005). This estimate likely excludes all Type 4 and some Type 3 fertilizer retailers. Apparently a significant proportion of the agro-inputs dealers do not carry fertilizer because it is too expensive for them to do so.

Figure 2: Fertilizer Distribution chain in Ghana



2.2 Timeline of Events in Subsidy Implementation

Yara Ghana Ltd (Yara) -- the largest fertilizer importer -- proposed a subsidy scheme to the government of Ghana as far back as September 2007. The company anticipated the need for an intervention to curb the decreased use of fertilizer due to rising prices. It was however not until March 2008, when food and fertilizer prices continued their rapid rise, that the government and the heads of Yara, Dizengoff Ghana Ltd (Dizengoff), Golden Stork and Chemico Ltd (Chemico) started a series of meetings to discuss the design of a possible fertilizer subsidy.

On May 22, 2008, in a nationally televised address, the president of Ghana announced the government's intension to subsidize fertilizer costs as a part of its efforts to mitigate the hardship of the population due to high food and fuel costs. During this hour-long address, President John Kuffour stated that, "Government will subsidize the cost of fertilizer and ensure effective distribution to farmers to assure a good harvest." There were no further details on what would be subsidized, when the subsidy would take effect or the design of the program. However, many farmers in the country heard this statement and anticipated that the price of fertilizer would be reduced in the near future.

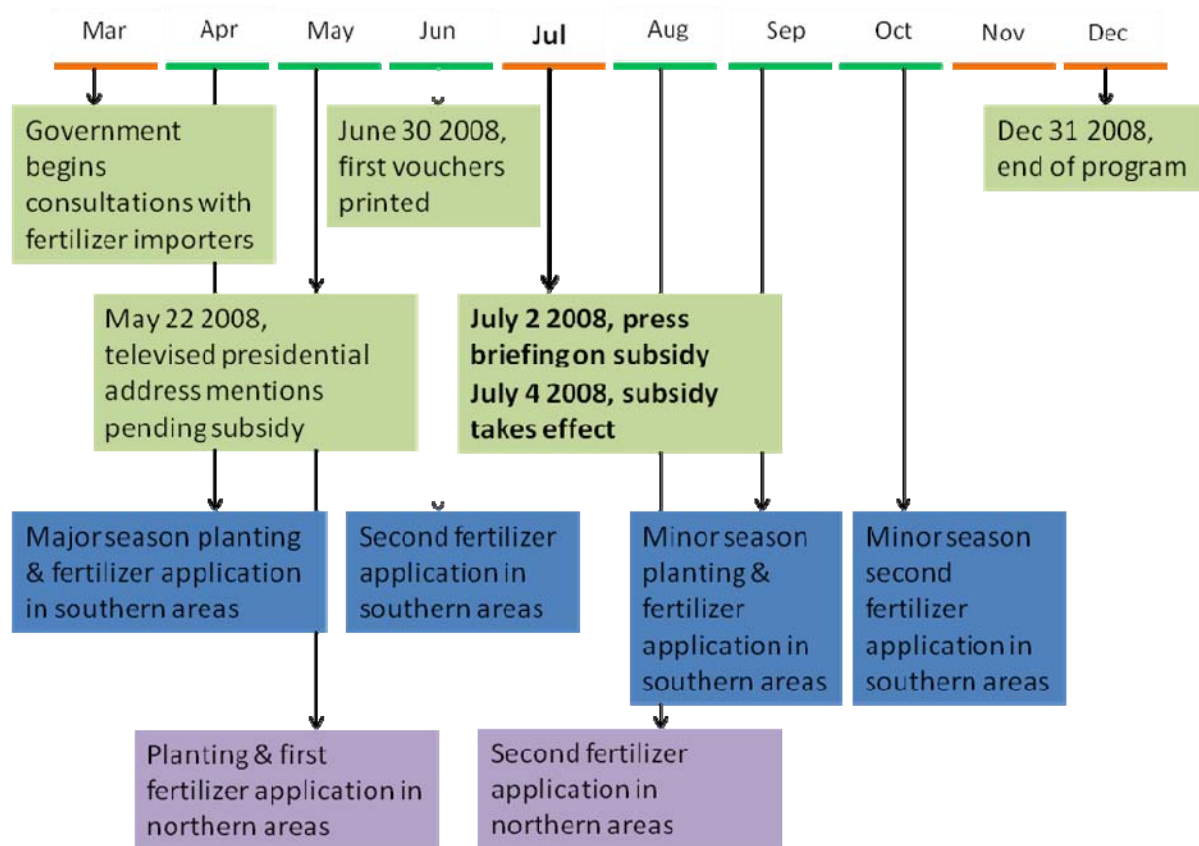
On July 2, 2008, the Minister for Food and Agriculture, Mr Ernest Debrah, held a press briefing at which he announced that there would be a subsidy on NPK 15:15:15, NPK 23:10:05,

sulphate of ammonia, and urea, which would last from July 4 to December 31, 2008. He stated that the subsidy would take the form of region-specific and product-specific vouchers. Subsidized fertilizer could be purchased upon presentation of a voucher and a matching cash amount. The vouchers would be distributed by agricultural extension agents (AEAs) to farmers within their operational areas. There was an emphasis at the press briefing on the fact that the farmer's cost of fertilizer would be equal in all district capitals in the country.

On June 30, 2008, the first batch of vouchers was delivered to the headquarters of the Ministry of Food and Agriculture in Accra. It appears that the regional agricultural directors convened meetings with their district agricultural directors to inform them about the details of the subsidy program at about the same time that Minister Debrah held the public press briefing. The district agricultural directors in turn convened meetings with the AEAs either just before or on July 4, 2008, to inform them about their roles in the subsidy scheme. After July 2, the supplemental cash amount to be used with vouchers, that is, the price to farmers, was announced widely on radio, and television. By this process, most farmers learnt when the subsidy program began. Figure 3 shows the timeline of some major events in the fertilizer subsidy program.

During the peak fertilizer application periods of April, May and July, the subsidized fertilizer was not available. Nevertheless, the hint of an impending subsidy program during the planting season provided farmers with incentives to hold off their purchases of fertilizer. There is anecdotal evidence that some farmers delayed applying fertilizer so much so that its effectiveness was reduced. It also seems that promise of cheaper fertilizer displaced the use of full-priced fertilizer even though subsidized fertilizer was not available.

Figure 3: Timeline of some major events in the Ghana fertilizer subsidy program of 2008



3. Operation of the Subsidy Program

3.1 Operational Design

The fertilizers subsidized were 50kg bag of NPK 15:15:15, NPK 23:10:05, urea, and sulphate of ammonia. The subsidy was implemented through fertilizer-specific and region-specific vouchers with face values that represented the subsidy amount. The vouchers provided a subsidy of approximately 50 percent of the price that had been negotiated with fertilizer importers. The subsidy absorbed all price increases at Tema port since July 2007 and made fertilizer available at uniform prices at all district capitals in the country. A voucher could be used towards the purchase of the relevant fertilizer from any retailer in the region of issue that was willing to accept it. The retailer then passed on the redeemed vouchers to an importer (in practice, one with whom they were contracted). The importer in turn was to transmit an invoice for the value of vouchers to the Ministry of Food and Agriculture (MoFA) and receive payment within a week.

Agricultural extension agents were given the mandate to distribute vouchers to the farmers in their operational areas. The cash cost to farmers for each type of fertilizer was equal in all district capitals but could be higher at retailers outside of district capitals. The subsidized price to farmers in district capitals was GH¢26, GH¢26, GH¢24, and GH¢18 for urea, NPK 15:15:15, NPK 23:10:05, and sulphate of ammonia respectively.

The subsidy program did not call for targeting of the voucher to farmers based on their income or the crop they cultivated. However, the types of fertilizers subsidized were generally not applied on cocoa, the major cash crop, as there were widely known special cocoa formulations that cocoa farmers utilize. NPK 15:15:15 was already widely used in the country as a basal dressing fertilizer while urea and sulphate of ammonia were the typical top dressing fertilizers. On the other hand, NPK 23:10:05, a product of Yara, was largely unknown to farmers before the subsidy program. With the exception of urea, which was used at the rate of 50kg per acre, all the other types of subsidized fertilizer were used at the rate of 100kg per acre.

The fertilizer was to be distributed solely through the existing network of privately owned fertilizer retailers. Due to the fact that vouchers could only be redeemed by importers, retailers who did not have direct relationships with importers by default did not accept vouchers. Yara, Dizengoff, and Golden Stork affiliated retailers were part of the fertilizer distribution system. The only importer that opted out of the network was Chemico. The commercial director of Chemico explained that this decision was driven by the fact that they did not have any stock of fertilizer at the time of the subsidy program.

The vouchers were in the form of checkbook-sized leaflets contained in booklets of 50 vouchers. Each voucher had two duplicates. Printed on each voucher was: the type of fertilizer which it could be used to purchase; the face value; the region of issue; a serial number; water marks and other security features. The upfront cost of printing the vouchers was GH50¢ per leaf and was paid by MoFA. When the importers redeemed the value of vouchers from MoFA, the printing cost of each voucher was deducted from the payment they received. Apart from the printed material on the voucher, the following information was needed for it to be deemed valid

at MoFA: the district agricultural director's signature, the district MoFA stamp, the name of the issuing agricultural extension agent, the recipient's name and a retailer's stamp.

The subsidy or the face-values of the vouchers differed across regions:

- Urea vouchers ranged from GH¢24.40 to GH¢27.70.
- NPK 15:15:15 vouchers ranged from GH¢24.45 to GH¢26.70.
- NPK 23:10:5 vouchers ranged from GH¢22.80 to GH¢25.70.
- Sulphate of ammonia vouchers ranged from GH¢14.50 to GH¢17.70.

