

# IDS Bulletin

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## DEVELOPMENT STUDIES – PAST, PRESENT AND FUTURE

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and Jeremy Allouche



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# Agricultural Input Subsidies in Sub-Saharan Africa

Tamahi Kato and Martin Greeley

**Abstract** The Institute of Development Studies (IDS) has contributed to African agricultural policy debate which has featured prominently in growth and poverty reduction assessment in sub-Saharan Africa. This debate has rekindled interest in the use of agricultural input subsidies to promote food security nationally and at household level. After the enforced withdrawal of these agricultural subsidies during the structural adjustment era, their re-introduction as 'market-smart' subsidies has led to several assessment studies. This article draws on evidence from five countries and a detailed study in Ruvuma Region, Tanzania. These subsidy programmes were reported to be successful in increasing maize yields and reducing poverty and had positive spillover effects on input use by non-recipients and private sector development in rural areas. However, unclear programme objectives and serious implementation problems prevented most of these programmes from being effective. These results underline the controversial nature of subsidy policies, with contemporary debate mirroring historical controversy.

## 1 Introduction

Development theory has built on the historic experience of rich countries to identify a foundational role for agricultural growth in national economic development. The policy implications of this role have been controversial and the Institute of Development Studies (IDS) has made seminal contributions to this central development debate, notably through the publications of Michael Lipton (e.g. Lipton 1968, 1977, 1989 and 1991). Much of the controversy has centred on the role of agricultural subsidies. Key actors, especially the international financial institutions, have supported different policies – in favour of subsidies and then opposed – in response to shifting ideological influence and the contestation between state and market. IDS (e.g. Colclough and Manor 1991) was deeply involved in the critique of neoliberal orthodoxy which advocated an unhealthy dependence on market-based solutions to development problems. Policy debates were especially vehement in the 1980s in sub-Saharan Africa (SSA) which experienced the enforced adoption of structural adjustment, including the withdrawal of agricultural subsidies along with a wide range of market-based agricultural policies.

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Agricultural input subsidies are again contentious today in policy debate over 'market-smart' subsidies, making this a particularly pertinent topic to explore in this *IDS Bulletin*. This article examines the use of agricultural subsidies policies through an analysis of design and implementation issues in five SSA countries before drawing on a detailed Tanzanian case study. It provides policy conclusions relevant to the current enthusiasm for 'market-smart' subsidies.

In the years before the mid-1970s, a number of SSA countries developed food security programmes by providing subsidised inputs, farm credit, extension services and marketing facilities to farmers as well as by controlling markets and food crop prices (Maxwell 2001). These subsidies supported nationalistic policies by providing direct support to farmers and were seen as a key tool for development through agricultural intensification. However, subsidies also represented a huge financial burden (Chirwa and Dorward 2013; Jayne and Rashid 2013). Their effectiveness has become increasingly questioned due to capture by wealthier farmers (Pan and Christiaensen 2012; Ricker-Gilbert and Jayne 2012). Due to the fiscal unsustainability and inefficiency of these state-controlled policies, structural adjustment programmes were introduced in the agricultural sector in the 1980s and 1990s. These programmes created liberalised input and output markets with the abolition of pan-territorial prices, the privatisation of state-owned enterprises and the removal of input subsidies. Although a positive growth rate of agricultural gross domestic product (GDP) per capita has been reported since then, food crop yields have been stagnant in the region (World Bank 2007). One of the reasons for this low productivity has been the low level of input use (Crawford, Jayne and Kelly 2006).

Subsidy programmes have been popular among politicians since they provided direct support to rural voters and 'compensate(d) for the lack of longer-term investment for infrastructure and short-cut the need for more complex coordination efforts for market development' (Poulton, Dorward and Kydd 2009: 1416). Subsidy programmes were continued in Malawi and Zambia, justified on the basis of the threat of food insecurity from drought and a stagnant economy. Since the early 2000s, other SSA countries have also gradually reintroduced input subsidy programmes using resources generated through debt cancellation under the Highly-Indebted Poor Countries (HIPC) initiative and General Budget Support.

The reintroduction of input subsidies often caused considerable tension between government and donors. The main opponents cited a history of inefficiencies due to mismanagement and fraud. However, the donors' positions varied over time and were not consistent even within the same institutions (Potter 2005; Chirwa and Dorward 2013), due either to differing ideologies or to the lack of evidence available as to the effects and efficiency of the subsidies.

