

# IMPACTS OF THE FERTILIZER SUBSIDY PROGRAMME IN MALAWI: TARGETING, HOUSEHOLD PERCEPTIONS AND PREFERENCES

BY STEIN HOLDEN AND RODNEY LUNDUKA

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**NORAD-PROJECT:**

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**Department of International Environment and Development  
Studies, Noragric  
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Department of International Environment and Development Studies, Noragric

Norwegian University of Life Sciences (UMB)

P.O. Box 5003

N-1432 Aas

Norway

Tel.: +47 64 96 52 00

Fax: +47 64 96 52 01

Internet: <http://www.umb.no/noragric>

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<sup>1</sup> Department of Economics and Resource Management, Norwegian University of Life Sciences, P. O. Box 5033, 1432 Ås, Norway. Email: [stein.holden@umb.no](mailto:stein.holden@umb.no)

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## **1. INTRODUCTION**

Malawi has over the last four years embarked on a comprehensive fertilizer and seed subsidy programme to boost its agricultural production and to enhance food security in the country. The programme aims to provide coupons for purchase of subsidized fertilizer and seeds to targeted poor rural households. It is of high interest to know more about the efficiency of the fertilizer-seed targeting programme in reaching poor households, the productivity and food security impacts of the subsidized fertilizers and seeds, and whether fertilizer subsidies crowd out organic manures and other crops than maize. The targeting of fertilizer subsidies is affected by the fact that informal markets for fertilizer coupons as well as for subsidized fertilizers have emerged and which have productivity, poverty and equity effects that have not been studied in earlier impact assessments of the programme. In this report we provide new evidence on the extent of leakages of coupons and seeds from the administrative programme and how these leakages re-enter the rural economies through the informal markets. The targeting efficiency of the administrative coupon system is assessed given the targeting criteria. The relationships between household characteristics and access to administratively targeted coupons, purchased coupons and purchased cheap fertilizers are analysed. The impacts of the programme are assessed with a number of indicators at household and village levels based on household perceptions. Household preferences for fertilizer, willingness and ability to pay are examined through a number of social experiments.

The objectives of the project were to identify

- 1) The extent to which poor rural households benefit from the targeted fertilizer and seed subsidy programme by receiving coupons for seeds and fertilizers that they are able to use to boost their own farm production to enhance their food security, income, and build-up of assets,
- 2) The extent to which the targeted fertilizer and seed subsidy programme results in efficient utilization of these inputs through enhancement of farm plot level land productivity,
- 3) The productivity of alternative seed varieties of maize (HYVs, OPVs, recycled seeds, local seeds),
- 4) The extent to which fertilizer subsidies for maize crowd out other crops and the use of organic manures and have other sustainable land management implications,

This report primarily addresses objective 1) and provides a partial analysis of objective 4) based on analysis at household level. The next report will contain the more detailed analyses using farm plot level data. This report is fairly short and intends to make key findings easily accessible to readers from different disciplines. Some references are provided to earlier studies to make clear what is new or different in this study as compared to earlier findings. We plan to produce more thorough analyses for publications in scientific journals.

### **1.1. METHODS AND IMPLEMENTATION**

The Norwegian University of Life Sciences' Department of Economics and Resource Management is running a NORAD-funded (NOMA) collaborative MSc-programme in

Development and Natural Resource Economics together with four African Universities. University of Malawi, Bunda College of Agriculture, has been the host for the students during the spring 2009 and the students carried out fieldwork for their MSc-theses during June and July 2009 in Malawi. This was a follow-up survey to 450 households in 6 districts in Central and Southern Malawi and was the third round survey to the same households. The earlier rounds were in 2006 and 2007. Only 376 of these households were found and interviewed in this new survey round. This gives a three round panel of household and plot level data that can be used to assess the impacts of the fertilizer subsidy programme by utilizing the panel nature of the data to control for observable and unobservable household and farm plot characteristics.

The household survey was implemented from the beginning of June 2009. The standard questionnaire from earlier survey rounds was complemented with an additional questionnaire that had a special focus on the subsidy programme. The purpose was to get more detailed information on access to free coupons for fertilizer and seeds, the extent of utilization of these coupons in form of accessing the farm inputs, access to coupons and fertilizers outside the official distribution system, households' own perceptions of the functioning of the distribution system and a variety of perceived impacts of the subsidy programme on the production system of households, their welfare, and general impacts in their villages. They were also asked to identify the main problems related to the system and to suggest solutions to these problems. In addition, the questionnaire contained a number of hypothetical (and one real) choice experiments to obtain better scientific estimates of the perceived value of the inputs and consequently the subsidy programme.

This report provides some of the basic descriptive findings based on the data collected in 2009. The data covers the 2008/09 agricultural season but also contains data from the previous year regarding the subsidy programme based on recall by households. We cannot rule out biases in the analyses due to limited ability to recall or unwillingness to respond for various reasons. We cannot claim that the sample is representative for the whole of Malawi but think it gives a rough approximation of the performance of the input subsidy programme and its impacts on rural households in Malawi.

## **2. TARGETING EFFICIENCY OF THE FERTILIZER SUBSIDY PROGRAMME**

Table 1 provides overview descriptive statistics on the access to fertilizer coupons among the sample households in the six districts in Malawi in the 2007/08 and 2008/09 growing seasons. Some earlier studies of the fertilizer targeting programme in Malawi have emphasized the need to target the subsidies such that it does not crowd out demand for commercial (unsubsidized) fertilizers (Ricker-Gilbert and Jayne, 2008; 2009; Dorward et al, 2008). They found evidence of such crowding-out effects. They also found that wealthier and better connected farmers were more likely to obtain fertilizer coupons. Their recommendation was therefore to target the fertilizer coupons towards households that are too poor to buy commercial fertilizer and towards geographic areas where commercial production is less well developed.

**Table 1. Distribution of coupons for fertilizer and seed**

Variable	2007/08	2008/09
Received coupons for fertilizer, %	68.0	75.3
Average number of coupons received	1.36	1.49
Recipients that used all coupons to obtain fertilizer, %	82.6	77.8
Households that received seed coupons, %	37.4	42.3
Average amount of maize seeds received for those receiving, kg	2.19	2.76

The Ministry of Agriculture and Food Security (MoAFS) has therefore attempted to develop a set of targeting criteria to improve this targeting efficiency during the last two production years. These targeting criteria for beneficiary selection include:

- a) A Malawian that owns a piece of land (they should own and the land should be cultivated)
- b) Guardians looking after physically challenged persons
- c) Residents of the village
- d) Only one beneficiary per household will be registered
- e) Vulnerable households such as child headed, female-headed or orphan headed households (MoAFS, 2008).

The interpretation of these criteria is not very clear, however, and leaves room for local variation in implementation of the criteria. This also makes it difficult to assess whether targeting has been successful. It is evident, however, that the criteria leaves out landless households but includes other vulnerable households that possess some land. Since almost all Malawian rural households have some land, the number of coupons is not sufficient to reach all landed households. This implies that the first criterion must be combined with one or more of the other criteria. Our interpretation is that priority should be given to land-owning vulnerable households, including female-headed and child-headed households that live in the village. Since the number of such households is small compared to the number of coupons, we expect that all these households should get a “full subsidy package” of one bag of basal dressing, one bag of top-dressing and a bag of maize seeds for the poverty targeting to be successful. We will use this to assess the degree of poverty-targeting success of the programme. As a second poverty targeting criterion we will assess whether these vulnerable households received a reduced package that contained at least parts of the full package. Finally, we will assess how the administrative distribution of coupons is correlated with key household characteristics. Dorward et al. (2008) found that a significant proportion of the subsidized fertilizers went to less poor households in the 2006/07 season and they expected that this was where the crowding out of commercial fertilizer demand was highest. It is therefore of interest to see whether the targeting of poor households has improved since then.

## **2.1. LEAKAGES OF COUPONS AND CROWDING-OUT EFFECTS**

Holden and Lunduka (2010) found evidence of other crowding-out mechanisms that may be more serious in limiting the targeting efficiency of the subsidy programme based on studies in two districts (Kasungu and Zomba) in Malawi. One of these was due to administrative errors and manipulation that partly has been captured by the DFID-supported monitoring system, the second is that there is a substantial (illegal) market for coupons and subsidized fertilizers. The basic

problem is that the list of potential beneficiary households may have been inflated from 2.5 million (according to the recent population census) to 3.8 million households possibly implying that many non-existing households have received fertilizer coupons. However, there is no consensus yet about what the correct rural population is. This study assumes that the population census is more reliable than the household registry generated through the input subsidy programme. The second problem relates to the fact that no proper record exists of how many coupons for fertilizers that have been printed and distributed (Logistic Unit, 2009). What is known, however, is the total amount of subsidized fertilizer that has been distributed by type of fertilizer.

The administrative system for coupon distribution is vulnerable to illegal activity and leakages of coupons such that too few coupons and fertilizer reach to the rural villages. However, at least part of the leaked coupons and fertilizer may still reach the villages through vendors (illegally) selling coupons and subsidized fertilizers. The household survey in the six districts included specific questions about access to coupons and fertilizers through these markets. We may assume that our estimates are an underestimate rather than an overestimate of this activity as all respondents may not have revealed full information on this. Some overview statistics from our survey are presented in Table 2.

**Table 2. Secondary markets for fertilizer coupons and fertilizers**

<b>Variable</b>	<b>2007/08</b>	<b>2008/09</b>
<b>Was the household offered to buy fertilizer coupons? % responding yes</b>	26.3	24.9
<b>Price offered for coupons. Median price, MKw/coupon for 50 kg bag</b>	1500	2500
<b>Did the household buy fertilizer coupons? % Yes</b>	14.0	13.5
<b>Number of coupons bought for those who bought. Average number</b>	1.96	2.04
<b>Did you manage to buy fertilizer with the purchased coupons? % Yes</b>	92.3	89.8
<b>Offered to sell your coupons? % Yes</b>	7.5	7.0
<b>Price offered to sell coupons. Median price per bag</b>	1500	2500
<b>Did the household sell any of the coupons received? % Yes</b>	0.8	1.1
<b>Was the household offered to buy cheap fertilizer? % Yes</b>	19.9	18.8
<b>What was the price offer for cheap fertilizer? Median price per bag</b>	3000	4500

In 2008/09 the commercial price for a 50 kg bag of fertilizer was about MK10 000. With a free coupon a household could get a bag of fertilizer at MK800, this implies a subsidy of MK 9200 per bag or 92%. For those buying coupons the price of fertilizer in 2008/09 would be the coupon price (e.g. MK2500) plus the MK 800<sup>2</sup>. This price is lower than the median price paid for cheap fertilizers, MK4500 in the same year.

One may speculate whether this secondary market for coupons partly is caused by some households that have received their coupons for free are selling their coupons. Particularly poor household may be unable to utilize the coupons efficiently, have difficulties of going to the depots to obtain the fertilizer if these are located far away and cueing and waiting is needed. We therefore investigated this in the survey. The responses are also presented in Table 2. While 7-8%

<sup>2</sup> Many households stated that they had to top up the MK800 with an additional MK200 to obtain the fertilizer at the official depots distributing the fertilizers.



of the households were offered to sell their coupons, only about 1% of them actually stated that they had sold any coupons in the two last production years. The large majority of the coupons in the unofficial market for coupons are therefore likely to come from other sources than the households that have received free coupons.

