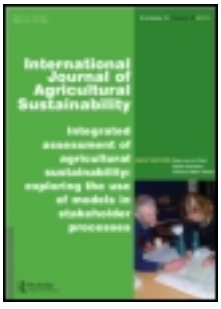

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The Malawi agricultural input subsidy programme: 2005/06 to 2008/09

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The Malawi agricultural input subsidy programme: 2005/06 to 2008/09

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Malawi's implementation of a large-scale agricultural input subsidy programme has attracted significant international interest. This paper reviews the programme from 2005/06 to 2008/09. Nationwide disbursement of heavily subsidized fertilizers and seed to large numbers of beneficiaries represents a significant logistical achievement and substantially increased national maize production and productivity, contributing to increased food availability, higher real wages, wider economic growth and poverty reduction. However, the latter years of the programme have been accompanied by high international fertilizer prices and costs and high maize prices, the latter undermining the programme's food security, poverty reduction and growth benefits for many poor Malawian farmers relying on purchased maize for substantial amounts of their staple food requirements. Estimated economic returns to the programme have been satisfactory, given other programme benefits not captured in cost–benefit analysis. With substantial reductions in both prices and subsidized volumes of fertilizers in subsequent years, there is considerable scope for building on achievements to raise programme effectiveness, efficiency and benefits. Any application of Malawi's subsidy experience to other countries should take into account the special characteristics of the Malawian maize economy and measures needed to raise programmes' effectiveness and efficiency and their contribution to sustainable development policies.

Keywords: fertilizers; inputs; maize; Malawi; subsidies

Introduction

This paper describes the Malawi agricultural input subsidy programme (MAISP) from 2005/06 to 2008/09,[1] with occasional reference to the 2009/10 implementation. Following this introduction, we provide background information about the constraints and opportunities facing Malawi's agriculture and its role in people's and the nation's livelihoods. A description follows of core and changing elements, implementation achievements and programme outcomes. We conclude with a discussion of the effectiveness, efficiency and sustainability of the programme and its benefits, and of the wider applicability of the lessons outside Malawi.

Background

Agriculture and maize are critically important to the Malawian economy and to the livelihoods of most Malawian people, but when combined with low agricultural and maize productivity this leads to high incidence of poverty and national and individual/household food insecurity with large numbers of very poor people working on very small areas of land that are predominantly planted to maize (e.g. SOAS *et al.*, 2008).

Agricultural, rural and national economic development in Malawi is constrained by a number of interacting household, local and national vulnerability, poverty and productivity traps, as illustrated in Figure 1.

- Continual cultivation of maize on land without organic or inorganic fertilizers leads to low yields and consequent inability to afford input purchases. Most farmers also cannot buy inputs on credit because of underdeveloped credit markets and high costs of credit administration, high borrower and lender risks, consumption rather than sale of

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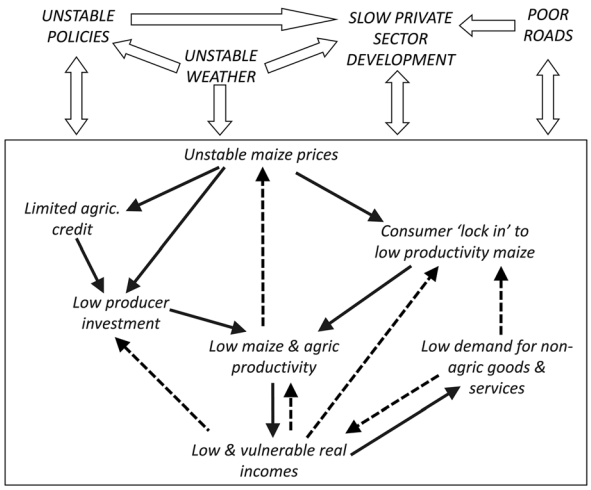

Figure 1 | Vicious circle of the low productivity maize production trap. Dotted arrows represent feedback effects

produce (with lack of cash for repayment), and high input prices and access costs due to low input demand, poor infrastructure and high transport costs.

- High variability in maize prices also contributes to risks in input use.
- Low input demand itself raises costs and inhibits the development of input supply systems in less accessible areas.
- Poverty and vulnerability to shocks (low yields, high food prices, sickness, loss of employment or remittance income) further constrain productivity and productive investments – with women, who play a key role in agricultural production and rural livelihoods, particularly vulnerable to these shocks.
- Investments in maize market development are constrained by low traded volumes and thin markets (with large quantities of maize produced in Malawi consumed within households and villages, never reaching the market), so relatively small changes in national production may lead to large changes in market supply and, with relatively inelastic demand, high price variability.
- High price variability for this critical commodity leads to government intervention in maize markets (with, e.g., setting of minimum and maximum prices, export bans and bans on private trade), but difficulties in designing and implementing interventions mean that they often increase price variability for maize sellers, buyers and traders (see e.g. Chapoto and Jayne, 2010), inhibit investment and participation in markets and exacerbate the problems they attempt to address.

The various negative feedbacks described above lead to a vicious circle of low maize productivity and unstable maize prices inhibiting (a) net producers' investment in maize production, (b) net consumers' reliance on the market for maize purchases, and (c) poor farmers' exits from low-productivity maize cultivation. The result is a lock-in to widespread cultivation of low-productivity maize and this, because of its scale, depresses wider labour and agricultural productivity and growth of the non-farm economy.[2]

Increased use of inorganic fertilizers and of hybrid and open pollinated maize varieties is one important, widely recognized and, in principle, relatively simple way of increasing maize productivity. However, widespread use of fertilizer on maize by smallholder farmers is constrained by problems of *profitability* and *affordability*. From the mid-1990s to the mid-2000s, the use of unsubsidized fertilizer was not generally profitable on maize produced for sale in Malawi, although it was more profitable on maize grown for own consumption due to farmers' fears of the effects of a bad year on maize purchase prices (SOAS *et al*., 2008). For poorer farmers, however, affordability of fertilizer is a major problem as they face both a 'hungry gap' during the cropping period (when they should invest labour and other inputs in crop production, but earn off-farm income as the previous season's food stocks run out) and limited borrowing opportunities, at very high costs. Hungry gap problems are exacerbated by depressed wage rates and asset prices and high food prices in the rural economy.