The face values of vouchers within each region are plotted in the graph in Figure 4 (numerical values are shown in Appendix A). For each type of fertilizer, the face value of the voucher generally increased with the distance from the Tema port. The program prices of the fertilizer were the result of negotiations between the fertilizer importers participating in program and the Ministry of Food and Agriculture. Table 1 shows how the negotiated prices of three of the four subsidized fertilizers compared with the market prices just before the subsidy was instituted. In all but a few cases, the negotiated price that took effect in July was higher than the market price prevailing in June and sometimes significantly so.

Figure 4: Average face value of vouchers for subsidized fertilizer by region

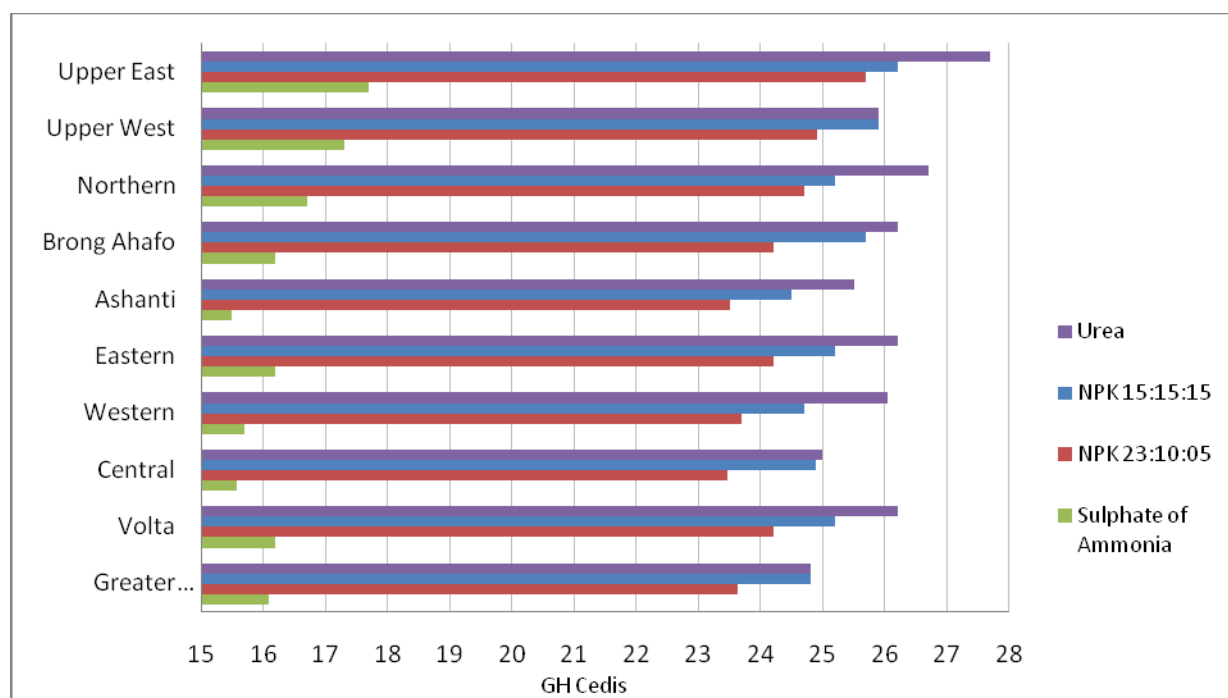


Table 1: Comparison of prices in GH¢ for 50 Kg bag of fertilizer before and during subsidy program

Region	NPK 15:15:15		Sulphate of Ammonia		Urea	
	Market price in June 2008	Negotiated price July-Dec 2008	Market price in June 2008	Negotiated price July-Dec 2008	Market price in June 2008	Negotiated price July-Dec 2008
Ashanti	35.00	50.50	35.00	33.50	35.00	51.50
Brong Ahafo	37.65	51.70	29.57	34.20	34.86	52.20
Central	40.00	50.88		33.58		51.00
Eastern	38.00	51.20	28.00	34.20		52.20
Greater Accra	50.80	50.80	32.50	34.10	37.00	50.80
Northern	33.10	51.20	27.10	34.70	34.10	52.70
Upper East	43.50	52.20	32.00	35.70	38.50	53.70
Upper West	40.00	51.90	33.00	35.30		51.90
Volta	44.00	51.20	35.00	34.20	45.00	52.20
Western	25.00	50.70	21.00	33.70		52.05

Source: Ministry of Food and Agricultural Statistics Research and Information Directorate

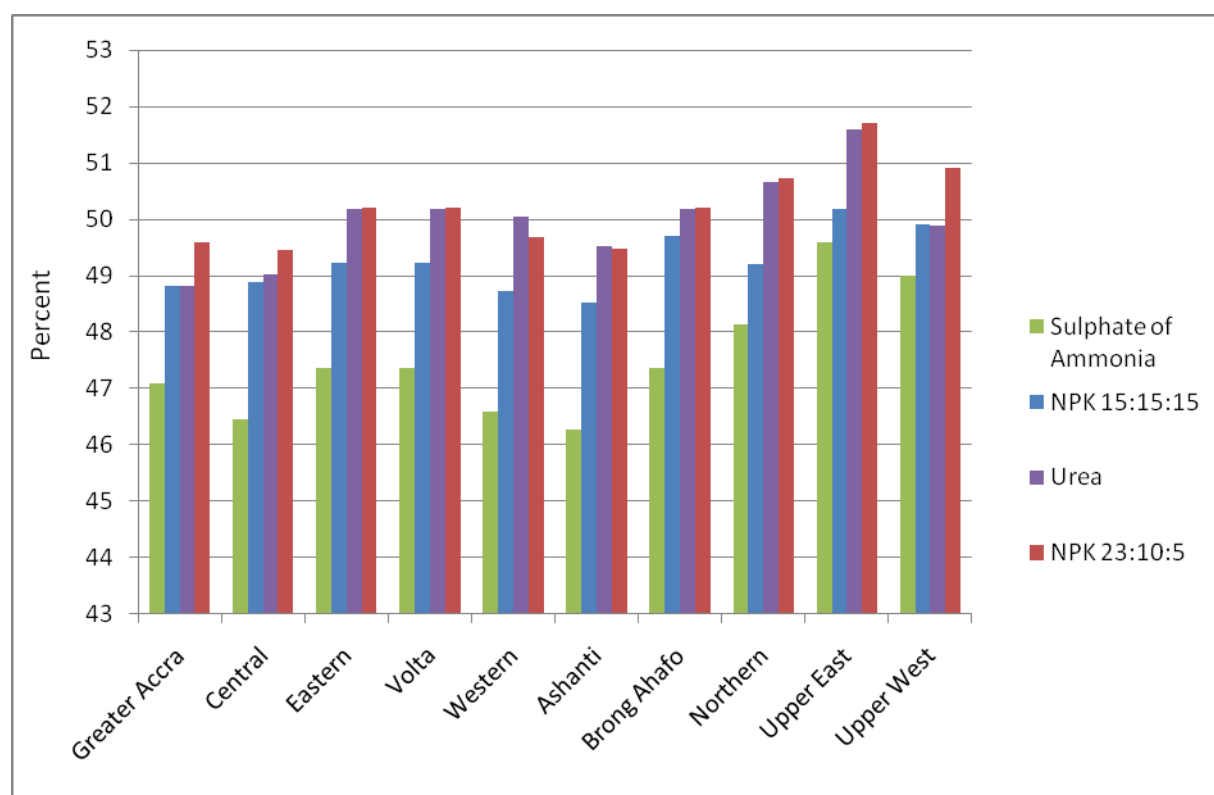
Notes: All prices shown are in GH¢. Prices shown are averages in the region. Negotiated price is subsidy plus farmer cash cost. Comparison for NPK 23:10:05 not shown because it was not widely available on market.

Due to the pan-territorial prices to farmers, the percentage of the full cost of fertilizer subsidized was different among the regions as shown in Figure 5. The subsidized percentage of the price was highest in the Northern, Upper East, and Upper West regions. NPK 23:10:5 and urea were the most subsidized fertilizers while sulphate of ammonia was the least subsidized fertilizer.

The number of vouchers printed and issued was larger than planned. The total number of bags of fertilizer to be subsidized was set at 600,000 (30,000 metric tons) with the following breakdown: 58, 247 bags of urea, 116,509 bags of sulphate of ammonia, 337,867 bags of NPK 15:15:15, and 87,377 bags of NPK 23:10:05. The total number of vouchers printed was actually 1,140,850, and over 57,000 metric tons of fertilizer would have been required to settle the vouchers.

The planned total quantity of fertilizer to be subsidized was based on importer-provided estimates of country wide fertilizer use from July to December. Table 2 shows information from a memo sent by MoFA to regional agricultural directors. It shows the regional distribution of fertilizer sales based on importer reports and the planned MoFA allocation of vouchers. It is not clear if the sales statistics reported by importers were based on the combined sales of all the types of fertilizer subsidized and if the sales trends are specific to a particular year. The basis of the MoFA allocation of vouchers to the different regions was not clear.

Figure 5: Percentage subsidy by region



The regional allocation was to be distributed amongst the district agricultural directors who in turn were to distribute them to agricultural extension agents within their jurisdiction. Each agricultural extension agent typically provides extension services for two or three operational areas.⁵ The extension agent was to distribute the vouchers to farmers within their operational area during their extension trips. With the possible exception of regional agricultural directors who received a memo detailing how the planned 600,000 bags of fertilizer would be split amongst the regions, none of the players in the distribution of vouchers knew the number and kind of vouchers they would receive. This means that there was no way for the various agents to budget how they would distribute vouchers to people below them in the eventual flow of vouchers to farmers.

⁵ The MoFA guidelines state that a district should be divided into 32 operational areas each served by 1 agricultural extension agent (AEA). However, most districts do not have enough agents on staff to allow this many operational areas.