The average amounts of fertilizers obtained from the different channels; a) distribution of free coupons; b) purchase of coupons; and c) purchase of cheap fertilizers; are presented in Table 3. If these figures are representative for the country, these secondary markets are of substantial size and are likely to contribute to crowding out commercial demand for fertilizer. Although the supply of coupons was considerably higher in the 2008/2009 season than in the previous year, it appeared that the activity in these secondary markets was similar in the two years although the prices had risen substantially also in the secondary markets.

**Table 3. An assessment of leakage and the size of the secondary markets for coupons and fertilizers in 2008/09 season**

<i>Source of fertilizers</i>	<b>Average survey household, bags/household</b>
Coupon fertilizer bags per household, all rural households	1.12
Secondary market for coupons: Purchased coupons	0.28
Secondary market for fertilizer: Purchase of cheap fertilizer	0.23
Targeted households selling their coupons	0.01

Note: These calculations are for all households, while 75% of the households were found to receive at least one coupon.

One may ask what the leakages and secondary markets for coupons and subsidized fertilizers imply for the targeting of fertilizers. One basic hypothesis could be that these markets allocate fertilizers towards more efficient producers that are also more able to pay the prices demanded by those selling them and making a business out of this trade. The subsidy is then shared by the traders/vendors/others that have captured such coupons and fertilizers and reselling them and those being able to buy them at a reduced price as compared to the commercial price for fertilizers. The median prices for coupons at MK 2500/bag and for fertilizers at MK 4,500/bag in these markets give an idea about how the subsidy is shared. Those buying the coupons would have to pay an additional MK 800 to obtain the fertilizer at the depots while the commercial price was about MK 10,000/bag. Those buying these coupons and fertilizers are therefore still getting the largest share of the subsidy.

This secondary market for coupons and fertilizers is clearly a business driven by the targeted subsidy programme and it should also contribute to crowding out of commercial demand for fertilizer as it is highly likely that commercial farmers also are able to buy these types of coupons and fertilizers at reduced prices. This crowding out effect was not captured in earlier studies (Dorward et al. 2008; Ricker-Gilbert and Jayne, 2008; 2009) where it has been argued that targeting efficiency can be improved by targeting poorer households that cannot afford to buy commercial fertilizers and areas where there are few commercial farmers. While restrictions were imposed during 2008/09 that made it difficult to “cash in” coupons outside the district where they

were supposed to be used, this restriction may not be very efficient in reducing the crowding out effect.

As an anecdotal example, we interviewed households in Kasungu district who first failed to obtain free coupons and who then bought coupons (many of them were females). However, they afterwards, after having cued up for a long time at the ADMARK depot, failed to obtain fertilizer from their purchased coupons because these came from another district. It is obvious that such a restriction, if made countrywide, will reduce the mobility of coupons. In 2008/09 the restriction was only implemented in some districts.

### **2.1.1. Did the full input package reach the poor households?**

Our first question on targeting is to what extent a full input package reached poor households. Our data revealed that a fairly small share of the households received a full package. A common response to the arrival of too few coupons was to share the package among more households such that each household received one or sometimes even less than one bag of fertilizer. Female-headed households were included in the criteria for the type of vulnerable households that should be targeted. Our data for 2008/09 indicate that only 11% of female-headed households received the full package of at least two bags of fertilizers against 29% of the male-headed households. This may be explained by the leakages at higher levels, local favouritism, and preferences for more equal sharing causing the splitting of the packages.

We will now look at how the actual targeting of fertilizer coupons in 2008/09 was in terms of the household characteristics of recipients of coupons versus non-recipients of coupons. We used household size, household labour force, quality of the house, value of asset endowments, livestock endowments and farm size as wealth or poverty indicators. Simple T-tests were used to statistically compare recipients and non-recipients of fertilizer coupons in 2008/09. The last three variables were log-transformed to get a less skewed distribution. The findings are presented in Table 4.

**Table 4. Administrative targeting of fertilizer coupons in 2008/09 versus household characteristics**

Received coupon in 2008/09		Household size	Labour force	Quality of house	Log value of assets	Log livestock units	Log farm size
<b>No</b>	<b>Mean</b>	<b>4.83</b>	<b>2.94</b>	<b>8.76</b>	<b>4.94</b>	<b>0.18</b>	<b>0.60</b>
	St. error	0.19	0.12	0.29	0.38	0.03	0.03
	N	96	96	95	97	94	97
<b>Yes</b>	<b>Mean</b>	<b>5.43</b>	<b>3.12</b>	<b>9.15</b>	<b>4.16</b>	<b>0.30</b>	<b>0.61</b>
	St. error	0.13	0.09	0.17	0.26	0.03	0.02
	N	247	247	244	248	245	248
<b>All</b>	<b>Mean</b>	<b>5.27</b>	<b>3.07</b>	<b>9.04</b>	<b>4.38</b>	<b>0.27</b>	<b>0.60</b>
	St. error	0.11	0.07	0.15	0.21	0.02	0.02
	N	343	343	339	345	339	345
<b>T-test for difference</b>		2.54	1.12	1.19	-1.65	2.55	0.14
<b>P-value</b>		0.01	n.s	n.s.	n.s.	0.01	n.s.

We see from Table 4 that there was a significant difference in the characteristics of recipients and non-recipients of fertilizer coupons only in the case of household size and livestock endowment. Recipients of coupons both had a larger average household size and a larger livestock endowment than non-recipients of coupons. Only in the case of value of assets was there a tendency that recipients of coupons were poorer than non-recipients. The difference was almost significant at 10% level. Another test for whether female-headed households were more likely to receive coupons also failed to find a significant difference.

**Table 5. Administrative targeting of fertilizer coupons in 2008/09 towards children and women**

<b>Received coupon in 2008/09</b>	<b>Number of children</b>	<b>Consumer/worker ratio</b>	<b>Male labour force</b>	<b>Female labour force</b>
<b>No</b>	<b>2.20</b>	<b>1.22</b>	<b>1.56</b>	<b>1.38</b>
	0.15	0.02	0.09	0.07
	96	96	96	96
<b>Yes</b>	<b>2.79</b>	<b>1.31</b>	<b>1.71</b>	<b>1.41</b>
	0.10	0.02	0.07	0.05
	247	247	247	247
<b>All</b>	<b>2.63</b>	<b>1.28</b>	<b>1.67</b>	<b>1.40</b>
	0.09	0.01	0.05	0.04
	343	343	343	343
<b>T-test for difference</b>	3.14	2.95	1.24	0.31
<b>P-value</b>	0.005	0.005	n.s.	n.s.

However, as shown in Table 5, households with more children and with a higher consumer/worker ratio (these two variables are connected), were more likely to have received fertilizer coupons. These differences were highly significant. When we tried to subdivide the labour force in male and female labour, we found no significant difference for each of these for recipients versus non-recipients.

To further test the factors related to access to administratively distributed coupons during 2007/08 and 2008/2009 a number of logistic regression models were run with reception of fertilizer coupons as the dependent variable. Models with and without district dummy variables are presented in Table 6.

As can be seen from Table 6 the key results are stable to the alternative formulations. Households with more children were more likely to receive fertilizer coupons and so were households with more livestock endowments in 2008/09. These findings were highly significant. There were also significant differences between districts in the probability that households had received coupons. The same analysis for the previous year, 2007/08, showed the same result for the number of children which remained significant and with a positive sign while livestock endowment became insignificant.

**2.1.2. Who participates in the secondary markets for coupons and cheap fertilizers?**

A similar analysis of the factors correlated with participation in the secondary markets for purchase of coupons and cheap fertilizers was implemented. Our basic hypothesis is that the wealthier households are more likely to obtain coupons and cheap fertilizers through these markets. However, the fact that the prices in these markets are substantially lower than the commercial prices may reduce this wealth effect. Even we could propose that a study of the demand in this secondary market for coupons and cheap fertilizers could represent a simulation of how a general subsidy on fertilizer would work since the price here is substantially lower than the commercial price and trade is determined more freely by supply and demand. This market is, however, affected by the administratively targeted coupons which reduces the demand. After controlling for this administrative targeting, the demand may simulate the demand in the case of a general subsidy. However, one may also need to control for other general subsidy effects like exportation of cheap fertilizers into neighbouring countries. The results are presented for 2008/09 and 2007/08 with and without district dummy variables in Table 7 while controlling for actual receipt of coupons through the administrative distribution.

**Table 6. Logistic regressions for access to fertilizer coupons in 2007/08 and 2008/09**

	2007/08	2007/08	2008/09	2008/09
<b>Sex of household head</b>	-0.019	0.037	0.051	0.199
<b>Male=1, Female=0</b>	(0.29)	(0.31)	(0.31)	(0.35)
<b>Male labor force</b>	0.098	0.147	0.019	0.021
	(0.13)	(0.14)	(0.15)	(0.16)
<b>Female labor force</b>	-0.122	-0.059	-0.231	-0.244
	(0.18)	(0.19)	(0.19)	(0.21)
<b>Children</b>	0.249***	0.253***	0.325****	0.341****
	(0.09)	(0.09)	(0.09)	(0.10)
<b>Quality of house</b>	0.065	0.002	0.039	-0.064
	(0.05)	(0.05)	(0.05)	(0.06)
<b>Log value of assets/cu</b>	-0.041	0.006	-0.086**	-0.049
	(0.04)	(0.04)	(0.04)	(0.05)
<b>Log livestock units/cu</b>	-0.085	-0.016	2.741**	3.176***
	(0.73)	(0.75)	(1.14)	(1.19)
<b>Log farm size/cu</b>	-0.096	0.287	-0.606	-0.588
	(0.61)	(0.67)	(0.67)	(0.75)
<b>Zomba district</b>		-1.343***		-2.464***
		(0.48)		(0.77)
<b>Chiradzulu district</b>		-0.159		-1.154
		(0.66)		(0.97)
<b>Machinga district</b>		-1.775***		-3.334****
		(0.59)		(0.87)
<b>Kasungu district</b>		-1.266**		-1.701**
		(0.52)		(0.82)
<b>Lilongwe district</b>		-1.881****		-3.381****

		(0.50)		(0.79)
<b>Constant</b>	-0.343	0.97	0.307	3.245****
	-0.53	-0.68	-0.57	(0.99)
<b>Prob &gt; chi2</b>	0.058	0.000	0.001	0.000
<b>Number of obs.</b>	335	335	335	335

Note: Dependent variable: 1 if received coupon, 0 otherwise. Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%. Thyolo district was the base reference in models with district dummies.

Table 7 shows that there was a positive correlation between receiving free coupons and purchase of coupons, however the correlation was no longer significant after introduction of district dummy variables. The most significant and robust finding is that livestock-rich households were more likely to have bought coupons. Households with better quality house were also more likely to have bought coupons. Male-headed households were more likely to have bought coupons in 2007/08 than female-headed households while households with more female labour force were more likely to have bought coupons.