Improving the *profitability* of fertilizer use in maize production requires lower fertilizer prices (with greater efficiency in fertilizer supply and lower importation and distribution transport costs or a subsidy), higher maize prices and/or greater efficiency in fertilizer use. High maize prices are a two-edged sword, however, as 60 per cent of Malawian maize producers are net buyers of maize (SOAS *et al*., 2008) so that most (particularly poorer) people's livelihoods and food security are damaged by high maize prices. Furthermore, increased maize prices and improved efficiency of fertilizer use will not improve the *affordability* of fertilizer for poor rural households (indeed they exacerbate affordability problems for net buyers of maize – see Dorward, 2006). This requires low-cost and accessible financial services and/or very

large reductions in fertilizer prices. The development of financial services for fertilizer use in maize production requires that maize be profitable, that smallholders have other sources of cash income to repay fertilizer loans when they consume the majority of the maize they produce and that very low-cost systems are used for loan disbursement and recovery. All these are difficult, explaining the long-standing and often contentious emphasis on agricultural input subsidies in Malawi (and in many poor rural economies). Thus from the mid-1970s to the early 1990s, the government financed a universal fertilizer subsidy, subsidized smallholder credit and controlled maize prices. This system began to break down in the late 1980s/early 1990s and collapsed in the mid-1990s but, with widespread perceptions that falling fertilizer support was leading to declining maize production and a food and political crisis, free provision of small 'starter packs' was made initially to all households (in 1998/99 and 1999/2000) and then to smaller (but varying) numbers of targeted households (from 2000/02 to 2004/05) (see e.g. Harrigan, 2003; Levy, 2005). Continuing severe food security difficulties despite these subsidies led to significant political emphasis on larger subsidies and, building on 2004 election manifesto commitments, the Malawi government decided to implement in 2005/06 a very large-scale input subsidy programme across the country.

The agricultural input subsidy programme: processes and achievements

The core of the 2005/06 and subsequent programmes has been their use of vouchers (or coupons) to target approximately 50 per cent of farmers in the country to receive fertilizers for maize production, with further vouchers for tobacco fertilizers and for improved maize seeds. 'Maize fertilizers' have been provided in a package of one voucher for a 50kg bag of 23:21:0 +4S basal fertilizer and one voucher for a 50kg bag of urea. Improved maize seeds subsidized under the programme were initially open pollinated varieties (OPVs) but there has subsequently been much greater emphasis on hybrid maize varieties. The seed and fertilizer packages drew on long-standing Ministry of Agriculture and Food Security (MoAFS) crop production recommendations.

Coupons are distributed to extension planning areas within districts in two rounds with the first allocation initially in proportion to crop areas and (in later years) farming population. Within districts traditional authorities (TAs), local government and MoAFS staff have had varying roles in coupon allocations between villages and, within villages, worked with village committees and local stakeholders to identify recipients to receive two coupons for redemption at very reduced cash prices, for inputs specified on the coupon. There has been considerable variation over time and between areas in the criteria determining selection of beneficiaries, numbers of coupon recipients and numbers of coupons received per recipient. Criteria and systems for subsequent supplementary rounds of coupon allocation and distribution later in the season are less clear but are intended to address problems of unmet demand in first round distribution. There have also been different systems for coupon redemption for different inputs (seed and fertilizer) in different years, with varying involvement of parastatal and private sector input retailers (see below).

The programme's core objective has been to improve poor smallholder farmers' access to agricultural inputs to increase their and national food self-sufficiency and incomes from crop production. The 2005/06 programme was politically popular and widely considered a success and was therefore continued in subsequent years with changes in design, scale and implementation (see Table 1).

Three aspects of implementation achievements are considered: innovation and adaptation, scale and performance indicators.

Innovation and adaptation

The subsidy programme has built on Malawi's experience in implementing universal starter pack and targeted input programmes from 1998/99 to 2004/05 (Levy, 2005). These involved large-scale registration and targeting of farmers across the country, experimentation with voucher systems and coordination across government, parastatal, private sector, donor and community stakeholders. However, the AISP also involved substantial changes: in objectives (from social protection and food security for vulnerable households to national food production and self-sufficiency[3]); in scale (increasing from around 50,000mt of fertilizer in 2004/05 to 130,000mt in 2005/06); in cash redemption of vouchers; and in the addition of tobacco inputs.

Throughout the MAISP, the government and other stakeholders have worked with varying success and agreement on innovations to address difficulties,

improve programme performance and broaden impact. These changes emerged from formal and informal discussions, reviews and lesson learning within government and with other stakeholders and from changing policy concerns in a changing economic and political environment.

The major modifications in subsequent years are shown in Tables 1 and 2:

Table 1 | **Principal programme features, 2005/6 to 2009/10**

		2005/06	2006/07	2007/08	2008/09	2009/10
Fertilizer voucher distribution (mt equivalent)		166,156	200,128	216,000	195,369	160,000
Households receiving fertilizer coupon(s)		n/a	54%	59%[1]	65%	n/a
Total subsidized fertilizer sales (mt)	planned	137,006	150,000	170,000	170,000	160,000
	actual	131,388	174,688	216,553	202,278	161,495
Voucher value, approx. (MK/bag)		1,750	2,480	3,299	7,951	3,841
Subsidy % (approx.)		64	72	79	91	88
Subsidized maize seed (mt)		n/a	4,524	5,541	5,365	8,652
% Hybrid seed		0	61	53	84	88
Cotton seed/chemicals; legume seed		No	No	Yes	Yes	Legumes
Total programme cost (MK million)	planned	5,100	7,500	11,500	19,480	n/a
	actual	4,480	10,346	13,362	33,922	20,249

[1]Seed or fertilizer coupon (NSO, 2009b).
Sources: Logistics Units reports; 2005/06 (CISANet), 2006/07 (SOAS *et al.*) and 2007/08 (MoAFS) evaluation reports; key informants; MoAFS implementation guidelines; GoM budget statistics; 2008/09 survey results; NSO (2009b).

