STDF Standards and Trade Development Facility

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## Kenya regional report

# Implementation of the International Standard on Phytosanitary Measures, ISPM 15 (Regulation of wood packaging material in international trade): An empirical analysis of how the regulation affects the economy of a group of countries in Africa

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## 1. Introduction to the Kenya report

Kenya has been implementing ISPM 15 since 2006. The implementation process is explained in the Plant Protection act (CAP 324) and in the Kenya Plant Health Inspectorate Service (KEPHIS) Act number 54 of 2012. Currently a new draft regulation having legal power is under consideration; the objective of the regulation is to ensure proper enforcement of the standard.[3]

The process for implementing ISPM 15 includes authorising treatment facilities, as well as inspecting imports and exports at entry and exit points for compliance with the standard. The process of authorising WPM treatment facilities (for which a manual is not yet available) begins with an application sent to KEPHIS. The application dossier includes a certified copy of the company's registration certificate, certificate of registration for using approved chemicals by the authorised agency, and details of the location of facility. Any company or person registered for business in Kenya can apply to KEPHIS for authorisation as a treatment facility. This also includes WPM manufacturers and other interested parties that are active in the sector. Upon satisfactory appraisal, a certificate of authorisation is issued. The authorization, which lasts for one year, is renewable upon satisfactory performance.

During KEPHIS inspections, the following is checked: the source and species of wooden material used, the operational methods used (i.e. HT or MB), the volume of WPM being treated, and the buyers of those treated WPM. KEPHIS also checks whether treated WPM are kept is storage areas separated by at least five metres from untreated WPM. KEPHIS has not written an inspection manual yet, and the inspectors currently only use guidelines.

For what concerns import inspections, the CAP 324 regulation sets up rules for imports by specifying for instance that "a person shall not import plant, plant product and regulated article […]", without specifying the type of inspection needed for imported WPM.

The Kenya report looks specifically at the implementation of the ISPM 15, its effect at the trade level and the costs and the benefits of the standard implementation at the WPM treating facilities point of view. The report is organized in the following way; next section sets out the context of the analysis by describing the effects –both at the economic and non-economic level- of standards for trade. Section 3 deals with the description of the qualitative component of the research. It reports the content of a number of qualitative interviews with private and public stakeholders and it highlights the main implementation challenges the country faced. Section 4 describe the macroeconomic analysis to see whether the standard implementation has had any effects at the trade level. The analysis points out which economic sectors have gained and which have lost in the international markets in the aftermath of the standard implementation. Section 5 looks at the viability –i.e. it compares the costs and the benefits- of the standard implementation from the point of view of the WPM treating facilities. The section looks at the costs and at the revenues the treating facilities face when treating WPMs.

[3] The previous regulation did not have any legal status and it was therefore impossible for KEPHIS to enforce its content. Copies of the "CAP 324" and of the "KEPHIS Act number 54" documents are available upon request.

## 2. Context and Framework of the Analysis

There are many environmental measures nowadays that help us regulate the impact of a diverse range of human activities on the environment. In many domains of environmental protection (such as air and water quality, provision of ecosystem services, climate stability), markets are not sufficient alone to regulate the extent of environmental degradation that affects welfare in a non-excludable and non-rival manner. In other words, market mechanisms cannot reduce the extent of "public bads", since it is often prohibitively expensive to exclude certain individuals alone from the welfare costs of environmental damage, while the disutility and displeasure experienced by any individual is independent of the one experienced by others. These are typically referred to as the case of "missing markets", where those contributing to environmental damage and those demanding a reduction of it do not physically meet to negotiate solutions to the problem, in the form of appropriate compensation mechanisms or other implicit pricing. In such cases, negative environmental externalities often affect other individuals than the ones generating them and policymakers need to intervene in order to limit environmental degradation.

On many occasions, policymakers resort to market-based instruments to control for the levels of environmental pollution and degradation (Pirard, 2012). This rather heterogeneous group of policy instruments incorporate a price component that aims at incentivizing (or disincentivizing) certain behaviors through the provision of financial rewards and penalties. Charges and taxes on pollution or environmentally-destructive activities increase the price of goods and services that result in pollution or excessive resource use. These can be applied per item (e.g. plastic bag levies) or based on measurable environmental parameters (e.g. a tax linked to the carbon intensity of fuels). Using financial penalties is a similar mechanism that goes a step further by implicitly "criminalizing" certain unsustainable behaviors and imposing monetary penalties to those deviating from the pre-defined "status quo". Instead of imposing charges that limit but nevertheless legitimize a certain activity, financial penalties treat non-compliant behavior as an environmental offence (e.g. a fine imposed on those discharging waste in a water source or engaging in hunting during certain periods of the year). Tradable permits is a form of policy mechanism that allows one to sell some entitled environmental rights that are not exercised, such as carbon permits in the EU emission trading scheme where environmentally-conscious companies may sell unused carbon allowances to firms that exceed their own quota (at a price determined by the overall supply and demand of total carbon allowances).

Naturally, market-based instruments can also reward certain types of behavior, as in the case of subsidies and fiscal incentives. For instance, several energy-saving technologies are subsidized at their initial stages of development and adoption (e.g. solar panel technologies). Fiscal incentives can render certain types of behavior more attractive to tax payers, for instance by exempting from income tax accrued revenues from "green" investments. Policymakers, and increasingly so also private companies and large investment funds, may also use positive discrimination in favor of public investment projects and contracts that have a positive environmental impact.

On many occasions, governments resort to policy measures that restrict pollution more directly, rather than through market price signals. These types of instruments are often referred to as command and control regulatory measures (Engel *et al*., 2008) or, alternatively, as non-tariff or non-market barriers to

trade when the measures apply specifically to imports and exports of goods and services. Again, there is a wide range of policy instruments that aim to directly influence the level of unsustainable activities (rather than indirectly via distorting relative prices). Licenses and quotas regulate the level of trade transactions (and hence amount of imports of certain commodities) through the issuance of permits and quantitative restrictions. In extreme cases, embargoes can be imposed on the entire amount of a particular commodity before reaching a destination market. Standards fall in this latter category of command and control instruments that restrict the production or trade of certain commodities as they often prescribe certain conditions that products need to meet in order to minimize health risks and enhance consumer protection. Environmental standards specifically aim at products complying with predefined processes that minimize or eliminate certain types of environmental damage. ISPM 15 addresses the need to treat wood packaging material thicker than 6 mm (to prevent the spread of pests and resulting damage to the ecosystems of importing countries) and falls into this category of standards.

There are some important issues that need to be recalled when discussing the distinction between the market-based and the command and control type of instruments (as in the case of phytosanitary environmental standards; see Harrington and Morgenstern, 2007). First, command-and-control measures directly regulate the extent of environmentally damage, rather than attempting to achieve this indirectly by influencing relative prices across traded commodities. Taxes and charges, instead, try to limit environmental damage by making environmentally-polluting products more expensive. While, in practice, taxes and charges may achieve similar results as command and control measures, their success depends on the underlying price elasticity. In other words, the decline in demand for an environmentally-damaging commodity will depend on how consumers and firms respond to price changes with respect to the initial level of prices. First, setting a tax at a very low level may result in a minimal adjustment of behavior; similarly, setting a tax at a very high level may achieve the exact same result that a more modest tax could have achieved. Second, charges and taxes do not only discourage behavior that damages the environment (when fulfilling their role as a price signal) but also generate public revenues. These additional public revenues can have multiple purposes. Governments, for example, can decide to make use of them to finance green public investment that further improves environmental quality. Thus, they can dedicate financial resources for the same purpose that the original environmental tax was adopted in the first place. Alternatively, governments can view these additional public revenues as a substitute for existing unpopular taxes. For example, environmental taxes could allow governments to reduce income taxes, particularly for those economies suffering from high unemployment rates. Environmental standards (and command and control measures more broadly) have, in general, a neutral fiscal effect, although governments can still collect some fees through issuing permits to those firms that are allowed to implement the standards. Historically, market-based instruments (such as tariffs) played a much more important role in generating public revenues, but the increasing prominence of other sources of taxable income (e.g. through sales or income taxes), accompanied by the development of a sophisticated system to collect these, supported a gradual transition towards non-trade barriers (and a gradual elimination of tariffs).

## 2.1 Implementation of Environmental or Trade Standards – Key Issues

There is a wide range of criteria policymakers need to have in mind when designing appropriate instruments, including environmental or trade standards. Effectiveness is naturally a key criterion to consider when selecting and designing policy instruments, which should grasp the extent to which the desired outcome has been achieved (e.g. preventing the spread of plant pests and diseases in the context of ISPM 15). In practice, policymakers and governments face multiple constraints when deciding the appropriate policy (or policy-mix) response to an environmental problem and as a result of this, multiple criteria are normally applied simultaneously. Efficiency is another critical factor that influences decisions behind the optimal response and policy instrument to tackle some environmental concerns this and primarily focuses on how well resources (public funds, human resources, etc.) have been utilized to achieve a specific (environmental) objective. This is also where cost-benefit analyses (similar to the one presented in Chapter 6) become handy, as they provide estimates on the country-specific net benefits (associated with a specific instrument) translated in monetary terms.

Policy instruments can rank differently when assessed in effectiveness and efficiency terms (Oosterhuis et al., 2014). While an instrument can be very effective in environmental protection, it may at the same time be very costly (and inefficient), leaving few other resources available for other uses. Efficiency becomes a more meaningful concept when trying to take into account any indirect (positive or negative and often unintentional) effect that the policy instrument is likely to induce. Environmental standards, for example, increase the cost of exports and may, hence, result in a considerable loss of competitiveness. This effect is likely to be sector-specific (and is the focus of Chapter 5), depending on the final change in consumer prices and producer profits, as well as the intensity of competition in international markets. Some sectors, such an environmental improvement can, for this reason, come at the expense of output loss and increased unemployment for the local population. For other sectors, there can be an increase in employment and demand by allowing local firms to export to new markets with more stringent environmental regulations. Furthermore, the increase in demand for environmentally compliant materials could, for instance, also create additional employment for treatment facilities, inspection agencies, and so forth.

Implementation costs of standards or other policy instruments are naturally an integral part of efficiency. Some obvious direct costs of implementation (e.g. related to acquiring specialised equipment to manage the standard, or training personnel) are straightforward to calculate in monetary terms. Trade and environmental standards often involve multiple other, less direct, transaction costs that would also need to be taken into consideration. These include:

**i. Information costs.** These relate to the information that is required to implement effectively the standard. For example, awareness raising campaigns to sensitize the public or firms to the necessity of the standard and its environmental benefits, or surveys to capture the expected responsiveness of target groups to a change in price as a result of the implementation.

**ii. Administrative costs.** These can be substantial costs (both for the government and target groups) when the standard entails detailed bureaucratic procedures with large numbers of individual firms or households involved (e.g. processing and evaluation of forms, or sampling costs). For the government,

the costs also often involve planning and decision-making costs; for instance staff costs in policy-making departments, as well as the cost of stakeholder consultations.

**iii. Monitoring and enforcement costs.** These depend on the complexity of the requirements and the efforts involved in verifying compliance with the standard. These costs can be borne either by the government or by the target groups. Corruption is often one of the key constraining factors (particularly in developing countries) behind enforcement of standards and it is often perceived as a separate cost itself.

**iv. Judicial procedures.** A standard will be less costly in this respect if its provisions and conditions are clearly specified and unambiguous. Nevertheless, legislative amendments, required to support implementation, can involve substantial costs and may delay implementation.

In addition to these costs, a number of other situation-specific considerations play a role in terms of identifying how successfully a trade or environmental standard is implemented:

**i. The scale and nature of associated environmental benefits**. It is likely that the legitimacy and social acceptance of a standard will be higher (as a means to ensure some environmental benefits, such as pest control in the case of ISPM 15) when the public sees a close link between the standard's implementation and its intended environmental services.

**ii. The number of actors involved**. The larger the number of government departments and companies involved, the higher the associated transaction costs described above are likely to be. The spatial distribution of actors can also be relevant; costs are for instance likely to be higher when the monitoring and enforcement process of a standard takes place in multiple locations.

**iii. Financial constraints of the local government or institutions**. This is particularly relevant in the case of developing countries where the successful implementation of the standard might be hindered by the availability of resources. Even when these resources become available, they might come at the expense of the provision of another public good.

**iv. Social and cultural conditions**. Customs, habits and traditions can affect the acceptance of a specific standard. Misconceptions and the spread of inaccurate information can hinder the acceptance and enforceability of a standard. This is also likely to happen when the standard is at odds with established social norms and common practices. In such cases, there is often much resistance to change, when a new (potentially beneficial) instrument is introduced. Consequently, low social acceptance will typically lead to infringements and this, in turn, to reduced effectiveness and high enforcement costs.

### 2.2 Economic and Non-Economic Impacts of Standards

Any thoroughly conducted cost-benefit analysis needs to take into consideration all these additional socio-economic side effects (positive or negative) that are associated with the implementation of a standard. Many of these, often indirect, side effects might not be evident at first sight. The implementation of a standard, for example, can create employment gains or losses in associated economic sectors and changes in competitiveness as a result of price distortions.

In the case of trade standards with an environmental objective (as ISPM 15), the expected environmental benefits associated with the standard's implementation also need to be monetized and contrasted against costs. There is a wide array of benefits that need to be incorporated into such an analysis (Born *et al*., 2005), specifically:

**i. Direct use values**, which can for instance be (a) consumptive use values when the standard aims to preserve an environmental asset that will be consumed in the future (timber, food, etc.); (b) recreational use values, which indicate the environmental asset preserved (e.g. forest) that is valuable to individuals for recreational purposes (for walks, camping, etc.); (c) aesthetic use values, as evident from the price premium associated property in the vicinity of the environmental assets. In addition, for specific (often indigenous) communities, environmental assets can also provide significant spiritual values and fulfillment.

**ii. Indirect use values**, which include preserving an environmental asset (e.g. forest) through which also additional environmental services are safeguarded. For example, forests provide ancillary ecosystem services to local communities in the form of flood protection, improved erosion control, protection of water resources and biodiversity, and more, as well as benefits in the form of carbon sequestration for the global community.

**iii. Option values,** which relate to the value of potential (i.e. as of yet an undiscovered potential for use in the future). For example, the preservation of a particular species may allow the development of some future medical breakthroughs.

**iv. Non-use existence values,** which concern the satisfaction of continued existence of an environmental asset, even when there are no immediate tangible benefits associated. People might value the continued existence of a particular tropical forest or natural habitat, even if they never visited or intend to visit it in the future.

**v. Non-use bequest values,** which relate to the satisfaction one receives by ensuring that the environmental assets remain available to future generations. This is an issue of intergenerational equity and fairness where current individuals wish to safeguard the possible (yet unknown) satisfaction of future generations.

**vi. Non-use altruistic values,** which are those attached to a resource being available to others in the current generation. This captures the issues associated with intragenerational equity and fairness; although we might not be directly affected by a certain loss of an environmental asset, we value that this environmental asset is available for other communities and individuals (many of whom might have limited opportunities to substitute such an environmental asset with another one).

Any comprehensive cost-benefit analysis associated with a trade standard with an environmental objective should attempt to incorporate as many of these values as possible. Naturally, attaching monetary values to all the benefits discussed above is a formidable task that, in most cases, allows us only to approximate the real value of a particular environmental asset. Furthermore, this largely remains an anthropocentric approach to the benefits of environmental assets, given that the latter are directly or indirectly measured through human preferences.

## 2.3 Standards and Issues of Fairness

Fairness is another important dimension that policymakers should consider when designing a new standard (Gross, 2007). Environmental standards, for instance, are often designed with an emphasis on the attainment of certain environmental targets, with little consideration given to how certain groups (e.g. low income groups, women, indigenous people, small-scale firms) may be disadvantaged or proportionately less favoured in the process. Small firms may be unintentionally excluded from the implementation of a new standard because of budget constraints due to initial transaction costs, or simply through informational barriers. Much literature points to multiple barriers (financial, informational, discriminatory) that particularly women often disproportionately face when they attempt to engage in new business practices (Brindley, 2005; Pehrsson, 2009). There is also evidence pointing to a lower participation of small firms in many new environmental initiatives, often as a result of limited access to capital and skills or due to higher transaction costs compared to their income. Small firms may also be less willing to align their production methods to a new standard, when this adjustment entails uncertain financial returns given their high discount rates and relatively high risk aversion. This also concerns perceptions of typically disadvantaged groups regarding whether they feel that their voice is heard in the design and implementation of a standard. This type of fairness is often referred to as "procedural justice".