Table 2: Proposed pattern of distribution of fertilizer vouchers

Region	Sales of fertilizer (%)	MoFA Proposed allocation of vouchers (%)
Northern	9	15
Upper East	6	9
Upper West	6	9
Central	9	9
Eastern	9	9
Brong Ahafo	10	15
Western	9	6
Greater Accra	8	6
Volta	9	9
Ashanti	25	13

Source: Memo to Regional Agricultural directors from Ministry of Food and Agriculture June,2008

3.2 Number of Vouchers Printed and Issued

The government distributed more vouchers than it had initially planned. Table 3 shows the total numbers of vouchers of each fertilizer type that were planned and the numbers that were printed.

Table 3: Vouchers printed by fertilizer type

Fertilizer	Planned vouchers	Actual vouchers
Urea	58,247	146,350
Sulphate of Ammonia	116,509	339,950
NPK 15:15:15	337,867	470,650
NPK 23:10:05	87,377	183,900
Total	600,000	1,140,850

The first batch of vouchers was delivered to MoFA on June 30, 2008, and contained a total of 297,800 vouchers made up of just under half of each kind of fertilizer allocated to each region. A second batch was delivered to MoFA on July 15, 2008, and contained 303,600 vouchers. The fertilizer type and regional distribution in this batch deviated slightly from the planned distribution pattern. By this point, a total of 601,400 vouchers had been printed. There was subsequent printing of vouchers for all regions except for Western, Central, and Greater Accra regions. These vouchers were delivered to MoFA in small batches on July 23, August 4, August 18, September 11, and a bulk of the additional vouchers on October 17. The composition of these extra vouchers by fertilizer type and region of redemption did not follow any clear pattern. For the planned vouchers (the first two printings), only a proportion of the available vouchers was

issued to the regions. However, the vouchers printed after mid July were immediately released in their entirety to the regions when they arrived at MoFA headquarters in Accra.

By the beginning of the program on July 4, 2008, each region had received some arbitrary proportion of the printed vouchers delivered to MoFA on June 30. By October 29 all printed vouchers had been transferred to the relevant MoFA regional offices. The data on dates of printing and issue to regional MoFA offices were collected on November 17. As of that date, the number of vouchers issued to the regions was 100 percent of vouchers printed with the exception of NPK 15:15:15 vouchers in Upper East (102 percent) and Western Regions (96 percent). These aberrations are likely to be data entry errors. It is not yet known the time lapse between vouchers reaching MoFA regional offices and their eventual release to extension agents then to farmers. In the visited districts, the transfers to extension agents happened within a day or two.

3.3 Data on Vouchers Redeemed

The highest number of bags of all types of fertilizer bought using vouchers was in the Northern region and the lowest number was in the Western region. The numbers of vouchers that were redeemed by farmers and submitted by importers to MoFA for payment as of October 17, 2008 are shown in Figure 6 (by region) and Figure 7 (by importer sales). The plots show the number of bags of fertilizer that were purchased and do not include vouchers which were transferred to farmers but were not redeemed.

Both retailers and importers have it in their best interest to forward redeemed vouchers to the entity from which they retrieve the cash value as quickly as possible. This incentive and the fact that the last issue of vouchers to all regions before October 17 was over a month earlier means that the plots are highly representative of fertilizer sales during the entire program. In addition, the fertilizer application season in Ghana is typically concluded by mid October. Only Ashanti, Brong Ahafo, Eastern, Volta, and Western regions received vouchers on or after October 17.

Yara accounted for more than half of all the sales in the program. Apart from Yara's wider distribution network, this result may be explained in part by the relatively large stocks of fertilizer Yara maintained. Without counting sales for NPK 23:10:5, for which Yara was the sole importer, Yara had average market share of 66 percent, Golden Stork had a share of 23 percent, and Dizengoff 11 percent. The commercial director of Dizengoff stated that prior to the subsidy program, his company had a market share of about 30 percent.

Figure 6: Number of vouchers redeemed at MoFA (October 17, 2008)

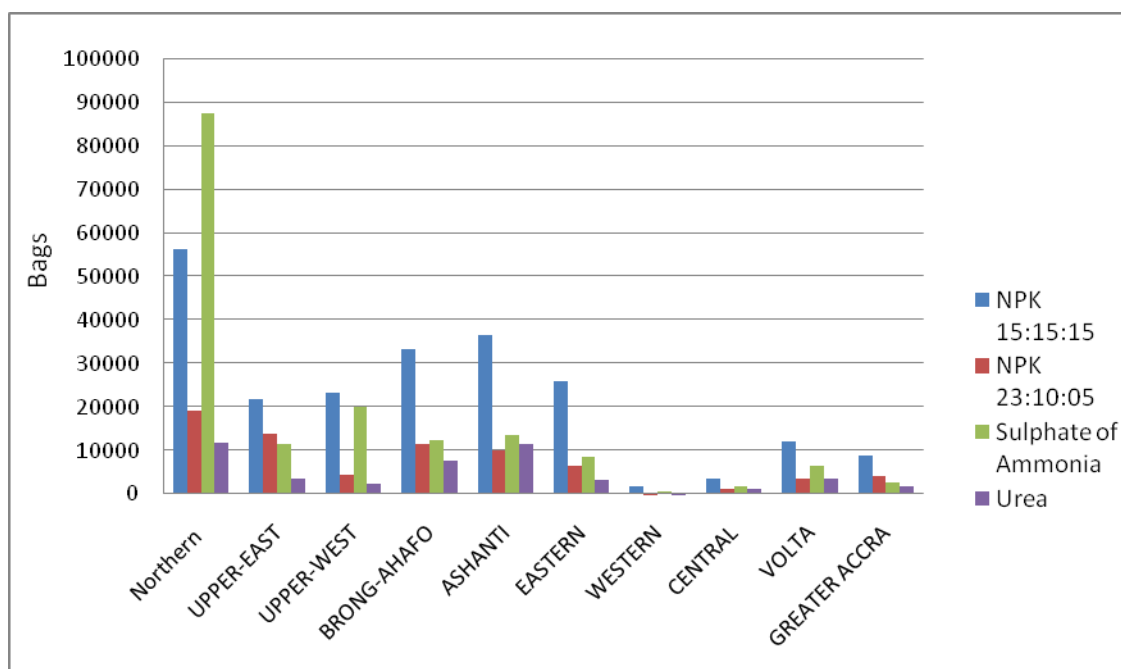
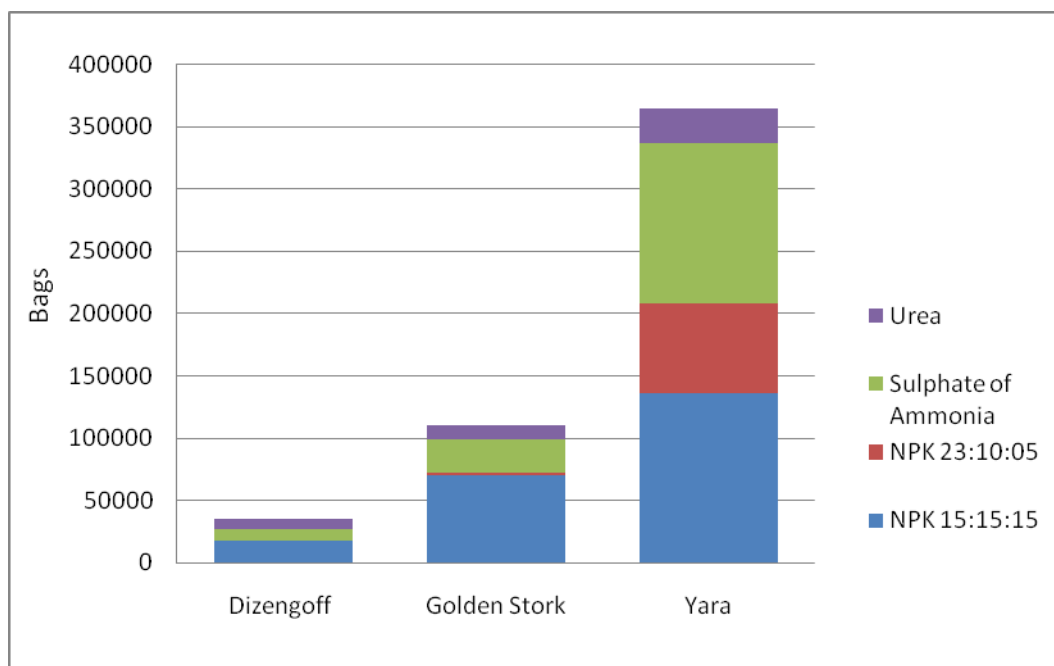


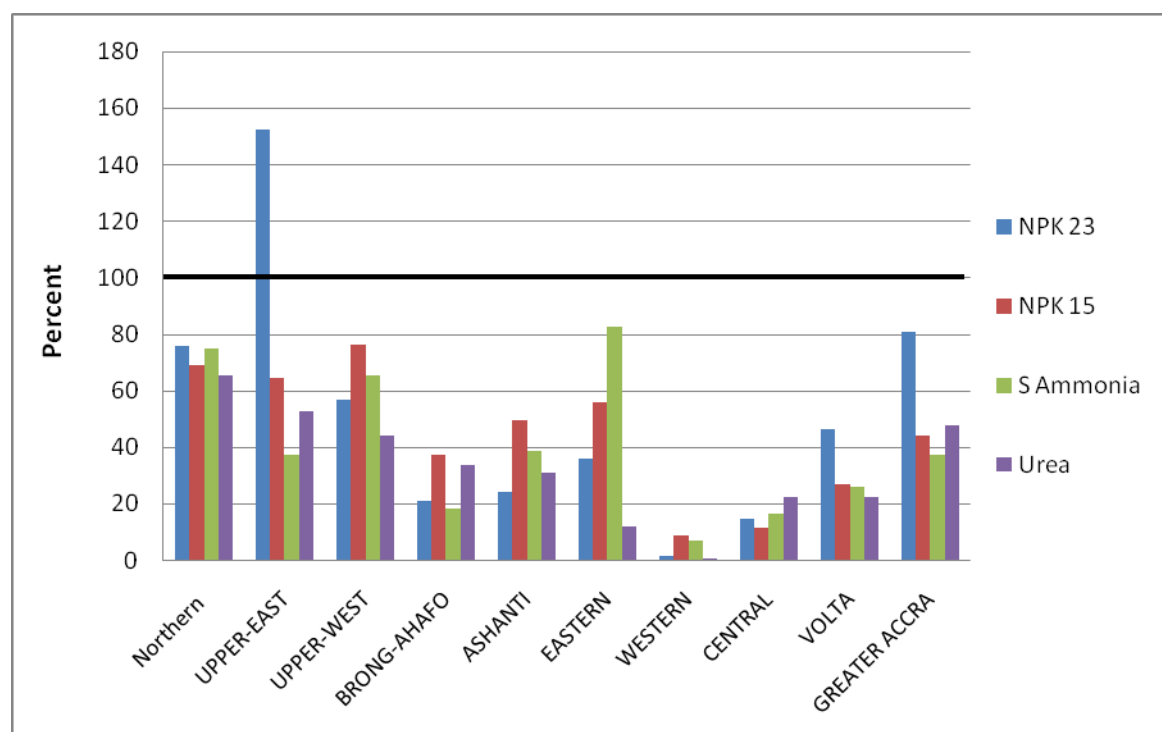
Figure 7: Number of bags of fertilizer redeemed by importer (October 17, 2008)



