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Electronic version

URL: <http://journals.openedition.org/histoiremesure/5780>

DOI: 10.4000/histoiremesure.5780

ISSN: 1957-7745

Publisher

Éditions de l'EHESS

Printed version

Date of publication: 30 June 2017

Number of pages: 121-140

ISBN: 978-2-7132-2701-1

ISSN: 0982-1783

Electronic reference

Héctor Vera, « Counting Measures », *Histoire & mesure* [Online], XXXII-1 | 2017, Online since 30 June 2019, connection on 04 January 2020. URL : <http://journals.openedition.org/histoiremesure/5780> ; DOI : 10.4000/histoiremesure.5780

Counting Measures The Decimal Metric System, Metrological Census, and State Formation in Revolutionary Mexico, 1895–1940

Héctor VERA *

Abstract. This article analyses the Mexican state's policies to homogenize the employment of the decimal metric system in the country. It advances a theoretical outlook that explains why enforcing metrological uniformity throughout a national territory gives modern states leverage to fulfil some of their essential functions. The paper then describes the initial attempts to introduce the metric system in the country prior to its formal launch in 1895. After the Mexican Revolution of 1910, government officials arranged for a national census of weights and measures to be conducted, the aim of which was to find out how many pre-metric units of measurement were still in use in the country. Carried out in the 1930s, the census showed that despite decades of pro-metric policy, in nearly half of the country people were still using customary units of measurement. These results served to launch a campaign to eradicate the use of traditional measures. This included a forceful policing of commercial activities and the articulation of a political discourse that linked metrication to the idea of national unification. . On the other hand, the census provided crucial information to understand how regular people, with no formal education or technical training, learned to use the novel and sophisticated metric system.

Keywords. weights and measures, Mexico, census, state formation, national unification

Résumé. La mesure des mesures. Le système métrique décimal, le recensement métrologique et la formation de l'État dans le Mexique révolutionnaire, 1895-1940. Cet article analyse les politiques de l'État mexicain pour imposer l'utilisation du système métrique décimal. Il propose une perspective théorique selon laquelle l'uniformisation métrologique sur le territoire national donne aux États modernes un levier pour remplir certaines fonctions. Sont analysées les premières tentatives d'introduction du système métrique dans le pays avant le lancement officiel en 1895 ainsi que l'organisation d'un recensement national des poids et des mesures après la Révolution de 1910 pour évaluer les unités de mesure pré-métriques toujours en usage dans le pays. Ce recensement effectué dans les années 1930 montre que, dans près de la moitié du pays, nombreux sont ceux qui utilisent encore les unités de mesure traditionnelles. Une campagne est alors lancée en vue d'éradiquer cet usage, par une surveillance étroite des activités commerciales et par l'articulation d'un discours politique liant la conversion au système métrique à l'idée d'unification nationale.

Mots-clés. poids et mesures, Mexique, recensement, formation de l'État, unification nationale

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This paper analyzes a crucial phase in the introduction of the decimal metric system of weights and measures in Mexico. As part of an effort by the reconstituted nation state (an offspring of the Mexican Revolution of 1910) to homogenize the whole territory and population by employing a single system of measurement, state officials arranged for a national census of weights and measures to be conducted. The aim of the census was to find out how many colonial (and in some cases even pre-Columbian) units of measurement were still in use in the country. The census was successfully carried out in 1930. It showed that despite decades of pro-metric policy (the introduction of the metric system had started in 1857 and became mandatory in 1895), almost half of the municipalities in the country were still using customary units and instruments of measurement.

The data produced by the census served to launch a nationwide campaign to eradicate the use of traditional measures (especially in rural areas and indigenous communities). The campaign was twofold: on the one hand, it involved more forceful policing of commercial activities to guarantee that all transactions were conducted exclusively with metric units; on the other hand, the campaign articulated a discourse that linked the practice of using a single system of measurement throughout the territory with the idea of a unified and progressive Mexican nation. Additionally, the census of units of measurement represented an opportunity to understand how common people—at the time the majority of the population received only a few years of formal education, if any—were learning and using the metric system by adapting it to their vernacular methods of measurement and quantification.