Another important aspect of fairness relates to the so-called "distributive justice"; the distribution of benefits (and costs) when the standard is implemented. Distributional justice can be examined at multiple levels. It might be that the costs of implementation of a particular standard affect small-scale firms disproportionately negatively (that subsequently struggle to maintain a positive profit margin and hence remain in production), or that firms that comply with the standard experience little improvement in the demand they face (and, hence, lose competitiveness with non-compliant producers). Fairness also relates to the distributional aspects of any anticipated benefits. It may be, for example, that any additional employment opportunities stemming from the implementation of the standard, only benefit specific groups of employees. In the case of trade standards with an environmental objective, the associated environmental benefits might largely accrue to others than those paying for the costs of implementation, and in many cases the beneficiaries might be located in other areas or even countries compared to those who bear the costs of implementation.

There are multiple ways to address issues of distributive injustice. In some cases, it might be possible that the additional cost initially borne by the implementing actor of the standard can be passed on to the ones ultimately enjoying the benefits accruing from the standard. This is not always easy, given that even in the case of agreed higher prices (e.g. passed to the final consumer), depending on the price elasticity of demand, those implementing the standard can face a substantially lower demand for their product and consequently a drastic reduction in profits. In other instances, the government or an international agency can compensate those who lose out from the implementation of the standard.

Perceptions of fairness, as to participation and distribution of benefits and costs, are often instrumental in the success of the implementation of and compliance with a standard. The legitimacy of new standards can, for this reason, depend on the following factors: (a) how involved actors are approached and how actively they become engaged in the process; and (b) the distribution of involved costs and

benefits, and compensatory schemes. In this sense, fairness perceptions are likely to relate to how involved actors reflect on the entire implementation process, from the beginning when the standard is designed extending to the stage when it is advertised, administered and monitored.

# 3. ISPM 15: findings based on qualitative interviews

This chapter will describe and critically analyse all the procedures put in place by the Kenya NPPO to implement and comply with ISPM 15. The material used in this section derives from qualitative interviews with a number of stakeholders involved in the ISPM 15 implementation and compliance, such as exporters and importers, inspectors, and WPM treatment facility personnel. Through our descriptions of the field research in Kenya, we will highlight the malpractices adopted by the ISPM 15 implementing agencies. Malpractices put in place by other agencies or organizations, either public or private, and that affect the correct implementation of ISPM 15, will be discussed too. Some of the malpractices are country-specific –i.e. are peculiar to the Kenya case- but in most cases the same challenge and mal-practises highlighted in Kenya can be detected in other countries too.

The rest of the chapter is organized in the following way. The next section will describe the field research undertaken in Kenya; first we introduce the missions followed by a brief description of the interviews carried out with the stakeholders and an elaboration of the main findings. The policy implications of our findings and the main recommendations are summarized and discussed in the last section, whereas the appendix shows photos taken during the missions to help illustrate the issues discussed in this chapter.

## 3.1 Field research

The mission to Kenya, took place in Nairobi, where the headquarters of Kephis is located, and in Mombasa, home of the main port, from 13 to 21 of December 2015. A complete list of the interviewed stakeholders can be consulted in

Table 1.

*Interviews with the stakeholders*

The NPPO, Kenya Plant Health Inspectorate Service (KEPHIS), is responsible for ISPM 15 implementation. KEPHIS has been present in Kenya since 1997 and its activities range from plant protection, checking the quality of seeds used in the country, controlling the quality of agricultural inputs, to monitoring the effect of the agricultural practices on the environment. There are 20 KEPHIS offices located in Kenya and the majority of them are located at the borders between Kenya and neighbouring countries. Table 6 lists all the ISPM 15 related services offered by KEPHIS.

KEPHIS authorizes WPM treatment facilities and the license lasts for one year with possibility of renewable (Figure 2). All three ISPM 15 treatments (DH, HT and MB) are recognized by KEPHIS.

KEPHIS charges a pre-defined cost for inspection and audit of the facility, and for providing the stamp (Figure 2). In addition, KEPHIS sets the selling price of treated WPM at KES 3,000 per piece. In the last few years, some WPM treating facilities that used HT has shifted to MB, as MB is permitted by the Pest Control Products Board (PCPB). KEPHIS is in charge of training the inspectors on all matters related to ISPM 15, but KEPHIS staff has not received any training from FAO-IPPC or from IAPSC.

**Table 1: Type of service and price offered by Kephis in relation to ISPM 15 compliance**

| Type of service offered by KEPHIS | Price (in KES) |
|---|---|
| Application fee for the authorization per site | 1,875 |
| Authorization for treatment and marking fee | 18,750 |
| Renewal fee (annually) | 7,500 |
| Treatment 20ft container | 5,000 |
| Treatment – dunnage, planks, wooden boxes, wedges and others | 3,000 |
| Marking – Standard Pallet charges per pallet | 25 |
| Marking – dunnage, planks, wooden boxes, wedges and others per consignment | 1,000 |
| Auditing and monitoring per audit per site | 5,000 |
| Transport cost per km | 35 |

*Notes: This summary table has been provided by KEPHIS*

One branch of KEPHIS is located in the proximity of the Nairobi International airport. The main duty of this branch is to inspect all the consignments arriving and departing the country. Kenya faces the same problem as the other countries involved in the project regarding imports that are not fruits and vegetables where customs carry out inspections. These inspections are mainly related to the value of the consignment for tax purposes, and they do not focus on the WPM used, just as customs does not inform KEPHIS that consignments were transported into Kenya on WPM. To overcome this problem, KEPHIS representatives have suggested that the import permits also stated the type of packaging material used.

Since 2014, China, India, South Korea and Pakistan have intercepted pests from Kenyan WPM, although these interceptions have not influenced future trade volumes. Following notification, KEPHIS visited the specific treatment facilities where the problematic WPM came from to ensure that the company was complying with the standard. In order to limit the possibility that stamps can be easily copied – as this may be a threat in Kenya – a possible albeit costly solution would be to use unique barcodes applied to each piece of WPM.

VEGPRO is a Nairobi-based company that produces fruits and vegetables for both domestic and international markets (with exports going mainly to the UK). Nowadays, the company only uses WPM treated with heat, as they fear that MB may contaminate the fruits and the vegetables. They have purchased treated WPM from various facilities, such as Woodtext, but now buys most of the treated WPM from Mbbao & Allied, which is not actually a registered WPM treating facility anymore. To appropriately inform export companies, KEPHIS will publish a list of authorized WPM treating facilities online. In some cases, especially when Vegpro exports via air, it prefers to use iron sheets (Figure 4).

Woodtex is a WPM treatment facility which is specialized in HT. When KEPHIS granted them the license (Figure 6), they received training from the NPPO. The company now produces between 3,000 and 4,000 pieces of WPM per month but there has been no increase in the number of WPM manufactured after Kenya started to comply with the standard. The company has never had an interception.

The company has not faced any issues with fraud with the stamp. A year ago, it started to use a heat stamp which is more expensive than the ink one but faster to apply and easier seen. The company confirmed the common understanding that the WPM treatment is valid for 90 days and that after that period it will need to be re-treated. The company does not fix any broken WPM, and it is generally rare in Kenya to find facilities that repair broken WPM.

Figure 7 shows two WPM pieces stamped in a non-comprehensible way by Woodtex, and many other similar examples were seen by the research team.

Kayjay is a WPM production and treatment facility using HT since 2009. The company produces and treats a total of 120 pieces of WPM per month, and it does not charge regular customers extra for WPM that has been treated. In addition, as company claims the HT treated WPM needs to be used within a period of three months from the treatment to avoid re-treatment, it provides the exporters with a three - month HT certificate.

Kakuzi and Kenyawood are two other WPM treatment facilities. Both companies produce avocados for export to Europe and facilitate the export they manufacture and treat WPM. Both companies have about 300 employees but only a tenth of them work in the wood processing and treatment division. The companies have sustainable forests and, hence, never buy timber elsewhere. They produce approximately 7,000 units of WPM per year and they are exclusively used by the companies themselves. The companies noted that it was not complicated obtaining the KEPHIS license and that the NPPO performs one scheduled audit of the facilities per year, although it may also come unannounced on other occasions. The companies learned about ISPM 15 and about MB being phased out (except for quarantine purposes) through the media. Both the companies issue HT certificates in the rare cases that the treated WPM are sold to other companies (Figure 5).

Mr Manyeki, Deputy Director of Forest Conservation in the Ministry of Environment, Water and Natural Resources, stated that the Ministry does not carry out any form of pest analysis although he was aware of the presence of some pests that he assumed entered the country through the international movement of goods, and knows that some farmers lost their reserves of cypress. He was not aware of the fact that some pests may affect crops and thus affect the livelihoods of rural households.

Mr Odua, Assistant Director of Industries to Principal Secretary, in the Ministry of Industrialization and Enterprise Development, works to promote the industrial development of agricultural and industrial companies. The Ministry is not aware of ISPM 15 but he noted the Kenyan exports have increased over the past years and that the export companies do not need subsidies from the central government to comply with the international regulation.

Ms Machua, Deputy Director in the National Environment Management Authority, works closely with PCPB on issues regarding the provision and use of chemicals and pesticides in the country. The agency knows who imports MB and to whom MB is distributed to. This agency also knows that MB is allowed

only for quarantine purposes. Kenya has an allowance of two metric tons of MB per year, and this quantity has not been used yet.

The representatives of PCPB, which is the company giving the authorization for importing MB, stated that they were aware that the use of MB has been restricted but they were not convinced that the restriction did not apply to quarantine purposes as well. They only sell MB to large companies that can certify how the chemical is used.

The KEPHIS office in Mombasa is mainly responsible for inspecting imported and exported consignments moved via sea. The exports mainly involve produce such as tea, cotton, grains and coffee. KEPHIS inspects the consignments on a monthly basis to ensure the WPM is in compliance with ISPM 15. For what concerns imports, KEPHIS only inspects WPM used for the movement of horticultural goods. Normally, KEPHIS runs random checks of the WPM but when one instance of non-compliant WPM is found, all the other WPM in the same consignment is inspected. Mr Muli, KWPHIS representative in the Mombasa office, remembers only one such case from a few years ago, where a consignment from China arrived on WPM that had not been stamped; KEPHIS burned the whole consignment.

Representatives of Finlays, Mr Kabachia and Mr Khayo stated that the company only buys new WPM as second-hand WPM does not meet the company's high quality standards. In addition, some importing countries may not be satisfied with second-hand WPM, which is the case for Japan. Finlays acknowledges that this practice may have some serious implications in terms of forest depletion. The WPM used for exports do not return to Finlays. The price of the WPM has been incorporated into the final price of their products (tea), which has increased slightly after the introduction of ISPM 15. Finlays representatives confirmed that KEPHIS inspectors do inspect their facility once or twice a month.

The visit to the company POLUCON aimed at seeing how it stamps the WPM after treating them. The company also conducts laboratory tests, pest control analysis, qualitative and quantitative inspections, and analyses of samples of water and grains to detect infestation.

For what concerns the WPM treatment, the POLUCON started implementing ISPM 15 in 2010 using MB, but switched to HT in 2012 because of MB unavailability. The company preferred using MB for both logistic reasons (it was easy to treat the WPM directly at the export company's facility) and efficiency reasons, as they believe MB is a superior treatment compared to HT. The company treats a maximum of 600 pallets per month on average. The company uses a heat chamber, which is heated using briquettes and there is no plan of switching to solar panels although the temperatures in Mombasa in summer time reaches 40 °C. The company, contrary to what happens in other WPM treatment facilities, does not issue a certificate with an expiry date. POLUCON complies with ISPM 15, although they believe that the risk of reinfestation after treatment is extremely high.

**Table 2: List of activities scheduled for the mission to Kenya**

| Name of the Company / Organization / Institution | Contact person | Main activity |
|---|---|---|
| KEPHIS | Faith Ndunge | NPPO |
| KEPHIS | Esther Kimani | NPPO |
| KEPHIS | Nyaga | NPPO |
| FAO | Andrea Colussi | United Nations |
| Custom Office | | Imports inspection |
| Vegpro | | Exporting company |
| Woodtext | | WPM treatment facility |
| Kayjay | | WPM treatment facility |
| Kakusi | | WPM treatment facility |
| Kenyawood | | WPM treatment facility |
| Ministry of Industrialization and Enterprise Development | | |
| Ministry of Environment, water and natural resources | | |
| National Environment Management Authority | | |
| Pest Control Products Board (PCPB) | | |
| KEPHIS Mombasa | | NPPO |
| Mombasa port and custom | | Inspection |
| POLUCON | | WPM treatment facility |
| Finlays | | Tea exporter |

*Note: Transcripts of the interviews are available upon request.*

*Main findings*

Through the interviews with the stakeholders involved in the implementation of ISPM 15 at both the import and export levels, a number of interesting key points have emerged. These are summarized in the text that follows and translated into policy recommendations in Chapter 7, where the results of the qualitative interviews will be combined with the macro- and microeconomic analysis.

Figure 1 shows how the country as a whole and the NPPO in particular have organized the implementation process.

***i) Import inspections***

KEPHIS acknowledges that ISPM 15 compliance at the import level is lacking. Similarly to other countries, import inspections are mainly focused on fruits and vegetables consignments, and on the WPM carrying them. Other types of consignments are inspected by customs and the WPM is not

checked. Customs does not inform KEPHIS of consignments arriving on WPM, and KEPHIS does therefore not have the opportunity to inspect them.

KEPHIS representatives have pointed out that their inspections should be organized better and should involve additional checks, for instance to understand whether the stamp is real and not fraudulent.

***ii) Former WPM treatment facilities may still stamp the WPM***

In Kenya, there is a possibility that non-authorized treatment facilities use the ISPM 15 mark. As an example, Vegpro buys WPM from the treatment facility Mbbao & Allied, which is not authorized.

***iii) The duration of WPM treatments?***

KEPHIS representatives think that the WPM treatment will last no more than three months and that, after that, the WPM should be treated again. Several other stakeholders share this view, which is not in accordance with ISPM 15 and which bears significant environmental impacts.

***iv) The ISPM 15 stamp is too easy to replicate***

KEPHIS representatives think that FAO-IPPC should address the fact that the ISPM 15 stamp is easy to replicate. For instance, the size of the stamp is not standard which makes it easier to replicate as all sizes are accepted.

***v) Audits of the WPM treatment facilities***

KEPHIS carries out inspections and audits of WPM treatment facilities twice a year but these consist of an informal chat more than an actual inspection of how the facility applies the treatments. The inspection procedures should be formalized.

***vi) Guidelines***

KEPHIS claimed they had prepared some awareness material (flyers and brochures) on ISPM 15 implementation and compliance. However, Vegpro was not aware of any such material.