**Table 7. Factors affecting purchase of fertilizer coupons in 2007/08 and 2008/09**

	2007/08	2007/08	2008/09	2008/09
<b>Received free coupons</b>	0.920**	0.707	0.954**	0.773
	(0.41)	(0.44)	(0.47)	(0.51)
<b>Sex of household head</b>	1.134**	1.205**	0.569	0.639
<b>Male=1, Female=0</b>	(0.51)	(0.53)	(0.47)	(0.47)
<b>Male labor force</b>	-0.369*	-0.286	-0.115	-0.139
	(0.19)	(0.20)	(0.18)	(0.18)
<b>Female labour force</b>	0.366	0.542**	-0.029	-0.042
	(0.23)	(0.25)	(0.25)	(0.25)
<b>Children</b>	-0.088	-0.023	-0.11	-0.12
	(0.11)	(0.12)	(0.12)	(0.12)
<b>Quality of house</b>	0.200***	0.136*	0.124*	0.119
	(0.07)	(0.07)	(0.07)	(0.07)
<b>Log value of assets/cu</b>	0.008	0.069	-0.005	-0.002
	(0.05)	(0.06)	(0.05)	(0.06)
<b>Log livestock units/cu</b>	3.466****	3.961****	2.529***	2.521***
	(0.87)	-0.90)	(0.88)	(0.90)
<b>Log farm size/cu</b>	0.292	1.636*	-0.607	-0.68
	(0.87)	(0.84)	(1.15)	(1.21)
<b>Zomba district</b>		-0.982*		-0.561
		(0.50)		(0.52)
<b>Chiradzulu district</b>		-0.564		-0.706
		(0.61)		(0.67)
<b>Machinga district</b>		-1.620*		-0.159
		(0.85)		(0.75)

<b>Kasungu district</b>		-2.350****		-0.157
		(0.69)		(0.55)
<b>Lilongwe district</b>		-1.585***		-1.075*
		(0.60)		(0.64)
<b>Constant</b>	-5.438****	-4.779****	-3.838****	-3.190***
	(0.95)	(1.03)	(0.89)	(1.01)
<b>Prob &gt; chi2</b>	0.000	0.000	0.002	0.007
<b>Number of obs.</b>	335	335	335	335

Note: Dependent variable: 1 if purchased coupons, 0 otherwise. Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%. Thyolo district was the base reference in models with district dummies.

Table 8 provides the same type of analysis for factors correlated with the purchase of cheap fertilizers in the informal market. We expected similar factors to affect the demand in this market as in the market for coupons. It was therefore surprising to find that households with more children were more likely to buy cheap fertilizers. The value of assets was positively associated with purchase of cheap fertilizers in the first of the two years while livestock endowments were not significant in these models.

**Table 8. Factors affecting purchase of cheap fertilizers in 2007/08 and 2008/09**

	2007/08	2007/08	2008/09	2008/09
<b>Received free coupons</b>	0.398	0.133	-0.227	-0.429
	(0.32)	(0.35)	(0.39)	(0.43)
<b>Sex of household head</b>	-0.015	0.026	0.455	0.456
<b>Male=1, Female=0</b>	(0.39)	(0.41)	(0.50)	(0.51)
<b>Male labour force</b>	0.085	0.123	0.212	0.186
	(0.15)	(0.16)	(0.17)	(0.18)
<b>Female labour force</b>	-0.05	0.016	-0.15	-0.114
	(0.21)	(0.22)	(0.25)	(0.26)
<b>Children</b>	0.179*	0.240**	0.229**	0.230*
	(0.10)	(0.11)	(0.12)	(0.12)
<b>Quality of house</b>	0.043	-0.012	0.159**	0.114
	(0.06)	(0.06)	(0.07)	(0.07)
<b>Log value of assets/cu</b>	0.109***	0.154****	-0.002	0.055
	(0.04)	(0.05)	(0.04)	(0.05)
<b>Log livestock units/cu</b>	0.208	0.164	0.121	0.278
	(0.38)	(0.41)	(0.43)	(0.46)
<b>Log farm size/cu</b>	-0.172	0.693	-0.156	0.094
	(0.45)	(0.51)	(0.53)	(0.59)
<b>Zomba district</b>		-1.005**		0.21
		(0.44)		(0.58)
<b>Chiradzulu district</b>		-1.212*		1.256*
		(0.66)		(0.64)

<b>Machinga district</b>		-1.522**		-1.314
		(0.70)		(1.17)
<b>Kasungu district</b>		-2.424****		-0.462
		(0.58)		(0.67)
<b>Lilongwe district</b>		-1.930****		-0.328
		(0.53)		(0.67)
<b>Constant</b>	-3.124****	-2.221***	-4.336****	-4.228****
	(0.68)	(0.78)	(0.89)	(1.05)
<b>Prob &gt; chi2</b>	0.038	0	0.044	0.018
<b>Number of obs.</b>	335	335	335	335

Note: Dependent variable: 1 if purchased cheap fertilizers, 0 otherwise. Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%. Thyolo district was the base reference in models with district dummies.

## 2.2. CONCLUSION REGARDING TARGETING

We may conclude based on this that the administrative targeting has failed to reach many of the poorest households as the livestock-rich households were the most likely to receive such coupons. The findings that households with more children and with higher consumer/worker ratio were more likely to have received free coupons may indicate that households with higher consumption needs have been reached through the administrative targeting although these are not the poorest households. A correlation analysis between number of children and the key wealth variables; quality of house, livestock endowment, value of assets and farm size; revealed no significant correlation with number of children. Female-headed households were less likely to have received the full package while male-headed households were more likely to have purchased coupons in 2007/08.

The analyses of data from the secondary markets for coupons and cheap fertilizers do not indicate that these markets lead to a very different distribution of coupons and fertilizers than the administrative targeting does. Both systems appear to favour the wealthier households. This gives reasons to question whether the administrative targeting system is really worth the extra costs involved. Considering findings in earlier studies of the targeting efficiency (Dorward et al. 2008), the survey provides no convincing evidence that the administrative targeting of the poor has improved since 2005. Below we will come back to other social dimensions of the administrative targeting system before we make our final conclusions based on this study.

## 3. FERTILIZER USE, COSTS AND PRICES PAID BY HOUSEHOLDS

The average use of fertilizer in kg per household, average and median fertilizer costs per household in MK and average and median household level fertilizer prices per 50 kg bag are presented in Table 9.

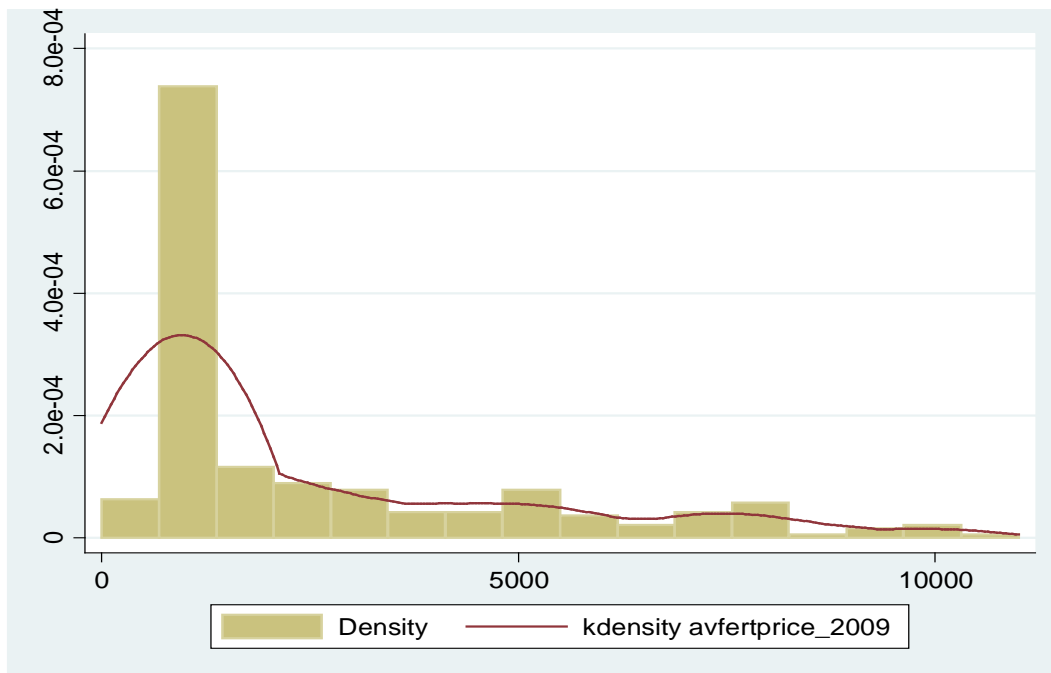
**Table 9. Fertilizer use by households by fertilizer type, fertilizer cost and fertilizer price paid by households**

Variable	2007/08	2008/09
Total fertilizer use, average kg per household	78.3	102.3
Total fertilizer cost per household, average MKw	6,190	10,002
Total fertilizer cost per household, median MKw	1,800	2,400
Average fertilizer price paid per household per 50 kg bag	2,149	2,505
Median fertilizer price paid per household per 50 kg bag	950	1,150

If households only had access to subsidized fertilizer in form of coupons, the price per 50 kg bag would have been 800 MK. We see from Table 10 that the average price was MK 2,149 in 2007/08 and MK2,505 in 2008/2009. This higher price is caused by a combination of free coupon fertilizer exchanged at MK 800, purchase of coupons and cheap fertilizers, and some purchase at full price.

The distribution of average fertilizer price paid per household per bag of fertilizer (all types) is presented in Figure 1 for 2008/2009. The figure shows that the large majority of households obtained cheap fertilizer and hardly any households obtained fertilizer only at the commercial price of about MK9500-10000, showing that the markets for coupons and subsidized fertilizers supply most of the fertilizers also to those that did not receive free fertilizer coupons.

Figure 2 shows the distribution of prices for coupons for fertilizers for those buying coupons. Figure 3 shows the distribution of the prices for cheaper fertilizers purchased by the households in the informal market for fertilizers. We see that the prices for coupons tended to be lower than the prices for cheap fertilizers as could be expected.



