3 Fertilizer

In Western Kenya most farmers grow maize, predominantly for subsistence. The average farmer plants just under one acre of maize during the "long rains" from March to July, and again during the less productive "short rains" from August until January. Using only one-half teaspoon of fertilizer per plant would increase yields by about $26 per acre and cost only $20 per acre. After accounting for the extra labor associated with fertilizer use, the fertilizer rate of return is around 70% a year, a worthwhile investment.[1]

Fertilizer is credited with increasing global yields of food crops by 40–60%,[2] and no region has been able to boost agricultural growth without increasing its use.[3] The Green Revolution, which can be attributed to the use of fertilizers and improved seeds, has had a dramatic impact on the food supply and incomes of many developing countries. During the past 40 years the world witnessed an extraordinary period of crop productivity and was able to overcome chronic food deficits. However, the use of fertilizers and other chemical inputs has increased soil erosion and acidification and groundwater pollution.[4] To counter this unwelcome development, care is necessary to prevent soil damage, environmental pollution or adulterated fertilizer use, while continuing to increase the much-needed use of fertilizer in certain regions.

Low productivity in regions such as Sub-Saharan Africa is associated with the limited adoption of fertilizer.[5] In West Africa, for example, where soil nitrogen and phosphorus contents are low, fertilizer use between 2002 and 2009 was at an average of 5 kg/ha, significantly less than the recommended 50 kg/ha.[6] While fertilizer use has dramatically increased in some countries such as Burkina Faso, from 0.4 kg/ha of arable land in 2002 to 14.3 in 2013, and in Ghana from 3.7 to 35.8 during the same time period, little change has occurred in other countries such as Niger, which has barely moved up from 0.6 to 0.7kg/ha.[7] Furthermore, low fertilizer use not only restricts yields today, but also promises future productivity declines due to the ongoing depletion of soil nutrients.[8]

Portrait of Abou amid millet stalks in southwest Niger.
Photo: Stephan Gladieu / World Bank.

Fertilizer use in developing countries is constrained by a number of factors, particularly high prices and unavailability that often reflect unsatisfactory procurement practices, inefficient administrative procedures and inadequate infrastructure. Limited understanding among farmers of fertilizer use hampers more widespread fertilizer uptake.[9] Some major challenges that impact farmers stem from the lack of new and innovative fertilizer products in the market, cumbersome import procedures that can discourage businesses from importing and adulterated or contaminated fertilizer products. Adulteration or contamination can lead smallholders to doubt the value and importance of fertilizers if their potency and effects are compromised.[10] In more serious cases, fertilizer adulteration can reduce crop growth, affecting output in ways that lead to food and income insecurity and may be environmentally harmful.

Policies and regulations that enable the sector to grow and producers to maximize their potential, for example, can often come into conflict with concerns regarding soil health and water contamination. Nevertheless, strong regulations that enable increased fertilizer access are essential to increase yields. As a result, as in any other industry, the debate remains on appropriate regulation levels.

What do the fertilizer indicators measure?

The fertilizer indicators measure laws and regulations on the registration, import and quality control of fertilizer products, all of which are crucial to increasing fertilizer access (table 3.1). The indicators cover the following areas:

Registering Fertilizer: In most countries, fertilizer cannot be imported, manufactured, distributed, sold or used unless it has been registered with a designated authority. Registration of fertilizer products ensures the safe entry of new products into the market as governments are able to provide market oversight through a registration scheme and test the fertilizer's impact on soil, human health and the environment. Moreover, product registration gives farmers confidence in the products that they are using. This indicator measures the following:

Registration requirements. The requirement to register fertilizer products, the types of entities required to register products, types of fertilizer products required to be registered and any time-limitations on fertilizer registration.

Registration procedures. Procedures, time and cost to register a new fertilizer product.

Fertilizer catalogue. The existence of an official fertilizer catalogue with a list of registered fertilizers, and its availability online.

Re-registration of fertilizer products. The requirement to re-register a product previously registered in another country.