At least eight countries have introduced or reintroduced input subsidies in the region (Crawford *et al.* 2006; Druilhe and Barreiro-Hurle 2012).

These input subsidies have evolved from demonstration packs to large subsidy programmes, but have mainly shifted to targeting small-scale farmers, as in Kenya, Malawi, Rwanda, the United Republic of Tanzania, Zambia, Mozambique, Nigeria and Ghana<sup>1</sup> (Druilhe and Barreiro-Hurle 2012; Liverpool-Tasie 2012b). We focus here on ‘market-smart’ subsidies, targeting small-scale farmers and promoting private sector development. Evidence shows that these subsidies have increased fertiliser use, average food crop yields and food crop production. But success depends on the context, and their design and implementation features (Dorward and Kydd 2005; Druilhe and Barreiro-Hurle 2012; Chirwa and Dorward 2013).

Input subsidies have been contentious. Opponents suggest that they are too expensive and suffer from fraud and mismanagement (World Bank 2007: 115; Ricker-Gilbert, Jayne and Shively 2013: 1). In addition, they tend to benefit wealthier farmers the most, rather than poor farmers, creating a widening gap between these two groups (Ricker-Gilbert and Jayne 2012). Proponents suggest that they educate farmers on input use and, if used properly, will develop the private sector which will give farmers better access to inputs (Crawford *et al.* 2006; Minot and Benson 2009; Chirwa and Dorward 2013). This article provides a review of the features and effects of these new subsidies. We first review five input subsidy programmes in Malawi, Zambia, Ghana, Nigeria and Tanzania, as these countries conducted the principal ‘market-smart’ subsidy programmes in SSA. We then focus on a case study carried out using mixed methods in Ruvuma Region in the Southern Highlands of Tanzania, which is a ‘high-potential area’ for input use. We conclude with an overview of the challenges posed by these programmes and opportunities for their strengthening.

## **2 Overview of five ‘market-smart’ subsidy programmes in SSA**

### **2.1 Design and implementation of ‘market-smart’ input subsidies**

Contemporary agricultural subsidy programmes generally have two objectives: (1) to increase national food security and accelerate economic growth through increased maize/rice production; and (2) to reduce poverty among small-scale farmers by improving household food security through increased production from increased use of inputs (Chirwa and Dorward 2013; Ricker-Gilbert *et al.* 2013). Targeting small-scale farmers explicitly supports the second objective and perhaps increases the effectiveness of the programme by increasing input use, given that these farmers generally had not used inputs before the programme.<sup>2</sup>

In aiming to overcome the past deficiencies of input subsidies, ‘market-smart’ input subsidies: (1) target small-scale vulnerable farmers who did not use inputs before but are expected to find it profitable to do so; (2) promote private sector development, where the private sector procures and distributes inputs by using vouchers, matching grants and loan guarantees; and (3) have an ‘exit’ strategy, because of their huge financial burden on governments and because of their possible contribution to market distortion (Morris *et al.* 2007; Chirwa and

Table 1 Characteristics of five input subsidy programmes in sub-Saharan Africa

	Malawi	Zambia	Ghana	Tanzania	Nigeria
<b>Programme</b>	Farm Input Subsidy Programme	Farm Input Subsidy Programme	Fertiliser Subsidy Programme	National Agricultural Input Voucher Scheme	Growth Enhancement Support Scheme
<b>Year implemented</b>	2005/06	2009	2008–13, 2015	2008/09–2013/14	2012
<b>Programme objectives</b>	Improve resource-poor smallholder farmers' access to improved inputs in order to achieve household and national food self-sufficiency, and raise incomes	Improve household and national food security, incomes, and small-scale farmers' access to agricultural inputs	Enhance national food production and security	Reduce poverty and household food insecurity as well as achieve economic growth and national food security	Promote fertiliser demand and private input sector
<b>Targeted crop</b>	Maize, legumes, and other cash crops (reverting to maize and legumes only since 2009/10)	Maize	Maize or rice, and legumes (soya bean)	Maize or rice	Maize or rice
<b>Targeted beneficiaries</b>	Smallholder farmers, with female-headed households a priority	Small-scale farmers (less than 5ha)	Smallholder food crop farmers (maize, rice, sorghum and millet)	Small-scale farmers (less than 1ha, although this criterion was eliminated in 2010) able to pay for and use inputs with female-headed households as a priority	Smallholder farmers
<b>Beneficiary selection mechanism</b>	Varied with time – through traditional authorities, varied stakeholders, village development committees, open meetings for allocation led by the Ministry of Agriculture and Food Security	Cooperative boards, extension officers, and local leaders are involved in selection	Extension officers	Village voucher committee	Farmer registration
<b>Subsidy delivery</b>	Coupons	Farmer cooperatives (piloted e-voucher)	Coupons	Voucher	E-voucher through mobile phone