For reasons such as product shortages, absence of vouchers at the time of fertilizer application, and farmers hoarding vouchers for possible future use, the use of available vouchers of all types was less than 50 percent (plotted in Figure 8). Nationally, the redemption rate as of October 17, 2008 was 47 percent, 41 percent, 48 percent, 32 percent for NPK 15:15:15, NPK 23:10:05, sulphate of ammonia, and urea respectively. The national redemption ratio for NPK 23:10:5 was pushed up by a curiously high take-up ratio of 155 percent in the Upper East region. It is not

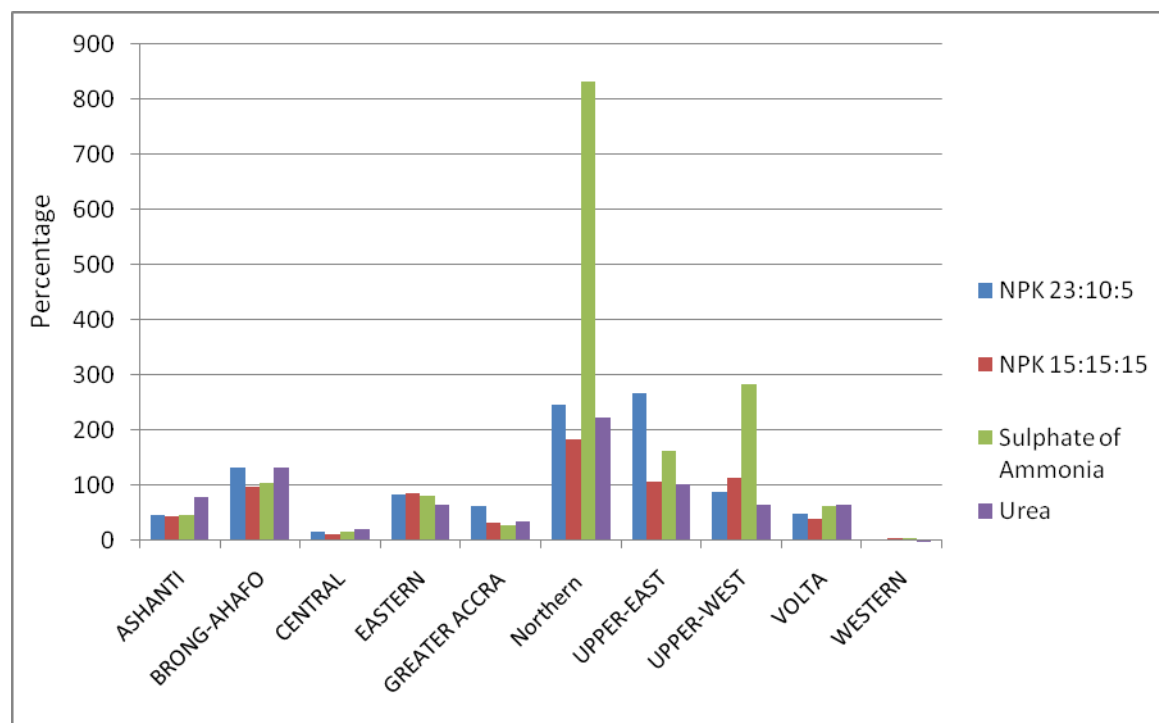
clear how more vouchers for this product were redeemed than were printed and issued. Further details on the redemption of vouchers by region and importer are shown in Appendix A. Following the earlier argument that data on the program as of October 17, 2008, was representative of the entire program concluding on December 31, the printing cost of the unused vouchers is on the order of \$310,000.

Figure 8: Percentage of issued vouchers that were redeemed (October 17, 2008)



There was insufficient data and information to say definitively whether the subsidy program was able to achieve any of its presumed goals. To estimate whether the use of fertilizer was at least as high as in 2007, fertilizer sales figures from that year are needed. The best available proxy was the importer-supplied regional distribution of sales and estimated need of 600,000 bags from July to December 2008. This rough estimate was used to calculate the percentages shown in Figure 9. The estimate shows significant differences among the regions in 2008 fertilizer use as a percentage of 2007 fertilizer use. The Northern regions generally had a higher percentage. Fertilizer use of NPK 15:15:15 and sulphate of ammonia in 2008 was only about 5 percent of the use in 2007 in the Western region but over 200 percent in Northern Region. Overall, the evidence available suggested that the subsidy program had a good prospect of ensuring that overall fertilizer use in 2008 was not drastically reduced below 2007 levels. The distribution of the total amount used may however be significantly different especially due to the timing of the commencement of the program.

Figure 9: Fertilizer sales from July to December 2008 sales as a percentage of presumed sales 2007



The subsidy program started too late to dramatically affect fertilizer use in the south. There was little to no opportunity for farmers in the south to benefit from lowered fertilizer prices during the major season. The rough estimates in Figure 9 show a clear pattern in which the southern regions (Central, Greater Accra, and Western) in 2008 used far less than 50 percent of the fertilizer used in 2007. The late commencement of the subsidy program likely reduced the beneficial effects it could have had in these parts of the country.

During the subsidy program, the prevailing wisdom in the country was that it was illegal to sell fertilizer to farmers who did not have vouchers. This prevented some farmers from obtaining fertilizer for use on their crops. This distortion was compounded by the untimely delivery of vouchers to some regions and may have further reduced the quantity of fertilizer used.

3.4 Voucher Allocation: Regional Agricultural Directors to District Agricultural Directors

Between June 30 and July 2, 2008, regional agricultural directors convened meetings with district agricultural directors at which vouchers were given out to be passed on to extension agents. In the Eastern Region, the district directors gave estimates of their fertilizer needs and the allocation was based on these reported needs. In the Ashanti Region the issue to districts was made without their input. They were told that the division was based on MoFA records of fertilizer use in the district. In the Brong Ahafo region, the issue of vouchers to each district was based on negotiations amongst the

district directors at a meeting convened by the regional director. In the Northern Region, the districts directors were informed by the regional director that vouchers were available to be picked up from the regional office. The district directors or their representatives went to the regional MoFA office and picked up as many vouchers as they deemed necessary.

In all the visited regions, subsequent issues to district agricultural directors were supposedly based on requests made to the regional MoFA office and sometimes directly to MoFA headquarters in Accra. However, it appears that the requests were not honored, as districts typically received an allocation different to what was requested. Tables 4 shows the number of vouchers issued to the visited districts by October 23.

Table 4: Total voucher allocations in visited districts (October 23, 2008)

District	Government vote % 2004	Population	% Rural ^a	Area (km ²)	Fertili- zer ^b	Number of voucher books	Number of surplus vouchers
Tamale	25	293881	84.4	720	NPK 15:15:15 NPK 23:10:5 S of Ammoni a Urea	256 72 335 146	- - 22.8 -
Tolon Kumbugu	29	132833	32.9	2410	NPK 15 NPK 23 S of A Urea	40 19 41 10	15 - 2 -
Sunyani Municipal Area	63	179165	27	1360	NPK 15 NPK 23 SA Urea	50 22 27 2	9.5 11.8 6.4 -
Kumasi Metropolitan Area	79	1170270	0	300	NPK 15 NPK 23 SA Urea	22 12 15 8	- - - -
Asante Akim North	76	126477	44.1	1260	NPK 15 NPK 23 SA Urea	120 55 50 33	- - - -

Suhum Kraboa Coaltar	60	166472	78.3	940	NPK 15 NPK 23 S of A Urea	40 6 10 4	- - - -
New Juaben	66	136768	16.6	200	NPK 15 NPK 23 SA Urea	18 3 4 1	- - - -

^a Ghana 2000 Census estimates. *GhanaDistricts.com

^bNPK 15 represents NPK 15:15:15, NPK 23 represents NPK 23:10:5, SA represents sulphate of ammonia.

A plausible expectation is that population, level of urbanization, district area, and northern geography (because of planting times) would have been positively correlated with the number of vouchers a district received. As shown in Table 4, a comparison of the number of vouchers that these districts received did not show any clear basis of the allocations. For example, more rural and larger Tolon Kumbugu district received significantly fewer vouchers than neighboring Tamale district even though political support for the ruling government was very weak in both districts.

3.5 Voucher Allocation: District Agricultural Directors to Extension Agents

The districts instituted different procedures for transferring vouchers to extension agents to pass on to farmers.

In Koforidua, the extension agents had no input into the number and kind of vouchers they received. There were 18 agriculture extension agents but there were not enough vouchers booklets to go around during each issue. The director selected which extension agents to give vouchers. The director instructed extension agents to give no more than three vouchers per person.