**Figure 1. Distribution of average fertilizer price per 50 kg bag of fertilizer for households in 2008/09**



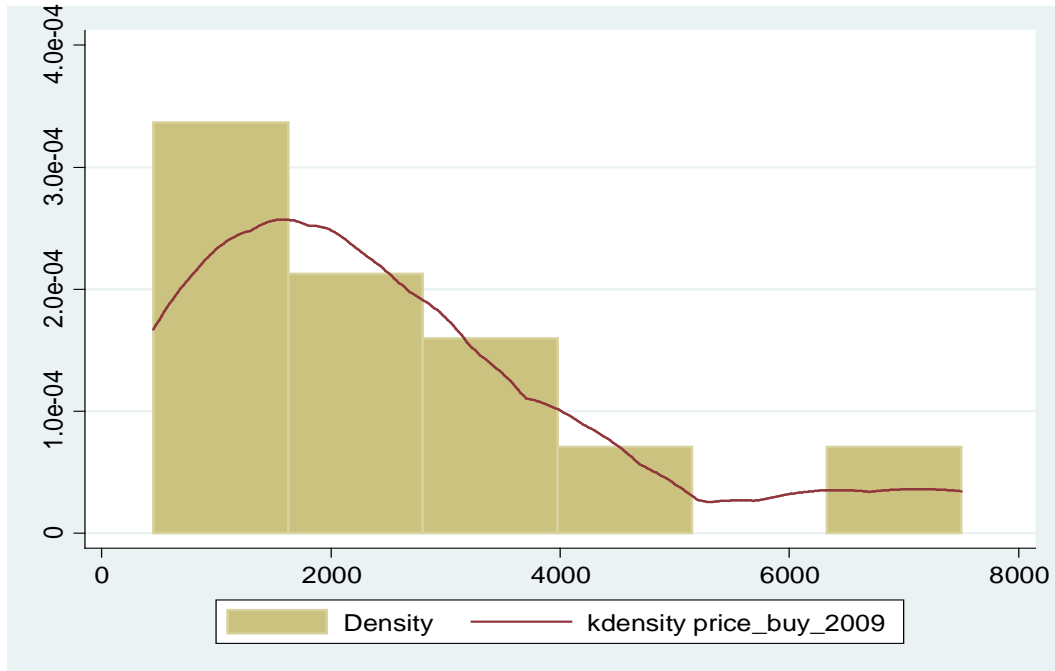


Figure 2. The price distribution for coupons for 50 kg bags of fertilizer in 2008/09

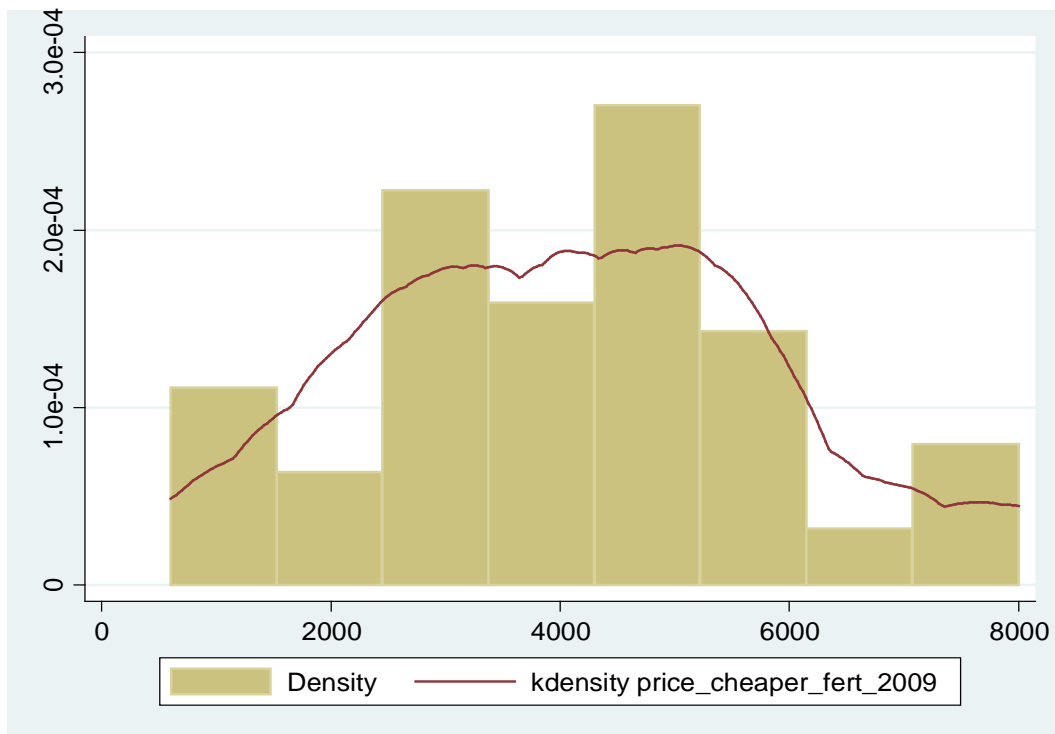


Figure 3. The price distribution for 50 kg bags of cheap fertilizers sold in the informal market 2008/09

How timely and adequately was the fertilizer supply in the two last production years? Table 10 summarizes the responses from the survey households on this question. There appears to be an improvement in the timeliness of fertilizer supply from 2007/08 to 2008/09 in the study areas.

**Table 10. Timeliness and adequacy of fertilizer supply in the study areas**

<b>Variable</b>	<b>2007/08</b>	<b>2008/09</b>
<b>Sufficient fertilizer arrived on time, % of respondents</b>	51.1	67.5
<b>The fertilizer arrived too late, % of respondents</b>	36.8	18.8
<b>The fertilizer supply was insufficient in quantify, %</b>	5.5	6.1
<b>The supply was both insufficient and arrived too late, %</b>	6.3	7.6

#### **4. IMPACTS OF THE INPUT SUBSIDY PROGRAMME**

We have explored a number of possible effects of the subsidy programme. These indicators include households' own perceptions of their situation, their agricultural production, and status as net buyers or net sellers of food (maize) and perceived food security. We have also investigated their perceptions of the effect on a wider set of welfare indicators like school attendance of children, health of children, crime- and conflict levels in the villages. Below we provide a mix of descriptive statistics and simple impact assessments.

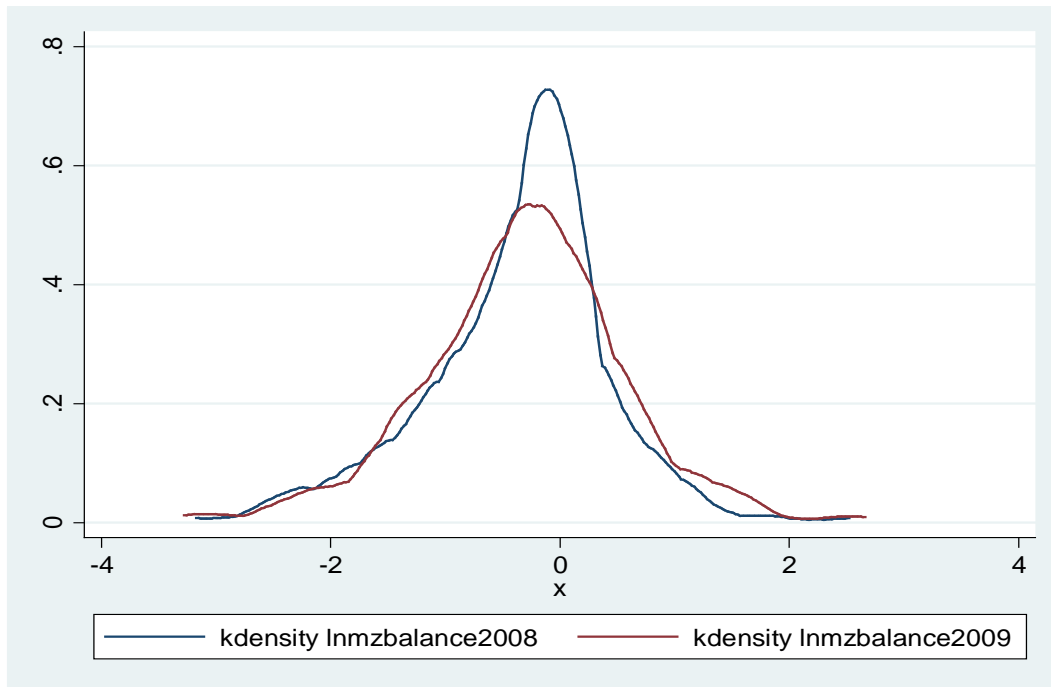
One may question what the appropriate counterfactual is for this type of analysis. As a simple assessment we have asked people to compare with the situation without the programme. A more appropriate comparison would have been an alternative programme with the same cost. Our earlier analysis makes some comparisons with a general fertilizer subsidy rather than the targeted subsidy. Randomized social experiments would be required to make such an analysis which was not feasible in this case. We instead assess the impact from receiving the administratively distributed coupons on household maize production and status in the maize market as net seller, self-sufficient or net buyer while controlling for the determinants of administrative allocation of coupons.

To what extent were households net sellers, self-sufficient or net buyers of maize? Table 11 gives an overview of this situation for the two years. More than 60% of the households were net buyers of maize, indicating that even with these high levels of fertilizer subsidies and distribution of free fertilizer coupons to the majority of households, the majority still depends on buying additional maize to meet their consumption demand for maize.

**Table 11. Categorization of households as net sellers, self-sufficient and net buyers of maize**

Variable	2007/08	2008/09
Net sellers, % of households	21.1	25.9
Self-sufficient, % of households	17.2	13.8
Net buyers, % of households	61.7	60.3

Figure 4 shows the distribution of the net household level surplus/deficit for the two production years. The distributions are based on log-transformed production and consumption levels for maize ( $\log(\text{production in kg}) - \log(\text{consumption in kg})$ ). It can be seen that most households are close to being self-sufficient with maize and there is no big difference between the two years.



**Figure 4. Kernel density distributions of household surplus/deficit production of maize by year**

How does access to fertilizer coupons and cheap fertilizers affect the status of households as net-sellers, self-sufficient and net buyers of maize? We expect to see that access to fertilizer coupons and cheap fertilizers reduces the probability that households are net buyers and increases the probability that they are net sellers. We investigate this in Table 13 below for both seasons 2007/08 and 2008/09. In both years we see that receipt of free coupons reduced the probability that households are net buyers and increased the probability that they are net sellers. This is the case after controlling for observable household characteristics that also have affected access to coupons. Access to coupons through purchase had a significant additional effect in the same direction in 2008/09 while purchase of cheap fertilizers had a significant additional effect in the same direction in 2007/08. In 2008/09 male-headed households were also less likely to be net buyers and more likely to be net sellers than female-headed households. This, together with the

earlier findings, indicates that the administrative targeting has not been successful in targeting female-headed households. Furthermore, we see that households with larger land endowment per consumer and more livestock per consumer were more likely to be net sellers and less likely to be net buyers. This is also as expected and implies that land- and livestock-poor households are more food insecure. Overall, the distribution of coupons appears to significantly improve food security of households despite their inefficient targeting.

Table 12 also presents the results for the effect of the access to free coupons, purchased coupons and cheap fertilizers. There was a strong positive correlation between access to free coupons and total maize production of the households after controlling for household wealth endowments and other household characteristics (we failed to find strong instruments to predict access to coupons). Similarly we find a positive correlation between total maize production and the dummy variables for households having bought coupons or bought cheap fertilizers. This indicates that the subsidy programme enhances household maize production for those accessing coupons and fertilizers.

Table 13 summarizes the overall perceived effect of fertilizer coupons on the food security of the households. It can be seen that about 2/3 of the households perceived the effect to be positive, while less than 1/4 perceived there to be no effect, and about 8% perceived there to be a negative effect. When asking about the perception of the overall effect on food security in the community, about 69% of the respondents perceived there to be a positive effect on food security.