A general objective of this article is to show the importance of the implementation of a homogenous system of measurement in the establishment and functioning of modern nation states.

1. Census, Metrological Standardization, and State Functioning

Nation states aim to unify weights and measures for both political and economic reasons. On the one hand, enforcing metrological uniformity throughout a territory gives the state leverage to fulfill some of its essential functions: to undermine the influence of local authorities; enhance the extraction of revenue; make the population and economic resources “legible”; monopolize symbolic capital; and reduce commercial frauds (thereby heightening the administration of justice).¹ It also helps the process of “nation-making” by introducing leveling, homogenizing institutions that aid the creation of a

1. On the functioning of the state and its need for measurement and quantification, see O. DUNCAN, 1984, p. 12–38; P. STARR, 1987; P. CARROLL, 2006, p. 81–112. On state formation

common national “spirit” or experience, and promoting the image of national unity among an imagined homogenous population and culture.² On the other hand, securing the usage of a single system of measurement (especially if it is a widely used system, like the metric system) helps states to consolidate an internal market, share standards of commerce with foreign countries, rationalize economic processes, and reduce costs of transaction and asymmetric information.³

To achieve this, modern states seek to establish a monopoly on the legitimate means of measurement. The authority to define units of measurement, store physical standards of measurement, prescribe proper methods of measurement, implement a traceability chain, determine how objects should be measured, appoint inspectors, and carry out punishments for metrological offences—which used to be in the hands of various and uncoordinated authorities (cities, corporations, guilds, town markets, and such)—was expropriated by modern state authorities during the nineteenth and twentieth centuries. In the same way that states dispossess their domestic competitors with regard to the instruments of physical violence and the right to use them, so they warrant their monopoly on the legitimate means of measurement by dispossessing social groups of their measuring rights and authority.⁴ This monopoly can thus be seen as part of the administrative expansion of the state and its control over increasing numbers of areas of social life.⁵ But making this monopoly effective presupposes considerable work, a large infrastructure, and legions of “quantitative laborers.”⁶

States are, in the words of Georges Gurvitch, social frameworks of knowledge. The cognitive systems of the state accord primordial importance to what Gurvitch called perceptual knowledge of the external world.⁷ Modern states perceive the world from the point of view of assuring that it functions smoothly and identifying economic resources in the territory in which they operate. For this purpose, states resort to the quantification of time and space and establish standards of measurement, all of which result in spatio-temporal references. States emphasize rational and technical types of knowledge to

and weights and measures specifically, see W. KULA, 1986, p. 18–23; D. GUEDJ, 2000; K. ALDER, 2002, p. 125–159; H. VERA, 2014b, p. 59–61; *id.*, 2016, p. 460–462.

2. At this point, metrological standardization at the national level is a similar process to the unification of language, the calendar, and the telling of the time, see D. GUEDJ, 2000, ch. 12; V. OGLE, 2013, p. 1381–1383. On measurement activities (like the national census) and nation-making, see M. LOVEMAN, 2014, p. 28–30.

3. On the crucial role of metrological unification and economic institutions, see W. KULA, 1986, p. 102–110; K. ALDER, 1994, p. 54–59; H. VERA, 2014a, p. 232–239; M. GEYER, 2001, p. 61; A. VELKAR, 2012, p. 16–27.

4. H. VERA, 2014b, p. 56, 63.

5. On the state’s administrative expansion, see M. LOVEMAN, 2005, p. 1660–1664.

6. W. ESPELAND & M. STEVENS, 2008, p. 410–412.

7. G. GURVITCH, 1971, p. 73–78.

manipulate productive forces and control populations. To this we can add the creation and implementation of reliable and uniform systems of weights and measures, which is one of the key cognitive strategies employed by the administrative apparatus to delineate the world.