***vii) Environmental hazard***

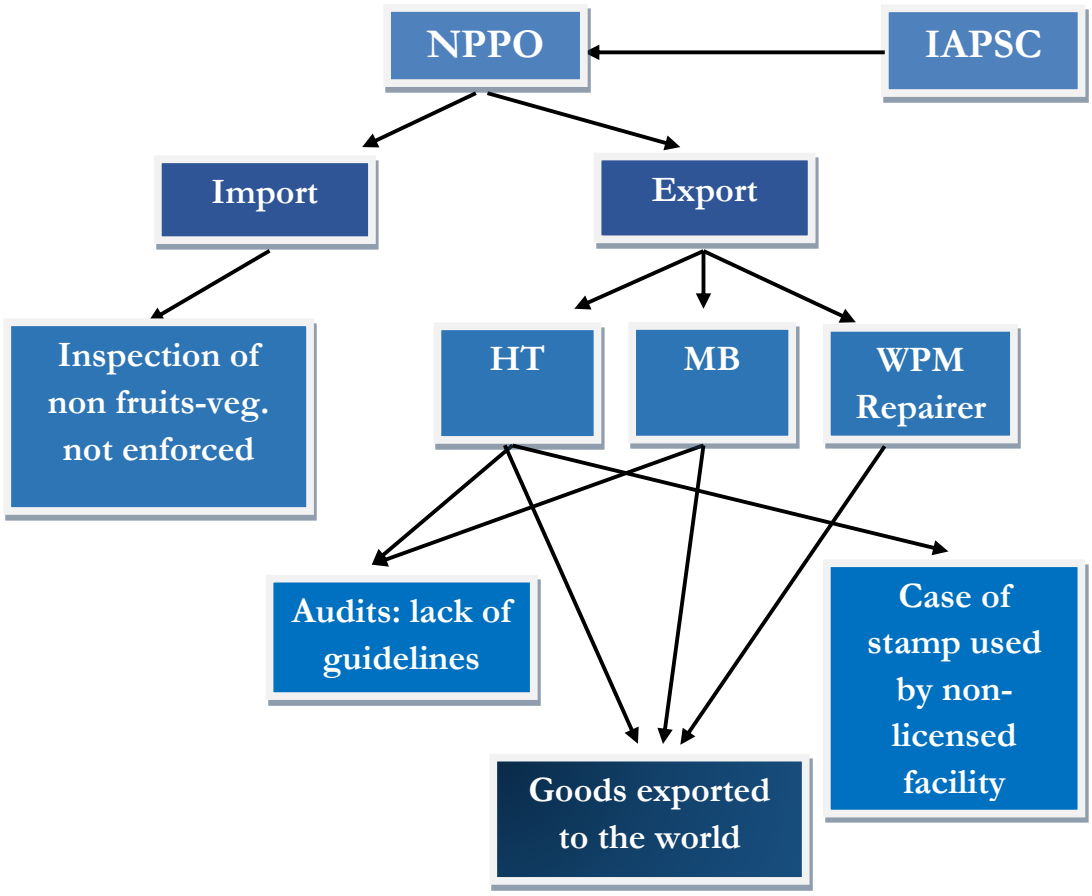
In Kenya, no companies repair WPM and instead they use new wood for the WPM. This may pose an environmental hazard for future generations in terms of deforestation.

***viii) Certification of the treatment***

Some importing countries require that the consignments should be moved on WPM that is treated with a specific ISPM 15 treatment, instead of allowing the export country determine the treatment (i.e. some require that the WPM is treated using HT whereas others only wish to import consignments on WPM treated using MB). Furthermore, KEPHIS has been asked by some importing countries to issue a certificate stating that the treated and stamped WPM had been treated. This additional requirement is not in compliance with ISPM 15.

It is the authors' consideration that KEPHIS could put in place a relatively small number of procedures to enhance implementation of ISPM 15 and to help stakeholders comply with the deriving regulations. Specifically, it would be beneficial to inform exporters and customs of ISPM 15 about what the implications of the standard are, although it was the overall impression that also the NPPO would benefit from capacity development to increase their knowledge on what the current trade agreements they have imply in terms of phytosanitary-related standards.

**Figure 1: Flow chart of the ISPM 15 implementation process in Kenya**




*Note: Authors' elaboration*

### 3.2 Policy implications and policy advice

Through the country missions and the stakeholder interviews, a number of malpractices were highlighted in relation to the working procedures of NPPOs and other organizations when implementing ISPM 15 (see Table 3). In some cases, these malpractices were generated from a misunderstanding of the standard. In other cases, the NPPOs are aware of the malpractice but they do not have the necessary resources or an adequate level of know-how to address it. It may also be that the NPPO is not aware of the specific issue.

Improvements in how ISPM 15 should be implemented should come from several directions. In the text that follows we propose possible solutions to the identified malpractices out. These proposals all stem from ISPM 15 or from procedures adopted by other NPPOs in other areas of the world. Some of these

proposals will be discussed in more details in Chapter 6, where qualitative results will be merged with the macroeconomic evidence and with the results stemming from the microeconomic analysis.

**Table 3: Overview of the malpractices observed when implementing the ISPM 15 in the four case-study countries**

| Malpractice | Kenya |
|---|---|
| Auditing the WPM treatment facility | V |
| Lack of inspections for imported goods | V |
| Duration of the treatment | V |
| Non-authorized treatment | V |
| Non-authorized facilities stamping WPM | V |
| Awareness of ISPM 15 | V |

*Source: Authors' elaboration.*
*Note: "V" indicates that the malpractice is present in the country; whereas "X" indicates that it is not present*

***Regulation***

An NPPO that needs to implement a standard should first develop a legislative and regulatory framework that will help explain it, to support delegation of functions as needed, and support auditing activities and inspections. In other words, Kenya should develop a law to ensure that the standard is well described in its entireness and all the stakeholders are well aware of its existence. Efforts should be made to inform all stakeholders whose activities may be affected by the standard of its existence.

The legislative support should explain all the steps needed to implement and to comply with the standard, and should therefore, among others, explain the approved treatments adopted and how to certify their uses, how WPM treatment facilities obtain license to operate, how to carry out audits, how to inspect imported consignments and how to disincentive fraud.

In what follows we try to enumerate all the information the legislative tool should have and we propose interactions and exchange of information between the public and the private sector.

***Coordination***

Awareness campaigns should be organized and informative brochures be prepared to promote the existence of the standard. As it stands several important stakeholders are still not aware of ISPM 15, including ministries regulating trade, agricultural activities, or in charge of safeguarding the environment.

It should be clear that the correct implementation of and compliance with the standard is not the responsibility of the NPPO alone, but a joint effort of all the stakeholders, both public and private.

***Import control***

Since WPM is associated with almost all shipments, including those that are not the target of phytosanitary inspections, cooperation with custom agencies is a *sine-qua-non* requirement for a correct implementation of the standard. The way inspections for imported goods are organized are similar in the four countries; the NPPO inspect plant-related imports, while customs inspect all imports for tax

purposes. As there is no exchange of information between these organizations as to the arrival of consignments, which are not plant related, the WPM associated with these consignments are rarely inspected. Cooperation between customs and NPPOs should be reviewed to ensure effectiveness in detecting potential non-compliance of WPM.

In this chapter we mentioned that other countries overcome this challenge by establishing a database of commodities that are most likely to be associated with WPM. Customs then targets these commodities and the NPPO inspects the WPM. Overall, an inspection manual should be prepared to inform inspectors on the share of imports to be inspected and based on what principle, and which actions should be taken when cases of non-compliance occur. It should for instance be decided whether to inspect randomly or according to assessment of risks based on the exporting country or type of consignment.

Continuous training of all staff (customs and NPPO inspectors, port employees) should be organized. A number of countries rely on paper documentations to track consignments. This challenges sharing of knowledge and the identification of pest risks, as the data is not easily analysed. All steps of the implement process should be computerized (lessons should be drawn from the ePhyto system).[4]

***Definition of all those measures related to the non-compliance at the point of entry***

Where WPM does not carry the required mark, action should be taken unless other bilateral arrangements between countries have been put in place. This action may take the form of treatment, disposal or refused entry, and the NPPO of the exporting country should be notified (ISPM 13 *Guidelines on notification of non-compliance and emergency action*). However, the authors did not find evidence of NPPOs having set up guidelines for non-compliance situations.

***Treatments used***

The treatments should be monitored extremely well by the NPPOs. Treatments different from those approved in ISPM 15 should not be used for treating WPM. One of the main objectives of the audits should be whether the amount of MB and the length of the HT are appropriate (see also *Contents of the audits*).

There is one case in Kenya where a WPM treatment facility uses a treatment that are not contemplated in ISPM 15.

There is evidence of treatment facilities re-treating WPM few months after the initial treatment, as it is believed that treated WPM can be reinfested. This has a significant cost for the environment.

***Content of the audits***

Does the chamber used for the HT meet the prescribed operating conditions? And do the treatment facilities use the prescribed amount of MB? Is the HT chamber properly loaded to allow the heated air to move through the entire load? Is the chamber equipment properly calibrated? Will the starting temperature of the wood – e.g. frozen wood – affect the treatment duration? Is the chamber appropriately sealed? Such questions highlight the fact that appropriate auditing would help improve implementation of the standard. Many interviewees stressed that audits need to be more accurate more frequent and unexpected, and records of the treatment operations need to be seen and studied.

[4] For more information on the ePhyto project see http://www.standardsfacility.org/PG-504 (last accessed: 28/06/2017).

The auditor needs to be able to answer questions related to the mark application, and if the mark is in line with the ISPM.

All this information is necessary to gather a complete view on different phases of the implementation process. As we have seen, malpractices can occur for a number of reasons; it is possible that WPM treatment facilities attempt to treat WPM according to ISPM 15 but that the treatment is not applied properly. This may be because the minimum required dose of fumigant or heat, or the time of the treatment are not adequate. The malpractices that may lead to non-compliance can be unintentional. As an example, a WPM treatment facility may follow the treatment schedules correctly based on sensors within the chamber, but because of cold pockets or uneven distribution of the fumigant not all wood is treated equally.

For heat treatments, ISPM 15 specifies that temperature probes need to be carefully inserted to the core of the largest wood pieces present in the chamber during each treatment cycle. If the probes do not reach the centre of the wood or if a probe is not well sealed from the ambient air then the target temperature of 56 °C will be indicated sooner than it should. To obtain accurate readings all equipment must be calibrated and working properly. In addition, fans are often needed in chambers to help circulate the fumigant or heated air, and the individual pieces of WPM should be properly stacked to ensure good airflow. Each of these factors, as many others (e.g. presence of bark, cross-sectional size of wood pieces), could result in reduced mortality of the pests during treatment and in the subsequent non-compliance.

Understanding how the WPM treatment facilities apply MB or HT is as important as defining what happens if inspections of those facilities find non-compliance. Is the facility interdict from operating for a limited period of time? Is it inspected more frequently? What happens to its stamp if the facility is suspended for some months? The NPPOs should take punitive action against the non-compliant companies and this information should be made public. NPPOs in other countries often take such action to incentivize other facilities to comply. As an example, Canada publishes the information of non-compliant facilities, thereby creating a deterrent for other producers. In our understanding, such actions are not being taken in the four case-study countries.

***Fraud***

Episodes of intentional ISPM 15 non-compliance or fraud can occur. This happens when the ISPM 15 stamp is knowingly applied to WPM that has not been treated, or not properly treated. Widespread usage of WPM with fraudulent marks, especially if infested, would reduce the apparent impact that the ISPM 15 has on reducing WPM infestation rates.

While we were not made aware of any intentional case of non-compliance, the issue of WPM repair facilities remain serious. These facilities repair broken WPM with an end result that appears to be treated WPM, as it has the ISPM 15 stamp. However, the repaired WPM may not necessarily comply with the ISPM 15; this is only the case when the repaired part is maximum a third of the total wood.

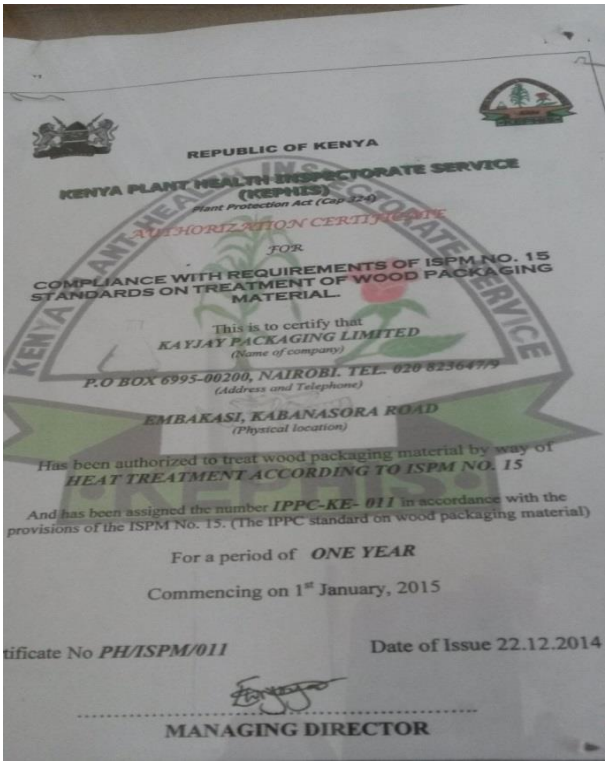
***Database on pest interceptions***

Several countries maintain databases of pests that are intercepted at their points of entry. Long-term pest interception databases have been developed by governments and NPPOs in Australia, Canada, Chile, Europe and North Africa (developed by the EPPO), Mexico, New Zealand, and the US. Typically,

inspectors target high-risk products, countries of import or pathways, rather than conducting completely random inspections. In addition, interception records are usually included in a country's database only when pests are found although there are exceptions.

This type of database is not present in ether of the four countries. A centralised database including all the 55 countries under the umbrella of IAPSC would be advisable, as it would offer a comprehensive picture of the impact of the standard.

**Figure 2: Yearly authorization certificate and authorization renewal released by KEPHIS to a WPM treatment facility in Kenya**



REPUBLIC OF KENYA

KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

Plant Protection Act (Cap 324)

AUTHORIZATION CERTIFICATE

FOR

COMPLIANCE WITH REQUIREMENTS OF ISPM NO. 15 STANDARDS ON TREATMENT OF WOOD PACKAGING MATERIAL.

This is to certify that

*KAYJAY PACKAGING LIMITED*

(Name of company)

*P.O BOX 6995-00200, NAIROBI. TEL. 020 8236477*

(Address and Telephone)

*EMBAKASI, KABANASORA ROAD*

(Physical location)

Has been authorized to treat wood packaging material by way of *HEAT TREATMENT ACCORDING TO ISPM NO. 15*

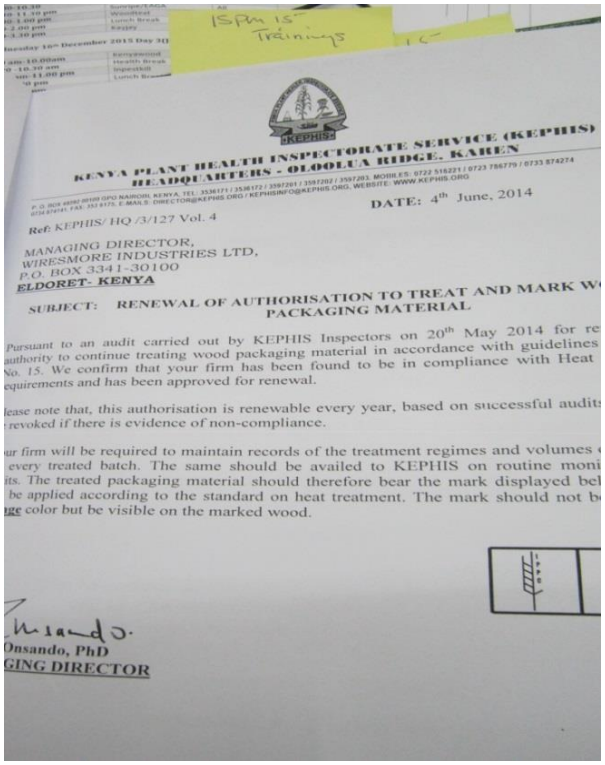
And has been assigned the number *IPPC-KE- 011* in accordance with the provisions of the ISPM No. 15. (The IPPC standard on wood packaging material)

For a period of *ONE YEAR*

Commencing on 1st January, 2015

tificate No *PH/ISPM/011* Date of Issue 22.12.2014

MANAGING DIRECTOR



ISPM 15 Trainings

KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

HEADQUARTERS - OLOOLUA RIDGE, KAREN

DATE: 4th June, 2014

Ref: KEPHIS/ HQ /3/127 Vol. 4

MANAGING DIRECTOR,
WIRESMORE INDUSTRIES LTD,
P.O. BOX 3341-30100
ELDORET- KENYA

SUBJECT: RENEWAL OF AUTHORISATION TO TREAT AND MARK W PACKAGING MATERIAL

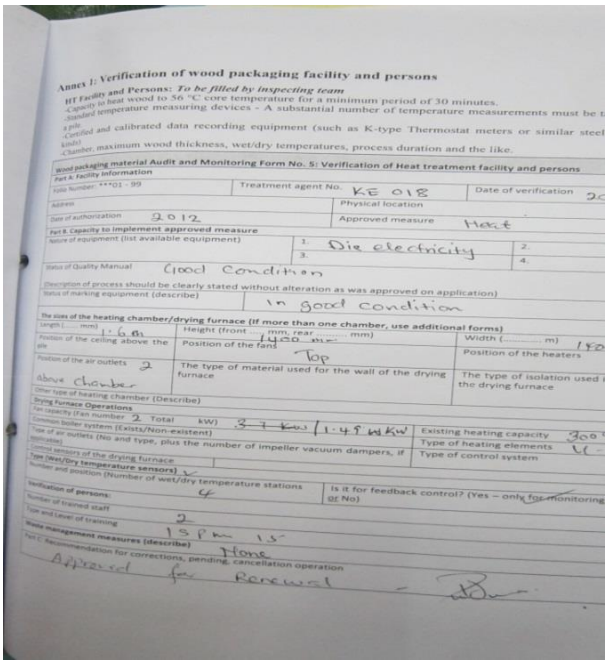
Pursuant to an audit carried out by KEPHIS Inspectors on 20th May 2014 for re authority to continue treating wood packaging material in accordance with guidelines No. 15. We confirm that your firm has been found to be in compliance with Heat equirements and has been approved for renewal.

lease note that, this authorisation is renewable every year, based on successful audit revoked if there is evidence of non-compliance.

ur firm will be required to maintain records of the treatment regimes and volumes every treated batch. The same should be availed to KEPHIS on routine moni its. The treated packaging material should therefore bear the mark displayed bel be applied according to the standard on heat treatment. The mark should not b ge color but be visible on the marked wood.