**Table 12. The effect of access to fertilizer coupons and cheap fertilizer on the status as net seller, self-sufficient or net buyer of maize and on total maize production in 2007/08 and 2008/09**

Variables	Status in the market		Total maize production	
	2007/08	2008/09	2007/08	2008/09
<b>Received free coupons</b>	-0.524*** (0.18)	-0.602*** (0.22)	0.511***** (0.12)	0.442*** (0.14)
<b>Bought coupons</b>	-0.077 (0.22)	-0.485** (0.23)	0.263* (0.16)	0.356** (0.15)
<b>Bought cheap fertilizers</b>	-0.561*** (0.20)	-0.16 (0.20)	0.505***** (0.14)	0.369*** (0.13)
<b>Sex of household head</b>	-0.116 (0.20)	-0.634*** (0.22)	-0.018 (0.14)	0.313** (0.13)
<b>Male=1, Female=0</b>				
<b>Male labour force</b>	0.005 (0.08)	-0.043 (0.08)	0.116** (0.06)	0.132** (0.06)
<b>Female labour force</b>	0.116 (0.12)	0.233* (0.13)	0.162** (0.08)	0.009 (0.08)
<b>Children</b>	-0.003 (0.05)	-0.052 (0.05)	0.017 (0.04)	0.068* (0.03)
<b>Quality of house</b>	0.028 (0.03)	0.006 (0.03)	0.048** (0.02)	0.035* (0.02)
<b>Log value of assets</b>	-0.031 (0.03)	-0.028 (0.03)	0.037* (0.02)	0.025 (0.02)
<b>Log livestock units</b>	-0.806* (0.48)	-0.984* (0.51)	0.731** (0.33)	0.869*** (0.32)
<b>Log farm size</b>	-2.069***** (0.58)	-1.273** (0.61)	1.064*** (0.41)	1.399***** (0.40)
<b>Zomba district</b>	0.309 (0.27)	0.312 (0.26)	-0.404** (0.18)	-0.602***** (0.17)
<b>Chiradzulu district</b>	0.05 (0.30)	-0.165 (0.29)	-0.253 (0.21)	-0.297 (0.19)
<b>Machinga district</b>	0.544 (0.36)	0.741** (0.37)	-0.621*** (0.24)	-0.786***** (0.22)
<b>Kasungu district</b>	0.118 (0.28)	0.102 (0.27)	-0.246 (0.20)	-0.137 (0.18)
<b>Lilongwe district</b>	-0.334 (0.26)	-0.126 (0.27)	-0.043 (0.19)	-0.097 (0.17)
<b>Cut1 constant</b>	-1.658***** (0.40)	-2.023***** (0.45)		
<b>Cut2 constant</b>	-1.081*** (0.39)	-1.571***** (0.45)		

<b>Constant</b>			4.492****	4.470****
			(0.27)	(0.27)
<b>R-squared</b>			0.34	0.37
<b>Prob &gt; chi2</b>	0.000	0.000	0.000	0.000
<b>Number of obs.</b>	298	285	295	281

Note: Results from ordered probit models with dependent variable=1 for net sellers, =2 for self-sufficient, and =3 for net buyers of maize. Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%. Thyolo district was the base reference in models with district dummies.

**Table 13. Overall effect of fertilizer coupons on the food security of the household and on the community in general**

<b>Response</b>	<b>Effect on household %</b>	<b>Effect on community %</b>
No effect on food security, % of respondents	<b>23.1</b>	<b>25.5</b>
Food security situation is worse	<b>7.6</b>	<b>4.0</b>
Food security situation has improved	<b>66.1</b>	<b>68.9</b>

It is of particular interest to see whether the fertilizer subsidy programme has lasting effects on investments or whether it primarily leads to increased consumption of maize with little residual effect on investments and productivity. Table 14 provides some evidence on this. About 27% of the households perceived that the fertilizer subsidy programme leads to increased investments. About 30% of the households perceived the programme to lead to an increase in maize consumption. Relatively few households perceived that a reduction in consumption of other staples was the primary consumption effect. This may be a sign of a positive health effect of the programme.

**Table 14. Effects of the fertilizer coupon system on investments and consumption (diet) of households**

<b>Response</b>	<b>Effect on investment %</b>	<b>Response</b>	<b>Effect on consumption %</b>
No effect	<b>67.0</b>	No effect	<b>64.1</b>
Reduced investments	<b>5.6</b>	Increased maize consumption	<b>29.9</b>
Increased investments	<b>26.7</b>	Reduced consumption of other staples	<b>4.9</b>

The perceptions on the effects of the programme on children's health and school attendance are summarized in Table 15. We can see that about 40% of the households perceived there to be positive effects of the programme on children's health and 65% that there was a positive effect on school attendance while very few perceived there to be any negative effects on these indicators.

**Table 15. Effects of the fertilizer coupon system on children’s health and on school attendance**

<b>Response</b>	<b>Effect on children’s health %</b>	<b>Response</b>	<b>Effect on school attendance %</b>
No effect	<b>54.9</b>	No effect	<b>31.0</b>
Improved health	<b>40.5</b>	Improved attendance	<b>64.7</b>
Worsened health	<b>2.5</b>	Worsened attendance	<b>3.7</b>

The subsidy programme may also affect crime levels and conflicts in the villages. We could hypothesize that improved food security reduces the need for criminal activity to meet basic needs. On the other hand, the targeted subsidy programme itself may stimulate illegal rent-seeking activity and corruption that also can enhance conflicts and criminal activity. Table 16 seems to find signs of both of these effects according to household perceptions. The negative effects on crime and conflict levels appear to dominate the positive effects, and even more so in the case of conflicts.

**Table 16. Effects of the fertilizer coupon system on crime level and on conflicts**

<b>Response</b>	<b>Effect on crime level %</b>	<b>Response</b>	<b>Effect on conflicts %</b>
No effect	<b>30.1</b>	No effect	<b>6.7</b>
Reduced	<b>26.2</b>	Less conflicts	<b>37.6</b>
Increased	<b>43.7</b>	More conflicts	<b>55.2</b>

To get a better idea about who are perceived to benefit the most from the subsidy programme we summarize the responses to this question in Table 17. It can be seen that 34% perceived the wealthiest households to benefit most, 44% perceived that all benefit, while 17% perceive the poorest to benefit most and only 4% perceive that nobody benefit.

**Table 17. Perceptions of who benefit the most from the fertilizer coupon system in the community**

<b>Response</b>	<b>%</b>
The poorest households	<b>17.3</b>
The wealthiest households	<b>34.3</b>
All benefit	<b>44.3</b>
Nobody benefit	<b>4.0</b>

The responses in the last Table indicate that the poverty targeting system, as it has been practiced the last two years, is far from perfect. There are reasons to question whether the targeted coupon system with all its extra administrative costs achieve a substantially better targeting of the poor than a general subsidy on fertilizers would do, taking into account the substantially lower administrative costs of such a system. An alternative could also be a general subsidy in

combination with a cash transfer system to the poorest households. A general subsidy would also channel more of the entrepreneurial skills away from rent-seeking activity in the subsidy programme and hopefully towards more productive activities.

We will now present the results of our analysis of the household panel covering the years 2006, 2007 and 2009 and assess the impacts of the targeted subsidies on households' investments and asset building. We have estimated the real value of assets for the households as well as their livestock endowment measured in tropical livestock units. We include a dummy variable for whether households have received subsidies or not in each of the years. The problem with this subsidy variable is that it is endogenous. We have therefore also run a model to predict access to subsidized fertilizer. We used an unconventional approach for this which briefly may be explained as follows: We used a linear probability model with household fixed effects and used it to predict the likelihood of households receiving subsidized (coupon) fertilizer. We derived four categories of observations for households:

- a) Subsidy01: Have not received subsidy but was predicted to get
- b) Subsidy11: Received subsidy and was predicted to get
- c) Subsidy10: Received subsidy and was not predicted to get
- d) Subsidy00: Did not receive subsidy and was not predicted to get (used as "baseline").

With clear targeting criteria based on household characteristics these four variables should capture errors of exclusion and errors of inclusion and we may expect systematic differences between these four groups and these differences may also have implications for the impacts. With unclear targeting criteria that vary across communities and years it is possible that such differences will be insignificant.

A general comment is also relevant for the impacts of the programme. The size of the programme implies that it has large general equilibrium effects and it is possible that these general equilibrium effects are the most important. These effects include among others more food available at a cheaper price and more employment opportunities and better wages. Finally, since the period from 2005 to 2009 was a period without serious droughts in Malawi but came after a period with some severe droughts and flood problems, a general welfare improvement (recovery) should be expected. The models we present have used household fixed effects (favoured over household random effects models, based on Hausman tests), meaning that we are controlling for time-invariant observable and unobservable household characteristics that could be associated with asset accumulation and access to subsidies. Based on these comments we present the results in Table 18.

We can see that there was a general build up of assets during the period from 2006 to 2009 clearly indicating that welfare has improved on a broad scale. A faster build up of assets was also weakly associated with better quality housing. There is no indication that households that received subsidized fertilizer were more able to accumulate assets than others. Among the predicted variables it was surprising to find that the "errors of inclusion"-variable (Subsidy10) was associated with less asset accumulation but the variable was only significant at 10% level. It is also possible that the unclear targeting criteria that may vary over time and space cause the problem of identifying direct impacts of access to subsidies on investment in endowments. The leakages and access to coupons and cheap fertilizers also make it harder to identify the direct



impacts of access to free coupons. Lack of significant direct impacts on investments may also imply that the general equilibrium effects of the programme are more important than the targeting per se.

For the livestock endowment models it was only the farm size variable that was significant. This means that accumulation of livestock took place only for households that increased their farm size during the period (since these are models with household fixed effects).

**Table 18. Endowment impacts of the subsidy programme 2006-2009: Household panel data models**

	Real asset value	Real asset value	Livestock endowment	Livestock endowment
<b>Fertilizer subsidy dummy</b>	-57.051 (761.29)		0.076 (0.13)	
<b>Age of household head</b>	-34.162 (40.07)	-30.166 (25.57)	0.009 (0.01)	0.009 (0.01)
<b>Sex of household head</b>	262.782 (1261.42)	387.901 (1458.52)	0.175 (0.22)	0.177 (0.20)
<b>Farm size in ha</b>	-22.403 (371.42)	-2.319 (759.20)	0.275**** (0.06)	0.279** (0.12)
<b>Male labour endowment</b>	48.451 (556.29)	69.674 (683.22)	-0.035 (0.10)	-0.029 (0.15)
<b>Female labour endowment</b>	951.766 (695.28)	933.598 (710.10)	0.094 (0.12)	0.092 (0.15)
<b>Quality of house</b>	346.332* (190.62)	336.312* (198.97)	0.043 (0.03)	0.042 (0.04)
<b>Dummy for 2007</b>	1782.409** (700.37)	1600.031** (710.16)	-0.091 (0.12)	-0.112 (0.14)
<b>Dummy for 2009</b>	3560.799**** (755.12)	3433.617**** (1040.04)	-0.152 (0.13)	-0.171 (0.16)
<b>Subsidy01</b>		-1355.031 (2090.71)		-0.048 (0.30)
<b>Subsidy11</b>		345.101 (1614.20)		0.166 (0.31)
<b>Subsidy10</b>		-2589.621* (1352.19)		-0.138 (0.25)
<b>Constant</b>	2852.689 (2952.41)	2795.609 (3270.81)	-0.029 (0.51)	-0.064 (0.61)
<b>Prob &gt; chi2</b>	0.000	0.002	0.000	0.383
<b>Number of obs.</b>	1183	1188	1176	1181

Note: A three year (2006, 2007, 2009) household panel has been used, applying household fixed effects. Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%.