Exploring an idea similar to that of Gurvitch, sociologist Pierre Bourdieu emphasized how states monopolize the legitimate use of physical and symbolic violence; the state exerts symbolic violence in the form of mental structures and categories of perception and thought. The state is the culmination of the concentration of various forms of capital: capital of the physical instruments of coercion, economic capital, symbolic capital, and—of particular importance for our purpose—*informational capital*.⁸ The state, according to Bourdieu, “concentrates, treats, and redistributes information and, most of all, effects a *theoretical unification*. Taking the vantage point of the Whole, of society in its totality, the state claims responsibility for all operations of *totalization*... and of *objectification*, through cartography (the unitary representation of space from above) or more simply through writing as an instrument of accumulation of knowledge, as well as for all operations of codification as cognitive unification implying centralization and monopolization in the hands of clerks and men of letters.”⁹

Bourdieu goes on to say that the state shapes mental structures and imposes shared forms of thinking, cognitive structures, categories of perception, and principles of vision and division that social agents apply to all things of the world.¹⁰ The state therefore has the ability to inculcate within a given territory a *nomos*, and becomes the foundation of a “logic conformism,” a tacit agreement over the meaning of the world. This is achieved especially through schooling and the generalization of elementary education.

It is debatable how much the Bourdieusian account of the cognitive penetration of the state is on target for every single empirical case—it is easy to see how his description would fit better in France than in England, for example. But Bourdieu’s framework can help to place the state’s efforts to establish a homogenous system of measurement in a broader context. Systems of measurement are, in the end, languages that shape the perceptual and cognitive structures of people; securing the existence of a sole system of measures also secures a way of perceiving and classifying the world.

On the other hand, it is no coincidence that in many cases state efforts to homogenize weights and measures coincide with the rise of censuses and maps—as famously described by Benedict Anderson.¹¹ For Anderson, these instruments serve as a means for states to think of their domains in a

8. P. BOURDIEU, 1994; *id.*, 2011.

9. *Id.*, 1999, p. 61.

10. *Id.*, 1994; *id.*, 2011.

11. B. ANDERSON, 1991, p. 163–185.

“totalizing classificatory grid” that can be applied to peoples, regions, religions, languages, and products under their control. For the colonial state, this was manifest in an ambition for “total surveyability,” as the colonial state “did not merely aspire to create, under its control, a human landscape of perfect visibility; the condition of this ‘visibility’ was that everyone, everything, had (as it were) a serial number. This style of imagining did not come out of thin air. It was the product of the technologies of navigation, astronomy, horology, *surveying*, photography and print.”¹²

Following a similar line of thought, James Scott has shown how metrological standardization of weights and measures is a “tool of legibility” for modern states.¹³ The fragmented nature of customary weights and measures, Scott underlines, creates administrative incoherencies that work to the advantage of local power-holders; centralized states strive to introduce uniform measures that make territories, resources, and the population more easily intelligible for administrators. These opposing interests promote a clash between “local knowledge and practices on the one hand and state administrative routines on the other.”¹⁴ Since traditional measures are local, contextual, and historically specific (as they are the product of indigenous understandings of labor and environment), centralized states cannot create coherent representations of their whole territories based on such standards. Local measures “would not lend themselves to aggregation into a single statistical series that would allow state officials to make meaningful comparisons.”¹⁵

The illegibility of local practices of measurement, Scott continues, not only creates administrative mayhem and gross inefficiencies but also compromises crucial elements of state security. For example, *food supply* could be in jeopardy without comparable units of measure as a result of the complications in monitoring markets and contrasting regional prices for basic commodities; unstandardized measures also thwart *taxation* because the state cannot obtain equivalent information about harvests and prices: “No effective central monitoring or controlled comparisons were possible without standard, fixed units of measurement.”¹⁶ For these reasons, the metric system—as the most widely recognized standardized, fixed system of measurement available—very quickly became the perfect intellectual instrument for governments to crack down on local metrological dialects and launch an intelligible, homogenous, and universal language able to render territories, populations, and resources legible.

12. B. ANDERSON, 1991, p. 184–185 (my emphasis).

13. J. SCOTT, 1998, p. 24–33.

14. *Ibid.*, p. 24. The problem in metrological matters of “separating knowledge from its local context” is shared by the political, economic, and scientific spheres, T. PORTER, 1995, p. 22.