cont./

**Table 1 Characteristics of five input subsidy programmes in sub-Saharan Africa (cont.)**

	Malawi	Zambia	Ghana	Tanzania	Nigeria
<b>Subsidised input package</b>	50kg of fertiliser + 2–4kg of seeds	200kg of fertiliser + 10kg of maize	No standard package (compound fertiliser + urea)	100kg of fertiliser + 10kg of seeds	100kg of fertiliser + seeds
<b>Subsidy amount</b>	About 64–93 per cent of input cost	About 50–75 per cent of input cost	About 50 per cent of input cost	About 50 per cent of input cost	About 40 per cent of input cost
<b>Exit strategy</b>	Not explicit	Scaling-down as the years go by	No – one-year programme	Three-year exit plan	No
<b>Monitoring and evaluation system</b>	Yes – numerous evaluation studies implemented (SOAS <i>et al.</i> 2008; Dorward <i>et al.</i> 2010)	Yes	Not reported	Yes – conducted impact evaluation (Patel 2011; URT 2014)	Not reported
<b>Private sector development</b>	Yes, but limited; the private sector has been involved in parallel with parastatal distribution and retailing (Chirwa and Dorward 2013)	Yes, but limited to a few contracted retailers. Concerns were raised that the programme discouraged private participation (Mason <i>et al.</i> 2013)	Yes, but limited to big input supplier companies, which reduced competition and sales by smaller retailers (Benin <i>et al.</i> 2013; Chirwa and Dorward 2013)	Yes. In some cases small agro-dealers could not deliver the inputs, and big retailers tended to be assigned for delivery by district government	Yes (Liverpool-Tasie and Takeshima 2013)

Source Authors' development.

Dorward 2013; Jayne and Rashid 2013).<sup>3</sup> In addition, the use of vouchers emerged as a mechanism for simultaneously targeting subsidies and promoting the private sector. The overview of several features of these programmes in the five SSA countries under study is given in Table 1.

Most of these programmes used decentralised targeting, through traditional authorities, local key stakeholders, voucher committees, or farmer cooperatives. Use of local stakeholders' knowledge during targeting reduces administrative cost, and is common in various anti-poverty programmes (Grosh *et al.* 2008). In the case of Tanzania, voucher committees were established from national to village levels (World Bank 2009). The national level decides the rules and regulations of the programme and evaluates it. This multisectoral arrangement encompasses the government, private sector and farmers' groups. The regional and district committees decide voucher allocation to the lower levels and monitors the programme implementation. The village-level committees select the beneficiary and monitor whether they use inputs.

Though targeting methods varied, all the programmes studied here target small-scale farmers. However, studies suggest that leakage to wealthier

farmers and elite capture were found in most of the countries (Pan and Christiaensen 2012; Chirwa and Dorward 2013; Jayne and Rashid 2013). In our case study in Tanzania (see Section 3) and in other programmes, decentralised targeting using vouchers based on eligibility criteria – albeit ostensibly more cost-effective and a better way of targeting those in need – has often been subject to elite capture and fraud, and therefore does not work efficiently (Pan and Christiaensen 2012). Liverpool-Tasie (2012a) analysed how the programme in Nigeria targeted farmer groups which would later distribute inputs among smallholder farmers; she suggests that social capital and intragroup dynamics were important in voucher allocation. Female-headed households were prioritised in several countries including Malawi, Zambia and Tanzania. However, the evidence in Malawi and the qualitative information in our study in Tanzania show that female-headed households had difficulty obtaining subsidised inputs (Chirwa *et al.* 2011). An e-voucher system, which avoids manipulation by government officers, politicians, village leaders and agro-dealers by delivering inputs via private input traders directly to the recipients' mobile phones, was piloted in Zambia and is also currently being implemented in Nigeria.