To further test for investment impacts of the targeted subsidy programme, an aggregate variable for the number of times the household had received free fertilizer coupons over the last four years, 2006-2009, was generated and included as a right hand side variable in the household panel models with household random and fixed effects to control for unobservable household characteristics that may affect both access to subsidies and asset accumulation. However, the aggregate subsidy variable was not significant in any of the models. When regressing the aggregate subsidy variable on the 2006 household characteristics and district dummy variables, only the district dummy variables came out as significant. These findings strengthen the impression that the direct targeting effect of the subsidy programme is less important than the economy-wide effect of the programme when it comes to growth effects in the economy.

Finally we asked the households to indicate the most important problem related to the current input subsidy system. The responses are recorded in Table 19.

**Table 19. Household perceptions of the main problems with the current input subsidy programme**

<b>Category</b>	<b>Most important problem</b>	
	Frequency	Percent
<b>No problem</b>	16	4.7
<b>Insufficient coupons</b>	96	28.2
<b>Late distribution of coupons</b>	6	1.8
<b>Late supply of inputs</b>	6	1.8
<b>Logistic problem at ADMARC</b>	7	2.1
<b>Insufficient inputs</b>	22	6.5
<b>Inputs unaffordable</b>	2	0.6
<b>Corruption</b>	145	42.5
<b>Conflicts</b>	39	11.4
<b>Poor coordination</b>	2	0.6
<b>Total</b>	341	100

As much as 43% of the respondents indicated that the most important problem related to the fertilizer subsidy programme was related to corruption, favouritism and biases in the distribution of the targeted coupons. The frequently mentioned problem of insufficient coupons can also partly be explained by the administrative leakages and poor targeting. Many expressed anger towards the chiefs for their biased distribution and illegal sales of coupons causing many not to get a coupon or have to share one coupon with others. It appears that this is the Achilles heel of the programme which seems to breed illegal activity at many levels. This needs to be taken seriously in the future as conflicts may grow stronger if and when the programme is to be scaled down or phased out.

As a follow up question we also asked households about what the main solution to the problems stated above would be. Their responses are summarized in Table 20. The first group of solutions (1-5) relate to the supply of inputs and coupons and accounts for about 47% of the responses. Within this group the main stated solution is to provide more coupons for fertilizer. The second

group of solutions (6-8) consisting of about 15% of the households, recommend abolishing the targeted coupon system and introducing a general fertilizer subsidy instead. The third group of solutions (9-15) focuses on reducing the corruption, favouritism, leakages, and poor targeting, and is seen as the main solution by 34% of the households. Since the government is limited in its capacity to expand the overall distribution of coupons and fertilizers due to budget restrictions, the more realistic solutions are either the second or the third groups of solutions. That means they either have to switch to a general fertilizer subsidy or they have to make a much more serious effort than in the past in addressing the leakages, corruption and unclear targeting of the coupons.

**Table 20. Households' suggested solutions to the problems with the targeted input subsidy programme**

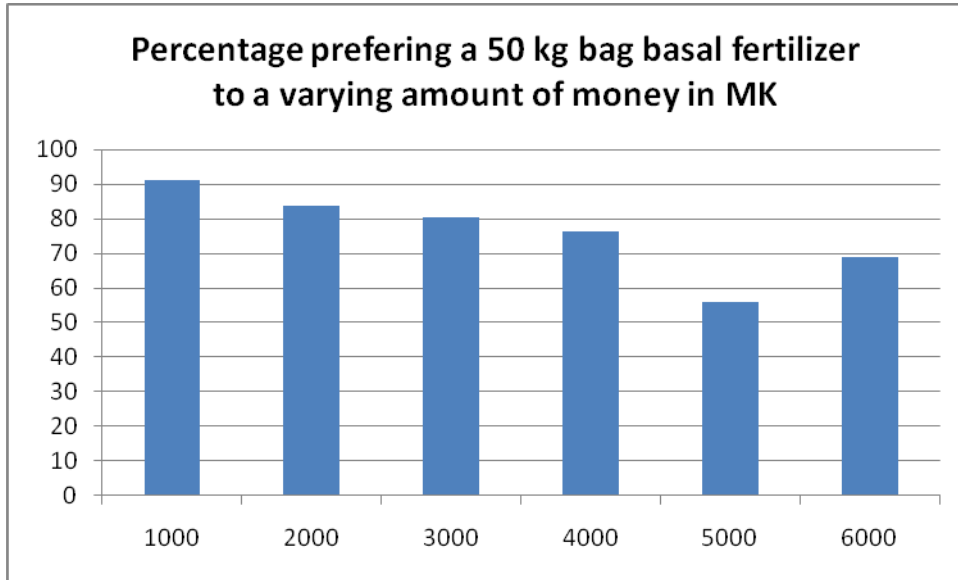
	<b>Solutions suggested by households</b>	<b>Freq.</b>	<b>Percent</b>
1	<b>Provide enough inputs</b>	29	9.8
2	<b>Distribute inputs early</b>	8	2.7
3	<b>More ADMARK depots</b>	7	2.4
4	<b>Provide more/enough coupons</b>	92	31.0
5	<b>Improve security at ADMARK depots</b>	3	1.0
6	<b>Stop coupon system</b>	11	3.7
7	<b>Introduce general fertilizer subsidy</b>	31	10.4
8	<b>Reduce prices</b>	2	0.7
9	<b>Improve coupon distribution system (government)</b>	58	19.5
10	<b>Give responsibility for distribution to independent outsiders</b>	7	2.4
11	<b>Distribute through clubs</b>	3	1.0
12	<b>Not involve chiefs in coupon distribution</b>	26	8.8
13	<b>Give coupons to the poor</b>	3	1.0
14	<b>Vendors should not have access</b>	1	0.3
15	<b>Arrest corrupt chiefs</b>	2	0.7
16	<b>No solution</b>	7	2.4
17	<b>Other</b>	7	2.4
	<b>Total</b>	297	100.0

## **5. SOCIAL EXPERIMENTS**

A number of social experiments related to household preferences for fertilizers, coupons for fertilizer, willingness to pay for the inputs, willingness to sell or buy input packages, allocation of a cash budget for fertilizer versus other expenditure categories, were included in the survey. Below we summarize some of the basic findings from these experiments.

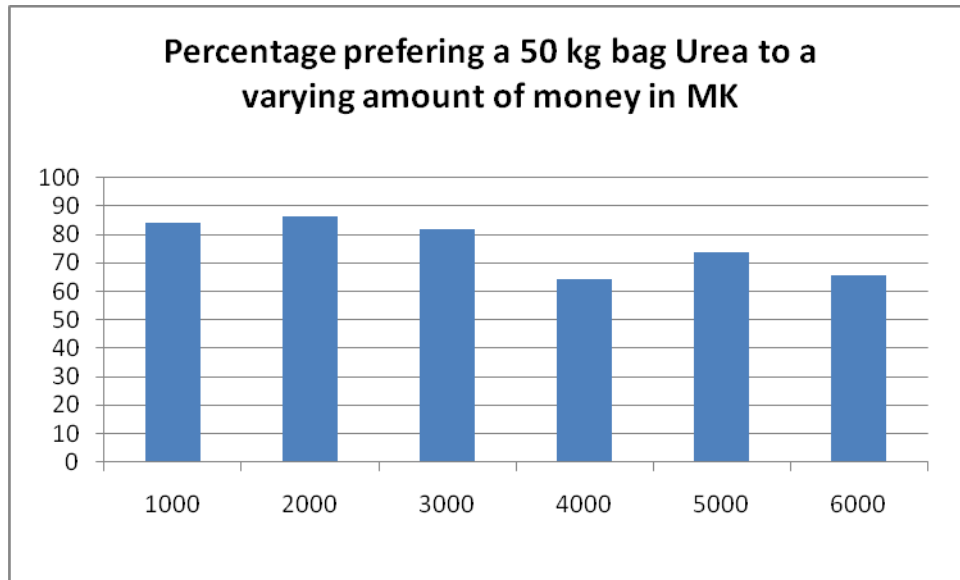
The first six experiments were hypothetical. Figure 4 below shows the percentage of households that preferred a 50 kg bag of basal fertilizer rather than a randomly determined amount of Malawi Kwacha (MK) varying between MK1000 and MK6000. The amount that each household was offered was determined by throwing a dice. The commercial fertilizer price at the time of the

survey (July/August 2009) was about MK4000 while it had been as high as MK10 000 at the beginning of the last rainy season (2008/09). A fairly large share of the households preferred to keep the fertilizer even if the price was 50% higher than the current commercial price at a time of the year (just after harvest) when there are still many months till the planting season when the fertilizer can be used.



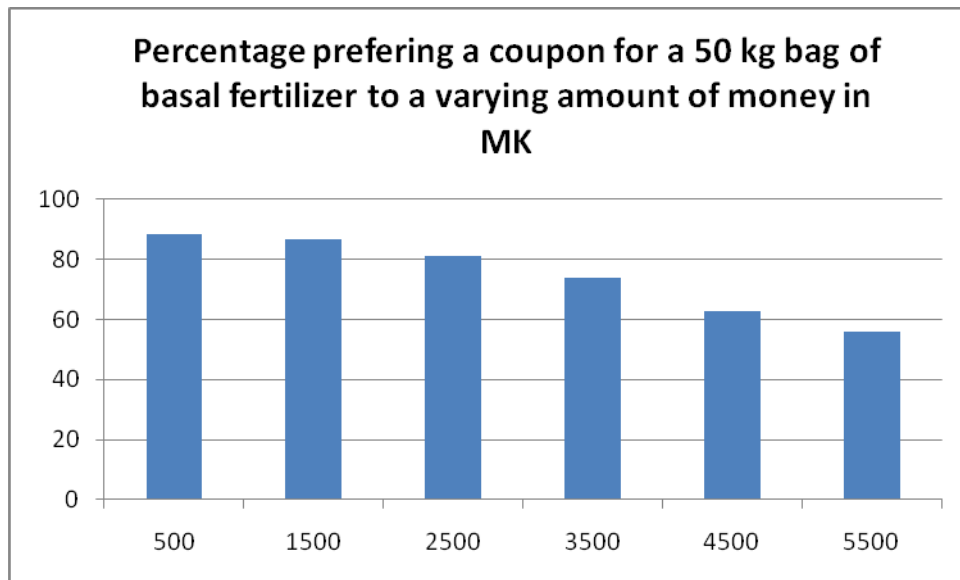
**Figure 5. Choice experiment 1 between basal fertilizer (23-21) and varying amounts of cash.**

Figure 6 provides the same type of data for a 50 kg bag of urea (nitrogen) fertilizer. It can be seen that households have a strong preference for keeping the fertilizer rather than the cash amounts even when the cash amounts are larger than the current commercial price for urea fertilizers (MK4000). This indicates clearly that fertilizer is in high demand even if it has been heavily subsidized over several years through the targeted input subsidy programme. We see that at least 60% of the households still prefer a bag or basal or urea fertilizer when the alternative is MK 6000.