15. J. SCOTT, 1998, p. 27.

16. *Ibid.*, p. 30.

In summary, the state monopoly of the means of measurement, from a cognitive point of view, involves two distinctive facets: first, the gathering and management of information; second, the imposition of a “logic conformism” in society at large. To this we need to add a third facet: the production and distribution of knowledge. The implementation of the metric system—or any other exclusive system of measurement—in a country is a work of distribution of knowledge (as present and future users of the new system need to learn it); it also requires the production of knowledge (i.e., state-sponsored knowledge): manuals (both for bureaucrats and for lay persons), reports, translations of metric and customary units, catalogs of local measures, tables of conversion, and so forth. Weights and measures are intellectual tools, but to control them they have to be studied themselves: metrology is, above all, a science of the state.

2. Introducing the Decimal Metric System in Mexico

The decree that introduced the decimal metric system in Mexico¹⁷ was promulgated on March 15, 1857, announcing that “The French decimal metric system will be adopted in the republic, without other modifications than those demanded by the nation’s particular circumstances.”¹⁸ The decree required that the new metric measures should be employed in all official acts and government affairs; the meter, liter, and kilogram thus became the official units of measurement.¹⁹ Those failing to comply with the new legislation would be “considered guilty of using false measures,” and those found in possession of non-metric standards and measuring instruments would be penalized. Likewise, all shops were to display the conversion tables between customary and metric measures distributed by the Ministry of Development.²⁰

The new law also requested the creation of a national Direction of Weights and Measures that would disseminate information about the new system among the population, specify rules about how to properly employ

17. For an overview of the history of systems of measurement in Mexico prior to the adoption of the metric system, see H. VERA & V. GARCÍA ACOSTA, 2011; J.-C. HOCQUET, 1997, p. 1024–1025.

18. *Decreto de pesas y medidas*, 1857, p. 1. The decree also established that the Mexican *peseta* was the new monetary unit, and that both measures and coinage would follow decimal progressions and subdivisions.

19. Before the metric system was adopted in Mexico, the existing official system of measurement was a local version of the Spanish weights and measures that were introduced in colonial times, plus various pre-Columbian units and methods of measurement that were widely employed in numerous parts of the country; H. VERA, 2007, p. 43–77. On the imposition of European measures in sixteenth-century Mexico, see S. GRUZINSKI, 2005.

20. For a detailed description of the introduction of the metric system in Mexico, see H. VERA, 2007, p. 79–119.

the new metric measures, provide assistance for the employment of the new measures in industry, and organize verification offices where the new instruments of measurement would be contrasted and verified.

The decree was the blueprint for an ambitious policy to transform the administration of weights and measures and the measuring practices of the common people, and its realization proved beyond the reach of the Mexican state at the time. The legislation, however, laid down the legal basis to reorganize the metrological administration of the country. For the first time, the whole metrological system came under a sole authority, hierarchized in a clear chain of authority with the federal government at the top (which meant that local governments and corporations would lose their control over metrological matters).

To fulfill its plan, the Mexican state needed to address some considerable challenges, like training inspectors and setting up local offices of weights and measures, teaching the population how to use the new metric system (the names, magnitudes, and decimal arithmetic of the metric units were unknown to lay people), persuading the population that the new system was more useful than the old measures (i.e., a campaign of propaganda was needed), and importing or building all the measuring and weighing metric instruments needed by commerce and government agencies (the new law would make thousands of measuring tools obsolete and illegal, and new tools had to be provided).