## 2.2 Input delivery

After attempts such as the Starter Pack and the Targeted Input Programme, Malawi launched the first modern Farm Input Subsidy Programme (FISP) across much of the country in 2004/05. This programme aimed to overcome the problems of previous input subsidies: it was targeted at small-scale farmers and achieved wide coverage through the use of vouchers (sometimes known as 'coupons'); and it used the private sector for the procurement and delivery of inputs in order not to distort the input market. This innovative approach, called a 'market-smart' subsidy (Minot and Benson 2009), led to increasing maize production and yields from 2005/06 to 2008/09 (Dorward and Chirwa 2011). This success gave impetus to the pro-subsidy lobby and led to the unanimous commitment of the African Union states to increasing input use through 'market-smart' subsidies to promote food crop yields, mainly of maize (AU 2006). Since the food and input price spikes in 2008, donors such as the World Bank have been supporting these programmes (Benin *et al.* 2013).

In terms of input procurement and delivery, the Malawi programme used parastatal agencies for input distribution and retailing, but with some participation by private agents in order for mutual trust between government and the private sector to be developed (Chirwa and Dorward 2013). In Tanzania and Nigeria these activities were undertaken by the private sector, which promoted the development of a private input sector through the increased input demand created by subsidies (Liverpool-Tasie and Takeshima 2013; URT 2014), while in Zambia and Ghana input delivery was limited to a few contracted, big input supplier companies, which reduced competition (Mason *et al.* 2013; Benin *et al.* 2013). There were problems in input delivery – late input delivery being the inherent problem – due to lack of administrative capacities of the government and/or lack of capacity of the agro-dealers.



### 2.3 Effects and challenges of the ‘market-smart’ input subsidies

Studies suggest that most of the programmes brought about increased maize production and maize yields when climatic and economic conditions were favourable. However, a synthesis of recent studies (Jayne and Rashid 2013) suggests that the costs of the programme outweighs their benefits. The production gains have been found to be limited due to low fertiliser use efficiency, missing vouchers, and displacement of previously commercial input use (*ibid.*). The studies reported that the programmes in Malawi, Nigeria, Tanzania and Zambia found increased maize land productivity and output, and in Malawi and Nigeria also increased household income and reduced poverty (Xu *et al.* 2009b; Yawson *et al.* 2010; Awotide *et al.* 2013; URT 2014). Examining the field results of rice-producing farms in Ghana, Wiredu, Zeller and Diagne (2015) suggest that the programme increased land productivity, but reduced labour productivity because more family labour was used in weeding and harvesting.

Meanwhile, most of the programmes were found to be ineffective, due to leakage to wealthier farmers which promoted displacement of commercial input purchase, and late delivery of vouchers and inputs. Using nationally representative panel data in Zambia, Xu *et al.* (2009a) suggest that the less developed the private sector, the more subsidies tend not to be displacing as they create fertiliser demand. One apparent solution for displacement is e-vouchers, as they deliver subsidised inputs directly to the small-scale farmer recipients’ mobile phone, not via government officials, by which Nigeria tripled fertiliser use from 2011 to 2013 per hectare (World Bank 2015).

Studies suggest that input subsidies have had a wider impact on the economy through increased food crop production: this led to a reduction in consumer food prices, to the benefit of poor food consumers; and an increase in rural agricultural wages (Druilhe and Barreiro-Hurle 2012; Chirwa and Dorward 2013; Dorward and Chirwa 2013). However, the benefit has varied with the nature of the subsidies and their context in the market, as well as with the weather. Chirwa and Dorward (2013) suggest that the large scale of the programme relative to the past fertiliser demand brought a reduction in real maize prices, and that it promoted private sector development and agricultural growth. An increase of input use by non-recipient farmers which was probably due to the informational spillover effect was observed in Tanzania (URT 2014). The right benefit–cost ratio (BCR) was keenly debated in the case of Malawi (Jayne *et al.* 2013, 2015; Dorward and Chirwa 2015). Jayne *et al.* (2015) suggest that the ratio is negative and that investment in traditional public goods such as agricultural R&D and extension, or road, rural electrification or other productivity-enhancing investment should be priorities rather than continuous investment in unproductive subsidy programmes (Fan, Gulati and Thorat 2007).

Compared to previous subsidy programmes, all the new programmes found it challenging to improve targeting, transparency, timely delivery

of voucher distribution, or monitoring and evaluation. Subsidies may also have preferentially benefited areas where the government leadership had a political interest (Banful 2011). The programme in Tanzania found that the late redemption of vouchers by the National Microfinance Bank caused reluctance among the agro-dealers to continue in the subsidy business.