Importing and Distributing Fertilizer: Fertilizer production is energy intensive, and the industry benefits from economies of scale as well as low costs of raw materials. It is no surprise, therefore, that the world's production capacity is concentrated in a few countries. With just five countries[11] producing half or more of the global supply of the most common types of fertilizer, simple and uncomplicated import procedures are essential to fertilizer access in the majority of countries around the world. This indicator focuses on:

Table 3.1 | What do the fertilizer indicators measure?

REGISTERING FERTILIZER	• Legal requirements to register a new fertilizer product and information accessibility • Time and cost to register a fertilizer product
IMPORTING AND DISTRIBUTING FERTILIZER	• Entities allowed to import fertilizer products • Requirement for a company to register as a fertilizer importer • Requirement of import permits to import fertilizer products • Entities allowed to distribute fertilizer products
QUALITY CONTROL OF FERTILIZER	• Labeling requirements for fertilizer bags • Prohibition and penalties for the sale of mislabeled and open-bag fertilizer

Source: EBA database.

Entities that are allowed to import and distribute fertilizer: Entities allowed to import and distribute fertilizer, including the private sector, nongovernmental organizations, and producers organizations.

Import registration: The requirement to register as a fertilizer importer and any time limits on the validity of the import registration.

Import permits: The need to obtain an import permit to import fertilizer products, any per-shipment or volume limitations applicable to the permit, any time limits on the validity of the permit and total time and cost to obtain the permit.

Quality Control of Fertilizer: The potential damage caused by adulterated fertilizer, typically not apparent until months after application, undermines trust in fertilizer quality and discourages farmers from using fertilizer at all.[12] Quality control and inspection methods, as well as punishments for breaking laws, vary significantly across the world. However, a minimum set of standards to increase fertilizer quality control can be applied in all countries and across regions and income groups. This indicator measures:

Labelling and packaging requirements: The obligation to label fertilizer bags and specific labeling requirements, including language and label content.

Mislabeled and open-bag fertilizer: The prohibition of and establishment of penalties against the sale of mislabeled and open-bag fertilizer.

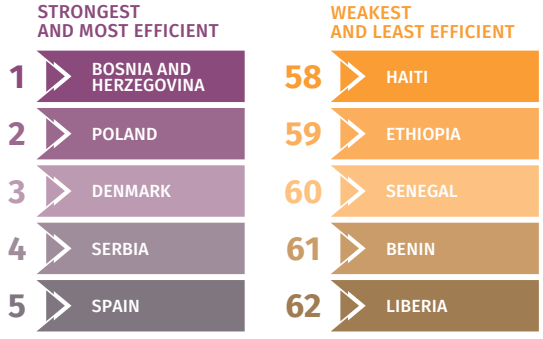
How do countries perform on the fertilizer indicators?

Bosnia and Herzegovina performs the best on the fertilizer indicators this year, due to strong regulations in all areas; it has one of the most inexpensive and least burdensome fertilizer registration procedures, and registration also does not expire and is not subject to periodic fees. In addition, all registered fertilizer products are included in a catalogue that is accessible online, creating further transparency for industry stakeholders. Bosnia and Herzegovina performs particularly well on the importing and distributing fertilizer indicator; for example, importer registration is a one-time-only requirement and no per-shipment import permits apply. On quality control measures, fertilizer bags must comply with comprehensive labeling requirements in at least one of the country's official languages, and mislabeled and open bags are prohibited and subject to penalties, encouraging further fertilizer quality control. EU countries also performed well across all fertilizer indicators, with Denmark, Greece, Italy, Poland and Spain all receiving among the top 10 scores, principally due to strong rules adopted and harmonized at the EU-level.[13] OECD high-income and Europe and Central Asia countries demonstrate strong regulations applicable to importing and distributing fertilizer—high-performing countries typically only require a one-time import registration at the company level and do not require any per-shipment import permits.