In Suhum, the 20 agricultural extension agents requested the number and type of vouchers that they needed. The district director states that he tried to meet requests within the limits of voucher availability. The extension agents were instructed to give four or fewer vouchers per farmer.

In Konongo, extension agents had no input into the number and kind of vouchers they received from the first allocation to the district. The district director stated that he distributed vouchers among the 23 extension agents based on his perception of fertilizer demand in their operational areas. For the subsequent issues of vouchers to the district, he took the extension agents requests into consideration. At first he instructed the extension agents to give no more than two vouchers per farmer but later on, he states that he allowed up to five vouchers for individuals with 'big' farms. However, the farmer interviewed at Konongo stated that he had received 100 vouchers for NPK15:15:15 and 50 vouchers for sulphate of ammonia.

In Kumasi as in Konongo, extension agents were assigned vouchers without their input from the first issue to the district. In subsequent issues, the district director had all the vouchers lodged with the district MoFA accountant. The 14 extension agents then made requests for vouchers from the accountant who issued them. The director instructed the extension agents to give 10 or fewer vouchers per farmer.

In Sunyani, the first issue of vouchers to the district was distributed amongst the 20 extension agents without their input. The district director had subsequent issues lodged with the MoFA stock keeper. He also allowed six supervisors of extension agents to carry extra stock to issue to extension agents in the absence of the stock keeper. To obtain vouchers, the extension agent had to speak with the director who then issued the agent a chit to be submitted to the stock keeper.

In Tamale, from the first issue of vouchers to the district, the 17 extension agents made requests to the district director that were fully met. When the director made requests for additional vouchers, he was informed by MoFA that very few of the issued vouchers issued to the Northern region were being used. The director then instituted a new distribution method for vouchers—extension agents were to sit in the stores of local fertilizer dealers and issue vouchers to customers as they came in. In subsequent issues, extension agents were assigned vouchers without their input. Since the vouchers were distributed in the retail shops, the extension agents served farmers outside their operational areas.

In Tolon Kumbugu District, direct neighbor to Tamale, the extension agents were also instructed to sit in retail shops and give vouchers to people who came to purchase fertilizer. Like in Tamale, extension agents typically issued vouchers to farmers outside their operational areas.

In all the visited districts, extension agents received instructions from the district agricultural directors on number of vouchers to give per farmer. However, these instructions were broad and extension agents generally created their own rules to determine how many vouchers they would distribute the vouchers they received. Based on interviews with extension agents in the seven visited districts, the norm was to allocate vouchers on a first come first served basis. Table 5 shows the vouchers extension agents in these districts received and how they were disbursed to farmers.

Table 5: Distribution of vouchers by interviewed extension agents

<i>Extension agent district; Operational areas</i>	<i>Farmer Population</i>	<i>Farm size (acres)</i>	<i>Crops to which fertilizer was applied</i>	<i>Other crops grown in district</i>	<i>Number of vouchers given to AEA NPK15/ NPK23/ SA/ Urea ^a</i>	<i>Number of vouchers given per farmer served</i>
Koforidua; Esikese,	2000	3-5	Oil palm	Maize	0/ 0/ 0/ 50	2 to 3

<i>Extension agent district; Operational areas</i>	<i>Farmer Population</i>	<i>Farm size (acres)</i>	<i>Crops to which fertilizer was applied</i>	<i>Other crops grown in district</i>	<i>Number of vouchers given to AEA NPK15/ NPK23/ SA/ Urea ^a</i>	<i>Number of vouchers given per farmer served</i>
Sushensu, Wrapong						
Suhum; Amprodiem, Obuotumpan, Cocoa Junction, Dademankye	3500	1 - 8	Cabbage, green pepper, tomato, pepper, okro, garden eggs	Maize, oil palm, cassava	200/ 0/ 0/ 50	2 to 4
Suhum; Adarkwa, Suhum Township, Ntumpum	5000	1 - 3	Tomato, Garden eggs, okro, cabbage, peppers, oil palm	Cassava	100/ 0/ 0/ 0	1
Konongo ; Nsonyameye	3000	0.5 - 15	Tomato, garden eggs, pepper, maize		300/ 150/ 250 / 100	2
Konongo; Kyekyebiaso	560	0.5 – 2 ; (20 - 30 oil palm, citrus)	oranges, oil palm, tomato, garden eggs, pepper, okro, cabbage, maize, plantain	Tangerine	100/ 100/ 50/ 50	8 to 10
Kumasi; Krounum, Kwadaso	1500	2 - 3	Carrots, lettuce, cabbage, tomato, bell peppers, spring onions	Maize	100 / 100/ 100 /0	2, 100 to Kwadaso agricultural college
Kumasi; Atonsu, Gyiansi, Dompase, Chapatre, Aprabo, Oti	5000	1.5	Lettuce, cabbage, spring onions, carrots		50/ 0 /20/ 0	10
Sunyani; Kyera	2000	3 - 4	Tomatoes	Plantain, cocoyam, cocoa, maize, cassava,	70/ 20 /40 / 0	1 to 2

<i>Extension agent district; Operational areas</i>	<i>Farmer Population</i>	<i>Farm size (acres)</i>	<i>Crops to which fertilizer was applied</i>	<i>Other crops grown in district</i>	<i>Number of vouchers given to AEA NPK15/ NPK23/ SA/ Urea ^a</i>	<i>Number of vouchers given per farmer served</i>
				cabbage, tomato, garden eggs, pepper, oil palm, mango, orange pineapple		
Sunyani; Odumase	1500	3 - 25	maize	Garden eggs, yam, okro, pepper, oil palm, oranges, lemons, plantain, cassava, tomatoes, cocoyam	100 / 75 / 100 /25	1 to 2
Sunyani; Odumase	1500	3 - 25	maize	Garden eggs, yam, okro, pepper, oil palm, oranges, lemons, plantain, cassava, tomatoes, cocoyam	100 / 75 / 100 /25	1 to 2
Tamale; Banvim	2500	1 - 10	maize, rice	Yam, sorghum, groundnuts, cassava, soy beans	400 /150/550 / 250	2 to 10
Tamale;Wamale	2000	2 -7	maize, rice	Yam, groundnuts, guinea corn, soy bean, cassava, millet, sorghum, rice, cowpea	300 / 300/150 /50	2 to 3

<i>Extension agent district; Operational areas</i>	<i>Farmer Population</i>	<i>Farm size (acres)</i>	<i>Crops to which fertilizer was applied</i>	<i>Other crops grown in district</i>	<i>Number of vouchers given to AEA NPK15/ NPK23/ SA/ Urea^a</i>	<i>Number of vouchers given per farmer served</i>
Tolon;Zangbalo, Demabe	1000	3-5	maize, rice	Millet, sorghum, rice, cowpea, yam, soya bean, "alefu," groundnut, "bora," tomato, okro, pepper	400/ 200/ 200/ 0	3

All data was reported by the Extension agents. a NPK 15 represents NPK 15:15:15, NPK 23 represents NPK 23:10:5, SA represents sulphate of ammonia.

3.6 Distribution of Vouchers to Farmers

In all the visited districts, the extension agents reported being hassled for vouchers with crowds of farmers gathering around them, coming to their homes, or crowding at MoFA offices. All of the extension agents interviewed, even those outside the Northern region, gave vouchers to farmers outside their operational areas. The extension agents (excluding those in Northern Region districts) distributed vouchers to farmers at the district MoFA office or at a previously announced location because it was easier for farmers to find them that way. Some agents already had well known locations where they carried out their extension-related activities, others contacted leaders in the farmer communities and asked them to inform farmers of where to meet them to get vouchers.

Extension agents reported that there was a strong preference for NPK 15:15:15 and sulphate of ammonia vouchers, as farmers were familiar with these two fertilizers. Urea was also known on the market but farmers generally disliked it because of the extra labor needed to apply it by burying. However, farmers were less selective when there was shortage of vouchers and of fertilizer. Extension agents noted that at the beginning of the program, there was low uptake of NPK 23:10:5 vouchers, as farmers were not familiar with the product. However, during the periods of shortage of vouchers (and actual product) for sulphate of ammonia, farmers willingly accepted vouchers for NPK 23:10:5. NPK 15:15:15 and NPK 23:10:5 were used interchangeably as basal dressing while NPK 23:10:5, urea, and sulphate of ammonia were used interchangeably as top dressing.

All the stakeholders complained about the physical stress of dealing with vouchers. District agricultural directors had to spend hours signing hundreds of vouchers. The farmers also had a hard time locating their extension agents and many of them stormed the MoFA offices to demand vouchers from whomever they saw. The extension agents had to contend with long

lines of impatient farmers whilst they filled out the name of the farmer, and their own names on each voucher given out.

Extension agents in all the districts complained of shortage of vouchers at the time that they were most needed. This is true even in districts in the Northern Region and Brong Ahafo region where there were surpluses of voucher booklets at the end of the planting seasons. During the periods of shortage of vouchers, farmers typically took whatever voucher was available.

Apparently, larger farmers and other special groups of farmers got special treatment in the voucher allocation; they did not have to track down an extension agent, they did not have to line up for vouchers and they got larger numbers of vouchers. In Kumasi a commercial farmer requested and received 300 vouchers. The Kwadaso agricultural college, also in Ashanti region, received 100 vouchers for fertilizer. In Tamale and Tolon, the voucher requests of farmers in a MoFA credit initiative were fully met first. In Tolon, the MoFA office itself kept some vouchers to be used towards the fertilizer purchases of a food security program that was underway.

3.7 Availability of Fertilizer

In all the districts visited there were complaints of shortage of fertilizer. District agricultural directors, extension agents, and farmers interviewed all indicated the need for more, better stocked, retailers in the fertilizer distribution network. Table 6 gives a synopsis of the fertilizer shortage in the districts.