Table 2 | **Principal programme changes to 2008/09**

	Subsidized inputs	Voucher distribution system	Voucher redemption systems	Other system innovations
2005/06	Maize and tobacco fertilizers, maize seed (OPV)	District allocation by maize areas, distribution through TAs	Only through SFFRFM and ADMARC	
2006/07 changes	Maize seed (hybrid and OPV)	Distribution through varied stakeholders	Fertilizers also through major retailers; flexible maize seed vouchers through a wide range of seed retailers	Coupons specific to fertilizer type. Fertilizer buy-back system. Logistics unit
2007/08 changes	Limited legume seed; cotton seed and chemicals	District allocation by farm household and areas, distribution through MoAFS/ VDCs	Cotton inputs through ADDs	Reduced copies of coupons. Remote EPA premium
2008/09 changes	Tea and coffee fertilizers, maize storage chemicals	Use of farm household register, open meetings for allocation and disbursement led by MoAFS	Fertilizers only through ADMARC and SFFRFM	Extra coupon security features and market monitoring. No remote EPA premium. ADMARC computers for voucher processing

Note: CISANet = Civil Society Agriculture Network; MoAFS = Ministry of Agriculture and Food Security; SOAS = School of Oriental and African Studies
Sources: Logistics Units reports; 2005/06 (CISANet), 2006/07 (SOAS *et al.*) and 2007/08 (MoAFS) evaluation reports; key informants; MoAFS implementation guidelines.

- increasing subsidized fertilizer sales;
- increasing hybrid maize seed sales, introduction of flexible vouchers for extra maize and legume seed, vouchers for grain storage chemicals and cotton chemicals and seed;
- increasing reliance on private sector imports to supply parastatal fertilizer sales, with improved tender procedures;
- changes in private sector involvement in fertilizer sales, with some larger retailers selling subsidized fertilizer in 2006/07 and 2007/08, a buy-back scheme to reduce government fertilizer stock holding risks, a premium in 2007/08 to stimulate retail networks in more remote areas, but private sector exclusion in 2008/09;
- changes in private sector involvement in seed sales, with all seed supplies from private seed supplies, and from 2006/07 seed sales through a variety of retail outlets including small agro-dealers, with seed pack sizes varying with seed costs;
- amendment of programme objectives and beneficiary targeting criteria and systems, increasing emphasis on vulnerable households, with increasing proportions of inputs for maize and increasing allocations mainly in the southern region;
- introduction of beneficiary registration and more open and tightly managed beneficiary selection, voucher distribution and market monitoring systems with less involvement of TAs, more involvement of MoAFS staff and, in 2008/09, use of open meetings for coupon allocation and distribution;
- from 2006/07 a fixed redemption price for all subsidized fertilizers, with the price falling and subsidy rising in subsequent years;
- funding of the seed component, a specialist logistics unit, independent evaluation and some other costs by donors;
- improved coupon design and security features.

Scale

The programme has grown each year, and involves complex logistical and organizational challenges to tight deadlines. A simplified summary of major tasks is shown in Figure 2. In 2008/09, more than 1.5 million fertilizer coupon beneficiaries were selected from over 2.5 million farm households, 5.9 million coupons were printed and distributed, and over 3.4 million bags of fertilizer purchased and distributed – to tight deadlines, to widely dispersed farmers across the country including remote areas and with fraud and theft a major temptation and threat (subsidized commodities were together worth around US$220 million, with each fertilizer coupon's value greater than 10 per cent of annual household income for more than 40 per cent of the population). These achievements built on Malawi's experience in implementing similar programmes at varying scales since 1998.

Implementation performance

We consider four aspects of implementation effectiveness and efficiency: subsidized input volumes disbursed; timing of subsidy sales and supplier payment; targeted beneficiaries' access to inputs; and cost.

Subsidised input volumes have generally increased with time. Disbursement targets were exceeded in 2006/07, 2007/08 and 2008/09 by 16, 27 and 19 per cent, respectively, showing success in meeting demand, but also difficulties in controlling disbursements – but this was not the case in 2009/10.

Timing of subsidy sales has improved as regards timely awards of seed and fertilizer contracts and fertilizer deliveries to depots and markets.

Information on *targeted beneficiary access* to inputs is based on household surveys and qualitative interviews for 2006/07 and 2008/09, which show

- 65 per cent of farm households receiving fertilizer coupon(s) in 2008/09, with an average 1.5 coupons per household receiving coupons and 1.1 coupons per household across all households (equivalent 2006/07 figures were 54 per cent, 1.7 and 1.0);
- variable targeting criteria across years and areas;[4]
- targeting of productive full-time farmers but disproportionate subsidy receipt by male-headed households with more land and other assets;
- modification of coupon allocations in some areas so that 40 per cent of households in the south and centre received one fertilizer coupon in 2008/09 (rather than fewer households receiving two);
- open meetings for coupon allocation in 2008/09 increasing the proportion of coupons and subsidized fertilizer reaching poorer households (Chirwa *et al*., 2010);
- underestimates by key informants of the proportion of households receiving subsidized inputs as compared with household survey information;
- 75 per cent or more of parastatal and private suppliers experiencing frequent major queues;
- five per cent of households making payments to receive coupons (with median prices of MK1,000 and MK2,000 in 2006/07 and 2008/09);

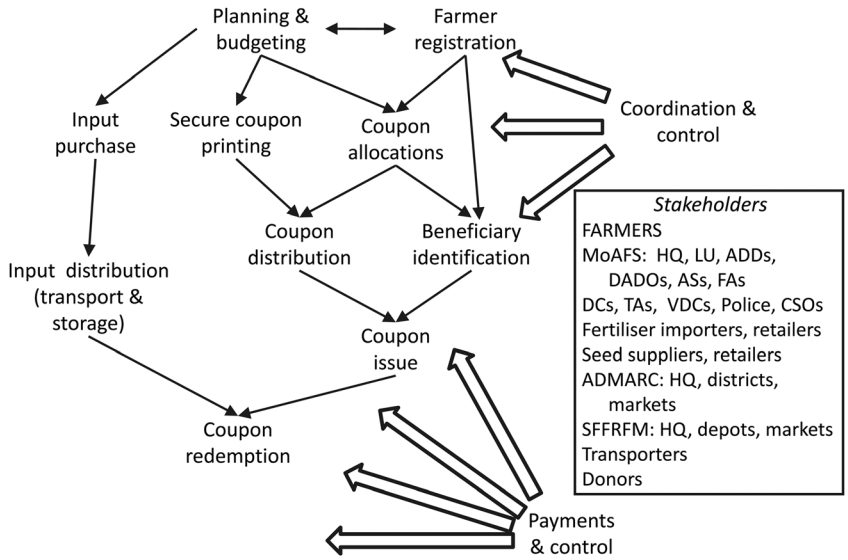

Figure 2 | Major tasks in programme implementation
Note: ADDs = Agricultural Development Divisions; ASs = Area Supervisors; CSOs = Civil Society Organisations; DADOs = District Agricultural Development Offices; DCs = District Commissioners; FAs = Field Assistants; HQ = head quarters; LU = Logistics Unit; MoAFS = Ministry of Agriculture and Food Security; TAs = Traditional Authorities; VDCs = Village Development Committees; SFFRFM = Smallholder Farmers' Fertilizer Revolving Fund of Malawi

- around 15 per cent of fertilizer coupons requiring payment of a 'tip' for redemption, giving median total redemption costs of MK1,000 per bag in both years.