### **3 The case of Tanzania – the National Agricultural Input Voucher Scheme (NAIVS)**

This section provides a mixed-methods case study on the Tanzanian voucher scheme (NAIVS) carried out in Ruvuma Region in Tanzania. By using mixed methods we could provide evidence on the impact quantitatively and the qualitative research provided crucial insight into the factors that impacted upon programme performance and outcomes. As Ruvuma normally has a good rainfall, and received a relatively substantial amount of subsidy per farmer – 10 per cent of the subsidy distributed in the country for 3 per cent of the national population – the study could expect to observe some impact. It could thus be relevant as a case study for input subsidies in general in SSA. The study employs: (a) panel data from 340 farm households collected in Ruvuma during the agricultural season previous to the pilot year of the subsidy programme<sup>4</sup> and again in its third year in order to measure the programme's impact; (b) qualitative information from 130 key-informant interviews; (c) five farmer-group discussions which were mainly conducted in the region; and (d) secondary data sources.

The intention of the programme was to respond to the food and input crisis in 2008 by ensuring food security, especially that of the poor and vulnerable households facing food and input price hikes. This accords with poverty reduction and economic growth under the overall framework of the National Strategy for Growth and Reduction of Poverty and to prioritising the provision of inputs and services in the Agricultural Sector Development Programme (ASDP). The programme was originally meant to be short term and had an 'exit' strategy.

Our quantitative and qualitative studies found that unclear programme design and various problems in implementation made it unlikely that the programme would yield the expected effects. The panel data regression results do not show any statistically significant impact of voucher receipt on maize yield, income poverty, calorie consumption, household assets or sending children to school among recipient households. Meanwhile, the qualitative data revealed a positive impact on maize yields, food security and poverty reduction. These contradictory results between quantitative and qualitative findings might have been due to the way the panel households were selected, or to the reporting errors in both methods of data collection, such as conformational bias of the interviewees (Copestake and Remnant 2015) and recalling errors (Deaton 1997). While recognising this data limitation, we suggest that the programme did not bring about the expected direct impact on poverty and farmers' livelihoods due to flaws in design and implementation.

The programme had originally a dualistic design of aiming for national as well as household food security. After the crisis ended, in 2011 the targeted group officially changed from small-scale farmers with less than one hectare under maize or rice cultivation to middle-scale farmers, who cultivate more than one hectare of maize or rice and are able to pay a top-up. However, this reflected the reality revealed since the pilot year. In the first years in practice, better-off farmers became the main users of vouchers because small farmers often did not understand the benefits of input use and anyway could not afford to pay a top-up. It became more difficult for the poor farmers to pay a top-up as the years went by due to the increase in input prices. And the change in the target group also made it difficult to target the same households for three years in order to achieve the stated 'exit' strategy, which was actually hindered from the egalitarian distribution of vouchers by village leaders. This made a thin distribution of vouchers, with 68 per cent of recipient households receiving vouchers for only one or two years.

The implementation of the programme was also flawed due to the frequent late delivery of vouchers, corruption, patron-client relationship, politicised voucher allocation, illegal collusion between leaders and agro-dealers, missing vouchers and resale of vouchers by farmers. We found a large gap between the government data on the number of vouchers distributed in the region and the number of vouchers received as reported by panel households. According to government data, the number of vouchers distributed in the region was nearly three vouchers per farm household during four years of the programme. The practice was very different; a little more than half of panel recipient households were actually issued with vouchers but only in one or two years. The 'missing vouchers' might have been captured by agro-dealers, or by leaders from regional to village level. Vouchers are exchangeable for money, and thus became a source of conflict. When fewer vouchers were distributed, tension became higher among villagers, village leaders, agro-dealers, government officers and lower level politicians. But in the end, politicians, government officials, village leaders and agro-dealers got most of the benefit, while small-scale, poor farmers benefited least from the programme.

An unforeseen problem was the increasing real top-up price which voucher recipients had to pay. This was due to the rise in international market prices, which was also promoted by the power of multinational input supplier companies who provided the inputs to NAIVS. Due to the rise of input market prices, the real value of vouchers to farmers was reduced. With relatively stagnant real maize prices, this made it increasingly difficult for small-scale farmers to pay a top-up.

The challenges of effectiveness and efficiency could be met by making the programme intention clear, strengthening programme design and having a proper implementation plan, while developing sufficient institutional capacity to run the programme well. A mechanism for voucher delivery which is independent of the government administration system needs

to be established. The implementation plan put in place must seek to prevent the illegal behaviours described above. Effective monitoring and evaluation is necessary for implementation to be accountable.

