

# MOZAMBIQUE

## Strategy Support Program



### AGRICULTURAL INPUTS SUBSIDY AND THEIR DEVELOPMENTAL IMPACT: CONVENTIONAL WISDOM

HIROYUKI TAKESHIMA AND HAK LIM LEE

A subsidy is defined as a payment, generally made from public resources, that reduces the price that a buyer pays for a good or service below the price at which the seller provides it. The difference between the sellers' price and the buyer's price is the amount of the subsidy.

A subsidy can be analyzed as a negative tax. The effect of a subsidy on the quantity produced and the quantity consumed is just the opposite of the effect of a tax – with a subsidy, the quantity demanded of the subsidized good or service generally increase.<sup>1</sup> Agricultural input subsidies are one of the most common subsidies employed as policy instruments in the agricultural sector in order to lower the prices that farmers pay for their inputs (such as fertilizer, seed, and equipment) below their market prices.

Agricultural input subsidies have often been used in sub-Saharan Africa, often inappropriately, to achieve one or more of the following goals:

- Improve the affordability of agricultural inputs for smallholder farmers;
- Improve the accessibility farmers have to inputs;
- Develop the input-supply distribution system;
- Sensitize farmers to the use of inputs where it may potentially be profitable;
- Provide social protection for vulnerable groups by increasing productivity and access to food;
- Restore soil fertility and improve soil fertility management practices; and
- Reduce social costs due to rural-urban income disparities, with broader goals of raising agricultural production and food security.<sup>2</sup>

### IMPACTS OF SUBSIDIES: CONVENTIONAL WISDOM

In many cases, however, subsidies on agricultural inputs are regarded as being less than an optimal allocation of public resources. Standard economic theory that describes the likely outcome of public agricultural policies suggests that subsidies on agricultural inputs likely will result in an oversupply of subsidized inputs to farmers who are unable to be sufficiently productive to use those inputs efficiently, thus creating a deadweight loss to society (Figure 1). A deadweight loss can be defined as a loss of economic efficien-

cy, resulting from the misallocations of resources where goods are supplied at higher cost than the value they create and bought by those who extract less value from the goods than their cost, when their cost is valued at non-subsidized prices.

The inefficiency of input subsidies arises for a number of reasons. For example, public resources, such as funds from the annual government budget or grants from development partners, that are used for supplying fertilizer to farmers at a subsidized cost have associated opportunity costs – that is, they can as well be used in many other ways which might provide greater social benefits than those that society receives from the increased use of (subsidized) fertilizer. These uses include directing those resources to support other economic activities that may be more productive economically, such as research; reducing the tax burden on individuals and firms to promote increased investment into productive assets; or direct income transfers to the poor in order to help them accumulate productive assets, increase productivity, and increase their income.

Although subsidies do not always lead to such inefficiencies, the conventional wisdom on subsidies in the agricultural sector is that their use will result in distortions in the efficient use of economic resources. Input markets without subsidies are more likely to allow both government and private firms and individuals to make more productive investments that result in higher returns overall in terms of benefits to society. In Asia in the 1990s, it was found that the rate of return to agricultural input subsidies generally was lower than the returns to public investments in road infrastructure, agricultural research and extension, and education.<sup>3</sup> Other types of inefficiency can potentially arise from subsidies, particularly for subsidized agricultural inputs<sup>4</sup>:

- Some of the subsidy may go to reducing the production cost of goods that would be produced anyway even if the input was not subsidized, instead of leading to additional production. In consequence, little increase in the demand for the input results. One effect of this is that firms that do not receive subsidized inputs may be crowded out of the market for the goods that they produce, as they are unable to supply the products at a price competitive with their competitors who receive subsidized inputs.

Markets for subsidized inputs are linked to the markets of other inputs in a way that may erode any potential benefits from subsidized inputs through interactions with those unsubsidized input markets. For example, a subsidy on fertilizer may raise far-

mers' demand for land, labor, or machinery in order that they use the fertilizer most profitably. But if these other inputs are relatively scarce, farmers receiving subsidized fertilizer will compete for scarce land, labor or machinery, offering higher prices for those inputs, and pass the fertilizer subsidy benefits to suppliers of these other inputs.

- Inefficiencies in the use of subsidized inputs may arise due to poor targeting, late supply, poor input quality, or farmers' misunderstanding of appropriate uses of inputs.