The countries, from lowest to highest, with the worst performance on the fertilizer indicators include Liberia, Benin, Senegal, Ethiopia, Haiti, Sudan, and Burkina Faso, along with Niger. These countries have rudimentary regulatory frameworks for registering fertilizer. Countries that performed poorly with respect to regulations for importing and distributing fertilizer are primarily located in Sub-Saharan Africa and the Middle East and North Africa regions, where the renewal period for importer registrations are shorter and import permits are expensive and valid for a shorter period of time. Ethiopia received the lowest score of all 62 countries on importing and distributing fertilizer because the private sector is prohibited from engaging in any such activities. The lowest scores in the quality control indicator, also found predominantly in the Sub-Saharan Africa region, are driven by the absence of laws prohibiting mislabeled and open-bag fertilizer, the lack of appropriate penalties and the absence of labeling requirements in at least one of the official languages of the country (table 3.2).

Significant variation was found across countries with respect to the efficiency and complexity in registering fertilizer products. The time and cost to register a new fertilizer product are lowest on average in OECD high-income and upper-middle-income countries, and highest in low-income countries (figure 3.1). For example, it takes on average 330.7 calendar days to register

Table 3.2 | Where are fertilizer regulations strong and least burdensome, and where are they not?



Source: EBA database.

a fertilizer product in the 62 countries sampled, ranging from 1205 days in Romania to 11 days in Uruguay. This stark difference in time is driven principally by lengthy field testing. Across the 62 countries sampled, the average cost to register a new fertilizer product is 171.7% of income per capita, and it is most expensive in Malawi, totaling 3030.5% of income per capita. It is cheapest in Spain where it is free.

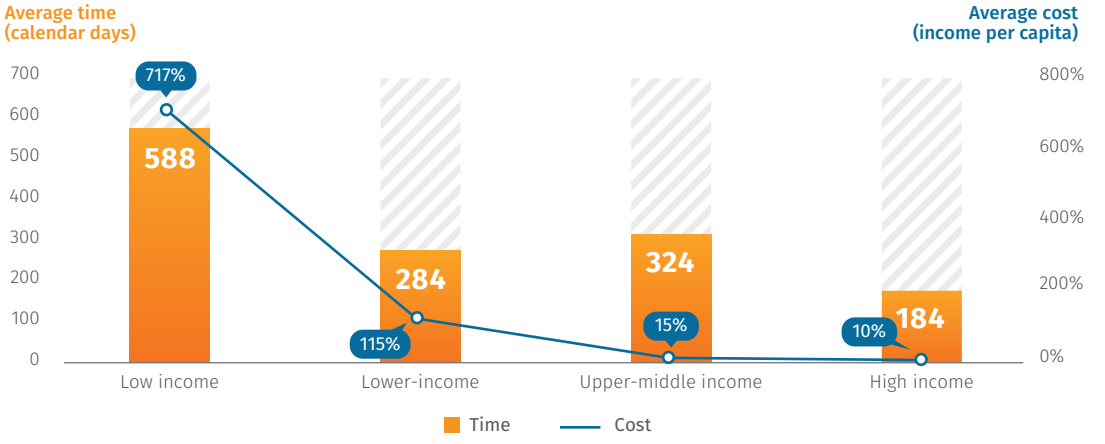
What are the regulatory good practices?

Box 3.1 highlights regulatory good practices and some countries that implement these practices.