Table 6: Fertilizer shortage in districts

District	Number of Agro-Inputs retailers*	Number selling fertilizer and accepting coupons*	Main shortage
New Juaben	5	2	Urea
Suhum	10	2	Urea, NPK 23:10:5
Konongo	20	12	Sulphate of ammonia
Kumasi	100	3	Sulphate of ammonia
Sunyani	15	3	Sulphate of ammonia, NPK 23:10:5
Tamale	9	8	Sulphate of ammonia
Tolon	7	4	Sulphate of ammonia

*District agricultural director and extension agent estimates

There was widespread shortage of the subsidized fertilizers especially sulphate of ammonia and urea. In the all the districts visited, there was no unsubsidized fertilizer available for sale. This suggests that higher than planned fertilizer use was not the cause of the shortages. The supply of vouchers themselves underwent periods of shortage and then glut.

A surprising observation during the field visits was that the sale of fertilizer without vouchers was deemed illegal. As such, the periods of shortage of vouchers, which coincided with the recommended fertilizer application time, created even more disruption in the use of fertilizer. This situation was particularly disruptive in the northern parts of the country. It has not been ascertained which entity instated this 'law'.

4. Implications of Operational Design

4.1 Public-Private Partnership

In Ghana, the fertilizer sector is completely liberalized and the government is not involved in any way in procurement, distribution, and retailing of fertilizer. This is in contrast to the situation in Malawi and Tanzania, two other African countries which have recently had large-scale fertilizer subsidy programs. Conditions in Ghana were therefore apt for a public-private partnership. Ghana's subsidy program was touted as a response to steep rises in food prices, and there was a sense of urgency in implementing an intervention. The resulting public-private partnership may have been necessitated by the haste with which the program had to be implemented; a major advantage of the design was that it allowed for almost immediate deployment of the program. Nevertheless various aspects of the program design show the government's commitment to supporting the private fertilizer sector.

There was no public tender process for the procurement of subsidized fertilizer, as in Malawi, nor did the government attempt to directly import fertilizers for use in the program like in Tanzania. The government engaged the fertilizer importers right from the design stage of the subsidy program. This dialogue not only ensured their cooperation but also gave the government access to spatially disaggregated data on fertilizer use and other information that was critical to the design of the program. One can also presume that by leaving all aspects of handling of the fertilizer to private companies, the government of Ghana benefitted from some private sector efficiencies in transmitting fertilizer to farmers. Most importantly, the program could not have been implemented at the time it occurred without the fertilizer stock held by private importers.

The government went beyond sourcing fertilizer from private importers. The government left all aspects of distribution of subsidized fertilizer to the private sector. Farmers were also free to decide from which store to buy the fertilizer. This is in contrast with the experience in Malawi and Tanzania where retailers were allocated fertilizer stocks to sell and farmers were instructed where to go to purchase fertilizer. Excluding that command economy aspect of the design in Ghana prevented some of the inefficiencies that resulted in Malawi and Tanzania. For instance, during their subsidy programs, it was sometimes the case that the stock of fertilizer allocated to retailers was lower than the amount that farmers were authorized to buy from them and vice versa. The government of Ghana had minimal interference in the fertilizer market during the implementation of the subsidy, and as such, the program did not undermine the private sector in the way the Malawi program is alleged to have done. The fertilizer and seed subsidies in Malawi between 2005 and 2007, by relying either solely or heavily on existing parastatals for sourcing products, are blamed with stunting the growth of the private fertilizer market (Dorward et al 2008).

While there were many advantages to a public-private partnership, this case also demonstrates the challenges in protecting public interest. Demand for fertilizer in Ghana appears to be very

elastic and the subsidy program was a boon to importers who would have seen their sales plummet due to rapidly rising prices. As there were significant information asymmetries the government relied on importer-supplied information on fertilizer sales to inform the allocation of vouchers to each region and in negotiating prices that would prevail during the program. Information also appears to have been the basis for negotiating prices.

As shown in Table 1, there are noticeable differences between the market price of fertilizer in June just before the subsidy program, and the price of fertilizer during the program. Also, at some point during the program, the face values of some vouchers to some regions were revised upwards. This raises several questions:

- How do the negotiated total prices of the subsidized fertilizers compare to what could have prevailed in the market had the government not intervened?
- What was the basis for renegotiating prices?
- The importers were only obligated to ensure fertilizer supply was adequate in regional capitals; but was that level of supply consistent with effective country-wide distribution?

While the program was supportive of the private sector by having minimal government involvement in the procurement and distribution of fertilizer, it may have constrained competition and strengthened the role of major importers. Due to the fact that vouchers were only redeemable with the importers, fertilizer retailers that did not have contracts with them, that is Type 3 and Type 4 retailers, were effectively removed from the subsidized fertilizer market. Field observations suggest that Type 3 and Type 4 retailers were unable to even sell unsubsidized fertilizer because they are unable to obtain their supply from Type 1 and Type 2 retailers. This constricted the network of fertilizer retailers during the subsidy program while having potential long-term deleterious effects on competitive growth in the fertilizer sector by strengthening the oligopolistic hold of retailers controlled by fertilizer importers.

Radio stations spontaneously became public service media for disseminating the new farmer prices for fertilizer. However, most of the media outlets did not make the distinction that the prices of fertilizer they announced were only relevant to fertilizer sold in district capitals. The MoFA posters informing farmers about the subsidy only showed the district capital price of fertilizer. The distinction that prices could differ from those announced was perhaps deemed unnecessary because a majority of fertilizer retailers were located in district capitals. The result was that farmers insisted on paying only these prices even at retailers located outside the district capitals. The belief was that if the retailer was accepting vouchers, then the cash price to farmers must be those announced. In areas where MoFA officials were themselves misinformed, this situation led to further constriction of the subsidized fertilizer distribution network. Some retailers who were afraid of the threatened police action decided to stop accepting vouchers. Sometimes, an unnecessarily clandestine market developed in which farmers and retailers used vouchers even if the cash price was a few cedis higher than the announced prices. Even if retailers without relationships with importers found ways to indirectly redeem the value of vouchers, the widely announced supplemental cash amount made sale of fertilizer profitable only for Type 1 and Type 2 retailers who received special concessions from importers.

The program design effectively eliminated the part of the fertilizer distribution network that penetrates most deeply into rural areas from the subsidized fertilizer network. This fact would have been less troubling if there were alternatives to subsidized fertilizer. Based on the field observations, it appears that there were essentially no sales of fertilizer without vouchers. In fact the prevailing knowledge was that it was illegal to buy or sell fertilizer without a voucher. For instance, in the Northern region where there was demand for unsubsidized fertilizer, retailers were instructed by importers not to sell without vouchers.

As a result of eliminating Type 3 and Type 4 fertilizer retailers, the supply of fertilizer in less than 50kg amounts was heavily constricted. Type 3 and Type 4 fertilizer retailers were the most likely to give credit to farmers and their absence presumably eliminated a source of credit for some farmers. There was anecdotal evidence of farmers forming groups to buy one 50kg bag of subsidized fertilizer to share. It was not possible to quantify the effect the absence of Type 3 and Type 4 retailers from the subsidized fertilizer network may have had on demand in 2008.

The Type 1 and Type 2 retailers who did not receive credit from importers were also likely to be adversely affected by the program. Such retailers were forced to keep about 50 percent of their fertilizer sales earnings locked-up in vouchers and request payment from importers. This arrangement also opened up room for abuse by importers who may have refused to make timely payments. Retailers who did not buy on credit from importers reported that importers did not give cash for the value of voucher submitted to them. Instead, they were forced to use the value of the voucher towards further purchases from the importer. There were also reports of importers not honoring face value of voucher with retailers. Importers reported that MoFA was not paying them on time for the value of redeemed vouchers, and they may have in turn passed on the inconvenience and cost to retailers. It may also genuinely have been difficult for importers who were used to receiving payment from retailers to set up protocols for paying them.

One consequence of the design of this public-private partnership may have been strengthening of the role of the importer in the supply chain. Under the subsidy program, fertilizer retailing became a government supported oligopoly. The contract relationships that Type 1 and Type 2 retailers had with importers made them more like retail outlets of the importers rather than separate privately owned entities. In exchange for credit and other concessions, the retailers sold at prices determined by the importers and were generally viewed as subordinates of the importers and not as customers. Due to farmer routine, Type 3 and Type 4 retailers who were not in the distribution network risked losing their customers for good thereby leaving only importer controlled retailers in the system. Over time, such a system could result in an increased threat for oligopolistic collusion to keep new entrants out of fertilizer retail.

4.2 Distribution by Extension Agents

The subsidy program design called for agricultural extension agents to physically hand vouchers to farmers. The reasoning behind this decision was that the extension agents were the ones directly in touch with farmers and could identify individuals who would actually use fertilizer on a

farm (as opposed to resell it, for example). However, making extension agents the face of the subsidy also had several beneficial side effects.

Extension agents are existing government employees and not special agents created to disburse what is essentially a cash windfall to farmers who use fertilizer. They originate from all ethnic groups and political parties and are typically assigned to district MoFA offices in areas different from their hometown. An expectation was that the vouchers were less likely to become tools of political patronage than if they were distributed by ad hoc bodies as in the case of the subsidy program in Malawi, Ethiopia, and Zambia (Jayne 2003). Using an easily identifiable subset of people like extension agents also acted as a policing system on local elites who may have otherwise acquired vouchers to distribute. Identification of beneficiaries was also simplified because it was any person who farmed in the operational area of the extension agent. This was unlike the situation in Malawi where there was an algorithm for choosing beneficiaries that provided opportunities for favoritism. Additionally, extension agents were relatively low on the power rung within MoFA offices and had superiors who would likely immediately be informed of gross misconduct. As such, any favoritism was likely to be less distorting. During the field visits, there were some reports of extension agents selling vouchers but supervisors were made aware of these lapses.