Onsando, PhD
GING DIRECTOR

**Figure 3: Report of an audit done by KEPHIS to a WPM treatment facility in Kenya**



Annex 1: Verification of wood packaging facility and persons

HT Facility and Persons: *To be filled by inspecting team*

Wood packaging material Audit and Monitoring Form No. 5: Verification of Heat treatment facility and persons

Part A: Facility Information

Treatment agent No. KE 018

Date of verification 2012

Physical location

Approved measure Heat

Part B: Capacity to implement approved measure

1. Die electricity

Good Condition

In good condition

The sizes of the heating chamber/drying furnace (If more than one chamber, use additional forms)

Height (front ... mm, rear ... mm) 1.6m

Width (... m) 1.5m

Position of the fans Top

Position of the heaters

The type of material used for the wall of the drying furnace

The type of isolation used in the drying furnace

Drying Furnace Operations

Fan capacity (fan number 2 Total kW) 3.7 kw / 1.45 mkw

Existing heating capacity 300

Type of heating elements

Type of control system

Verification of persons: 4

Is it for feedback control? (Yes – only for monitoring or No)

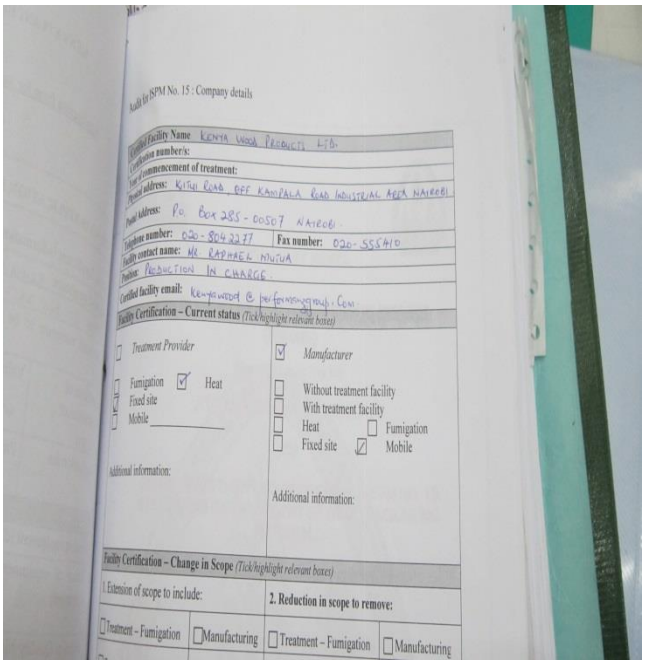
Number of trained staff 2

Type and Level of training ISPM 15

Waste management measures (describe) None

Part C: Recommendation for corrections, pending, cancellation operation

Approved for Renewal



Audit to ISPM No. 15 : Company details

Certified Facility Name KENYA WOOD PRODUCTS LTD.

Certification number/s:

Date of commencement of treatment:

Physical address: KITUI ROAD OFF KAMPALA ROAD INDUSTRIAL AREA NAIROBI

Postal address: P.O. BOX 285 - 00507 NAIROBI

Telephone number: 020-8042277 Fax number: 020-555410

Facility contact name: MR RAPHAEL MUTUA

Position: PRODUCTION IN CHARGE

Certified facility email: kenyawood@performancesystems.com

Facility Certification – Current status (Tick/highlight relevant boxes)

☐ Treatment Provider ☑ Manufacturer

☐ Fumigation ☑ Heat

Fixed site

Mobile

☐ Without treatment facility

☐ With treatment facility

☐ Heat ☐ Fumigation

☐ Fixed site ☑ Mobile

Additional information:

Additional information:

Facility Certification – Change in Scope (Tick/highlight relevant boxes)

1. Extension of scope to include:

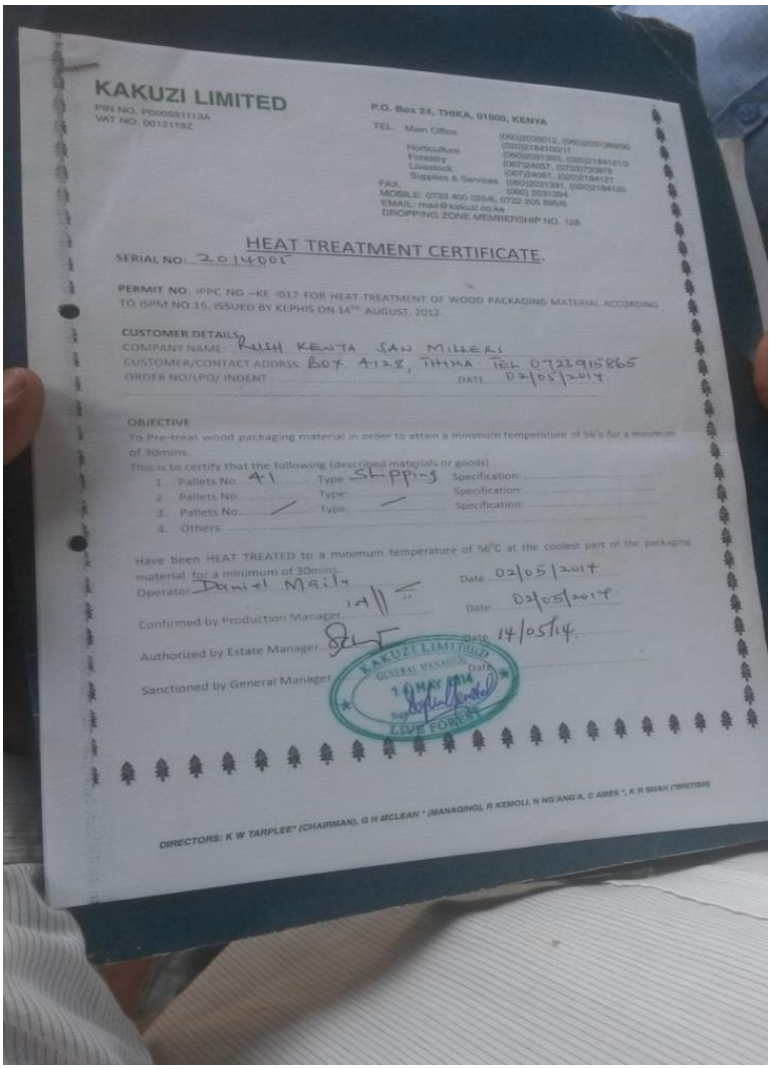
☐ Treatment – Fumigation ☐ Manufacturing

2. Reduction in scope to remove:

☐ Treatment – Fumigation ☐ Manufacturing

**Figure 4: Iron sheets used to export flowers by ai**

**Figure 5: WPM heat treatment certificate issued by a WPM treatment facility in Kenya**



KAKUZI LIMITED

PIN NO. P000591113A
VAT NO. 0012119Z

P.O. Box 24, THIKA, 01000, KENYA

TEL: Main Office (060)20300/12, (060)20313/8/99
Horticulture (020)21841001/1
Forestry (060)20/31393, (020)21841210
Livestock (067)24057, (0733)730975
Supplies & Services (067)24061, (020)21841/37
FAX: (060)20/31391, (020)2184120
MOBILE: 0733 400 025/6, 0722 205 895/6
EMAIL: mail@kakuzi.co.ke
DROPPING ZONE MEMBERSHIP NO. 128

HEAT TREATMENT CERTIFICATE

SERIAL NO: 2014001

PERMIT NO. IPPC NO.–KE -017 FOR HEAT-TREATMENT OF WOOD PACKAGING MATERIAL ACCORDING TO ISPM NO.15, ISSUED BY KEPHIS ON 14TH AUGUST, 2012.

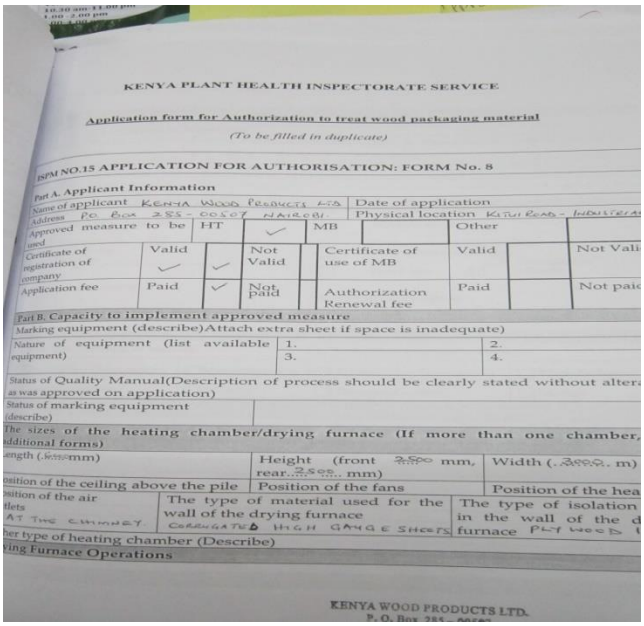
CUSTOMER DETAILS:
COMPANY NAME: RUIH KENYA SAN MILLERS
CUSTOMER/CONTACT ADDRESS: BOX 4128, THIKA TEL 0723915865
ORDER NO/LPO/ INDENT: DATE 02/05/2014

OBJECTIVE
To Pre-treat wood packaging material in order to attain a minimum temperature of 56°c for a minimum of 30mins.
This is to certify that the following (described materials or goods)
1. Pallets No. 41 Type Shipping Specification:
2. Pallets No. Type: Specification:
3. Pallets No. Type: Specification:
4. Others:

Have been HEAT TREATED to a minimum temperature of 56°C at the coolest part of the packaging material for a minimum of 30mins.
Operator: Daniel Maina Date 02/05/2014
Confirmed by Production Manager: Date 02/05/2014
Authorized by Estate Manager: Date 14/05/14
Sanctioned by General Manager: KAKUZI LIMITED GENERAL MANAGER 10 MAY 2014 LOVE FOREST

DIRECTORS: K W TARPLEE* (CHAIRMAN), G H MCLEAN * (MANAGING), R KEMOLI, N NG'ANG'A, C AMES *, K R SHAH (*BRITISH)

**Figure 6: Application form needed to obtain authorization to treat WPM in Kenya**



KENYA PLANT HEALTH INSPECTORATE SERVICE

Application form for Authorization to treat wood packaging material

(To be filled in duplicate)

ISPM NO.15 APPLICATION FOR AUTHORISATION: FORM No. 8

Part A. Applicant Information

Name of applicant KENYA WOOD PRODUCTS LTD | Date of application

Address P.O. BOX 285 - 00507 NAIROBI | Physical location KIAMBU ROAD - INDUSTRIAL

Approved measure to be used: HT ✓ | MB | Other

Certificate of registration of company: Valid ✓ | Not Valid ✓ | Certificate of use of MB: Valid | Not Valid

Application fee: Paid ✓ | Not paid ✓ | Authorization Renewal fee: Paid | Not paid

Part B. Capacity to implement approved measure

Marking equipment (describe) Attach extra sheet if space is inadequate)

Nature of equipment (list available equipment) 1. 2. 3. 4.

Status of Quality Manual (Description of process should be clearly stated without alter... as was approved on application)

Status of marking equipment (describe)

The sizes of the heating chamber/drying furnace (If more than one chamber, additional forms)

Length (...mm) Height (front 2500 mm, rear 2500 mm) Width (...m)

Position of the ceiling above the pile | Position of the fans | Position of the hea...

Position of the air inlets AT THE CHIMNEY | The type of material used for the wall of the drying furnace CORRUGATED HIGH GAUGE SHEETS | The type of isolation in the wall of the d... furnace PLY WOOD

Other type of heating chamber (Describe)

Drying Furnace Operations

KENYA WOOD PRODUCTS LTD.

P. O. Box 285 - 00507

**Figure 7: ISPM 15 stamps applied on treated WPM by Woodtex**



*Note: The stamps applied are not visible in all their parts.*

**4. Description of the Macroeconomic Analysis**

The macroeconomic analysis employs econometric methods to assess changes in trade volumes (for a wide range of sectors) after the implementation of ISPM 15. We follow the conventional methodological approach used for such purposes in the empirical trade literature, which is the estimation of trade gravity models (see Clougherty and Grajek, 2014; De Santis, 2012). These allow estimating simultaneously the statistical correlation (association) of these bilateral trade flows with several socio-economic and geographical factors. Three gravity models were estimated for 86 different types of commodities:

**1.** A parsimonious (simple) "fixed effects" model, which can be summarized by the following specification:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + \varepsilon_{ijt}\ , \qquad \textbf{(1)}$$

where $V_{ijkt}$ refers to the value of trade (imports/exports) in product type *k* from/to our case-study country (Kenya) *i* to/from any trade partner country *j* at time *t*, $Income_{ijt}$ captures the real GDP size of both trading partners *i* and *j* (which, hence, controls for the fact that trade tends to expand in accordance with the increasing size of both exporting and importing economies), and $ISPM\ 15_{it}$ is a time dummy taking the value of 1 for the years corresponding to the year Kenya implemented the standard. $\varepsilon_{ijt}$ captures the unexplained component of the estimated statistical relationship (i.e. the part of the variation in the dependent variable, the sector-specific trade volume, that cannot be explained by either). All the *b*'s correspond to the estimated coefficients that capture the size of the correlation between trade flows and other explanatory variables. Fixed effect estimators control for the effects of time invariant variables (in other words, fixed effects models impose time independent effects for each entity, i.e. country combination, that are possibly correlated with the explanatory variables) and are typically the preferred analytical tool in econometric analysis, since they are able to control for often important (but often unobservable and hence omitted) time invariant factors (e.g. cultural characteristics).

Particular attention will be given to the coefficient *b2*, which measures changes in trade volumes during the periods before and after implementation of ISPM 15. We hypothesize that the sign of this coefficient can be either positive or negative, dependent on a number of factors. Implementation of ISPM 15 can harm some exporting sectors, assuming that compliance increases the costs of pallets and, hence, of exported products, rendering them less competitive in international markets. It can also be the case that the implementation has the opposite effect, for instance by creating opportunities for an increase in export volumes by allowing access to markets with stringent plant protection regulations. It can also reduce the volume of imports for specific commodities by permitting imports only from a reduced number of ISPM 15-compliant trading partners. Such a reduction in imports can be the combined result of reduced competition and higher import prices, of fewer trading partners to meet demands, of the higher WPM costs passed on to the price of the final product, or due to higher administrative (e.g. inspection) costs of the importing country. All trade volumes will be measured in a natural logarithmic

scale, and, therefore, the *b2* coefficient will capture the percentage change between the periods before and after ISPM 15 implementation.