Reduced field testing for fertilizer registration

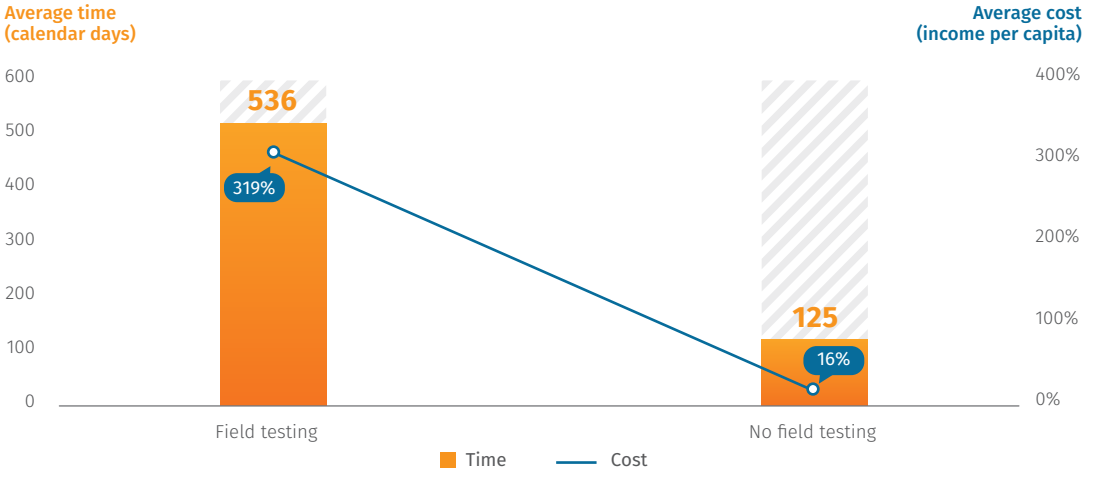
Registering new fertilizer products is a good practice because it ensures that a country has control over what fertilizers are used within its borders. Registration schemes and the oversight they provide are helpful in giving farmers assurance that inadequate nutrients, heavy metals or other residues found in fertilizer products do not contaminate crops, animals and the environment. However, registration procedures should be time and cost efficient to ensure that new products can reach the market in a timely manner. Although controls are necessary to prevent soil damage, environmental pollution or adulterated fertilizer use, certain lengthy

Figure 3.1 | Low-income countries have the most inefficient and costly processes to register a new fertilizer product



Source: EBA database

Figure 3.2 | Countries with field-testing procedures tend to have higher time and cost to register fertilizer products



Source: EBA database.

Box 3.1 | Example of regulatory good practices for fertilizer

	REGULATORY GOOD PRACTICES FOR FERTILITZER	SOME COUNTRIES WHICH IMPLEMENT THE PRACTICE
REGISTERING FERTILIZER	Fertilizer product registration is inexpensive, is not subject to periodic fees and does not expire.	DENMARK, SERBIA
	An official fertilizer catalogue listing all registered fertilizers is available online.	INDIA, SPAIN
	Chemical fertilizer registration includes an application to register and lab sample analysis, and excludes field testing due to limited additional benefits.	BOSNIA AND HERZEGOVINA, POLAND
	Re-registration of a fertilizer product is not required if it is already registered in another country that is part of a regional agreement or approved in the regional catalogue.	GREECE, ITALY
IMPORTING & DISTRIBUTING FERTILIZER	All entities, including the private sector, nongovernmental organizations and producer organizations, can import and distribute fertilizer.	CHILE, KENYA
	All entities are required to register as importers, and registration is inexpensive and does not expire.	COLOMBIA, KOREA, REP.
	Import permits are not required or they are imposed only at the trader level, with no volume, shipment or time limits, and they are inexpensive and simple to obtain.	RUSSIAN FEDERATION, SPAIN
QUALITY CONTROL OF FERTILIZER	Fertilizer must be packed in sealed bags and labeled in at least one of the country's official languages, including details such as brand name, content, origin, manufacturing and expiration date, safety instruction, etc.	MEXICO, SERBIA
	Regulations prohibit the sale of mislabeled and open fertilizer bags, and impose penalties on those who fail to comply with set standards.	MOROCCO, ROMANIA

Source: EBA database.

and expensive procedures such as field testing are not deemed necessary as part of an effective registration process. Three complimentary nutrients (nitrogen, phosphorus, and potash) have been extensively tested and used for over a century, with general agreement on the required balance that will maximize production.[14] Practitioners report that a simple soil analysis can be used to determine if the product is suitable for that agro-ecological zone, and there is general consensus on which fertilizer to use for particular crops. As a result, field tests for these ingredients only drive up the time and cost of fertilizer registration, with little added value (figure 3.2).