Part of the subsidy was used as intended, which increased maize production due to the expansion of the total cultivated area, brought about better food security in the region, and raised awareness of the effects of the inputs on maize production. We also found the subsidy had an indirect wider impact on lowering real maize prices and increasing real agricultural wages in the region, which benefited net-food buyer and labour-surplus poor farmers but negatively affected net-food sellers, who were the majority of households in Ruvuma. We also found that the private input sector developed. The programme played an important part in input procurement, and especially in delivery to rural areas. The agro-dealers who worked with NAIVS expressed their intention to carry on after the programme ends, since they know that there is increased demand, and have established links between themselves and farmers. Meanwhile, the increased input demand has been hampered by the increased price of urea in recent years, which has caused a decrease in import quantity.

#### **4 Successes of and challenges to input subsidy programmes in SSA**

This article has so far provided an overview of the generic features and effects of agricultural subsidies in SSA. This concluding section focuses on challenges to consider for future development of the new 'market-smart' subsidies now been framed and explored in many SSA countries.

The recent input subsidy programmes were reported to be generally successful in increasing input use, maize production, maize yields and food security, at least under favourable economic and weather conditions, and in promoting private rural input business. A fall in maize prices and an increase in local agricultural wages were also reported in Malawi and our study in Ruvuma Region. These effects benefit net-food buyers and labour-surplus smallholders (Chirwa and Dorward 2013).

However, unclear programme objectives and the various implementation problems prevented most input subsidy programmes from being effective and efficient. A common challenge existed around the programme objectives; whether these were greater national maize production and national food security, or the increased use of productivity-enhancing inputs by poor, small-scale farmers to increase their household food security. In the programmes recently implemented, these two objectives, with different implications for targeting, run alongside each other. With a national food security concern, effectiveness would suggest more emphasis upon increasing the marketed surplus and therefore a preference for targeting larger farmers. However, from an efficiency perspective, marginal productivity might be expected to increase most on farms using lower levels of input use per hectare, which tend to be the small farms. Targeting smaller farmers is clearly also likely to better serve poverty reduction

and is also more likely to promote more widespread use of inputs in the long term when these smaller farmers are persuaded of the gains from use of improved seed and fertiliser because of their learning through the subsidy programme. Thus, it is quite possible that these different objectives are best served by different targeting strategies. Addressing effectiveness and efficiency concerns meaningfully therefore requires clarity in programme objectives and appropriate design and implementation plans to achieve them.

These results serve to underline the controversial nature of subsidy policies and contemporary debate mirrors historic controversy. One of the historic challenges has been to base policy reform on evidence rather than ideology. Today at last, the evidence to support specific policy agendas is beginning to emerge. The studies suggest that there were frequent reports of elite capture and illicit behaviour. As seen in Ruvuma Region, input subsidy can be a source of tension and conflict in the villages and can increase the gap between middle-scale and poor farmers, where the wealthier and more powerful win most of the benefit. Input subsidies should be targeted more effectively at poor, small-scale farmers, which would also serve social protection needs (Ellis, Devereux and White 2009; FAO 2015).

Despite the negative effects noted, there were positive impacts, such as spillover effects on input use to non-recipients and private sector development in rural areas. The mechanisms to deliver vouchers should be reconsidered in order to reduce the risk of embezzlement of vouchers. Also, the involvement of the private sector for procurement and delivery should be considered depending on the stages of input private sector development. Improved programme monitoring and evaluation is also important, for example to assess the efficacy of promising institutional innovation in delivery such as subsidies provided by e-voucher, piloted in Zambia and implemented in Nigeria.

### Notes

- 1 The ones in Burkina Faso, Senegal and Mali were universally distributed.
- 2 There are no scale economies in fertiliser use; nevertheless, an alternative argument is that larger farmers might be better educated or more experienced in fertiliser use and achieve higher marginal productivity. The evidence either way is not wholly conclusive but the evidence on lower fertiliser use per hectare by smaller farmers and the normal assumption of declining returns suggest the marginal productivity argument supports the small farm case.
- 3 However, among the subsidy programmes studied, only that in Tanzania explicitly mentioned 'exit'.
- 4 Household Vulnerability Panel conducted by the World Bank and FAO (Christiaensen and Pan 2009).

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