**2.** A richer "fixed effects" model, which includes a more sophisticated specification with additional explanatory factors:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + b3\ X_{jt} + \varepsilon_{ijt}\ , \qquad \textbf{(2)}$$

where again, the volume of bilateral trade will depend on (a) the size of economic activity (*Income*); (b) ISPM 15 implementation of Kenya and a vector *X* of additional control variables. These additional explanatory factors include: (c) an interaction variable that examines how non-implementation of ISPM 15 in Kenya can interact with ISPM 15 implementation in the export country to potentially reduce export volumes (variable: *ISPM 15 partner*). For the case of exports, this variable takes a value of 1 for the years when the trading partner implemented ISPM 15 but Kenya had not done so. For the case of imports, the corresponding variable takes a value of 1 when Kenya implemented ISPM 15 but the trading partner had not done so. Last, this richer model includes an institutional variable that relates to the extent of corruption in the export country (*Transparency*). The institutional variable aims to capture whether Kenyan prefers to trade with countries characterized by higher levels of transparency in transactions (see Anderson and Marcouiller, 2002). Again, the fixed effect estimators control for the effects of time invariant variables (in other words, fixed effects models impose time independent effects for each entity (country combination) that are possibly correlated with the explanatory variables).

**3.** A random effects model, that includes, in addition to the variables of Model 2, an additional set of time-invariant factors:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + b3\ X_{jt} + b4\ Z_{ijt} + \varepsilon_{ijt}\ , \qquad \textbf{(3)}$$

where the vector *Z* captures the additional time-invariant variables, namely: (a) *Distance* which is a variable capturing distance between countries (distance between capital cities in km) – we expect distance to correlate negatively with trade flows, as a result of larger transportation costs; (b) a dummy variable taking a value of 1 when Kenya and each trade partner share borders (variable *Borders*) (we expect countries with common borders to trade more with one another, other things equal); (c) a dummy variable taking a value of 1 when trade partners share a common language as this may facilitate trade (variable *Language*); and (d) a dummy variable taking a value of 1 in cases of historical links between colonies and colonial powers, which may increase trade for involved parties (variable *Colony*). For gravity models using similar geographical variables see the papers by Gómez-Herrera (2013) and Lohmann (2013). All the other explanatory variables appearing in Model 2 (fixed effects richer model) are also included in the random effects model. Contrary to fixed effects estimators, random effects models do not impose time-independent effects for each entity (country combination) that are possibly correlated with the explanatory variables. In other words, we assume that variation in the explanatory

variables arises from random causes and is not systematically related to the country-combinations over time.

The second model (fixed effects richer specification) provides the most reliable estimators (although results are shown also for the more parsimonious fixed effects and random effects specifications for key export and import commodities). Random effects estimations are based on the assumption that individual-specific effects are uncorrelated with independent variables, an assumption that is often violated in panel data settings (in other words, the corresponding Hausman tests conducted are in favour of the fixed effects estimators). The first model is likely to provide biased estimators as a result of an omitted variable bias (i.e. a restricted model with few variables is likely to omit key explanatory factors and, hence, bias either downwards or upwards of the estimated coefficients of the included variables). All models make use of robust standard errors that correct for any heteroscedasticity effects on statistical significance.

## 4.1 Description of Macroeconomic Data

The research team has compiled data from multiple sources such as UN Comtrade dataset, World Development Indicators, and World Governance Indicators. Below is a detailed description of all variables used in the macroeconomic analysis.

***Trade flows***: These have been captured by the value of imports and exports across 86 commodity categories from/to Kenya and to/from any trade partner country. These bilateral annual trade flows are expressed in a natural logarithmic scale and are available for the years 1992–2013. All data are available from the UN International Trade Statistics Database, commonly known as the Comtrade website (https://comtrade.un.org).

***ISPM 15***: Data on ISPM 15 implementation for all countries. The *ISPM 15* variable is a time dummy taking the value of 1 for the years corresponding to the implementation year of the standard by Kenya. The variable *ISPM 15(partner)* is an interaction variable that examines how non-implementation of ISPM 15 in Kenya can interact with ISPM 15 implementation in the export country to potentially reduce export volumes. For the case of exports, this variable takes a value of 1 for the years when the trading partner implemented ISPM 15 but Kenya had not done so. For the case of imports, the corresponding variable takes a value of 1 when Kenya adopted ISPM 15 standard but the trading partner had not done so.

***Income***: Data on real GDP in 2010 constant prices. In all regressions, the natural logarithm of the product of the GDP size (of pairs of trading partners) has been used. Data are available from the World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators).

***Transparency***: An institutional variable that relates to the extent of corrupt practices in the export partner economy. This is a control of corruption index that captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" (appropriation) of the state by elites and private interests. It is measured in a −2.5 to 2.5 scale where 2.5 corresponds to the lowest level of corruption and −2.5 corresponds to the highest level of corruption. Data are available from the Worldwide Governance Indicators (www.govindicators.org).

***Borders***: A dummy variable taking a value of 1 when Kenya and trading partner share borders.

***Language***: A dummy variable taking a value of 1 when the trading partners share a common language.

***Distance***: A variable capturing distance between the capital cities of partner countries (expressed in km and logarithmic scale).

***Colony***: A dummy variable taking a value of 1 in cases of historical links between colonies and colonial powers.

The descriptive statistics for all variables are available in Table 4.

**Table 4: Descriptive statistics - Kenya**

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Trade flows (exports) | 10.11 | 3.05 | 0 | 19.47 |
| Trade flows (imports) | 10.55 | 3.11 | 0 | 21.28 |
| ISPM 15 | 0.47 | 0.50 | 0 | 1 |
| ISPM 15 (export partner) | 0.04 | 0.19 | 0 | 1 |
| ISPM 15 (import partner) | 0.03 | 0.18 | 0 | 1 |
| Income | 49.07 | 2.39 | 40.49 | 54.32 |
| Transparency | 0.34 | 1.16 | −1.92 | 2.50 |
| Borders | 0.09 | 0.29 | 0 | 1 |
| Language | 0.40 | 0.49 | 0 | 1 |
| Distance | 8.40 | 0.78 | 6.37 | 9.63 |
| Colony | 0.03 | 0.17 | 0 | 1 |

## 4.2 Empirical Analysis

A total of 516 models were estimated (i.e. 86 sectors × 2 trade categories (imports/exports) × 3 model specifications). Results are presented below.

***Exports***

Tables 16 and 17 present detailed results for the two most important export sectors of the Kenyan economy (in terms of export value); coffee, tea and spices (

Table 5) and vegetables (

Table 6). We present estimates for all three empirical models (column 1 for the parsimonious fixed-effects specification, column 2 for our preferred richer fixed effects specification and column 3 for the random effects specification).

According to

Table 5 (Model 2), there was a statistically significant increase of 39% in the exports of coffee, tea and spices during the period after ISPM 15 implementation (17% and 28% according to Models 1 and 3). For the case of exports of vegetables (

Table 6, Model 2), there was a decline by 15% during the same period, although this is not statistically significant (-23% and 32% according to Models 1 and 3).

**Table 5: Kenyan exports of coffee, tea and spices**

| Dependent variable: | FE | FE | RE |
|---|---|---|---|
| | (1) | (2) | (3) |
| Constant | −14.49 | −5.04 | −13.54 |
| *Income* | 0.57** | 0.37 | 0.58*** |
| | (0.26) | (0.25) | (0.11) |
| *ISPM 15* | 0.17 | 0.39*** | 0.28*** |
| | (0.15) | (0.15) | (0.10) |
| *ISPM 15 (partner)* | | 0.26** | 0.19* |
| | | (0.12) | (0.11) |
| *Transparency* | | 0.42 | 0.34* |
| | | (0.28) | (0.21) |
| *Borders* | | | 3.30*** |
| | | | (1.21) |
| *Language* | | | 0.13 |
| | | | (0.51) |
| *Distance* | | | −0.31 |
| | | | (0.40) |
| *Colony* | | | 3.65*** |
| | | | (0.65) |
| $R^2$ overall | 0.23 | 0.19 | 0.28 |
| (within; between) | (0.06; 0.22) | (0.07; 0.19) | (0.07; 0.25) |
| *Countries* | 143 | 140 | 129 |
| *N* | 1174 | 926 | 893 |

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

**Table 6: Kenyan exports of vegetables**

| Dependent variable: | FE | FE | RE |
|---|---|---|---|
| | (1) | (2) | (3) |
| Constant | −65.53 | −53.74 | −2.08 |
| *Income* | 1.57*** | 1.33*** | 0.46*** |
| | (0.28) | (0.45) | (0.08) |
| *ISPM 15* | −0.23 | −0.15 | 0.32* |
| | (0.17) | (0.22) | (0.17) |
| *ISPM 15 (partner)* | | 0.24 | 0.40* |
| | | (0.24) | (0.22) |
| *Transparency* | | 0.23 | 0.66*** |
| | | (0.39) | (0.18) |
| *Borders* | | | 0.46 |
| | | | (0.95) |
| *Language* | | | 0.27 |
| | | | (0.37) |
| *Distance* | | | −1.22*** |
| | | | (0.25) |
| *Colony* | | | 5.88*** |
| | | | (0.50) |
| $R^2$ overall | 0.20 | 0.21 | 0.39 |
| (within; between) | (0.10; 0.21) | (0.06; 0.22) | (0.05; 0.46) |
| *Countries* | 139 | 136 | 126 |
| *N* | 917 | 742 | 705 |

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Figure 8 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2) across all export sectors (based on the estimates of our preferred Model 2). Effects are presented in descending order, with the sectors experiencing the largest increases in export volumes during the post-ISPM 15 period appearing at the top. Approximately half of the sectors experienced an increase in export volumes. The largest increases were in explosives and pyrotechnics (+221%) and wood pulp (+184%), while the largest decreases were in fur products (−227%) and salt and sulphur products (−202%).

**Figure 8: Distribution of ISPM 15 effects across all exporting sectors**

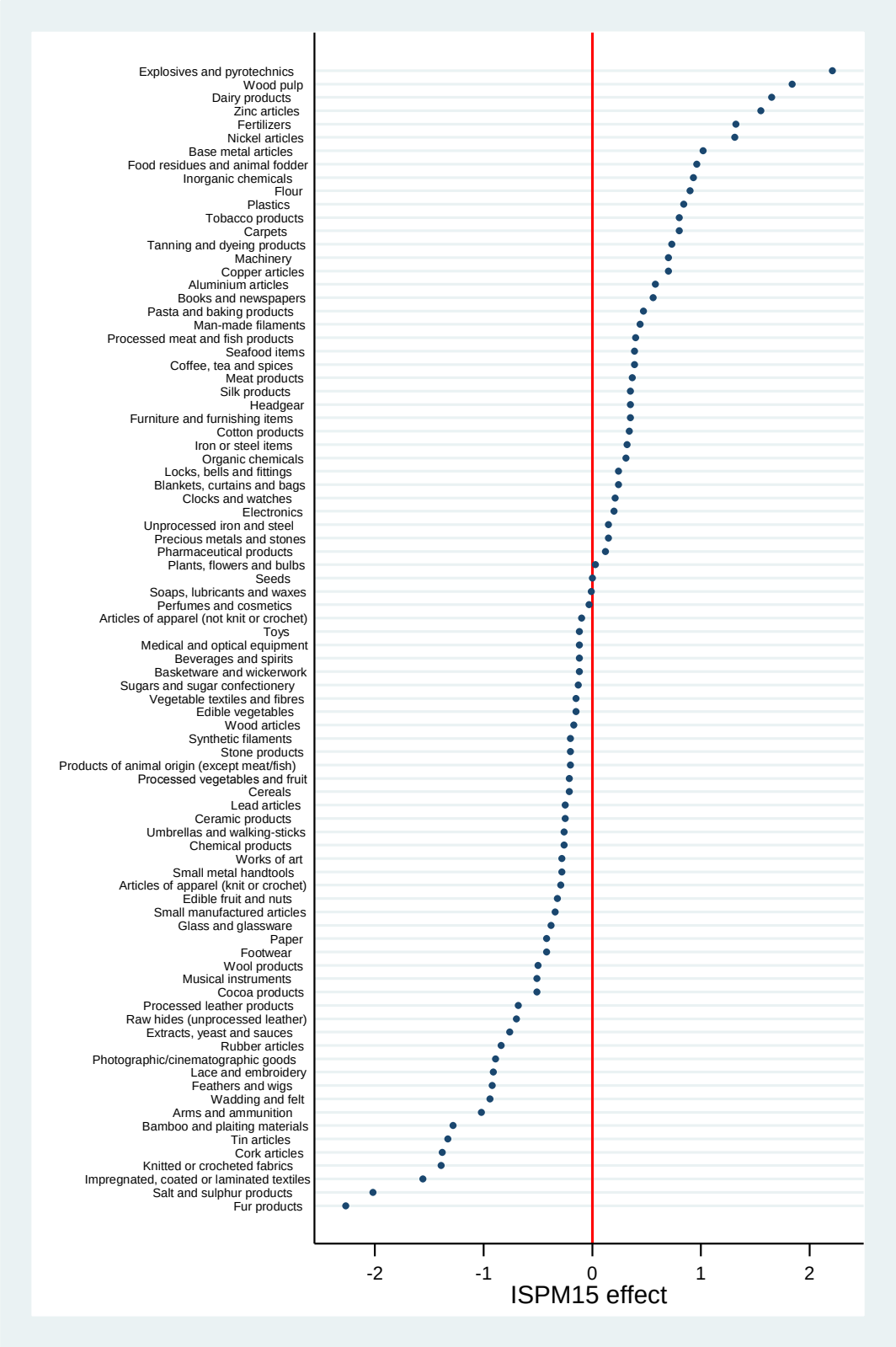
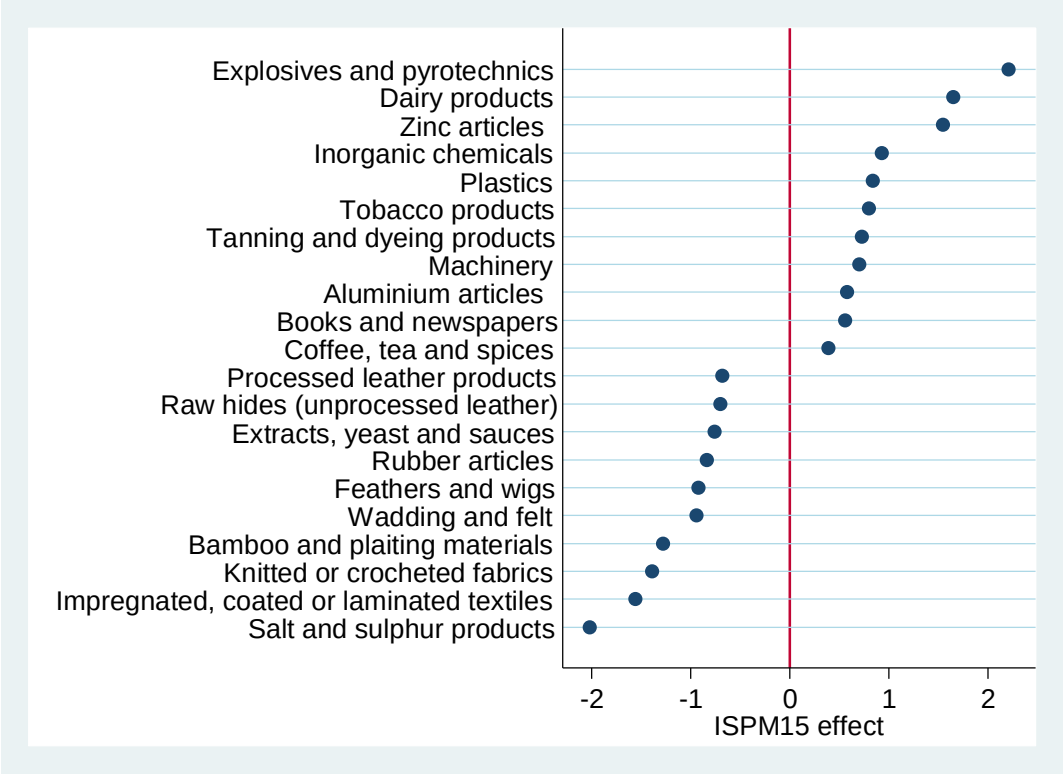


Figure 9 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2; Model 2) only for those export sectors where the effect was found to be statistically significant (at least at the 10% level of significance). Approximately half of the sectors experienced an increase in export volumes. The largest statistically significant increases in the period after ISPM 15 implementation were in explosives and pyrotechnics (+221%) and dairy products (+165%), while the largest decreases were in salt and sulphur products (−202%) and impregnated, coated or laminated textiles (−156%).