Another beneficial side-effect of giving extension agents the power to distribute the vouchers was that it increased the standing of extension agents in the eyes of farmers. Extension agents are at the forefront of disseminating information to farmers but are subordinate to almost every other position in the district MoFA offices. Because of this new power of extension agents, farmers may have become more attentive to their extension advice and more likely to attend meetings they convene. Additionally, farmers who had not been familiar with their extension agents in the past were forced to interact with them to obtain a voucher. This introduction may grow to become a relationship that lasts even after the subsidy program.

A drawback to extension agents distributing the vouchers was that a farmer had to know which operational area his farm falls within and which extension agent was in charge. There were typically several operational areas in a district and farmers were likely to have difficulty in pinning down their extension agent. The process may have wasted labor days in trips to the district MoFA offices seeking information. Once a farmer knew which extension agent he was to receive vouchers from, he still had to locating him or her. This was a considerable constraint to some farmers.

Regardless of the fact that official power to distribute vouchers lay with extension agents, de facto power rested with their superiors. The operational design called for vouchers to be issued to farmers by agricultural extension agents but gave no clear direction on how vouchers were to reach the hands of the extension agents. The vouchers were to pass from the regional agricultural director to the district agricultural director and finally to the extension agent. At each stage, there was no clear indication of how the vouchers should be allocated. The absence of data required for estimating disaggregated fertilizer demand at the district and operational area level, meant that the resulting distribution was based on subjective perceptions, which could be clouded by ulterior motives.

An effect of the haphazard process of transferring vouchers to agricultural extension agents is that they did not know the number and type of vouchers that they would receive for distribution. With the exception of regional agricultural directors, the players in the voucher distribution program had no way of knowing how many vouchers they would receive and when they would receive them. Extension agents' dependence on a chain of superiors for vouchers to pass on to farmers made them less credible as the ultimate source of vouchers.

4.3 Use of Vouchers

According to statements from the government of Ghana, the fertilizer subsidy program was prompted by an increase in food prices coupled with a doubling of fertilizer prices between 2007 and 2008. It is plausible to assume that a major objective of the program was to encourage fertilizer use so that food output would at least not drop below levels in 2007. The decision to subsidize fertilizer prices to return them to levels prevailing in Accra in 2007 also supports this assertion. By including pan-territorial pricing, another likely objective was for there to be additional incremental fertilizer use in areas of the country further from the Tema port, which would experience comparatively larger price decreases. With these two main objectives, a major question is why the operational design called for the use of vouchers.

The use of vouchers in a subsidy program incurs extra costs which can sometimes be justified by gains made in other dimensions. The main gains of using vouchers are the ability to target the subsidy to a particular group of people and the ability to ensure that the subsidy prices are obtainable only at a certified network of distributors. In the case of this subsidy program, there was no intention to target the vouchers to any group of people, and all the fertilizer supply in the country came from entities which were all eligible to sell subsidized fertilizer. An official at MoFA indicated that the use of vouchers was motivated in part as a mechanism to monitor payments made to the fertilizer importers. Additionally, the use of region-specific vouchers was a way to force fertilizer importers to serve each region; it was feared that without this incentive, fertilizer would have been supplied only to areas near Tema port where transportation costs would be relatively low. Another feature of the use of vouchers was the political gains to be made from having the government very visibly involved in providing support for farmers, a large proportion of the electorate, in an election year.

The extra costs of implementing the subsidy by vouchers were evident. These included costs incurred for: printing the vouchers; transferring vouchers from MoFA headquarters in Accra to regional MoFA offices, to district MoFA offices, and to agricultural extension agents; district agricultural directors and agricultural extension agents who needed to fill out information required to validate a voucher; farmers trying to track down their extension agent for vouchers; retailers to redeem voucher value from importers; and importers to redeem voucher values from MoFA and the government of Ghana. The printing cost of the vouchers was not negligible—by the author's estimates the printing cost of unused vouchers was about \$310,000.

The use of vouchers to transmit the subsidy to farmers also allowed some abuses. Some farmers collected vouchers that they had no intention of using or could not afford to use. They

rightly predicted that there would be periods of shortage of vouchers and sold the vouchers to other farmers who desperately needed to apply fertilizer. Despite the plan for the subsidy program to end on Dec 31, some farmers were hoarding the coupons in the hopes of using them next planting season. There were some reports that some farmers were able to use the vouchers towards the cost of non-subsidized items like, weedicides and using multiple vouchers to buy a single bag of fertilizer (and paying no cash). There was no way of measuring how prevalent any of these abuses were. It is apparent that use of vouchers did have some benefits but one can question the justifiability of those benefits or whether they could have been readily achieved by alternative cheaper methods.

4.4 Preliminary Conclusions

Based on field observations, it was apparent that farmers understood the benefits of using fertilizer, both in increasing their harvest and as a soil management tool. Farmers were also aware of optimal application rates. Farmers who did not use fertilizer or used fertilizer at less than recommended rates stated that they did so because of the high prices of the product. Therefore the fertilizer subsidy is an intervention that overtime can increase the number of farmers using fertilizer as well as encouraging existing users to use optimal doses.

The fertilizer subsidy program as a response to the food price spike was a less successful intervention, as it was a single-pronged approach to a problem with many facets. Reducing the price of fertilizer for farmers is only one of the considerations that farmers rationally make in the decision to use fertilizer and increase their yields. Other major sticking points for farmers include costs of purchasing responsive seeds, labor costs of applying fertilizer, maintaining the farm and harvesting, inadequate storage facilities for output, and unfavorable prices for output. Even with lower fertilizer prices, some farmers may find the other obstacles to fertilizer use insurmountable. More perplexing is the fact that sale of fertilizer to farmers who did not have vouchers was deemed illegal. Negotiated prices that were significantly higher than prices that prevailed before the program may have generated incentives to diminish the sale of unsubsidized fertilizers.

There was insufficient data to say definitively whether the subsidy program was able to achieve its presumed goals. There is a need for further evaluative studies on the 2008 subsidy program, whatever its future. The program is at yet the most liberal example of a public-private partnership in a national agricultural investment scheme in an African country—the government of Ghana was not involved in any aspect of procuring or distributing the fertilizer. The possibly perverse effects of the program on competition in the private fertilizer market especially must be studied. It was also a novel combination of an intervention to mitigate the effects of an extreme adverse shock with one that creates pan territorial pricing. At the most basic level, the return to this investment in the agricultural sector must be studied against the possible alternative employment of the resources utilized.

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Appendix A: Supplementary Data

Table A 1: Number of vouchers printed by region and printing dates

Region	Date printed	Number of NPK 23:10:05 vouchers	Number of Sulphate of Ammonia vouchers	Number of Urea vouchers	Number of NPK 15:15:15 vouchers
Ashanti	6/30/2008	5700	7600	3750	21950
	7/15/2008	5700	7550	3850	22000
	9/11/2008	20000	20000	10000	20000
	10/17/2008	10000		20000	10000
Brong Ahafo	6/30/2008	6600	8750	4350	25350
	7/15/2008	6550	8750	4400	25350
	9/11/2008	21050	24750	7100	19100
	10/17/2008	21050	24750	7100	19100
Central	6/30/2008	4000	5250	2650	15200
	7/15/2008	4000	5250	2600	15250
Eastern	6/30/2008	4000	5250	2650	15200
	7/15/2008	4000	5250	2600	15250
	10/17/2008	10100		23000	16100
Greater Accra	6/30/2008	2700	3500	1750	10150
	7/15/2008	2550	3500	1750	10150
Northern	6/30/2008	6600	8750	4400	25350
	7/10/2008	6550			20350
	7/15/2008		8750	4350	5000
	7/23/2008		50000		
	8/18/2008	12350	48800	9300	30650
Upper East	6/30/2008	4000	3700	2650	14200
	7/10/2008	4000			16250
	7/15/2008		6800	2600	
	8/18/2008	1150	20000	1500	2500
Upper West	6/30/2008	4000	5250	2650	15200
	7/10/2008	4000			15250
	7/15/2008		5250	2600	
	8/4/2008		20000		
Volta	6/30/2008	4000	5250	2650	15200
	7/15/2008	4000	5250	2600	15250
	10/17/2008		15000	10000	15000
Western	6/30/2008	2700	3500	1250	10150
Western	7/15/2008	2550	3500	2250	10150

Source: Ministry of Food and Agriculture

Table A 2: Number vouchers issued to regions and dates of issue

Region	Date issued	Number of NPK 23:10:05 vouchers	Number of Sulphate Ammonia vouchers	Number of Urea vouchers	Number of NPK 15:15:15 vouchers
Ashanti	6/30/2008	5000	5000	3000	15000
	7/16/2008	700	2600	750	6950
	7/30/2008	5700	7550	3850	
	8/30/2008				22000
	9/11/2008	20000	20000	10000	20000
	10/17/2008	10000		20000	10000
Brong Ahafo	6/30/2008	5000	5000	4000	15000
	7/22/2008	1600	3750	350	10350
	7/22/2008	6550	8750	4400	25350
	9/11/2008	21050	24750	7100	19100
	10/17/2008	21050	24750	7100	19100
Central	6/30/2008	4000	5000	2000	10000
	7/13/2008	4000			
	8/13/2008		250	650	5200
	8/13/2008		5250	2600	15250
Eastern	7/1/2008	4000	5000	2000	10000
	7/17/2008		250	650	5200
	7/21/2008	4000	5250	2600	15250
	10/17/2008	10100		23000	16100
Greater Accra	7/2/2008	2000	3000	1000	5000
	7/15/2008	700	500	750	5150
	8/6/2008	2550	3500	1750	10150
Northern	6/30/2008	5000	5000	4000	15000
	7/4/2008	1600	3750	400	10350
	7/11/2008	6550			20350
	7/16/2008		8750	4350	5000
	7/23/2008		50000		
	8/19/2008	12350	48800	9300	30650
Upper East	6/30/2008	4000	3000	2000	10000
	7/4/2008		700	650	5000
	7/16/2008	4000			16250
	8/19/2008	1150	26800	4100	2500
Upper west	6/30/2008	4000	5000	2000	10000
	7/4/2008		250	650	5200
	7/11/2008	4000			15250
	7/17/2008		5250	2600	
	8/4/2008		20000		
Volta	7/1/2008	2000	3000	1500	7500
	7/18/2008	2000	2250	1150	7700