All this was complicated and expensive, and the government did not have the resources to carry out the plan. There were no factories in the country to produce metric instruments; neither were there enough experts and inspectors to calibrate the existing tools and verify that merchants would not take advantage of buyers during the period of transition.²¹ Furthermore, the government and its experts sometimes did a poor job at preparing the materials designed to help people learn the new system. The conversion tables comparing metric and customary units had to be made and remade on several occasions due to miscalculations, and once the tables and charts were finalized the government did not print enough of them.²²

The hopes of the newly established liberal government to metricate the country immediately met with problems. Due to a civil war between liberals and conservatives, the metric legislation had to be suspended.²³ This

21. One of the few actions in favor of metrication that the federal government was able to put forward was a decree of 1861 that ordered the mandatory teaching of the metric system in all elementary schools. This became a very consistent policy that brought positive results. *Memoria que el Secretario de Justicia e Instrucción Pública*, 1902.

22. F. JIMÉNEZ *et al.*, 1863.

23. *Decreto que suspende los efectos de la ley que estableció el sistema métrico-decimal francés*, 1877 [1858], p. 656.

suspension of the metric decree set the tone for what was to come over the next 40 years, when every new piece of legislation mandating the metric system was followed by a new provision postponing it.²⁴

It was not until the presidency of Porfirio Díaz that the metric system was actually introduced. A new law passed in 1895 was the first legislation on the metric system that was put into practice. The federal administration during the Díaz presidency was more effective in enforcing the law and had better finances to support its public projects. At the same time, the international presence of the metric system had increased considerably. By then almost all of continental Europe and Latin America had adopted it. The Díaz regime was interested in connecting Mexico with the “most advanced countries of the world,” and the introduction of the metric system was seen as a way to enhance commercial and intellectual exchanges with those nations. In 1890 Mexico signed the Treaty of the Meter and purchased meter and kilogram standards from the International Bureau of Weights and Measures (BIPM). With that acquisition, Mexico became one of the few countries that possessed such high-end metrological tools.²⁵

The state machinery started working to instill the meter, liter, and kilogram into the economic and social life of the nation. A titanic effort was made to distribute copies of the new metric legislation along with instructional handbooks among the population. The government ordered the importation, manufacturing, and commercialization of hundreds of thousands of weights, scales, balances, measuring rods, and other metric equipment so that merchants throughout the country could buy the new instruments. Every municipality got at least a verification office and trained agents and inspectors to make verifications, and the latter soon began their work by overseeing the daily trades of merchants, fining those who continued to employ non-metric measures.

In his 1904 address to Congress, Porfirio Díaz claimed that “the decimal metric system has taken definitive root in the country, and the final obstacles for its generalization have been sorted out.”²⁶ This announcement was premature and overoptimistic, but the progress made in the previous eight years certainly gave the president reasons to feel good about what had been achieved, despite all the trouble encountered. In spite of some raucous opposition to the metric system in some provinces,²⁷ metrication was on its way.

24. H. VERA, 2007, p. 91–92.

25. *Ibid.*, p. 97–104.

26. *Informe del ciudadano general Porfirio Díaz*, 1904, p. 118–119.

27. On the movements of opposition to the metric system, see H. VERA, 2011, p. 187–193.

3. The Metric System and the Revolutionary Regime

During the years shortly after the 1910 revolution, the federal government did not make much effort to complete the introduction of the metric system. The revolution brought a new constitution, which—like its predecessors in 1824 and 1857—gave Congress the authority to “establish mints, fix the standards of coins and coinage, to determine the value of foreign currencies, and to adopt a general system of weights and measures.”²⁸ But only during the presidency of Plutarco Elias Calles were those efforts renewed, in the wake of new weights and measures legislation passed on June 14, 1928.

A preamble to this was given in 1922 when Mexico joined the international time zone system. Although Mexico had taken part in the International Meridian Conference of 1884, held in Washington, DC, the country did not put into effect Greenwich time as its point of reference. Instead, the official time was in accord with the “Tacubaya Meridian” (also known as “railroad time”), as indicated by the National Observatory. It was this time that was used in the telegraph and railroad systems. This interest on the part of the Mexican government to synchronize with international conventions was then extended to weights and measures.