**Figure 9: Distribution of only statistically significant ISPM 15 effects (exports)**




***Imports***

Tables 18 and 19 present detailed results for the two most important import sectors of the Kenyan economy (in terms of import value); electronics (Table 7) and machinery (Table 8). We present estimates for all three empirical models (column 1 for the parsimonious fixed effects specification, column 2 for our preferred richer fixed effects specification, and column 3 for the random effects specification).

According to Table 7 (Model 2), there was a non-statistically significant increase of 15% in the imports of electronics during the period following ISPM 15 implementation (4% and 30% according to Models 1 and 3). For the case of machinery (Table 8, Model 2), there was a statistically significant increase of 49% during the same period (25% and 48% according to Models 1 and 3).

**Table 7: Kenyan imports of electronics**

| Dependent variable: | FE | FE | RE |
|---|---|---|---|
| | (1) | (2) | (3) |
| Constant | −65.90 | −64.28 | −41.43 |
| *Income* | 1.60*** | 1.56*** | 1.25*** |
| | (0.23) | (0.31) | (0.11) |
| *ISPM 15* | 0.04 | 0.15 | 0.30** |
| | (0.18) | (0.20) | (0.13) |
| *ISPM 15 (partner)* | | −0.40 | −0.43 |
| | | (0.29) | (0.30) |
| *Transparency* | | −0.52* | 0.30 |
| | | (0.32) | (0.19) |
| *Borders* | | | −1.72* |
| | | | (1.01) |
| *Language* | | | 1.76*** |
| | | | (0.40) |
| *Distance* | | | −1.01*** |
| | | | (0.36) |
| *Colony* | | | 0.35 |
| | | | (0.47) |
| $R^2$ overall | 0.23 | 0.41 | 0.51 |
| (within; between) | (0.06; 0.22) | (0.12; 0.40) | (0.13; 0.54) |
| *Countries* | 159 | 156 | 142 |
| *N* | 1355 | 1096 | 1052 |

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

**Table 8: Kenyan imports of machinery**

| Dependent variable: | FE | FE | RE |
|---|---|---|---|
| | (1) | (2) | (3) |
| Constant | −50.92 | −43.10 | −33.97 |
| *Income* | 1.30*** | 1.13*** | 1.09*** |
| | (0.21) | (0.29) | (0.09) |
| *ISPM 15* | 0.25 | 0.49*** | 0.48*** |
| | (0.16) | (0.19) | (0.13) |
| *ISPM 15 (partner)* | | −0.80*** | −0.76** |
| | | (0.32) | (0.36) |
| *Transparency* | | 0.02 | 0.53*** |
| | | (0.29) | (0.15) |
| *Borders* | | | −0.41 |
| | | | (0.86) |
| *Language* | | | 1.06*** |
| | | | (0.32) |
| *Distance* | | | −0.88*** |
| | | | (0.30) |
| *Colony* | | | 0.92** |
| | | | (0.43) |
| $R^2$ overall | 0.51 | 0.51 | 0.58 |
| (within; between) | (0.14; 0.55) | (0.13; 0.55) | (0.13; 0.66) |
| *Countries* | 163 | 159 | 142 |
| *N* | 1450 | 1164 | 1103 |

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Figure 10 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2) across all import sectors (based on the estimates of our preferred Model 2). Effects are presented in descending order, with the sectors experiencing the largest increases in import volumes during the post-ISPM 15 period appearing at the top. Approximately a third of all sectors experienced an increase in export volumes. The largest increases were in pasta and baking products (+72%) and aluminium articles (+62%), while the largest decreases were in vegetable textiles and fibres (−218%) and arms and ammunition (−130%).

**Figure 10: Distribution of ISPM 15 effects across all importing sectors**

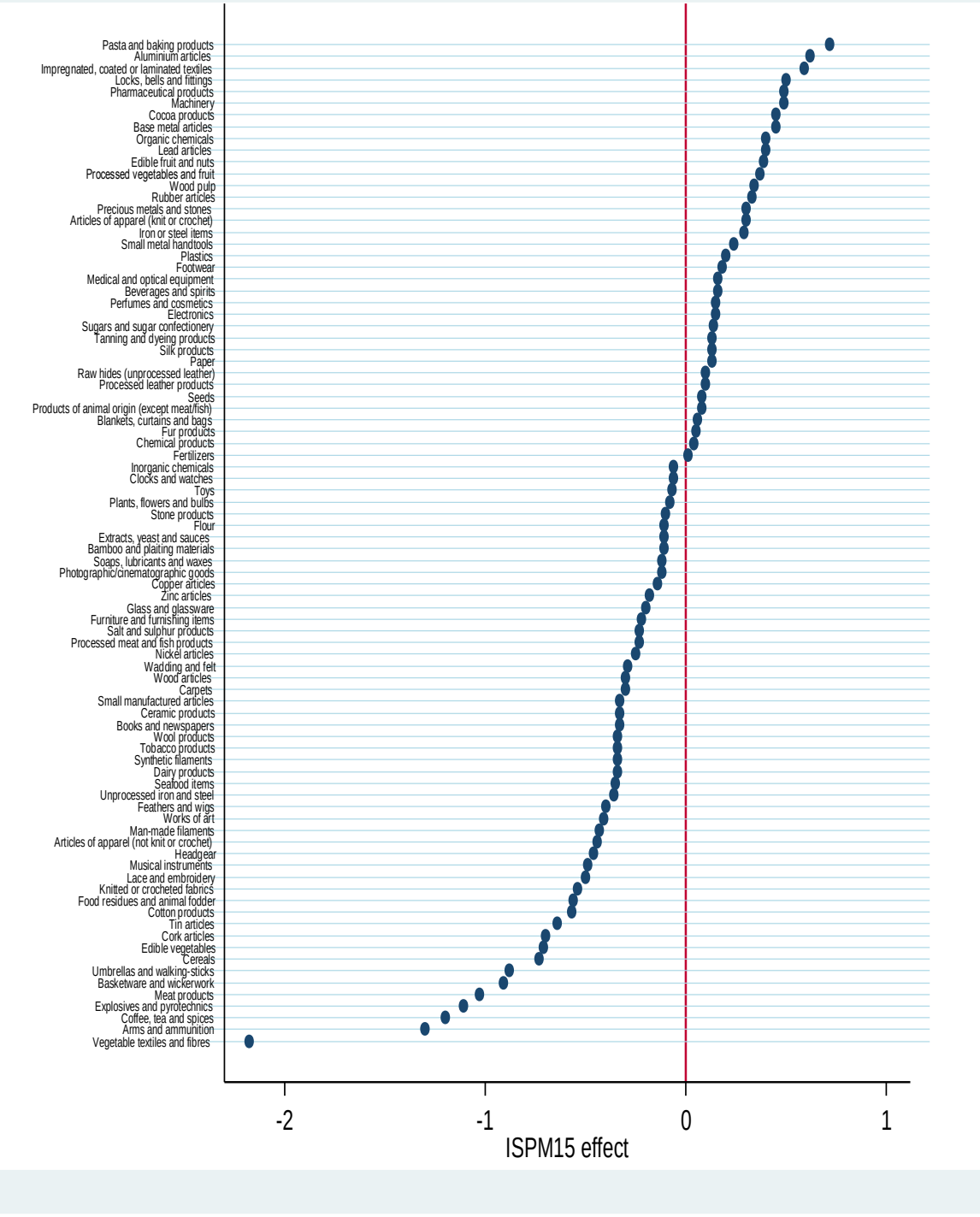
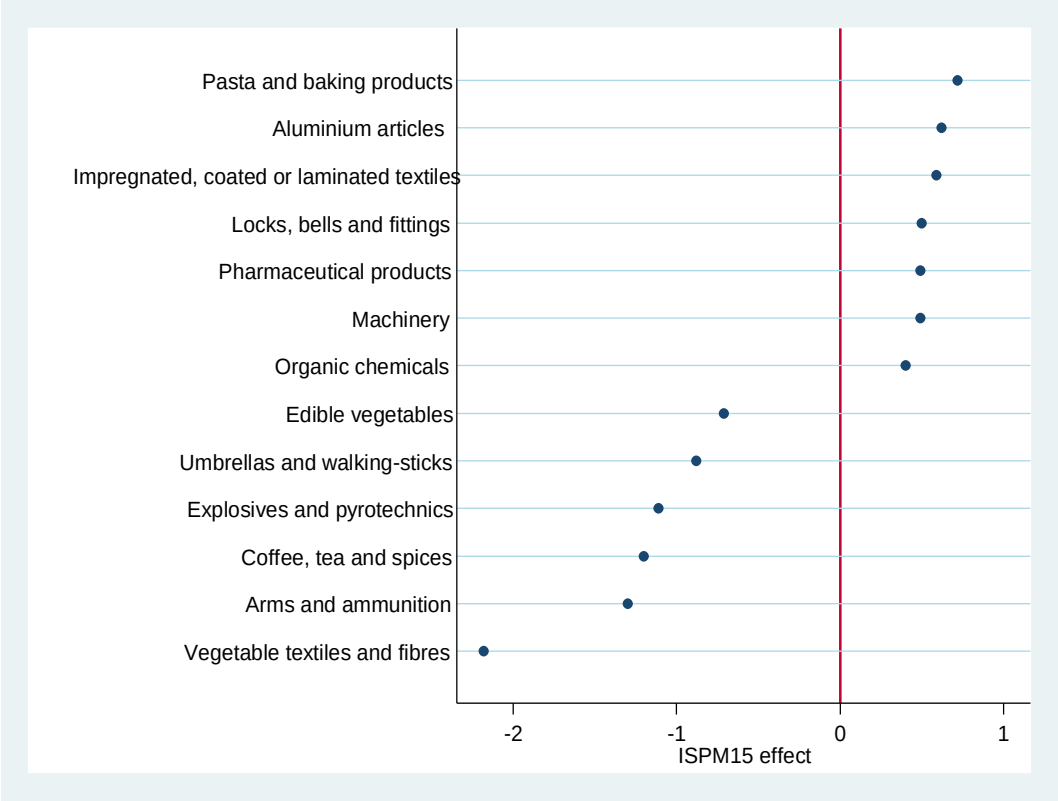



Figure 11 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2; Model 2) only for those import sectors where the effect was found to be statistically significant (at least

at the 10% level of significance). Approximately half of the sectors experienced an increase in import volumes. The largest increases in the period after ISPM 15 implementation were in pasta and baking products (+72%) and aluminium articles (+62%), while the largest decreases were in vegetable textiles and fibres (−218%) and arms and ammunition (−130%).

**Figure 11: Distribution of only statistically significant ISMP 15 effects (imports)**




***Change in trade balance***

Multiplying the sector-specific coefficient of ISPM 15 with the value of the corresponding sector (2013 values) provides an estimate of the change in value for the particular exporting/importing sector between the period before and after ISPM 15 implementation (after controlling for other determining factors, such as the size of economic activity, transparency levels, etc.). We do this for all sectors where the effect of ISPM 15 is statistically significant (i.e. those listed in

Figure 9 for exports and Figure 11 for imports). Tables Table 9 and

Table 10 display the change in export and import value (in million USD) per sector. The largest drop in export values was in salt and sulphur products (USD −343.4 million) and raw hides (USD −70 million). The largest drop in import values was in edible vegetables (USD −34.79 million) and coffee, tea and spices (USD −26.4 million).

Aggregating these values across all these exporting and importing sectors provides the overall change in value for all exports and imports (in the period before and after ISPM 15 implementation). Overall, exports increased by USD 551 million, while imports increased by USD 1,227 million. As a result of this, the trade balance decreased by USD 676 million (Figure 12).

**Table 9: Change in export values per sector (in million USD)**

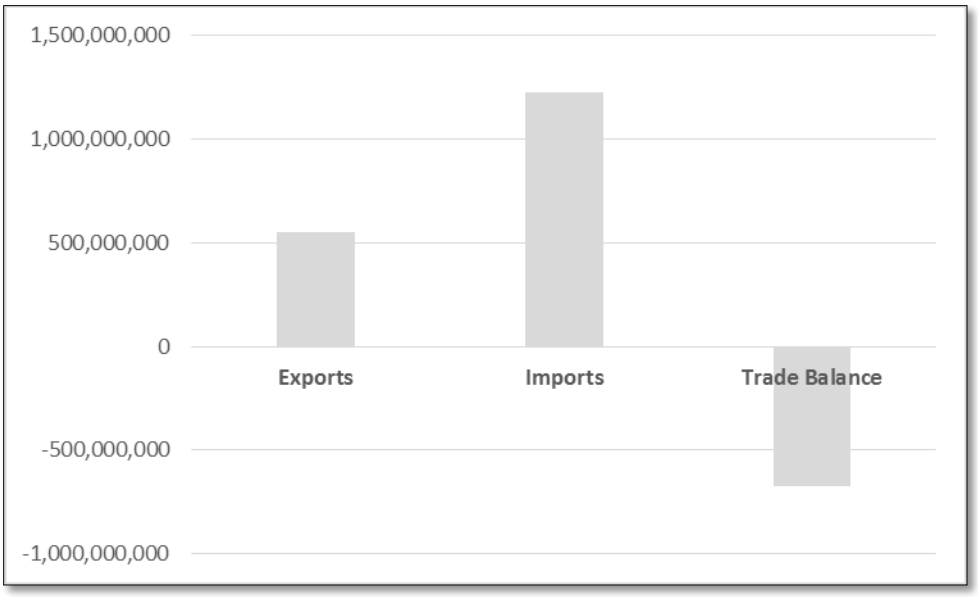
| | |
|---|---|
| Salt and sulphur products | −343.40 |
| Raw hides (unprocessed leather) | −70.00 |
| Bamboo and plaiting materials | −48.64 |
| Extracts, yeast and sauces | −22.80 |
| Rubber articles | −15.96 |
| Feathers and wigs | −10.12 |
| Wadding and felt | −3.76 |
| Processed leather products | −1.36 |
| Impregnated, coated or laminated textiles | −0.66 |
| Knitted or crocheted fabrics | −0.53 |
| Zinc articles | 1.86 |
| Explosives and pyrotechnics | 2.87 |
| Tanning and dyeing products | 16.79 |
| Books and newspapers | 19.04 |
| Dairy products | 21.45 |
| Aluminium articles | 31.90 |
| Machinery | 36.40 |
| Inorganic chemicals | 120.90 |
| Tobacco products | 128.00 |
| Plastics | 142.80 |

| | |
|---|---|
| Coffee, tea and spices | 546.00 |

**Table 10: Change in import values per sector (in million USD)**

| | |
|---|---|
| Edible vegetables | −34.79 |
| Coffee, tea and spices | −26.40 |
| Explosives and pyrotechnics | −11.10 |
| Arms and ammunition | −10.66 |
| Vegetable textiles and fibres | −3.71 |
| Umbrellas and walking-sticks | −1.58 |
| Impregnated, coated or laminated textiles | 6.49 |
| Locks, bells and fittings | 25.50 |
| Pasta and baking products | 36.00 |
| Organic chemicals | 64.00 |
| Aluminium articles | 80.60 |
| Pharmaceutical products | 220.50 |
| Machinery | 882.00 |

**Figure 12: Changes in values of exports/ imports/ trade balance in Kenya (in USD)**




***Summary of Findings***

The purpose of this macroeconomic analysis is to estimate changes in trade volumes (exports/imports) during the periods before and after ISPM 15 implementation across multiple commodity sectors. We followed the conventional methodological approach used for such purposes in the empirical trade literature, which is the estimation of trade gravity models. These allow estimating simultaneously the statistical correlation (association) of these bilateral trade flows with several socio-economic and geographical factors. Overall, we found that:

- Approximately half of the sectors experienced an increase in export volumes. The largest statistically-significant increases in the aftermath of the implementation of ISPM 15 were in explosives and pyrotechnics (+221%) and dairy products (+165%), while the largest decreases concerned in salt and sulphur products (−202%) and impregnated, coated or laminated textiles (−156%).
- Approximately half of the sectors experienced an increase in import volumes. The largest increases in the aftermath of ISPM 15 implementation were in pasta and baking products (+72%) and aluminium articles (+62%), while the largest decreases were in vegetable textiles and fibres (−218%) and arms and ammunition (−130%).
- Overall, exports increased by USD 551,000,000, while imports increased by USD 1,226,850,000. As a result of this, the trade balance decreased by USD 675,850,000.

