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Strengthening Measurement Systems in Zambia's Agriculture through Standardized Trade Instruments and Quality Assurance

ZMA's legal metrology program supports the agricultural industry toward employment creation and food security for national-level poverty reduction

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The Challenge

Agriculture plays a critical role in ensuring Zambia's food security. Thus, to accurately quantify the national annual food consumption requirements, metrology plays a critical role. It is important that whatever goes into the various streams of agricultural food production is accurately measured, because *"if you can't measure it, you can't manage it."* Accurate measurements must be undertaken at every stage of production, from raw materials (e.g., seed, fertilizers, pesticides, water) to agricultural end products intended for direct consumption by the population or for export.

In Zambia, the agriculture sector employs nearly 50 % of the workforce and accounts for around 7 % of the national GDP. This sector is seen as the key supporter of most households nationwide. However, the cost of farming remains high, and the largest share of this cost is due to the continuously rising prices of inputs such as fertilizers, seeds, and pesticides. Driven by these high costs, some suppliers of farming inputs have been found to engage in fraudulent practices, including tampering with net quantity measurements. This, in turn, led to low farm yield and poor product quality. Furthermore, during the farm produce marketing season, most buyers were engaging in fraudulent activities, using inaccurate measuring instruments to swindle farmers.

Over the past few years, the use of uncertified, unverified, or incorrect measuring instruments across the agricultural sector has threatened national food security and economic stability at the household and national levels. The use of uncertified measuring instruments can lead to financial losses during transactions, poor accountability, poor data capture, and unsustainable business practices. Critical to this is that both consumers and businesses operating in commercial transactions cannot accurately quantify what is happening in the production process and, consequently, cannot realize the desired financial benefit from traded products.

Measurements are critical to the agriculture sector, as they enable players to accurately quantify raw materials and produce. This then enables players in the sector to effectively determine the costs involved and correctly price the produce to earn a profit. When measurements are not taken accurately in the initial stages, the application of farming inputs (e.g., fertilizer) may be disproportionate, and as a result, yield is likely to be significantly affected. Inaccurate chemical application to crops further affects the quality of farm produce.

Further, the accurate quantification of raw materials in the production process was also doubtful. Furthermore, the absence of reliable and traceable measurement systems compromised the accuracy of data capture and the quantification of raw materials throughout

the production process. This created a risk of inaccurate measurements and unreliable production data, which could adversely affect decision-making, resource allocation and ultimately efforts to safeguard food security. Zambia also exports much of its agricultural produce to neighboring countries, such as the Democratic Republic of the Congo (DRC). Failure to accurately quantify national food stocks risks disrupting cross-border trade. A disruption in trade with neighboring countries can weaken national export revenue and lead to currency instability.

The Solution

In 2018, the Zambia Metrology Agency (ZMA) embarked on a comprehensive legislative realignment of Zambia's legal metrology framework to address key measurement-related challenges, particularly those affecting the agricultural sector. This process culminated in the enactment of two principal regulations in 2021:

1. Statutory Instrument No. 55 of 2021—the Metrology (Measuring Instruments) Regulations, 2021¹
2. Statutory Instrument No. 56 of 2021—the Metrology (Pre-packaged Commodities) Regulations, 2021²

Statutory Instrument No. 55 of 2021 provides for the metrological control of measuring instruments used in production, trade, law enforcement, health, safety and environmental management. Unlike the previous regulations, which focused primarily on measurements used in trade, the new framework empowers ZMA to regulate measuring instruments throughout the production and supply chain. This broader scope promotes measurement accuracy, consumer protection, public safety and sound environmental management from the point of production.

Statutory Instrument No. 56 of 2021 provides for the metrological control of pre-packaged commodities. It establishes enforceable requirements for product labeling, declarations of net quantity, packaging, and verification of the actual quantity of products contained in prepackages. These requirements provide a clear basis for monitoring compliance and protecting consumers against misleading labeling and short measure.

The regulations are aligned with internationally recognised recommendations issued by the International Organization of Legal Metrology (OIML), particularly:

- OIML R 79:2015—Labeling Requirements for Prepackages,³ which specifies requirements for the information presented on prepackage labels, including the declaration of product identity, nominal quantity and responsible business entity; and

¹ <https://zambialii.org/akn/zm/act/si/2021/55/eng@2021-05-14>

² <https://zambialii.org/akn/zm/act/si/2021/56/eng@2021-05-14>

³ https://www.oiml.org/en/publications/recommendations/en/files/pdf_r/r079-e15.pdf

- OIML R 87:2016—Quantity of Product in Prepackages,⁴ which establishes metrological requirements and conformity assessment procedures for determining whether prepackages contain the declared quantity of product.

Through this legislative framework, Zambia has strengthened the regulation of measuring instruments and pre-packaged commodities, thereby improving measurement accuracy, fair trade, consumer protection and confidence in the agricultural value chain.

Since 2018, ZMA has conducted routine inspections of grain and cereal manufacturing facilities. **Figure 1** depicts a routine legal metrology inspection activity at a client's cereal grain manufacturing facility. The activities cover the verification of net quantity compliance, the assessment of the calibration and verification status of measuring equipment, the confirmation of type approval and certification requirements, and the evaluation of labeling and packaging to ensure compliance with applicable legal metrology requirements.