Programme costs from 2006/07 to 2008/09 were over budget and increasing with growing subsidy volumes and large international fertilizer price increases (see Tables 1 and 3) but this trend was dramatically reversed in 2009/10. At their peak in 2008/09, subsidy costs accounted for around 74 per cent of the public budget to agriculture and 16 per cent of the total national budget. Rising costs have been met by increasing budgetary allocations to MoAFS without budget cuts to other activities, but there are questions about benefits forgone from alternative investments that could have been made with those funds. Subsequent falls in fertilizer prices and government commitment to reduce the volumes of subsidized inputs dramatically reduced costs in 2009/10, with total fertilizer costs substantially lower than in 2008/09.

The programme also diverts substantial staff time and resources from other activities in the critical time before and at the start of the cropping season. This poses challenges to essential research and extension activities of MoAFS even if financial costs are reduced dramatically in future.

Fraud may arise through voucher allocation to non-existent ('ghost') beneficiaries (or villages), diversion to others (government staff, traditional leaders or politicians), direct allocation to non-beneficiaries and printing of extra or counterfeit vouchers. Each year there are press and anecdotal reports of fraud but determining its extent is difficult without published audits for the programme or resolution of discrepancies between National Statistical Office (NSO) and MoAFS estimates of the total farm families in Malawi (with MoAFS estimates 30 per cent higher than NSO estimates). SOAS *et al*. (2008) considered there was insufficient evidence to suggest widespread fraud, and survey estimates of subsidized fertilizer access were consistent with MoAFS farm household estimates. Dorward *et al*. (2010b) suggest that NSO estimates (NSO, 2009a) may underestimate total farm families, but it is unlikely that they underestimate numbers by a third. In 2008/09 a major security breach in voucher printing led to reprinting of more secure vouchers for two regions.

The agricultural input subsidy programme: outcomes and impacts

Increased crop production is critical to the achievement of programme objectives and results from

Table 3 | **Fertilizer and programme costs**

	2005/06 Actual	2006/07 Actual	2007/08 Actual	2008/09 Actual	2009/10 Actual
Fertilizer costs (US$/mt)					
Parastatal	393	490	600[1]	1,250[2]	614
Private retailers	n/a	490	612	n/a	n/a
Programme costs (US$ million)					
Malawi Government	51.4	81.4	109.6	227.8	137.6
Donors		9.5	7.1	37.8	17.5
Total	51.4	90.9	116.8	265.4	155.1
Net of farmer payments	32.0	73.9	95.4	242.3	143.7
Total as % MoAFS budget	n/a	61	61	74	n/a
Total as % national budget	5.6	8.4	8.9	16.2	n/a
Total as % GDP	2.1	3.1	3.4	6.6	n/a

[1]Excluding costs of buy back brought forward.
[2]Including costs of buy back brought forward.
Parastatal costs exclude ADMARC overheads. 2005/06 fertilizer costs may include some seed and coupon production/distribution costs.
Sources: Logistics Units reports; 2005/06 (CISANet), 2006/07 (SOAS *et al.*) and 2007/08 (MoAFS) evaluation reports; GoM budget statistics; Dorward *et al*. (2010a, b).

incremental use of inputs (mainly fertilizers and seeds) leading to increased yields, with yield responses to these inputs depending on the weather and efficiency of input use. Other, complementary, potential outcomes of the programme are development of more effective and efficient input supply systems, poverty reduction and economic growth. An important distinction needs to be made between direct impacts on subsidy recipients and wider, indirect impacts resulting from programme impacts on market prices (principally for maize and labour) and affecting both non-recipients and recipients. These arise because of the very large scale of the programme and are traced out in Figure 3. Achievements in each of these spheres need to be considered in terms of effectiveness, efficiency and sustainability, and there are major difficulties in comparing programme outcomes against possible alternative means of achieving the same outcomes.

Incremental input sales and use determine incremental production from the programme and depend on subsidized input sales and the extent to which they displace unsubsidized commercial sales (when the subsidy reduces commercial input purchases).

Displacement is difficult to estimate as farmers change commercial purchases from year to year with changing output prices, input prices and seasonal finance access. SOAS *et al*. (2008) estimated fertilizer displacement in aggregate sales in 2005/06 and 2006/07 as 20–30 and 30–40 per cent, respectively (with higher displacement for fertilizer for tobacco than for maize). Ricker-Gilbert *et al*. (2009) used panel data of farmer purchases to estimate displacement of 29 per cent in 2006/07, with greater displacement among less poor subsidy recipients. However, much lower displacement is estimated for 2008/09 (Ricker-Gilbert and Jayne, 2010) due to higher fertilizer prices, earlier beneficiary registration and improved targeting of poorer beneficiaries (perhaps associated with increased allocations to the Southern Region). Displacement of maize seed sales appears to be lower, with strong growth in commercial seed sales (Kelly *et al*., 2010).

Incremental production depends on incremental input use and its yield impacts, which depends on rainfall/crop variety/fertilizer/soil fertility/crop management (timing and methods of planting, weeding and fertilizer application) interactions. Estimates of the subsidy's production impacts can be made from consideration of crop responses to incremental input use, of total national maize production and of changes in maize prices.

There are substantial difficulties in obtaining precise measurements of crop responses to