Because of such potential inefficiencies, use of agricultural input subsidies always warrants careful consideration. As is discussed in brief (4), alternative options for achieving the intended policy goals should be closely considered in deciding whether to proceed with a subsidy program.

## BOX A: EXAMPLE OF DEADWEIGHT LOSS - FERTILIZER SUBSIDY IN MALAWI

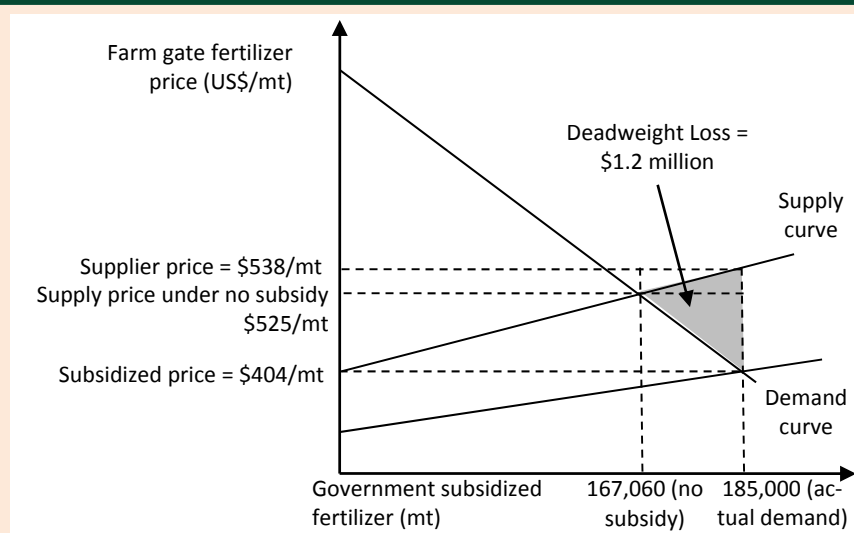


Figure 1 illustrates a simplified example of the potential deadweight loss that arises from a fertilizer subsidy, using an example drawn from the fertilizer subsidy program in Malawi for the 2006/07 season.<sup>5</sup> This is an illustrative example based on simplifying assumptions concerning the operations of the fertilizer market in Malawi. We only show the case for the government-distributed fertilizer. A subsidy rate of 25 percent was applied. The total quantity of subsidized fertilizer in Malawi was estimated at 185,000 mt. We assume an elasticity of supply of fertilizer of 4.0 consistent with estimates from elsewhere,<sup>6</sup> an exchange rate of US\$ 1.00 = MK 130.

If the subsidy rate is zero and government simply distributes fertilizer as if it is private firm, 167,060 mt of fertilizer will be supplied and bought at US\$ 525/mt. If the subsidy rate is 25 percent, then demand increases to 185,000 mt, as the price for farmers drops to

US\$ 404/mt. The unsubsidized cost of supplying this amount of fertilizer rises to US\$ 538/mt. In consequence, the total subsidy cost is US\$ 24.9 million. Farmers capture US\$21.4 million of the subsidy from reduced fertilizer price, while fertilizer suppliers capture \$2.3 million from their increase in supplies and a higher sales price. The remaining US\$ 1.2 million of the total subsidy amount is a deadweight loss and an economic loss to society, because both farmers and fertilizer suppliers could have benefited more if the subsidy cost of US\$ 24.9 million were simply allocated among them rather than allocated to them through the fertilizer market. With the subsidy, total benefits of only US\$ 23.7 million were allocated to them.

## ECONOMIC CHARACTERISTICS OF SUBSIDIZED INPUTS

The key economic characteristics of agricultural inputs that determines the size of the deadweight loss created by a subsidy is the elasticities of demand and supply for the input, as well as how a subsidy would shift these demand and supply curves. (See Box B for a discussion of the concept of “elasticity”.)

### Elasticity of demand

With elastic demand for a certain input, providing a small subsidy on the input may significantly increase its use. However, the higher the subsidy rate, the greater the deadweight loss that a society will face. Therefore, it may be desirable to keep subsidy rates as low as necessary to achieve the development objectives sought.