It is also important to note that the formulation of these statutory instruments recognized the need to align the national metrology legal framework with that of the region (SADC MEL) and the broader international community (OIML). Further, in addressing issues related to the use of unapproved measuring instruments, the Agency took advantage of its national status as an OIML Member State and subscribed to the OIML Certification Scheme (OIML-CS) as a Utilizer. This scheme has provided industry stakeholders with easy access to type-approved measuring instruments and has enabled them to use suitably approved instruments for a given field of application (see **Figure 2**).

A Quantifiable Impact

For over 30 years, the Zambia Metrology Agency (ZMA) has been at the center of ensuring that measurements in the agriculture sector are monitored and controlled. This has been achieved by examining the accuracy of measuring instruments used in the production of various farming inputs at the factory level, through compliance inspection of net content of pre-packaged commodities (seed, fertilizers, and pesticides), and further extending compliance management of measuring instruments such as weighing scales, weighbridges, and volumetric measuring vessels used during the marketing season. With these interventions, the Agency has seen excellent compliance among players in the agriculture sector and reports a compliance rate above 95 % for fertilizers and seeds in its 2025 annual report. This achievement stems from a long history of engagement and education activities with key stakeholders on the importance of adhering to metrology standards to build a better, more sustainable agricultural sector.

⁴ https://www.oiml.org/en/files/pdf_r/r087-e16.pdf



Figure 1. A ZMA inspector conducting routine legal metrology inspection activities at a client's cereal grain manufacturing facility.



Figure 2. An example of a ZMA “Certified for Use” verification sticker on an automatic packer that dispenses a predetermined quantity of product into packages.

With the appropriate legal metrology framework in place, the Agency has begun to effectively manage measurement applications across the agricultural sector. For instance, the Agency has consistently certified measuring instruments for the Food Reserve Agency annually, prior to the grain marketing season. Further, the Agency runs a certification scheme for private grain buyers across the country, conducted during the grain marketing season by following traders in villages nationwide. The Agency also manages weighing instruments for large-scale farmers (e.g., weighbridges, hoppers, and platform scales).

Prior to the 2016 metrology intervention, the Agency had no formal mechanism to verify compliance due to the lack of a fully operational inspection unit. Based on inspection experience and sector conditions at the time, compliance is estimated to have ranged between 50 % and 65 %, depending on the product category and the level of control exercised by individual producers. This relatively low compliance was attributable to limited awareness among producers and packers of legal metrology requirements, weak internal quality control systems within packaging operations, inconsistent inspection coverage and enforcement, and limited use of verified, properly calibrated measuring instruments.

In 2025, a decade of annual reports (2016 to 2025) on inspection reports and non-compliance management status from the ZMA were examined to ensure the correct interventions were undertaken. The Agency also held stakeholder engagement meetings, during which more data on sector challenges were captured. With these interventions, the Agency has observed a significant increase in compliance rates for pre-packaged farming inputs, ranging from 95 % to 97 % across all product types. Further, the control interventions on measuring instruments have also increased the number of certified instruments from 34 976 in 2021 to 76 961 in 2025.

Sound metrology policies play a catalytic role in job creation by enabling agro-industrial growth, improving product compliance, and facilitating access to regional export markets. By improving measurement accuracy and enforcing net content requirements, the ZMA has increased confidence in Zambian agricultural products, thereby supporting investment and expansion in agroindustry processing. Although job creation figures directly attributable to metrology interventions are not systematically tracked, sector evidence illustrates the scale of impact. For instance, Zambeef Products—one of Zambia’s largest integrated agroindustry processing companies—employs over 5 000 people directly and supports extensive upstream and downstream value chains. At the facility level, a typical grain, seed, or fertilizer processing plant can generate 100–300 direct jobs and 500–2 000 indirect jobs, particularly throughout grower schemes and supply networks.

With agriculture accounting for a substantial share of national employment, the observed improvement in compliance rates (which are now above 95 %) has likely contributed to job creation and retention at scale, especially in export-oriented value chains supplying regional markets such as the Democratic Republic of Congo (DRC). The metrology intervention also opened broader export opportunities, primarily by improving confidence in the accuracy of

net content declarations, reducing the risk of disputes, and strengthening the credibility of Zambian food products exported to neighboring markets such as the DRC. These outcomes underscore the broader socio-economic impact of metrology as a trade facilitation tool.

In Zambia, effective agricultural policies and strong institutions play a critical role in driving food security, economic growth, and rural development by increasing productivity, improving farmer incomes, and promoting access to inputs, mechanization, irrigation, financing, markets, and extension services. Institutions such as the Ministry of Agriculture, the Food Reserve Agency, and the Zambia National Farmers Union support production and market systems, while the Zambia Development Agency and the Development Bank of Zambia help attract investment and financing into agribusiness. Sound policies also encourage agro-industrial processing, export growth, job creation, and industrialization through institutions such as the Zambia Bureau of Standards and regional bodies such as COMESA and SADC. Furthermore, climate-smart agriculture and sustainability are strengthened through bodies such as the Zambia Environmental Management Agency, while governance institutions ensure transparency, accountability, and efficient implementation of agricultural programs. Collectively, strong policy and institutional relevance position agriculture as a strategic engine for poverty reduction, resilience, employment creation, and long-term national transformation.

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