	7/31/2008	4000	5250	2600	15250
	10/22/2008		15000	10000	15000
Western	7/2/2008	2000	3000	1000	5000
	9/11/2008		4000		
	10/26/2008				14500
	10/29/2008	3250		2500	

Source: Ministry of Food and Agriculture

Table A 3: Face value per fertilizer voucher by region

	Face Value in GH cedis ^b:			
Region	NPK 15:15:15	NPK 23:10:05	Sulphate of Ammonia	Urea
Greater Accra	24.80	22.80 24.45	14.50 17.70	24.80
Central	24.45 25.70 24.50	23.50 23.45	15.45 15.50 15.90	24.40 24.45 25.45 25.70
Eastern	25.20	24.20	16.20	26.20
Volta	25.20	24.20	16.20	26.20
Western	24.50 24.90	23.50 23.90	15.50 15.90	25.90 26.20
Ashanti	24.50	23.50	15.50	25.50
Brong Ahafo	25.20 26.20	24.20	16.20	26.20
Northern	24.70 25.70	24.70	16.70	26.70
Upper East	25.70 26.70	25.70	17.70	27.70
Upper West	25.90	24.90	16.90 17.70	24.90 25.90 26.90

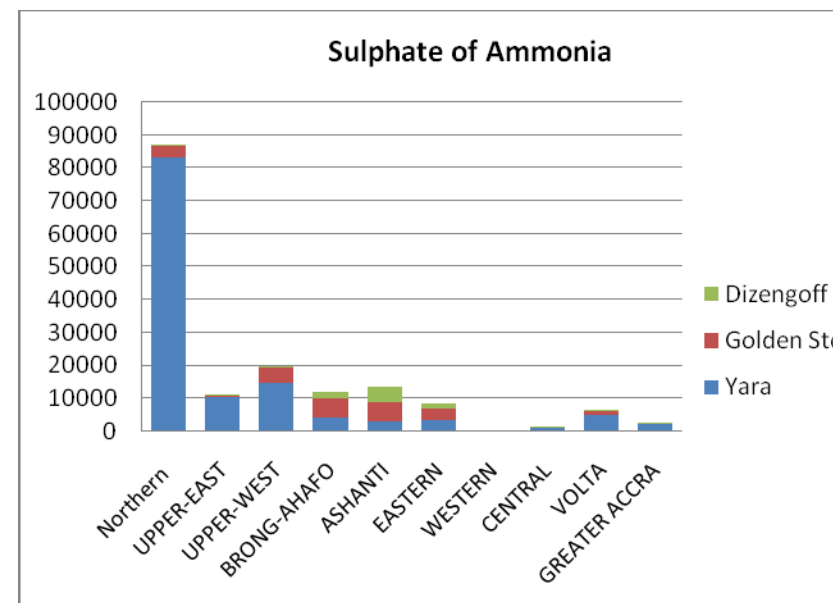
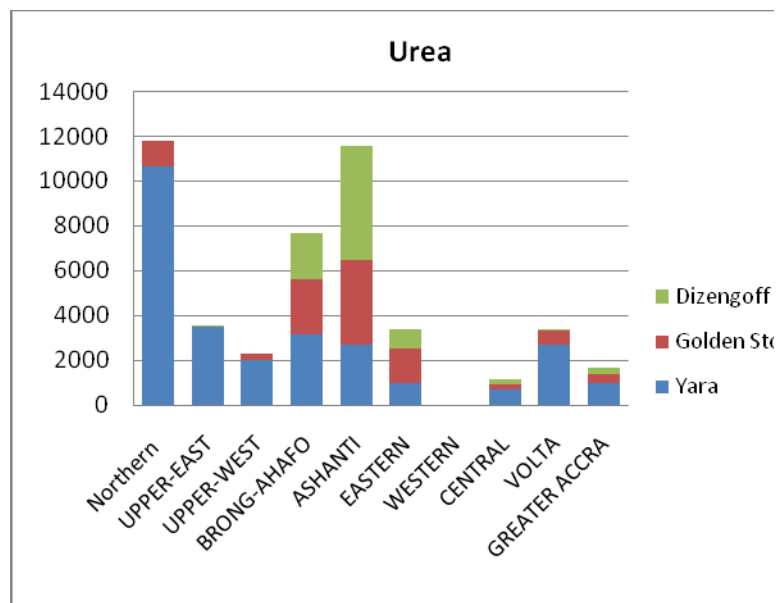
^b Source: Author observations of fertilizer importer invoices to Ministry of Food and Agriculture

Table A 4: Number of vouchers printed as of November 17, 2008, and redemption rate as of October 17, 2008

Region	Fertilizer	Number Printed*	Redemption rate %
Ashanti	Urea	37,600	30.8
	Sulphate of Ammonia	35,150	38.6
	NPK 15:15:15	73,950	49.4
	NPK 23:10:5	41,400	24.0
Brong Ahafo	Urea	22,950	33.5
	Sulphate of Ammonia	67,000	18.3
	NPK 15:15:15	88,900	37.4
	NPK 23:10:5	55,250	20.8
Central	Urea	5,250	22.4
	Sulphate of Ammonia	10,500	16.4
	NPK 15:15:15	30,450	11.5
	NPK 23:10:5	8,000	14.7
Eastern	Urea	28,250	12.0
	Sulphate of Ammonia	10,500	82.4
	NPK 15:15:15	46,550	55.7
	NPK 23:10:5	18,100	35.6
Greater Accra	Urea	3,500	47.4
	Sulphate of Ammonia	7,000	37.2
	NPK 15:15:15	20,300	44.1
	NPK 23:10:5	5,250	80.7
Northern	Urea	18,050	65.1
	Sulphate of Ammonia	116,300	75.0
	NPK 15:15:15	81,350	69.0
	NPK 23:10:5	25,500	75.6
Upper East	Urea	6,750	52.6
	Sulphate of Ammonia	30,500	37.1
	NPK 15:15:15	32,950	64.2
	NPK 23:10:5	9,150	152.5
Upper	Urea	5,250	44.0

West	Sulphate of Ammonia	30,500	65.1
	NPK 15:15:15	30,450	76.0
	NPK 23:10:5	8,000	56.7
Volta	Urea	15,250	22.4
	Sulphate of Ammonia	25,500	25.9
	NPK 15:15:15	45,450	26.6
	NPK 23:10:5	8,000	46.3
Western	Urea	3,500	0.5
	Sulphate of Ammonia	7,000	6.7
	NPK 15:15:15	20,300	8.5
	NPK 23:10:5	29,550	1.2

Note: Issue percentage is 100 percent in all cases except the Upper East region where NPK 15:15:15 was 102.4 percent and in Western region, where NPK 15:15:15 was 96.01 percent



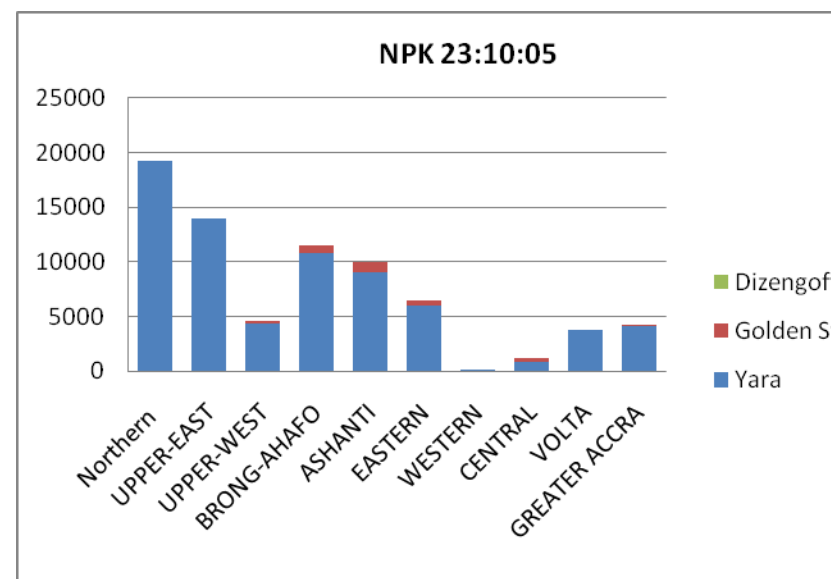
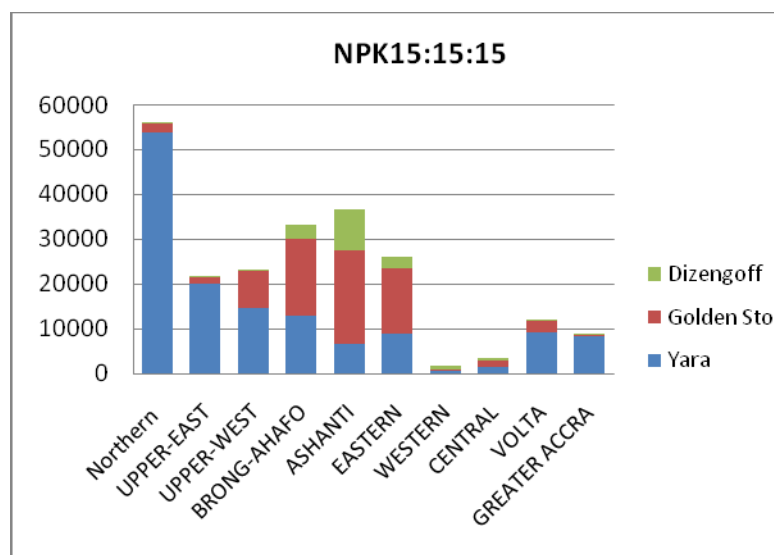


Figure A 1: Regional sales of fertilizer by importer