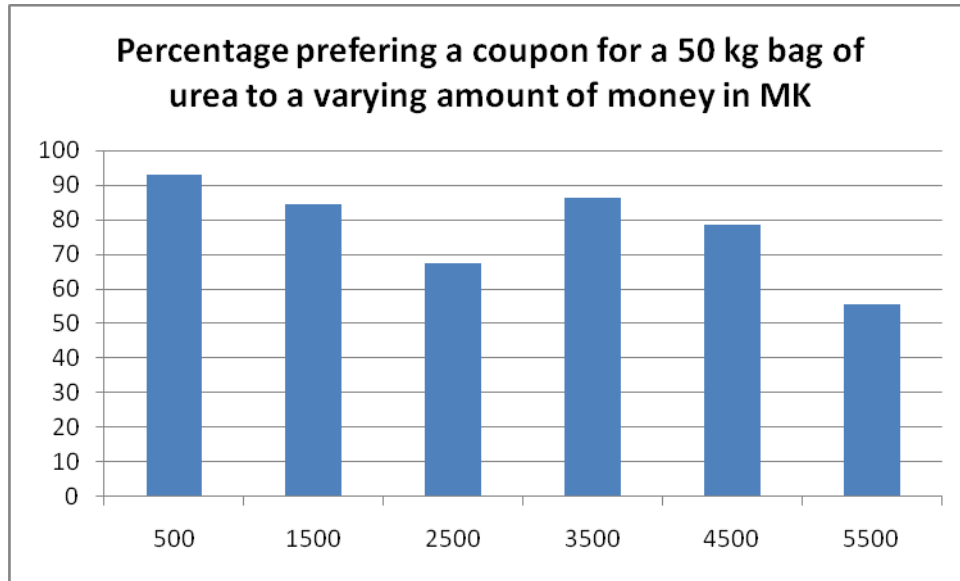
**Figure 6. Choice experiment 2 between urea (nitrogen) fertilizer and varying amounts of cash.**

The targeting of fertilizer subsidies has been organized by distributing coupons for fertilizers to households identified as beneficiaries. To assess whether there is a difference in the perceived value of such coupons than that of the actual fertilizers, two choice experiments were introduced where the choices were between coupons for basal and urea fertilizers versus equivalent amounts of money. The responses are presented in Figures 7 and 8.



**Figure 7. Choice experiment 3 between a coupon for a 50 kg bag of basal (23-21) fertilizer and a varying amount of cash.**

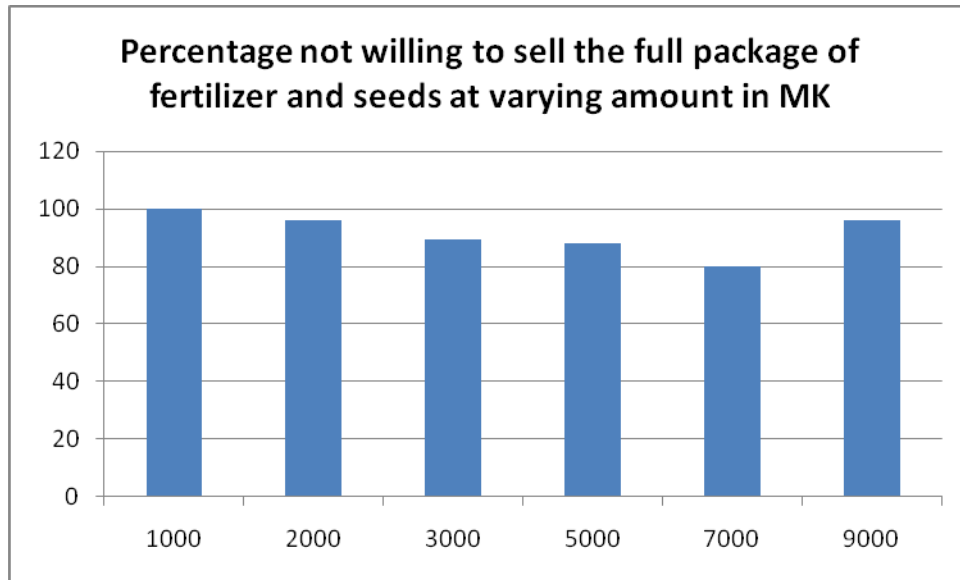
Figures 7 and 8 indicate that households value the coupons about as much as the fertilizer itself. This should indicate that households have a high trust in the possibility of cashing in the coupons for fertilizer. When cashing them in for the 2009/10 season they have to pay an additional MK.500 per bag of fertilizer. This is the difference between the random amounts provided in choice experiments 1 and 2 (Tables 5 and 6) versus 3 and 4 (Tables 7 and 8). While about 90% of the households preferred the coupons at the lowest random amount of money, about 55% preferred coupons at the highest amount of money.



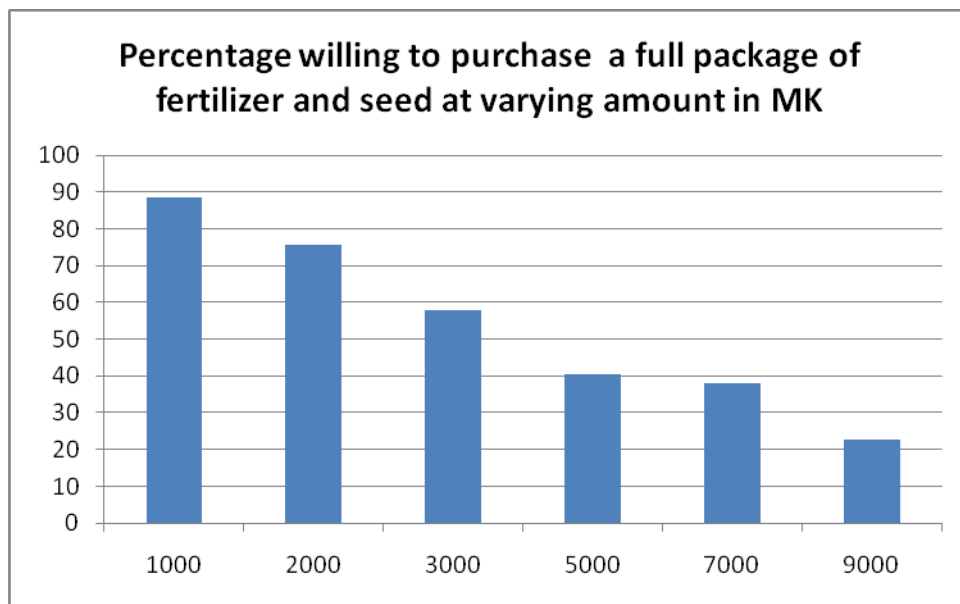
**Figure 8. Choice experiment 4 between a coupon for urea fertilizer and a varying amount of cash.**

The two next experiments involved randomly allocating the households with an input package for maize production consisting of one bag of basal fertilizer, one bag of urea (top dressing), and one bag of hybrid maize seeds, or if they were not lucky to “win” the package, they were offered the opportunity to buy the same package. The allocation of the package for free was determined by the toss of a coin. The lucky winners were then offered the possibility of selling the package at an amount determined by throwing a dice. The summary of the responses to this offer is presented in Figure 9. The unlucky ones were offered to buy the package at an amount also determined by throwing a dice. The responses to this offer are presented in Figure 10.

Figure 9 demonstrates that very few were willing to sell the package even at the highest amount of money offered which was equivalent to the commercial price of the inputs. This also indicates that households value the input package highly. Figure 10, however, demonstrates that many households face problems buying such an input package due to their cash constraints and only slightly above 20% can afford to buy the package at the full commercial price and only about 50% seem willing to buy it at a 50% level of subsidy (half price).



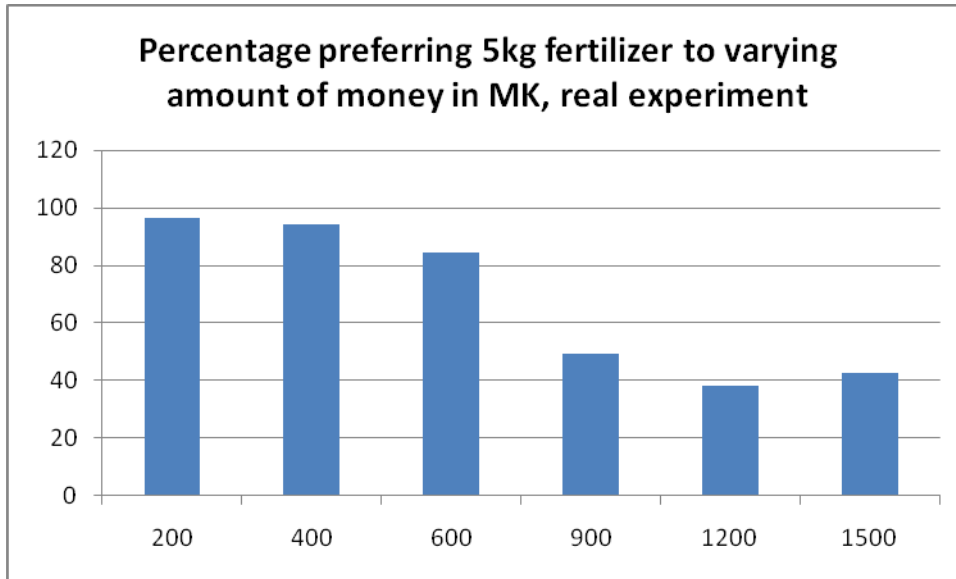
**Figure 9. Choice experiment 5 between selling the full input package at a varying amount and keeping it for own use.**



**Figure 10. Choice experiment 6 between buying the full package at a varying amount and not buying it.**

We introduced a real experiment where the households had the choice between 5 kg basal fertilizer and a varying amount of money determined by the throw of a dice. The amount of money varied between MK 200 and 1500. The daily wage rate was at the time of the survey about MK 200-300. The household responses are summarized in Figure11.

We see that the preference for fertilizer was reduced from above 90% for the two lowest amounts of money to about 40% for the two highest amounts of money. Considering that the highest amount offered is more than three times the commercial price per kg, this illustrates that there is a substantial demand for small amounts of fertilizer among many households where they are willing to forsake cash that they have available.



**Figure 11. Choice experiment 7 between receiving 5 kg basal fertilizer and a varying amount of cash.**

We also asked the households how they would allocate a cash amount of MK 10 000 that they are free to decide on how to use among a) buying fertilizer, b) buying food, c) buying other important/urgent commodities, d) investing in business, and e) saving for later use. The determinants of household allocation for fertilizers and food are analyzed in Table 20 below.

In relation this analysis it is useful to take into account an interesting finding and proposal by Duflo et al. (2009) based on a study and social experiments in Kenya. They found that poor households are willing to invest in response to small, time-limited discounts in form of free delivery of fertilizer just after harvest. Their finding may indicate that distribution and selling of fertilizer just after harvest can be a better system than selling fertilizers at planting time when households may no longer have sufficient cash from the selling of their harvest. Our findings in the experiments above seem to indicate that when households first have acquired the fertilizer they are not willing to sell it again unless they get a very good price. It is possible that this trade off between fertilizer, food and money changes substantially depending on the timing of the offers.