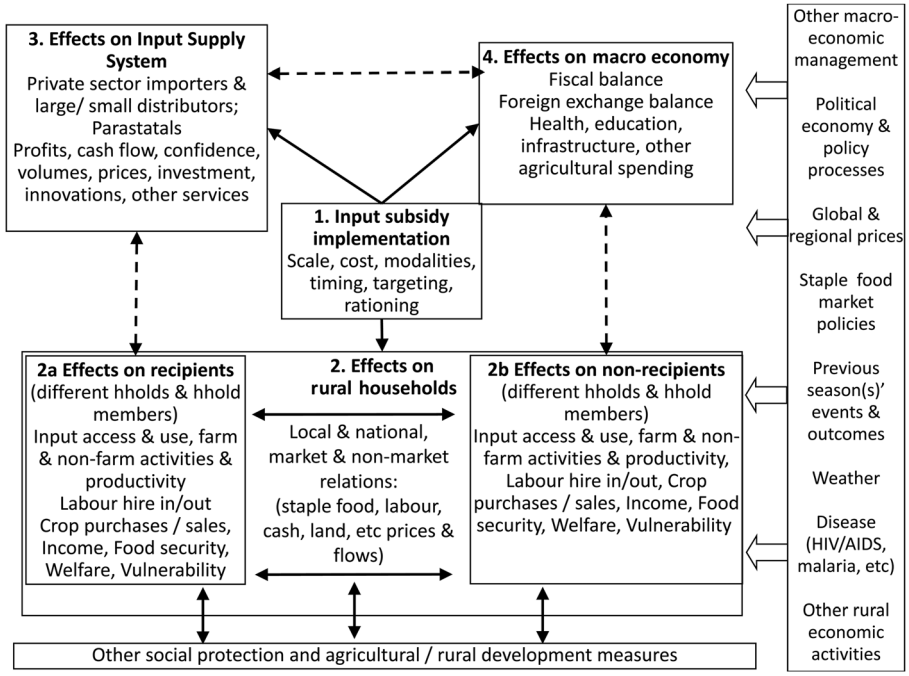

Figure 3 | Direct and indirect subsidy impacts
Source: SOAS *et al*. (2008).

Table 4 | **Estimated incremental maize supplies, 2005/06 to 2008/09**

		2005/06	2006/07	2007/08	2008/09
Estimated yield response as % 2008/09		80	100	70	100
Subsidy programme incremental maize production (mt)	Total 'medium' estimate	406,348	647,474	566,235	968,900
	above 2002/03 and 2003/04	273,609	514,735	433,496	836,161
	High estimate: +20%	487,618	776,969	679,482	1,162,800
	above 2002/03 and 2003/04	328,332	617,683	520,196	1,003,514
	Low estimate: −20%	325,078	517,979	452,988	775,200
	above 2002/03 and 2003/04	218,887	411,788	346,797	669,009
National crop production estimates	Increment above 2002/03 and 2003/04 (mt)	975,262	1,698,956	1,031,938	2,031,816
Net maize exports (following year exports − imports) (mt)		−78,491	224,972	−101,027	−50,398

Notes: 2002/03 and 2003/04 production seasons taken as two non-drought years for pre-subsidy comparisons, although 35,000 and 22,000mt of fertilizer were subsidized in these years (10 per cent displacement assumed).
Sources: Dorward and Chirwa (2009), Dorward and Chirwa (2010), MoAFS, Jayne *et al*. (2010).

incremental input use. However, a broad range of 12–18kg grain per kg of N, with 15 a reasonable 'medium expectation', is supported by both secondary sources and farm survey results (SOAS *et al*., 2008; Dorward and Chirwa, 2010). Table 4 shows estimates of annual incremental production with changes in the grain:nitrogen response ratio reflecting different conditions between years.[5]

The following points should be noted:

1. Incremental production is sensitive to yield responses to inputs, so that good programme and crop management is critical for raising yield responses through early subsidy sales, planting and fertilizer application, high plant populations and the use of organic matter.
2. Higher fertilizer response by hybrid seed means that increasing sales of hybrid maize seed can increase programme impacts.
3. Incremental production estimates are very large, and have grown with increasing incremental input use.

The incremental production estimates are, however, considerably lower than those implicit in the national crop estimates for maize production, with much lower variation. Annual changes in maize prices also suggest that post-subsidy maize supplies have been lower than suggested by the national crop estimates. Figure 4 plots per capita maize supply estimates (MoAFS 'crop estimates' of production plus net imports divided by estimated national population) against maximum monthly prices in Lilongwe for the following season. For the 1994/05–2005/06 production seasons, there is a downward sloping relationship. The three later subsidy seasons do not however fit this pattern, with high prices despite high estimates of production. However, these high prices did not lead to reports of widespread suffering and distress as experienced in previous years with equivalent prices (e.g. following the poor 2000/01 and 2004/05 harvests).

A number of explanations are put forward for the apparent discrepancies in this:[6]

- Increased real incomes, falling poverty rates and increasing population may raise national demand, causing the 1995/96 to 2004/05 pattern to drift to the right over time – this explains the lack of distress in later years despite high prices but neither the dramatic shift from 2006/07 nor differences between later subsidy years.
- Storage losses may be increasing with more hybrid maize in later subsidy years – but Mangisoni (2010) reports relatively low losses and 50 per cent of 2009 household survey respondents reported no storage losses in 2007/08 and 2008/09 storage, with just over 20 per cent reporting high losses.
- Higher welfare and real incomes following the 2005/06 harvest and low maize prices could have led to more retention and consumption of the 2006/07 harvest and a tighter, thinner market.

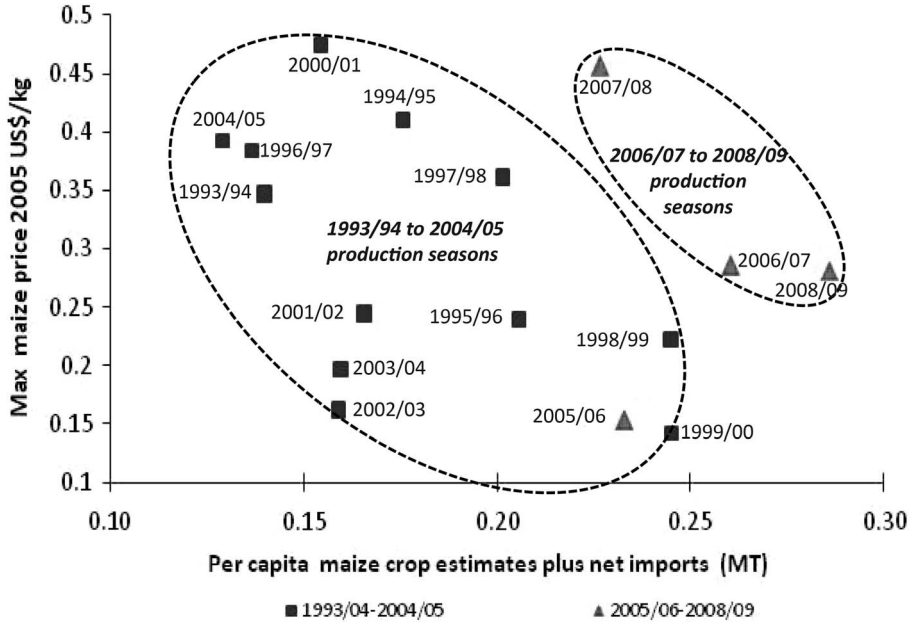

Figure 4 | Maximum monthly maize prices by estimated maize supply by production season
Estimated maize supply = crop estimate plus exports − imports

- Overestimates of national maize production following the implementation of the subsidy programme.