In contrast, with inelastic demand, providing a small subsidy will lower the price of the input for farmers without creating too much deadweight loss. In such a situation, it may be desirable to apply a subsidy to reduce the cost of the input. In sub-Saharan Africa, fertilizer demand is still fairly inelastic,<sup>7</sup> meaning that demand

for fertilizer increases by less than one percent when the price of fertilizer drops by one percent.

### Elasticity of supply

When the supply of inputs is elastic, most of the benefits from a subsidy on inputs can be captured by farmers. This is because the increased demand resulting from the subsidy will not push up the price of the input.

On the other hand, an inelastic supply implies that most of the benefits from a subsidy likely will not be captured by farmers, but by the suppliers of the input. Generally, the supply of inputs like fertilizer is elastic, because of their tradable nature. However, their supply can be inelastic if the domestic supply network within a country is under-developed with insufficient number of agro-dealers or if poor road conditions can raise inputs costs transported to the remote areas. These conditions certainly apply in much of Mozambique. Similarly the supply of certified improved seeds in sub-Saharan Africa may be inelastic if imports are restricted by complex national seed certification control processes, limited domestic seed production capacity, or long multiplication lead times.<sup>8</sup>

## How a subsidy shifts demand and supply curves

Subsidies can shift out demand curves for inputs – that is, more of an input will be demanded at all prices. A greater shifting out of the demand curve for an input implies that farmers have become more productive and efficient in using their inputs, possibly due to learning. However, it is unclear how much learning factors can be expected to shift the demand curve for some inputs like fertilizer.

Similarly, subsidies can shift out the supply curve for an input if, for example, increased demand for inputs help agro-dealers to enlarge the scale of their businesses and, in consequence, lower the cost per unit of input that they supply to farmers. If such effects of a subsidy are expected, the subsidy may involve a transfer of most of its benefits to farmers over time. But, if such expansions in demand and supply occur simultaneously, it becomes unclear who capture most benefits from the subsidy.

In certain cases, particularly when labor or land is scarce, a fertilizer subsidy could initially increase the demand for labor or land, raising their price. The higher prices of these necessary complementary inputs may discourage fertilizer demand, shifting in the

demand curve – that is, less fertilizer will be demanded at all prices. In such cases, the benefits from the subsidy could be partly transferred to hired workers and land owners, instead of being captured by farmers.

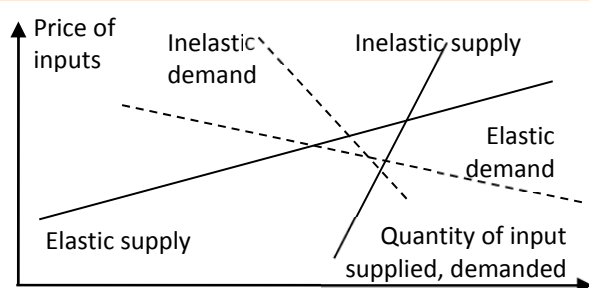
Overall, an input subsidy program needs to be formulated and implemented with a good understanding of the following issues:

- What are the strategic development objectives that the subsidy program is to achieve? These objectives could include boosting food production through increased use of inputs, reducing poverty among smallholders through reduced costs of inputs, developing a private input-supply network, improving soil nutrients, or some other goal altogether.
- What are the economic characteristics of the agricultural inputs to be subsidized?
  - Will demand for inputs be expected to increase when the inputs are offered at a subsidized price?
  - Is there sufficient supply capacity for meeting such increased demand?

## Notes

1. Pindyck RS & DL Rubinfeld. (2005). *Microeconomics*. 6th ed. New Jersey: Pearson Education, Inc.
2. World Bank. (2007). *World Development Report 2008: Agriculture for Development*. Washington, DC: World Bank.
3. Fan S., S Thorat & N Rao. (2004). *Investment, Subsidies, and Pro-Poor Growth in Rural India: Institutions and Economic Policies for Pro-poor Agricultural Growth*. IFPRI discussion paper, IFPRI, Washington, DC.
4. Dorward A, E Chirwa & TS Jayne. (2011). *Malawi's agricultural input subsidy program experience over 2005-09*. In P Chuhan-Pole & M Angwafo (eds), *Yes Africa can: Success stories from a dynamic continent*. World Bank, Washington DC.
5. Ricker-Gilbert J, TS Jayne & E Chirwa. (2011). *Subsidies and Crowding Out: A Double-Hurdle Model of Fertilizer Demand in Malawi*. *American Journal of Agricultural Economics* 93(1): 26-42.
6. Quizón J & H Binswanger. (1986). *Modeling the Impact of Agricultural Growth and Government Policy on Income Distribution in India*. *World Bank Economic Review* 1(1), 103-148.
7. Langyintuo AS, K Foster & J Lowenberg-DeBoer. (2003). *Potential impact of input policy on maize supply in Ghana*. In *Maize revolution in West and Central Africa*, B. Badu-Apraku. IITA, Ibadan, Nigeria.
8. Dorward A. (2009). *Rethinking agricultural input subsidy programmes in a changing world*. Paper presented for the Trade and Markets Division, Food and Agriculture Organization of the United Nations.