By “accident” we were able to investigate this issue as we had to rerun the social experiments for a part of our sample in December, at planting time, while most of the experiments were conducted at harvest time. This effect is captured by the “Late sample” (dummy) variable in the models for cash allocation for fertilizer versus food in the Table 20. On the one hand we could expect a lower demand for food at harvest time and perhaps a stronger ability and willingness



then to allocate cash for fertilizer (Duflo et al. 2009). On the other hand, the perceived need for fertilizer may be felt stronger at planting time in December. It is therefore not obvious which direction the relative demands would go. However, as we see from Table 21, the willingness to allocate money for fertilizer out of a given budget in December was significantly higher than in June-July, and likewise the willingness to allocate money for food was significantly lower in December than in June-July. Otherwise, we see some of the usual wealth effects in the regressions. Better-off households are more willing and able to allocate cash for fertilizers while poorer and older households prefer to allocate more of the cash for food.

**Table 21. Determinants of preferences for cash allocation for fertilizer versus for food purchase**

<b>Explanatory variables</b>	<b>Cash for fertilizer</b>	<b>Cash for food</b>
<b>Sex of household head</b>	-683.415	423.502
<b>Male=1, Female=0</b>	(447.18)	(416.25)
<b>Age household head</b>	-3.045	24.508**
	(12.45)	(11.39)
<b>School years household head</b>	-11.04	74.716*
	(49.54)	(45.39)
<b>Number of children</b>	-34.902	54.738
	(113.75)	(107.27)
<b>Quality of house</b>	156.920**	-75.164
	(69.22)	(61.80)
<b>Value of assets</b>	0.023*	-0.022*
	(0.01)	(0.01)
<b>Livestock units</b>	138.829	-157.505
	(132.28)	(133.56)
<b>Farm size</b>	-308.197	-50.747
	(206.21)	(203.41)
<b>Late sample</b>	3010.619****	-1402.469***
	(787.20)	(439.79)
<b>Constant</b>	3511.906****	946.042
	(1055.44)	(913.92)
<b>Sigma u constant</b>	730.518**	0
	(283.64)	(282.87)
<b>Sigma e constant</b>	3103.877****	2819.284****
	(131.27)	(139.24)
<b>Probability &gt; chi2</b>	0.001	0.003
<b>Number of obs.</b>	341	340

Note: Standard errors in parentheses. Significance levels: \*:10%, \*\*:5%, \*\*\*:1%, \*\*\*\*:0.1%.

## 6. IMPACTS ON THE NATURAL RESOURCE BASE AND PRODUCTION SYSTEM

This part investigates the effects of the input subsidy programme on the production system and the natural resource base. This includes effects on the intensity of production, residual effects on land productivity and on use and making of organic manure/compost. The analysis in this report relies primarily on the responses and perceptions of the households regarding these issues. The next report will go into more detailed analysis of the issues with use of farm plot level data.

We first look at household perceptions of the effects of access to coupons for fertilizer on maize production and maize area, see Table 22. Since most farm households in Malawi are land scarce and to a limited extent use fallowing, a change in maize area is likely to have a direct effect on the area under other crops. The other limitation on the perception data is what households may use as the comparison as some years have now passed since the introduction of coupons for fertilizer.

Around 80% of the households indicated that the access to fertilizer coupons had no effect on their areas planted with maize, while 11-14% indicated that they had increased their maize area in response to access to coupons for fertilizer and 4-6% indicated that they had reduced their maize areas based on the access.

**Table 22. Perceived effect of fertilizer coupon access on maize production and maize area, % of respondents**

Variable	2007/08	2008/09
No effect on production	28.6	26.3
Higher production	56.9	55.6
Lower production	8.6	13.3
Smaller maize area	3.8	6.1
No effect on the area	84.3	79.1
Larger maize area	11.4	14.4

The households were furthermore asked about the residual effect from fertilizer use on the yields of crops in the following year. This effect could be positive if residual nutrients from the previous year benefit the following crops. On the other hand, the effect could also be negative if the fertilizer use has a negative effect e.g. due to increasing soil acidity due to the fertilizer use. The latter effect could be more important on soils that already are acidic and if particularly acidifying fertilizers were used. The responses are summarized in Table 23.

**Table 23. Residual effect of fertilizer use on yields of crops grown in the following years**

Response	%
No effect	66.1
Higher yield	24.0
Lower yield	7.4

We see that 24% perceived there to be a positive residual effect of fertilizer use while 7% perceived there to be a negative effect. The remaining households perceived there to be no residual effect, indicating a limited soil fertility investment effect of fertilizer use.

A related issue is whether access to cheap fertilizers leads to more or less use of organic manure. Organic manure may be a complement or substitute for inorganic fertilizers. Farmers' responses are summarized in Table 24.

**Table 24. Effect of fertilizer coupons on use of organic manure by households**

<b>Response</b>	<b>%</b>
No effect	<b>65.7</b>
Less use of organic manure	<b>12.8</b>
More use of organic manure	<b>6.0</b>

We see that about 13% of the respondents responded to better fertilizer access by reducing their use of organic manure while about 6% used more manure with better access to fertilizers. This means that more households treat manure and inorganic fertilizer as substitutes than as complementary inputs in their production.

We also asked about the preferences for different types of maize varieties in case of access or no access to fertilizers. The responses are found in Table 25. Sixty-six % of the households preferred hybrid maize when they have access to fertilizer and this is reduced to 49% when they do not have access to fertilizer. Local maize variety was preferred by 30% of the households when they had access to fertilizers and this was increased to 47% when they had no access to fertilizer. Only a small percentage of households preferred open-pollinated varieties in either situation.

**Table 25. Preferred type of maize seed with and without access of fertilizers**

<b>Variable</b>	<b>With fertilizer access</b>	<b>Without fertilizer access</b>
Local variety	<b>29.9</b>	<b>46.9</b>
Open-pollinated variety (OPV)	<b>3.4</b>	<b>4.1</b>
Hybrid maize (HYV)	<b>66.7</b>	<b>49.0</b>

The main reasons for preferring hybrid seeds of maize were that they were high yielding and respond well to fertilizer. Those that preferred local varieties even when they had access to fertilizer gave resistance to weevils, good for long storage, and good for pounding as the main reasons. In the case of no access to fertilizer, more people preferred local varieties because they also gave a reasonably good yield when no fertilizer was applied and because the seed was cheap and easily available.

## **7. CONCLUSIONS**

This report presents new findings from a household survey covering about 375 households in 6 districts in central and southern Malawi during June and July 2009 covering the last two agricultural production years.

The main new evidence in this study is related to the extent of secondary markets for coupons and cheap fertilizers. Earlier surveys have largely neglected or grossly underestimated the extent of these. The findings indicate that the sales of coupons and cheap fertilizers do not come from households that first received free coupons and then sold them. They must come from leakages higher up in the system. It is important to realize that MoAFS has not been able to control the distribution of coupons well. Leakages have therefore occurred at many levels and may have been exaggerated by the fact that 2008/09 was an election year.

Secondly, our study assessed the administrative targeting efficiency related to the MoAFS-criteria for targeting particularly poor, vulnerable (child-headed, female-headed, orphan headed, guardian) land-owning households, although it is not clear how to interpret these targeting criteria. A significant smaller share of female-headed households received a full package of fertilizer (2 bags) than that of male-headed households. Those receiving coupons through administrative distribution were on average better off than those not receiving coupons in form of having a significantly higher livestock endowment. On the other hand they also had more children but having more children was not positively correlated with poverty. Other impact indicators provided evidence that the subsidy programme may enhance child health and school attendance.

The secondary market for coupons for fertilizer also favoured livestock-rich households and households with better quality houses. The secondary market for cheap fertilizers appeared to favour households with more assets and more children. Overall, it is therefore not very clear that the administrative targeting system is much more efficient in targeting poor and vulnerable households than a general subsidy of fertilizer would be. Furthermore, the administrative targeting system frustrated many respondents because of the corruption and conflicts associated with the administrative distribution.

Lack of transparency and lack of accountability in the administrative distribution appears to breed rent-seeking and conflicts. Large profit-opportunities appear to attract a lot of entrepreneurial skills that should have been mobilized for more productive activities. The unclear targeting criteria and exclusion of some households for unclear reasons appeared to frustrate a lot of people. One of the most common responses to the arrival of too few coupons was to reduce the number of coupons per household from two to one coupon or even less, demonstrating the egalitarian mindset. A clearer targeting policy, like one coupon for basal fertilizer for every resident rural household, based on a publicly displayed list of resident households for open validation in every village, and based on the recent population census (if it can be trusted), appears as an attractive alternative targeting strategy.

Overall, the study indicates that either very strong efforts should be put into improving the administrative targeting by enforcing transparency and accountability at all levels, or the

programme may be changed to a general input subsidy programme. The latter solution would be much easier to administer than the former but would involve other forms of possible leakages. A ceiling on the number of bags that can be bought at a subsidized price could be one relevant remedy in that case.

There are clear positive effects of the subsidy programme on household maize production and self-sufficiency. Small farm sizes contribute to more than 60% of the households still being net buyers of maize but a large share of these net buyers produce a larger share of the maize they need to meet their staple food requirement.

Our panel data analysis did not find any direct effects of receiving subsidized fertilizer on asset or livestock accumulation of households in the period 2006-2009. This could also be due to the indirect access to cheap coupons and fertilizers. However, there was a significant general asset accumulation in this period which possibly has been strengthened through the economy-wide effects of the subsidy programme.

The survey also included social experiments to study household preferences and willingness to pay for fertilizers and coupons. Households were found to value fertilizers highly and are reluctant towards selling the fertilizers that they have received. The ability to buy a seed and fertilizer package depends much on the price of the package and only about 20% of the households stated that they were able to buy a full package at the full market price (MK 9000) in June-July 2009 while close to 90% were willing to buy it at the full subsidy price (MK 1000). About 50% of the households would buy the package at a subsidy reducing the price to about MK 4000. Distribution of fertilizers just after harvest when households still have their harvested crops may be a way of stimulating fertilizer demand as proposed by Duflo et al.(2009). We found that a cash amount of MK10 000 provided to households at this time would result in a large allocation to fertilizers relative to food and other needs. However, a similar distribution of cash at planting time in December would lead to an even larger share of this cash to be allocated for purchase of fertilizers. The problem may, however, be that cash shortages are more severe at planting time and therefore early selling of subsidized fertilizer may lead to higher demand. It may be harder for households to reserve cash for purchase of fertilizer from harvesting time till planting time than to keep fertilizer that they bought immediately after selling their crops after harvesting.

Finally, we looked at some of the possible production system effects of the subsidy programme based on households' own perceptions of these. The results revealed that there may be small changes in the cropping pattern as maize is such a dominant crop. There was a tendency that fertilizer was seen as a substitute for organic manure by a few households. Close to 25% of the households perceived there to be a positive residual effect of fertilizer use on subsequent yields, while only about 7% perceived there to be a negative effect. However, a much more thorough analysis of the effects on the production system will follow in the next report.

The input subsidy programme has been cut back in the 2009/10 season due to the excessive expenses in the previous year. Subsidies are now only provided to maize farmers after the experience with surplus tobacco production in the 2008/09 season. Stricter controls have been imposed on fertilizer purchase and distribution of fertilizers and coupons. It remains to be seen what the impacts of these changes will be.

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