Of the 48 countries that actually practice fertilizer product registration, 21 require field testing, the majority of which are in Sub-Saharan Africa (7), South Asia (4), and Europe and Central Asia (6). In countries requiring this procedure, the average cost in income per capita is 319% (63% if outliers Malawi, Nepal, Tanzania and Ukraine are excluded), compared to 16% in countries that do not require field testing. The average time to register a new fertilizer product in countries requiring field testing is 536.35 days, in contrast to 125.1 days in countries where this requirement does not exist.

Streamlined import permit requirements

Among the 62 countries studied, 22 countries do not impose any import permit requirements, nine of which are in Europe and Central Asia, and six are OECD high-income countries.[15] Several countries in Sub-Saharan Africa (Cameroon, Côte d'Ivoire and Kenya) and in Latin America and the Caribbean (Haiti and Peru) do not require an import permit and can serve as good examples for other countries.

Fertilizer in bags, preparing for rice growing in rice field, Bangkok, Thailand. Photo: Shutterstock.

In 20 of the 39 countries that require import permits, those permits are valid for less than 12 months. If an import permit is required, the least burdensome option are blank permits with no volume, shipment or time limits that are affordable and simple to obtain. Blank permits with time validities of 12 months or more grant importers flexibility in terms of the departure and arrival time of shipments, and allow companies' decisions with respect to the volumes and prices to be based on commercial interests. Twelve countries impose blank permits with no volume restrictions, the majority of which are in Sub-Saharan Africa (5) and the Middle East and North Africa (3). The majority of these countries have a permit validity of more than 12 months.

Per-shipment import permits with short time validities pose several problems. First of all, they limit the importer's negotiating power, as the import permit is attached to a specific shipment (and therefore volume) that cannot be changed once the permit is issued. Furthermore, short time validities force companies to negotiate purchases within very specific time periods and, in some instances, they also present logistical complications, such as the permit expiring before the fertilizer is shipped from one place to another.

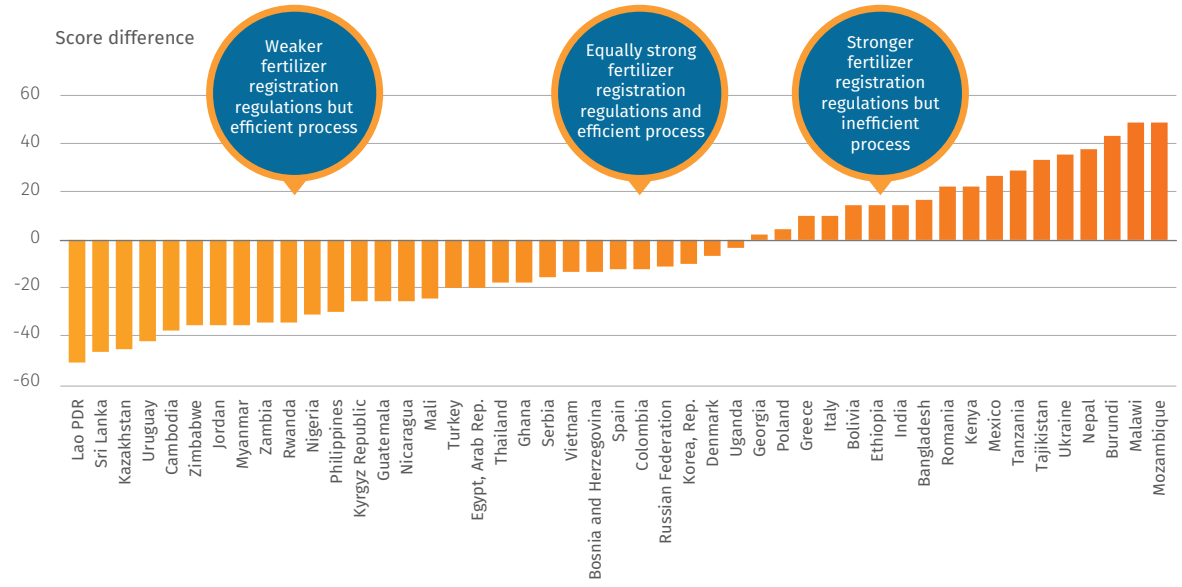
Twenty-three countries still impose per-shipment import permits, and four countries impose permits by volume. Burundi and Sudan require a per-shipment import permit with a two-month validity, whereas Bolivia, Nicaragua, Tanzania and Vietnam require a per-shipment import permit that expires within a month. Bangladesh and Nigeria impose a different kind of restriction by requiring per-shipment import permits with a particular volume quota that is valid for 12 months. Not all 23 countries impose such limited time frames—Senegal requires a blank permit that is valid for 48 months and Benin's blank permit is valid for 24 months.