## BOX B: ELASTICITY OF DEMAND AND SUPPLY; MARGINAL PRODUCTIVITY OF INPUTS



**Figure A1: Elastic and inelastic supply and demand curve**

Price elasticity of supply (demand) measures how much the supply (demand) of a good (or service) in the market changes when the price of the good changes by one percent. For a market good with a supply elasticity of one, a one percent rise in price results in a one percent increase in the quantity supplied. Similarly, for a good with a demand elasticity of one, consumers will demand one percent less of the good when its price increases by one percent. Elastic (inelastic) supply or demand indicates that quantity of the good supplied or demanded changes greatly (little) when the price of the good changes slightly.

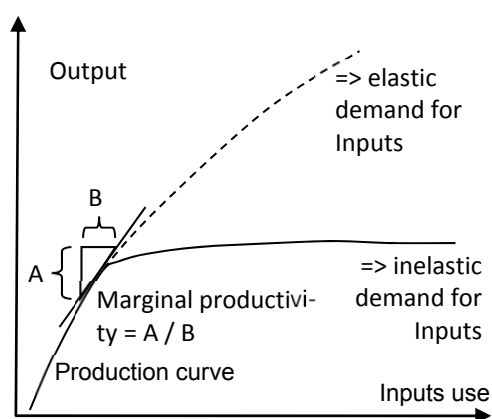
Supply will be price elastic generally if the production of goods can be expanded relatively easily without raising unit production cost. Goods widely traded internationally, including fertilizer, usually have elastic supply. On the

other hand, goods that are not easily tradable, such as land in land scarce countries, have inelastic supply. Demand will be price elastic if the consumption or use of additional units of the good continues to bring high returns to the consumer/user. In contrast, goods for which returns decrease quickly with the use of additional units have inelastic demand.

**Figure A2: Marginal productivity and elasticity of demand**

Marginal productivity measures how much crop output increases if an additional

unit of input is used. In Figure A2, the marginal productivity of an agricultural input is measured as the slope of the production curve. The production curve flattens out if marginal productivity diminishes as more input is used, and this leads to inelastic demand for inputs.



The elasticity of demand for inputs generally will depend on both the prevailing production technology used and crop prices. Elastic demand for inputs generally implies that the marginal productivity of inputs is high but input use is low due to high prices. For example, farmers may have available improved crop varieties that respond well to fertilizer, but the uptake of these varieties is low because of high fertilizer prices (Figure A2). Inelastic demand generally implies the opposite – farmers may be growing crop varieties for which the response to fertilizer quickly diminishes at quite low rates of application, or farmers have little access to other inputs such as irrigation, machinery or labor necessary to attain the full yield potential of the crop variety.

### INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW • Washington, DC 20006-1002 USA

T: +1.202.862.5600 • F: +1.202.467.4439

Skype: ifprihomeoffice • Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

### IFPRI-Mozambique

c/o INIA

Av. FPLM 2698, P.O. Box 2100, Maputo, Mozambique

Telephone: +258-21-462776

This publication has been prepared as an output of the Mozambique Strategy Support Program (MozSSP), which is facilitated through funding from the United States Agency for International Development (USAID) mission office in Mozambique. It has not been peer reviewed. Any opinions stated herein are those of the author(s) and are not necessarily representative of or endorsed by the International Food Policy Research Institute or USAID/Mozambique.

Copyright © 2012 International Food Policy Research Institute. All rights reserved. To obtain permission to republish, contact [ifpri-copyright@cgiar.org](mailto:ifpri-copyright@cgiar.org)