***Policy Recommendations***

Given the unequal distribution of effects across sectors, the Kenyan authorities should pay attention to those sectors that experienced an economic contraction in the aftermath of the implementation of ISPM 15. The export sectors with the largest percentage decreases were: salt and sulphur products (−202%) and impregnated, coated or laminated textiles (−156%). In total, six export sectors experienced a statistically significant drop in export revenues (

Figure 9). A more qualitative-based analysis per sector needs to identify the extent to which the drop in export revenues for each sector was associated with the administrative burden and costs associated with the implementation of ISPM 15 in combination with other underlying internal and external factors (e.g. changes in prices locally and globally, emergence of new competitors, constraints in domestic productive capacity, or exchange rate volatility). The same should also apply in the context of import sectors.

In Kenya, the ISPM 15 implementation appears to be associated with an overall increase in both exports and imports. Overall, exports increased by USD 551,000,000, while imports increased by much more (USD 1,226,850,000). As a result of this, the trade balance decreased by USD 675,850,000. This is an issue of concern, given that Kenya has been running an overall trade deficit in the last five years. Supporting those exporting industries that experienced a contraction in the aftermath of ISPM 15 implementation could at least partly offset these persistent trade deficits. Alternatively the government could support those sectors that grew substantially in the period after the implementation of ISPM 15, as long as these industries can expand further and compensate for the value and employment loss that other sectors experienced.

**5. ISPM 15: findings based on microdata**

The precise assessment of the costs and the benefits related to implementation of ISPM 15 does not constitute an easy task. Available studies on the subject have not been able to go beyond rough estimates, as a number of hypothetical and sometimes unquantifiable factors are often involved. There are no studies, to our understanding, trying to quantify the costs and the benefits related to the implementation of ISPM 15 in developing countries, which makes the present research of particular importance for its contribution to the subject matter.
The available evidence – mostly based on country case studies and regional assessments conducted in developed areas of the world – suggests that:

- **i.** The burden of the compliance cost is imposed on exporting countries.
- **ii.** WPM treatment facilities (i.e. private businesses) have to bear the implementation costs. Those costs are later transferred to the exporters and to the final consumers via the importers.
- **iii.** The cost of compliance is relatively high if put in relation to the income level of the low income and least developed countries.
- **iv.** While the cost of compliance is high, the short- and long-term costs related to the lack of compliance is enormous, in terms of potential foregone export, income and employment.

**v.** The cost and efficiency of the compliance depend, *inter alia*, on the organization of the supply chain.

Although the implementation and compliance costs relate to both imports and exports, the majority of the costs burden the exporter. For this reason, this chapter will assess the costs and the burden of compliance from the perspective of the WPM treatment facilities, which were very likely to experience a number of new fixed and variable costs and benefits since implementation of ISPM 15 became compulsory in the country.

Implementation of and compliance with ISPM 15 may, however, also generate costs on stakeholders other than the WPM treatment facilities. For instance, the NPPO may incur additional costs related to the organization of training courses, or there may be the need for additional phytosanitary inspectors (Table 11).

**Table 11: Costs and benefits related to the ISPM 15 implementation**

| **Implementation at the export level** | | **Implementation at the import level** |
|---|---|---|
| *Costs* | *Benefits* | *Costs* |
| Fixed costs for the WPM treatment facilities<br>Inspections/audits costs for the WPM treatment facilities<br>Variable costs for the WPM treatment facilities<br>Validation checks | Revenues from the sale of treated WPM | Legislative changes<br>Hiring of inspectors and inspections<br>Training inspectors<br>Adminstrative costs<br>Purchase of the necessary equipment |
| | | |
| **Overall benefits for the country** | Being able to export<br>Reduction in the introduction and spread of economically devastating pests<br>Agricultural yields not affected by economically devastating pests | |

*Source: Authors' elaboration.*

Those costs are not taken into account here when computing the overall costs that compliance with the standard may have generated. In this chapter we limit our analysis to estimating the costs the WPM treatment facilities are facing and comparing them to the revenues. For the time being we will disregard all the costs related to organizing the import inspections.

From the perspective of the WPM treatment facilities, the compliance costs can be high in absolute and relative terms, especially for those developing countries lacking the know-how, resources and specific competencies related to ISPM 15. According to the available literature on this issue, the cost of compliance is the sum of all expenses that are directly and indirectly related to the standard's

implementation. Those costs include the funds disbursed for purchasing components of the supply chain (fixed costs) for instance to purchase a heat chamber or the necessary equipment to apply MB. In addition, the cost analysis should take into account a number of variable costs too; costs related to hiring workers with the necessary technical expertise of the treatment, to carrying out inspections, to obtaining the license to operate, and so forth.

The revenue benefits for the WPM treatment facilities relate to the mark-up price WPM treatment facilities can charge for their treated WPMs. If there is a positive difference between the benefits and the costs it would indicate that the WPM treatment facilities are economically viable entities. In addition, it would indicate that the whole system created ad-hoc for implementing and complying with the standard is generating revenues and that there is enough demand for treated WPM. However, if the costs are higher than the financial benefits this may indicate that the overall chain is not profitable enough. In this case, it would be important to understand which are the system bottlenecks, why a loss exists and which potential remedies could be put in place.

The cost-benefit analysis of ISPM 15 cannot be limited to the assessment of the economic profitability of the WPM treatment facilities. There are a number of other direct and indirect economic consequences the implementation of the standard may generate. For the sake of completeness, we have supported the results of the cost-benefit analysis with the analysis of the procedures put in place by the NPPOs (i.e. the agencies responsible for implementing ISPM 15), and with a macroeconomic analysis of the trade position of the country. The first type of analysis, referred to as the qualitative analysis (Section 3), will assist the NPPOs to implement ISPM 15 better. The second type of analysis, the macroeconomic analysis (Section 4), looks at how the trade position of each of the four case-study countries has evolved after the implementation of ISPM 15, and which sectors have benefited the most. The third, the microeconomic analysis, will be discussed in this section.

The stakeholders of ISPM 15 implementation, and especially the NPPOs, should take the results of the three types of analysis into consideration to increase their understanding of the effects the standard has generated. Therefore, the three analyses may be read as stand-alone or as three different components of the same phenomena.

The rest of this section is organized in the following way. The next section introduces and describes the survey tool used for the data collection process. The questionnaire was given to all the WPM treatment facilities operating in the country, and the rate of responsiveness, any missing data problems as well as data quality will be discussed too. The presentation of the descriptive statistics and the costs and benefits analysis is presented in Section 5.3, followed by the conclusions.

### 5.1 Description of the survey tool

There are many ways to conduct a cost-benefit analysis related to the implementation of ISPM 15. One way could be to examine all the expenditures the central government faced to guarantee the correct implementation of the standard. Those costs may relate to the research needed to understand and correctly apply the treatments, to the change in the regulation adopted by the country in matters

related to trade and in the management of the "new" supply chain, or to the hiring of phytosanitary inspectors. Another strategy could be to assess the aforementioned costs and compare them with the number of pests that have been introduced in the country before and after the standard was implemented; this comparison would help quantifying the funds saved as a consequence of the reduction of such pests. This analysis would also help understanding the impact the standard has had at the phytosanitary level and, possibly, on the agricultural yield and productivity. Data for assessing these costs and impacts are scarce, if not completely lacking.[5] As previously discussed, the activity of keeping up-to-date records of pests in the country is not conducted in any of the four case-study countries.

In what follows, we will assess the costs WPM treatment facilities have faced, and if the costs will outcast the benefits coming from the sale of the treated WPM. For this purpose, we prepared a survey tool consisting of a detailed questionnaire directed at the WPM treatment facilities operating in each of the four case-study countries. The questionnaire comprises several different sections, each of which relates to different aspects of the WPM treatment facilities' business cycle.[6] The seven sections the questionnaire are composed as following:

**i.** Section 1: Questions regarding the wood treatment facility

**ii.** Section 2: Wood treatment facility: general information

**iii.** Section 3: Wood treatment information

**iv.** Section 4: Wood treatment training

**v.** Section 5: Costs related to the wood treatment

**vi.** Section 6: Benefits related to the wood treatment

**vii.** Section 7: General comments.

Section 1 includes general questions about the respondent and its role within the facility, the year the facility started to operate as a treatment facility, and all the requirements needed to obtain the license to operate. The section also queries the number of employees and whether there was an increase in the number of employees following the implementation of the standard.

The second section, investigates the main activities performed by the facility. For instance, whether the facility also manufactures the WPM it will later treat, or if it repairs broken WPM. Given some types of packaging material is made of different materials, the section also queries if the facility only produces WPM or also other packaging material. Also the capacity of the facility in terms of number of treated WPM per year is queried, as are details as to potential repetition of treatments, and which companies buy the final product and for what purpose. In other words, the section aims at understanding the core businesses of the facilities and their capacity.

[5] The lack of data is related to the fact that it is extremely difficult to know, with a high degree of certainty, that a particular species was introduced by a particular commodity. Usually, such information is largely based on assumptions. Furthermore, it is computationally complicated to assess the economic and environmental impact of the pest in a particular region.

[6] The questionnaires used in the four countries differ slightly to reflect country-specific situations. However, the content of the four questionnaires, as well as the data collected, are in any case comparable. A copy of the master questionnaire, which was developed before the country missions, is attached to this study. Copies of the four country-specific questionnaires are available upon request.

The third section poses questions regarding the wood treatments used. We query which treatment the facility uses and the main reasons for choosing that instead of another treatment. We also query whether the facility is planning to invest in another treatment and the reasons behind that choice. Lastly, we inquire about any cases where their ISPM 15 mark has been used by other facilities without them knowing.

Section 4 outlines questions regarding the training received by the WPM treatment facility. In this section, we gather information about the type of training received and the organization offering the training, to understand if guidelines have been given to the treatment facility. Furthermore, we ask whether the treatment facilities receive updates on how to comply with ISPM 15 considering its various revisions. The section also seeks information on the time the facility spent purchasing new equipment or adapting old equipment for implementing the international standard. This part tries to assess whether the implementation process is time consuming, for instance in terms of permits required. The section then moves on to gather information on the audits the NPPO does of the facility; the frequency and the type of audit, whether they are done unexpected, and the result of the audits.

Section 5 gathers a series of financial data related to the costs the facility has to cover every year in order to run the treatment business. These are the fixed costs (e.g. investment costs, costs for equipment, license cost) and the variable costs (costs of labour, energy, maintenance, timber, and administration). We also query if the company received any Government subsidy.

Section 6 examines the sources of revenues of the facilities. In this section we gather data on the pieces of treated WPM sold, the unit price and the amount of the unit price for each WPM before ISPM 15 was implemented. The respondent is also asked to indicate the overall economic benefits and costs of ISPM 15 at the facility level.

Section 7 deals with perceptions and gathers data on the knowledge the interviewee has on the possible costs and benefits of the ISPM 15. Here, we try to differentiate between socio-economic impacts (both positive and negative), the main implementation challenges, and the main environmental consequences of the implementation.

### 5.2 Description of the respondents

Table 12 lists all the WPM treatment facilities currently operating in the four case-study countries and that have answered the questionnaire. The collection of the data was delegated to a team of enumerators working for the NPPO of the given country. The connection between the enumerators and the NPPO served to make sure that the enumerators were knowledgeable about ISPM 15 and to help ensure that the respondents (the WPM treatment facility employees) would trust the enumerators when providing any type of data, especially those pertaining to financial aspects. This strategy was successful in many cases, but failed in a few.

**Table 12: List of WPM treatment facilities for which microdata have been collected, divided by country**

| Progressive number | Name of the WPM treatment facility | District | City |
|---|---|---|---|
| | **Kenya** | | |
| **1** | Woodtex Kenya Ltd | Nairobi | Nairobi |

| | | | |
|---|---|---|---|
| **2** | Kayjay Ltd | Nairobi | Nairobi |
| **3** | Kenya wood Treatmet Ltd | Nairobi | Nairobi |
| **4** | Kakuzi Ltd | Murang'a South | Murang'a |
| **5** | Kenpack Ltd | Nakuru | Nakuru |
| **6** | Kensalt | Subukia | Nakuru |
| **7** | Wiresmore Industries Ltd | Moiben | Eldoret |
| **8** | Finlays | Kericho | Kericho |
| **9** | Jamji Tea Factory | Kericho West | Kericho |
| **10** | Sotik Tea | Sotik | Bomet |
| **11** | Polucon Services (K) Ltd | Mombasa | Mombasa |
| **12** | Merchant Inspection Services (K) Ltd | Mombasa | Mombasa |
| **13** | Merchant Technical Services Ltd (MTS) | Mombasa | Mombasa |
| **14** | Vectorcon pest control & supplies limited | Mombasa | Mombasa |
| **15** | SGS( K)lTD | Mombasa | Mombasa |
| **16** | Inpestkill Hygiene Services | Nairobi | Nairobi |
| **17** | Omega Sawmill | Nyandarua | Magumo |
| **18** | Britind Industries | Nairobi | Nairobi |

*Note: Some of the above-mentioned WPM treatment facilities are also WPM manufacturers.*

For what concerns the data collection process, the following should be noted.

It took the research team about three months to receive the lists of the WPM treatment facilities from the local NPPOs. For some European countries, such as Italy and the Netherlands, this list is published online, and only the WPM treatment facilities that have a valid license to operate are included (the list is updated regularly). Having an online list available to anyone is beneficial for several reasons, for instance exporters can check that the WPM treatment facility they buy treated WPM from has been authorized by the NPPO.

When designing the data collection process, we aimed at interviewing all the WPM treatment facilities operating in the country (and not a sample of them) to get a complete and exhaustive picture of that specific business.

It is also crucial to highlight a few things about the quality of the data collected by the enumerators. The overall rate of responsiveness was relatively good. The questionnaires were well compiled by the enumerators and well answered by the respondents. However, the section, aimed at gathering data on the financial disbursements of the facilities, presented some issues, as in some cases respondents were not willing to disclose their costs and their revenues. This in spite of making it very clear to all the interviewed facilities that data would have been used in an anonymous way.

Some of the questions in the survey presented missing values where the respondents did not give an answer. In those situations we have not imputed the missing value but continued the analysis without that particular data point. In several cases the information gathered via the survey tool has been triangulated with the qualitative information collected during the country missions or with other information or data coming from third sources. This check has been necessary to verify the correctness of some of the microdata, and in some cases, the data collected tell a different story than that told in the qualitative interviews. Most of the data collected is in line with data collected by third parties and

published in academic publications, which underpins the quality of the data and of the analysis presented here.

### 5.3 Descriptive statistics

Each NPPO, at its own discretion, sets a number of requirements each of the applicant facilities should present to obtain authorization as a legitimate WPM treatment facility. These requirements are not well communicated to the facilities. The respondents' answers within each country highlight that there is no consistency in the type of requirements requested from the facilities, even within the same country (Table 13). IN Kenya, the requirements listed by the respondents present an high degree of variability. On one side, all the respondents mention that a formal inspection by the authorizing agency (KEPHIS) is a *sine-qua-non* condition. On the other, the requirements verified during such an inspection seem to span from checking the application form, testing the equipment, checking that all the operational manuals are in order, to double checking the trade license.