Increased food self-sufficiency is not the same as increased food security, and both may arise at the national or household level. Table 4 showed estimated net maize imports over the four marketing seasons following 2005/06–2008/09 subsidies amounting to just over 1000mt. This compares with nearly 132,000mt over the previous eight seasons or a little over 21,000mt if seasons with very high imports (more than 289,000mt) due to poor rainfall are excluded. This suggests that the programme has substantially improved national food self-sufficiency. Our estimates of incremental maize production support this, and 2007 and 2009 focus group discussions also suggest household food self-sufficiency improvements for subsidy recipients. However, disproportionate receipt by male-headed households with more land and other assets means many poor, food-insecure households have not benefited directly – although as noted earlier there have been targeting improvements from 2006/07.

Food security is dependent not only on food availability and self-sufficiency but also on purchases and food prices. Mean maize prices of 0.25US$/kg in marketing seasons following subsidy implementation were higher than in the eight previous marketing seasons (0.25 compared with 0.18US$/kg, current US$). Similarly, maximum monthly maize prices in post-subsidy marketing seasons are higher than for earlier seasons (0.32 compared with 0.25US$/kg and see Figure 4). The apparent decline in food security indicated by these figures needs to be set against greater availability of maize in villages (reported by focus group discussions), lack of evidence of unusually severe food shortages and significant rising nominal wage rates from 2005/06. These have been greater than the maize price rises in 2006/07 and have roughly matched maize price increases from 2005/06 to 2008/09 (Dorward *et al*., 2010a). Household survey reports on food security show no clear trends of improvement (Dorward *et al*., 2010a).

The extent to which the programme has *increased incomes* depends on interactions between transfer gains for subsidy recipients (where recipients sell coupons or inputs, or the subsidy displaces unsubsidized input purchases), incremental production from incremental input use, prices determining the value of incremental production and labour market and wage effects. High maize prices lead to a high valuation of incremental production but low maize prices raise the real incomes of (particularly poorer) maize buyers. The extent and distribution of these effects determine the programme's *poverty reduction* impacts. There is evidence that poverty incidence has fallen in Malawi from 52 per cent in 2004/05 to 40 per cent in 2007/08 and 2008/09 (NSO 2005, 2006, 2009b).[7] It is not possible to directly attribute this to the subsidy programme (other contributors include high tobacco prices, macro-economic stabilization with low interest rates and inflation and good weather). However, indicative modelling of livelihood and labour market effects suggests that poor beneficiary and non-beneficiary households may have had increases in real income from 10 to 100 per cent and from 0 to 20 per cent, respectively, over the counterfactual no-subsidy situation (varying between areas, households with different savings behaviour and years with different subsidy rates and maize and labour market conditions) (Dorward, 2010).

Earlier discussion of the low maize productivity trap suggested that increases in maize productivity and real incomes with falling real food prices should provide pre-conditions for *economic growth* and diversification out of maize. The achievement of these conditions is debatable, with high maize prices in recent years, but there should nevertheless be some unquantifiable contributions to economic growth. Higher GDP growth rates have been reported for Malawi from 2004, and like poverty reduction, these may be attributed to a variety of causes – and may also be affected by the very large increases in national maize production estimates.

It is also difficult to determine the extent to which the programme has contributed to the development of *improved input supply systems* with different impacts on importers/suppliers and retailers of fertilizer and seed (both small independent agro-dealers and larger companies).

Private sector fertilizer importers have benefited from supplying increasing volumes of government subsidy sales, rising from 70,000mt to 162,000mt, although they have faced some exposure to foreign exchange losses with delays in payments in Malawi Kwacha. Maize seed suppliers have also benefited from significant growth in sales over the life of the programme.

There are four processes by which the programme affects participating and excluded retail outlets' sales:

- direct losses from displacement of commercial sales by subsidy sales harm all retailers;

- direct gains from sales of subsidized inputs benefit participating outlets;
- associated gains or losses from customers buying unsubsidized items while buying subsidized inputs benefit participating outlets and harm excluded outlets; and
- indirect gains from general increases in demand if the programme stimulates wider income growth and easing of liquidity constraints benefit all retail outlets.

Input suppliers are very much concerned about losses of fertilizer sales because of displacement if these are not counteracted by gains from participation in the subsidy scheme. Estimates of fertilizer displacement were reported earlier, but are contentious with fertilizer suppliers arguing for higher rates. Displacement of maize seed sales appears to be much lower and is not contentious.

Small agro-dealers have suffered from exclusion from retail sales of fertilizer subsidies in all four years of the programme, but a number have, with larger companies with retail outlets, been able to sell subsidized maize seed from 2006/07 onwards. Larger companies able to retail subsidized fertilizers in 2006/07 reported significant increase in unsubsidized sales in 2006/07 but their exclusion from fertilizer sales in 2008/09 led to falls in reported unsubsidized fertilizer sales (Kelly *et al*., 2010).

The agricultural input subsidy programme: effectiveness, efficiency and sustainability

The effectiveness of the input subsidy programme in delivering outcomes and impacts has been discussed above. Questions about efficiency, however, ask if outcomes and impacts could have been delivered at lower cost by other means or by improving programme design and implementation.

Economic efficiency is commonly measured using cost–benefit analysis. Returns to the programme largely depend on the economic prices of inputs and of maize, and production responses to increased input use. There are substantial difficulties in estimating both yield responses to input use and the value of incremental maize production. SOAS *et al*. (2008) show that benefit/cost ratios for the 2006/07 programme could, with reasonable variation in assumptions, range from 0.76 to 1.36, with a mid-estimate of 1.06. Adjustments using estimated maize and fertilizer prices for other years suggest that the programme should have yielded equivalent or higher returns in both 2005/06 and 2007/08. However, very high fertilizer purchase prices depressed returns for the 2008/09 programme, despite offsetting effects of good weather and higher maize prices. Estimates of fiscal efficiency (net economic benefit per unit fiscal investment) show a similar pattern to economic returns, but are also negatively affected by displacement of unsubsidized sales by subsidized sales.

Key conclusions from this analysis are that

- the yield response to fertilizer is a critical determinant of economic returns;
- displacement rates are critical to fiscal efficiency; and
- the programme can yield high returns with good programme implementation and yield responses.