Closing the gap between fertilizer registration law and practice

Of the 62 countries studied, 48 legally require fertilizer products to be registered before they can be imported and sold in the country. Some countries, such as those in the EU, perform well on the fertilizer registration indicator because they have strong legal frameworks in place *and* there is a low-cost process to register fertilizer products that is streamlined and efficient. However, many other countries lag behind despite a strong legal framework, either because businesses do not register fertilizer products in practice or because the registration process is so onerous as to discourage the registration of new fertilizer products altogether.[16]

Six countries either have no observable practice in terms of the registration of fertilizer products or only allow the public sector to register fertilizer products. In Burundi, Mozambique and Tajikistan, although the private sector is permitted to register new fertilizer products, no products were registered last year. In

Figure 3.3 | Few countries have both strong fertilizer registration regulations and an efficient registration process



Source: EBA database.

Bolivia, Ethiopia and Kenya, the law permits only the public sector to register new fertilizer products.

Several other countries have strong legal frameworks in place for registration but use complicated registration processes, including the total time (in calendar days) and cost (as a percentage of income per capita) to register a new fertilizer product (figure 3.3). For example, although Malawi's regulatory framework performs above average as compared with other countries, the practical experience for private sector actors registering fertilizer products in the country results in it receiving one of the lowest ratings on this component. Malawi follows regulatory good practices such as requiring fertilizer product registration and having no time limitation to the fertilizer product registration. However, Malawi has the fourth lengthiest and the most expensive fertilizer registration process out of all 62 countries, taking 913 days and 3030.48% of income per capita to register. Similarly, while Nepal's registration laws also perform above average, their practical application is relatively lengthy and costly; it takes 1,125 days, and 645.2% of income per capita to register a new fertilizer product in Nepal.

Conclusion

There are many opportunities for countries to implement laws and regulations that improve access to fertilizer, promote fertilizer use, and increase agricultural productivity. Regulatory best practices may be difficult to achieve in certain regions in the short term due to a mix of factors, including the absence of laws and lack of institutional capacity for implementation. However, certain practices can facilitate regulatory and market efficiency and thus increase fertilizer access. While fertilizer registration ensures the safe entry of fertilizer products into the market, efforts should be made to make the process as efficient as possible, while maintaining quality control. Ensuring that fertilizer registration is not held up by procedures such as field testing, which has been deemed unnecessary in most cases, can go a long way in cutting time and cost and encouraging the entry of new fertilizer products into a market. Furthermore, streamlining import permits can facilitate timely fertilizer entry into a country and help avoid time-consuming paperwork and logistical complications.

NOTES

1 Duflo et al. 2011.

2 Hoyum 2012.

3 African Union 2006.

4 Savci 2012.

5 Gregory and Bumb 2006.

6 Keyser et al. 2015.

7 World Development Indicators: Agricultural Inputs, Fertilizer Consumption (kilograms per hectare of arable land), (accessed November 7, 2016), http://data.worldbank.org/indicator/AG.CON.FERT.ZS.

8 Beaman et al. 2013.

9 Duflo et al 2008.

10 Pullabhotla and Ganesh-Kumar 2012.

11 Canada, China, India, the Russian Federation and the United States are the largest fertilizer producers in the world.

12 Pullabhotla and Ganesh-Kumar 2012.

13 Council Regulation (EC) No 2003/2003 of 13 October 2003 of the European Parliament and of the Council relating to fertilisers [2003] OJ L 304/1.

14 World Bank 2016.

15 Import permit data are not presented for Ethiopia because only the public sector is allowed to import and distribute fertilizer products.

16 *Ibid.*

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