Generally, the NPPOs should have clear requirements that apply to all applicants for WPM treatment authorization, and they should communicate these publicly. The NPPO could achieve this by preparing a document to be published in the country's official gazette or on its official website. This issue will be discussed more in details in the next concluding chapter.

**Table 13: Requirements for becoming a legit WPM treating facility**

| Requirement | Req. | Req. | Req. |
|---|---|---|---|
| 8 | Inspection | Trade license | Verification audit |
| 4 | Inspection | Application | Facility verification |
| 1 | Inspection | Trade license | Application |
| 1 | Inspection | Trade license | Auditing |
| 1 | Trade license | Heat treatment plant | Auditing |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

Generally speaking, the WPM treating facilities are relatively small, with the number of paid and permanent employees amounting varying to 34. The variability within country is rather high, as some facilities have more than 50 employees, while others have less than five.
The implementation of ISPM 15 has influenced the number of employees hired. Almost half of the facilities in Kenya experienced a similar increase; the average increase in the number of employees is of about 20 workers in Kenya. This shows, albeit at a very low level, that the implementation of the standard has caused an increase in the employment rate.

Most of the interviewed WPM treatment facilities were already in the WPM business before ISPM 15 was implemented and, as there was no requirements for treatments, they all were manufacturing WPM and selling it to export companies. With the implementation of the standard, some of them became, in addition to being WPM manufacturers, treatment facilities too. Those facilities that were not in business before the implementation of ISPM 15, opened their facilities because they believed it would be a profitable business.
In Kenya, 53 percent of the treatment facilities also manufacture WPM (Table 14), and in some cases they repair WPM (both treated and not treated).

**Table 14: Size and employees number of the WPM treating facilities and type of business**

| Average number of employees working in the WPM treating facility | Share of WPM treating facility which had an increase in the number of employees after ISPM 15 implementation (in %) | Average increase in the number of employees | Share of WPM treating facilities manufacturing WPM (in %) | Share of WPM treating facilities repairing WPM (in %) | Share of WPM treating facilities repairing treated WPM (in %) | Share of the WPM produced/ treated in the facility made of wood (in %) |
|---|---|---|---|---|---|---|
| 34 | 42 | 20 | 53 | 17 | 11 | 100 |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

Table 15 presents the amount of WPM treated monthly by the treatment facilities, and at the use and destination of the treated WPM. The amount of WPM being treated by each facility presents a very high degree of variability. In Kenya, on average about 1,000 WPM are being treated each month. However, it should be noted that these numbers may be inflated; Kenyan facilities believe that already treated WPM needs to be re-treated after a month, if not used. This contradicts ISPM 15 that instead provides that "[…] a unit of wood packaging material that has been treated and marked in accordance with this standard and that has not been repaired, remanufactured or otherwise altered does not require re-treatment or reapplication of the mark throughout the service life of the unit".
The treated WPM is in most cases used for exports, although some are used for internal purposes, where treatment is actually unnecessary.

When it comes to the treatment used, the facilities use either HT or MB treatments (Table 15). In Kenya, the facilities have chosen one or the other treatment or a combination of the two. In addition, a facility Kenya uses a method called chromated copper arsenate (CCA) which has not been authorized by the ISPM 15.

All facilities have chosen the treatment method based on the same reasons (whether HT or MR); lower costs, easier implementation, and effectiveness of treatment the WPM. The share of facilities considering using other treatments is very low, and the majority there are considering this are those currently using MB, wishing to apply instead HT. The treatment facilities are allowed to use the MB treatment for the time being but they will need to switch to HT soon because MB will be phased out for quarantine purposes too. One facility in Kenya is currently switching from MB to an aluminium phosphide treatment, which is not an approved ISPM 15 treatment.

**Table 15: Number of WPM treated, their use and type of treatment**

| Average number of WPM being treated per month | Internal or international customers | Use of the treated WPM | Treatment used | Reason for choosing that treatment | Share of facilities thinking of adopting a new treatment (in %) |
|---|---|---|---|---|---|
| 1011 | Internal<br>Ethiopia<br>South Africa<br>Tanzania<br>Uganda | Agricultural<br>Manufactured<br>Wood | HT (84%)<br>MB (21%)<br>CCA (5%) | 1. Less expensive<br>2. Easier to implement<br>3. More effective | 18 |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

One of the main activities the NPPOs have had to organize when the country decided to implement ISPM 15 was training of stakeholders. An initial training was offered by the NPPO to all the WPM

treatment facilities (Table 16). It is also crucial that the NPPO notify all stakeholders, and particularly the WPM treatment facilities, on matters related to compliance with the standard. In fact, according to the data collected, a very high share of the facilities operating in Kenya are aware of changes adopted to ISPM 15.

ISPM 15 clearly prescribes that the NPPO should audit all the facilities present in the country. The data indicate that the NPPOs inspect the facilities randomly, and that the inspections are carried out either by the NPPO or by the Ministry of Agriculture (Table 16). The frequency of the inspections is yearly or biannual. Two main observations arise from this. First, ISPM 15 does not clearly specify the frequency of inspections, leaving it up to the NPPO to decide. The NPPOs of the four case-study countries have decided for one or maximum two inspections per year, and this is in line with ISPM 15.
Second, the content of the inspections is unclear and varies between the inspections. The NPPO does not have guidelines or standard operating procedures for the inspections to guide the inspectors. This presumably leads to the result that different inspectors carry out the inspections different ways; some of them may assist at the WPM treatment, others may look at the records of MB used, yet others may simply have an informal chat with the facility managers. ISPM 15 also prescribes that "[…] for the purpose of auditing, the treatment provider keeps records of heat treatments and calibrations for a period of time specified by the NPPO", but the interviewed NPPOs did not show any indication that they comply with this.

**Table 16: Types of training received and inspections being made**

| Share of WPM treating facilities which have received training | Agency which organized the training | Share of WPM treating facilities which are receiving updates about the standard | Share of WPM treating facilities having random inspection (in %) | Organization in charge of organizing the random inspection | Number of random inspection per year |
|---|---|---|---|---|---|
| 100 | NPPO (100%) | 79 | 100 | Ministry of Agr. (100%) | 2 (100%) |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

The last section of the questionnaire refers to the consequences, at many different levels, the implementation of ISPM 15 may have had in the country. This section has the objective to understand the knowledge of the interviewees have of the standard and its spillover effects. The first question sought details on the effects on the small wood processing facilities (Table 17). All respondents agreed that the implementation of ISPM 15 has had and will have positive consequences for wood processing facilities, mainly in terms of business expansion. This matches the findings presented earlier one, namely that the implementation of standard has increased the employment rate.

The second part of Table 17 presents the positive and negative environmental effects caused by the implementation of the standard. The answers given by the respondents are all correctly related to ISPM 15. Few respondents focus on the negative aspects, and stress that the persistent use of MB will likely increase the pollution. Other respondents mention the fact that the ISPM 15 implementation is likely to

have caused a decrease in WPM recycling; broken WPM may now be less used as it may need to be re-treated. The re-treatment of broken WPM, which has been fixed and that consists of more than a third untreated WPM, may be considered as a cause for increased pollution. The answers related to "increase in deforestation" derive from the fact that some stakeholders believe that only newly treated WPM should be used, as it may otherwise have been reinfested. No positive environmental impacts have been mentioned by the respondents.

The last part of the table focuses on more general impacts of the implementation of the standard in the short and in the long run. Positive aspects relate to the increase in the employment rate; from a more macroeconomic perspective, the respondents mention the increase in the export market of the country and a reduction in the pest spread.

Some of the positive outcomes of ISPM 15 are interlinked with negative impacts. While the implementation of the standard provides trade access, it also increases the costs for businesses which may leads to a lower profitability.

**Table 17: Main social, environmental and overall impacts of the ISPM 15**

| |
|---|
| **Main social impacts** |
| Business expansion |
| Awareness |
| High cost for entering into the business |
| **Environmental impacts** |
| Increase in deforestation |
| Increase in pollution |
| Less recycling |
| **Positive (p) and negative (n) impacts of the ISPM 15** |
| Increase in employment (p) |
| Increase access to foreign markets (p) |
| Export growth (p) |
| Control of pest spread (p) |
| High initial investments (n) |
| Low profitability (n) |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

Table 18 lists the types of costs borne by WPM treatment facilities. The costs, which were originally measured in the local currency of the country, are expressed in USD in the table.[7] First, we query the

[7] The costs, as well as the revenues, refer to the year before the year when the interview has taken place. The interviews took place in 2016, hence the financial data refer to 2015.

amount spent for all the equipment and the number of years that equipment should be used for. The costs here are higher if the facility uses HT, just as the number of years the equipment will last for is higher than for MB treatments. The life expectancy of the equipment will serve to discount the amount spent for the equipment and allocate a share of those expenses to the next years.

Equipment and license costs constitute the fixed costs each facility has every year. In the case of Kenya, the cost of the license indicated by the respondents matches that provided by KEPHIS (see Chapter 4), which is a sign of the quality of the data. In both cases the estimated costs is KES 41,000, equal to approximately USD 416.

**Table 18: Average annual cost –in USD- for the WPM treating facilities, disaggregated by the source**

| Cost | Kenya |
|---|---|
| Equipment cost | 3006 |
| (Life expectancy of the equipment) | (13) |
| License | 421 |
| Costs for repairing equipment | 827 |
| Administrative cost | 1,648 |
| Timber costs | 1,442 |
| Salaries | 1,111 |
| External costs | 926 |
| Energy related costs | 1,718 |
| Other material cost | 1,058 |
| Other cost | 0 |
| **Total** | **12,170** |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

The process of estimating the costs related to the implementation of and compliance with ISPM 15 should consider the time needed to set up a WPM treatment facility This period relates to the time needed for the facility to purchase or update equipment, present all the necessary documentation, be inspected by the NPPO, and obtain authorization to operate. In the questionnaire, this was tackled through two questions; the first pertained to the time needed to purchase any equipment needed for treating the WPM, and whether the facility needed to update existing machines; the second related to the number of months needed to become fully operational.

There is substantial variation in terms of months needed among countries and among facilities located in the same country (Table 19). The average number of months needed for a facility to become operational amounts to less than 10; it takes between six and eight months to update the facility, and between one and 4 for the authorization to arrive.

The questionnaire also queried the revenues the WPM treatment facilities have realized in the current year. In order to compute this figure, we first queried the maximum capacity of the facility, (i.e. the maximum number of WPM the facility is able to treat per year). Here again, the answers vary among facilities with an average amount of 70,000.

The actual number of WPM the facilities treat every year is lower than the maximum number; in Kenya the facilities work at 17 percent of their capacity. The demand for treated WPM has slightly increased compared to the previous year, as the comparison between the number of WPM treated this year and last year shows.

Last part of Table 19 gathers all the different data previously analysed to assess whether the WPM treatment business is a profitable one. The first column presents the estimated annual cost each WPM treatment facility will bear to be operational. These costs are average, meaning that some of the facilities may face higher costs than those expressed. The second column indicates the number of WPM the facility treats every year. Based on the price each treated WPM is sold for, we can infer what would be the ideal amount of WPM to be treated and sold every year for the revenues to cover the total costs. This information is in the third column.

Results indicate that revenues are higher than costs meaning that the facilities operating in Kenya working in surplus, as they treat approximately 4,500 WPM more than what they need to operate without incurring in any loss.

**Table 19: Time needed for updating/purchasing equipment, total WPM capacity and total costs**

| Average number of months needed to update/buy machineries | Average number of months needed to become operational | Share of WPM treating facilities undergoing a verification process (in %) | Maximum number of WPM the facility can treat, per year | Number of WPM being treated in the current year | Number of WPM being treated in the previous year |
|---|---|---|---|---|---|
| 7 | 2.6 | 100 | 84,673 | 14,462 | 9,989 |
| Total cost | # of WPM treated | # of WPM treated for to break even | | | |
| 12,170 | 14,462 | 9,162 | | | |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

After having investigated whether the facilities operate in a loss or in a surplus, we will now examine whether it would be more profitable to close the facility and instead invest the money. To answer this, we need to know the current interest rates on savings in the four countries. Table 20 shows two different interest rates, one that is more conservative with lesser return, and the other less conservative with higher potential return on the investment. The interest rates relate to a deposit investment for a period of 24 months. The last two rows of the table show that in either case, whether a more conservative interest rate or a more speculative one is chosen, the revenues coming from the investments would be lower than the surplus coming from the facility.

**Table 20: Cost-benefit analysis for the WPM treatment facilities**

| | **Kenya** |
|---|---|
| Costs | 12,170 |
| Revenues | 14,903 |
| Surplus/deficit | + 5,460 |
| Interest rate (lower band) | 5.36 |
| Interest rate (higher band) | 11.92 |
| Revenues with no investments in WPM (lower band) | 424 |
| Revenues with no investments in WPM (higher band) | 944 |

*Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.*

*Data on Kenya comes from http://www.personal-finance-insights.com/savings-accounts.html . The interest rates taken into account are the one for 24 months deposit.*

**5.4 Conclusions**

Is implementing ISPM 15 sustainable for the WPM treatment facilities? Does it offer a good return on the investments disbursed by the facility? Is it necessary for the central government to subsidize the facilities? Would it be better to disinvest from the WPM treatment business and invest in a 24-months bank deposit?

This chapter has tried to answer these questions by using the microeconomic data gathered from the WPM treatment facilities located in the four case-study countries.

The objective of this chapter goes beyond the mere measurement of the costs and the revenues of the facilities. Instead it examines the implementation of the standard by looking at it from the perspective of the facilities. To do this, the facilities were studied with a magnifying glass to understand how they are organized, which have been their choices of treatments and why, and what is the demand of treated WPM. Furthermore, we wished to understand whether the information the facility gets from the NPPO is clear, if any training is provided and what the overall level of knowledge the facilities have of ISPM 15 is.

With this in mind, we designed a facility-level questionnaire with questions ranging from the documentation needed to be presented when requesting authorization from the NPPO to operate in the WPM business, the employment rate of those facilities, the treatments the facilities use, to the training organized to instruct the facility appropriate in how to comply with ISPM 15. In addition, we asked the respondents to elaborate on possible effects – environmental, social and economic – they feel ISPM 15 may have caused. Lastly, an entire section of the survey tool looked at the financial costs the facilities bear when operating, and at their annual revenues. We looked at all the costs related to the treatment process, both fixed and variable costs, and after assessing the costs related to the equipment, to obtaining authorization, and to salaries and energy, we compared them with the revenues from the sale of the treated WPM.

The analysis highlighted a number of interesting key points. First, there is no homogenous approach to what is requested from applicants wishing to obtain authorization as a WPM treatment facility. While ISPM 15 does not set requirements around this, there should be clarity within the country on the documentation requested from the applicant facilities to provide for transparency, equality and efficiency, and help ensure that the facilities meet all the requirements for operating the treatments set out in ISPM 15.

The authorization process is rather fast; overall the process from purchasing all the necessary equipment to receiving the license may take up to two months. The NPPOs should improve the process by providing clearer indications and ad-hoc training.

On the financial side, the content of this chapter, discussed in combination with the qualitative evidence and the macroeconomic analysis, will help understand the overall costs and benefits of implementing

the standard. There has recently been controversy over whether it is economically viable to implement and comply with the standard. Those in disagreement with the standard presents the argument that most introduced pests are innocuous whereas ISPM 15 implementation is costly and usually only delays pest introductions, rather than eliminating them.

This chapter demonstrates that the WPM treatment facilities operating in Kenya are self-sustainable and that the costs are off-set by the revenues from the sale of treated WPM.

We also presented the hypothetical scenario in which the average investment spent on a facility would be put in the bank for two years. This hypothesis demonstrated that investing in the facilities is more profitable than investing in a bank. The exercise shows the viability of the WPM treatment business in the four countries, and that the costs related to implementing the standard at the export level are off-set by the revenues. In the next and concluding chapter, we will incorporate the results from all the different analyses to offer a more complete view on the sustainability of the international standard, considering here also other benefits, such as the possibility to export to countries implementing the standard, which have not been considered in this chapter.