We discuss later how changes in programme design and implementation could improve economic returns. If this is not possible, economic cost–benefit analysis suggests that alternative types of investment, for example in research and extension and in rural roads, have yielded high returns in poor agrarian economies in the past (see e.g. Fan *et al*., 2004, 2007; Economist Intelligence Unit, 2008). There are, however, a number of difficulties in choosing between these different types of investment using a simple comparison of the rates of return. In particular:

- simple cost–benefit analysis does not allow for important dynamic and distributional aspects of the programme – for example, high maize prices give higher rates of return but the programme yields major pro-poor growth benefits by lowering domestic maize prices;
- subsidy programme benefits are very immediate (within two years) as compared with much longer payback periods for most other investments – but social discount rates are affected by wealth and hence are endogenous, so an investment yielding a low but rapid return may be preferred to one giving a higher return over a longer period. Returns are also affected by financial market failures;
- there are strong complementarities between alternative ways of increasing agricultural productivity, as, for example, high yield responses to inputs require research and extension into complementary soil fertility management methods as well as external input use. Rates of return on investments are affected both by these complementarities

and by increasing and decreasing returns to scale and the efficiency of their implementation. It may be best therefore to look for efficient packages of investments rather than the most efficient alternative investments.

These considerations are closely related to considerations of *sustainability*. Fundamental questions here concern the desirability of sustaining the programme, and its economic, political and agro-ecological sustainability.

As regards *desirability of sustaining the programme*, there is a common perception among economic analysts that subsidy programmes should play a short-term role in acquainting farmers with the benefits and methods of adopting a new technology and perhaps of kick-starting input markets (e.g. Morris *et al*., 2007). It is, however, argued in this paper that the MAISP is addressing longer-term problems of input affordability and lock-in to low-productivity maize cultivation that stifle diversification out of maize and the development of the non-farm economy. This requires sustained and consistent investment over many years – but this must also be effective, efficient and sustainable.

Economic sustainability requires constant striving for effective and efficient packages of complementary investments with constant adjustments to match changing circumstances and demands from the programme. The programme must also be affordable. Problems of crowding out of competing and complementary investments were discussed earlier, and these have been a subject of common criticisms that the MAISP is not sustainable macro-economically.

The programme undoubtedly has macro-economic impacts. Benefits arise from substantial increases in productivity of large amounts of land and labour employed in maize production by beneficiary households, with positive impacts on GDP growth. However, very large programme costs have negative impacts. As discussed earlier, a tripling of international fertilizer prices and increased subsidy volumes led to costs increasing dramatically from a little under 6 per cent of total government expenditure in 2005/06 to more than 16 per cent in 2008/09 and from 2.1 per cent of GDP to 6.6 per cent. Both fertilizer prices and volumes fell back dramatically in the 2009/10 programme.

In its first two years there was no evidence of the subsidy having negative macro-economic impacts (SOAS *et al*., 2008), as a result of sound macro-economic management, budgetary support from donors, improving macro-economic indicators (growth, inflation and government deficit) and wider growth in the economy (Reserve Bank of Malawi, 2010) – with the subsidy itself contributing to that growth. Higher programme costs in 2007/08 and particularly 2008/09 combined with internal and external macro-economic pressures to cause adverse changes in macro-economic indicators and reduced funding available to other activities such as health, education and infrastructural development (Dorward *et al*., 2010a).

It has been clear that the 2008/09 level of spending is not sustainable. The very high fertilizer prices in the 2008/09 season were temporary, and the government committed itself to controlling costs by limiting the volume of subsidized fertilizers in future years and restricting the subsidy to inputs for maize, and in 2009/10 the actual fertilizer subsidized was only just over the 160,000mt budgeted. Difficulties posed by high fertilizer prices are, however, instructive as with higher energy prices and carbon taxes likely in the future, fertilizer prices are likely to rise again. This challenges the programme's affordability and economic benefits, although international food prices are also likely to rise, increasing the programme's economic, political and welfare benefits. High fertilizer prices also increase the programme's role in addressing poorer farmers' affordability problems in accessing fertilizers, again increasing its economic, political and welfare benefits. The possibility of higher fertilizer prices in the future therefore increases the need to raise programme efficiency by reducing displacement, improving targeting, controlling fraud and costs, balancing investments across complementary investments (in research, extension and roads), realizing efficiencies and capital savings from private sector involvement in input distribution and raising agronomic efficiency in subsidized input use (discussed below). However, dilemmas from higher fertilizer prices (of higher and less affordable costs but greater benefits) and the implementation of many of these efficiency measures also affect the political and agro-ecological sustainability of the programme.

The government faces difficult political choices affecting the programme's *political sustainability*. The programme made a high-profile contribution to the President's and his Democratic Progressive Party's success in 2009 elections. Pressures to expand the programme and use it for patronage arose prior to the election. International experience suggests that such pressures are likely to grow as the programme continues (see e.g. Dorward, 2009).

These, however, must be contained and expenditures controlled to allow good macro-economic management and release funds for other investments and activities. Availability of budgetary resources and foreign exchange from aid and from mineral earnings will be important in determining political options and considerable skills are needed to balance short-term political and longer-term economic concerns in the context of different regional interests, declining relative importance of rural urban populations and changing political, economic and welfare relations between food and non-food expenditures and farm and non-farm employment.

Finally, we consider the programme's *agro-ecological sustainability.* There are concerns about inorganic fertilizer impacts on water courses and on soil health and fauna. Manufacture of inorganic nitrogenous fertilizers also involves large energy inputs and hence CO_2 emissions and their use releases nitrous oxide (N_2O), a potent greenhouse gas. However, continual cultivation of soils without fertilization leads to loss of soil structure and erosion, and low yields lead to continuous cultivation and its extension to steeper slopes and forest areas. It is therefore important to raise soil fertility with reduced but more effective use of inorganic fertilizer. This can be achieved by using more organic fertilizers (e.g. with reduced or no till practices in 'conservation agriculture') and better placement, timing and formulation of fertilizers in an integrated soil fertility management (ISFM) approach. This should both reduce the negative effects of inorganic fertilizer use and provide tangible benefits from reduced costs, increased efficiency and improved economic and political sustainability of the programme. The record of organic fertilizers in Malawi is, however, mixed. Although there are notable examples of specific successes, these have generally been small scale and not widely adopted (see e.g. Munthali, 2007). It is therefore important to consider how to promote more widespread and effective use of ISFM as an integral part of the subsidy programme. This has been addressed mainly by including subsidized legume seeds in the programme, but this has not been a major activity and seed supply has been limited (Dorward *et al*., 2010b) although subsidized legume seed sales rose from almost zero in 2008/09 to over 1500mt in 2009/10. Current efforts should be extended, together with more investment in the research and investigation of ways to link ISFM adoption to access to subsidized inputs (SOAS *et al*., 2008).

There are also concerns about the agro-ecological sustainability of cropping systems dominated by maize and increasing hybrid maize. These are complex and debated issues, related to genetic diversity, threats of climate change and relative benefits and trade-offs in increasing productivity and resilience. They need to be considered in the context of the effects of maize productivity improvements on the extent of maize cultivation (many argue that it promotes maize cultivation but we argue that it can also reduce reliance on maize, and 2008/09 survey results suggest that maize areas have stayed roughly constant, while Holden and Lunduka (2010) suggest that they have declined).

Lessons from the Malawi agricultural input subsidy programme

Two sets of closely related lessons for other countries can be drawn from our analysis of Malawi's recent agricultural subsidy experience, regarding first the potential benefits that subsidy programmes can yield and the circumstances under which those potential benefits are important and, second, key issues for the design and implementation of large-scale subsidy programmes delivering those benefits.[8]

Subsidies are too often income transfers from the state to less poor farmers, yielding low or negative economic and fiscal returns to investments. The core thesis of this paper is that Malawi's input subsidy programme addresses a low maize productivity trap that leads to food insecurity and poverty, constrains growth and, paradoxically, diversification out of maize and agriculture. The key successes of Malawi's programme arise where it relieves both affordability and profitability constraints to increased staple crop productivity from increased input use, and in doing this raises land and labour productivity and improves food security for large numbers of poor households through some combination of increased real wages and reduced food prices. This model of success will only potentially apply to other countries where large numbers of people face similar staple food productivity constraints and where substantial potential increases in productivity from increased input use are constrained by thin input markets, poorly developed input supply systems and widespread profitability and affordability problems.

For a large-scale subsidy programme to realize its potential benefits, its design and implementation

need to be effective, efficient and sustainable. The following key and often interrelated issues emerge from the discussion:

- *Focus*: subsidies should be focused on inputs for important staple crops with a high potential response to input use constrained by market, profitability and affordability conditions discussed above and with emphasis on both consumer and producer gains.
- *Scale*: sufficient local or national scale is needed for the subsidy to affect staple crop prices and/or labour markets, but the scale also has to be limited to control costs so that the programme is affordable and efficient, funds limit displacement and does not crowd out critical complementary investments
- *Effective targeting and rationing systems* must control costs, reduce displacement and improve subsidy impacts on incremental production and land and labour productivity. Targeting may use geographical (agro-ecological region or livelihood zone) or household approaches, with varying costs and practical and political feasibilities (see Dorward, 2009), but universal provision, with rationing, may also be practicable, effective and efficient (SOAS *et al*., 2008).
- *Entitlement systems* should be robust for effective targeting and rationing. Paper vouchers must be secure against counterfeiting and diversion. Smart cards and other electronic systems linked to debit cards and/or mobile phone-based financial transfer systems are becoming increasingly practical and have many potential advantages, but side effects of their implementation need careful consideration.
- *Logistical systems* face major challenges in coordinating targeting, entitlement, input distribution and purchases for timely, low-cost and easily accessed delivery of small quantities of subsidized inputs to large numbers of dispersed farmers. Major investments are needed to build human and physical capacity for development and operation of these systems.
- *Input supply system development* requires close attention to the complementary and changing roles of different public sector and commercial stakeholders, and to institutions and fora that foster the development of trust and of transparent and stable policies encouraging private sector investments and activities.
- *Performance monitoring, information and audit systems* are essential for developing trust, controlling costs and fraud and establishing incentives for engagement by public sector, commercial, civil society and political stakeholders. Malawi's experience demonstrates the importance of reliable information not just on programme implementation but also on much larger issues such as national population and production statistics.
- *Complementary policies and investments*: the impacts of a large-scale subsidy programme depend on a range of complementary investments and policies promoting infrastructure development, staple market development and stability, ISFM and improvement, agricultural research and extension, and economic diversification in rural areas.
- *Macro-economic management* must promote a good investment climate, favourable conditions for growth and budgetary resources to support the programme.
- *Political commitment* is essential for the mobilization of the substantial resources required for large-scale subsidy programmes in poor countries where such programmes have the most potential. However, the need for patronage to garner broad-based and sustained political support may conflict with the targeting, rationing, cost control and auditing required for economically efficient and sustainable programmes.
- *Stability, flexibility and innovation* are all needed – stability to provide stakeholders with confidence and security (to justify long-term financial and other investments associated with the programme's implementation and realization of long-term objectives); flexibility to adjust to changing conditions (e.g. in international and national markets, in weather and climate, in politics and in the national economy) with some changes in the direct or indirect and anticipated or unanticipated result of the programme; and innovation (in systems, in technology and in prices) to take advantage of learning and change during programme implementation. However, flexibility and innovation can undermine stability, so there must be stable principles governing both long-term objectives of and relations between different stakeholders on the one hand and processes for learning, flexibility and innovation on the other.

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Notes

1. The MAISP has recently been renamed the Farm Input Subsidy Programme (FISP). This paper uses the former name, used in the period reported.
2. Some elements of this analysis are not universally accepted, nor is this summary a complete account of the many issues involved. Explanations for high dependency on maize include different crops' calorific yields, dietary preferences, processing and storage considerations, farmers' familiarity with the crop, and government policies. Poor macro-economic management also constrained growth before 2005.
3. The Starter Pack, as originally conceived, was not intended as a social protection programme but to kick-start agricultural development (see Levy, 2005).
4. Variations in criteria are due to vagueness in guideline definitions of target beneficiaries and differences in ways that communities dealt with shortages.
5. This calculation only considers impacts on maize production, ignoring tobacco and crops mixed with maize – the former assumption reflects much higher displacement with fertilizer subsidy for tobacco.
6. Higher world prices are unlikely to have affected the local prices much due to the high transport costs and the wide gap between import and export parity prices.
7. However, analysis by Chirwa *et al*. (2011) suggests that falls in poverty estimates may be due in part to changing times of data collection and seasonal effects on poverty rates.
8. Dorward (2009) contains a full discussion of these issues within a detailed theoretical consideration of agricultural input subsidy programmes.

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