The 1928 law brought some changes designed to move forward the use of the metric system in commerce. In particular, it applied more pressure to control goods coming into the country, forcing importers to display the information on the product labels using metric units, instead of the units from the countries where those commodities were made. Obviously, this requirement affected United States exporters especially, because most of the other countries that did business with Mexico had already switched to metric.²⁹ In the past, customs let foreign goods enter the country even if the quantities were marked in pounds, pints, or other units from the English system; now it was expected that all imported goods would come with dual labeling, i.e., metric and English units.

Later on, state officials decided to enact another provision of the law, which specified that packages should indicate the exact amount of units they contained. For example, boxes should say “12 eggs” or “144 bottles” instead of saying “a dozen eggs” or “a gross of bottles.” In other words, the law was banning the use of concepts for grouping units—the only exception was the term “pair,” which could be used when applied to certain goods such as gloves or socks.³⁰ The aim of this regulation was to inhibit the use of the number 12 in calculations and metal grouping, because the duodecimal system hindered

28. *Constitución política de los Estados Unidos Mexicanos*, article 73, fraction XVIII.

29. *El Informador*, July 22, 1929, p. 3.

30. *The New York Times*, November 9, 1937, p. 16.

the development of decimal quantification. This was, in other words, an attack on the arithmetic habits of the people.³¹

A third area where the new regulations were actually implemented was advertising. The law banned storekeepers from having any kind of posters, signs, or propaganda displaying non-metric units. Offenders were now fined more systematically than before. These legal dispositions helped to wear down some of the obstacles that had halted metrication in the country, but much work was still needed.

4. Counting Measures: A National Census of Units of Measurement

Thanks to the Mexican government's renewed interest in completing the metrological unification of the territory, in the late 1920s and early 1930s it carried out the most ambitious research ever conducted in Mexico regarding weights and measures. As part of 1930 census of agriculture, farmers and peasants were asked about the extension of their plots, their harvesting areas, and the yield obtained; when they could not answer these questions using the metric system—which happened rather frequently—they were allowed to indicate those quantities with the customary units of their own region.³² In those cases, the personnel of the Census Bureau made the computations to define the equivalences between customary and metric units.³³ The results of this titanic work were published by the Ministry of Economy in 1933 in a volume titled *Medidas regionales* (Regional measures).³⁴

The census of regional units of measurement held an additional interest for Mexican statisticians. In 1933, when the first version of the census was published, the Twenty-First Meeting of the International Statistical Institute was held in Mexico. It was the first session of the Institute in Latin America, and it coincided with the commemoration of the first centenary of the prestigious Mexican Society of Geography and Statistics (which was founded in 1833, and was a crucial institution for the development of expertise for the Mexican state in areas such as cartography, economics, statistics, demography, metrology, and surveying). At the beginning of the first volume of *Medidas regionales*, there is a sole page with a note reading “This publication is dedicated to the honorable

31. On the crucial interconnection between measurement practices and arithmetic knowledge, see Y. MAREC, 1980; J.-C. HOCQUET, 2007, p. 17–20; *id.*, 1995, p. 101–105.

32. In a preliminary agricultural census made in 1929, the diversity of weights and measures and the attempt to use metric terms caused confusion among the interviewees, so census officials decided to accept agricultural production figures in local units of measurement. See M. ERVIN, 2007, p. 560.

33. On the Mexican state and the 1930 census, see M. ERVIN, 2009, p. 157–159.

34. Dirección General de Estadística, 1933.

members of the 21st International Statistical Congress.”³⁵ The massive amount of work needed to collect detailed information about local measures prior to the introduction of the metric system has been a daunting enterprise for all countries that have intended to do it.³⁶ The census acted as a symbol of Mexico’s statistical prowess, as a product worthy of recognition by the census makers of other countries.³⁷ The metrological work conducted by Mexican authorities in the twentieth century was vastly superior to the endeavors carried out in the era before Porfirio Díaz (when, for example, the tables of equivalences were highly defective). The Díaz administration was very active in the production of statistical knowledge on Mexico’s population and territory,³⁸ and the revolutionary governments continued that momentum. The 1930 national census was already the fifth national census completed since 1895.³⁹

A couple of years after *Medidas regionales* was printed, government agents returned to the field to verify and fine-tune the information obtained in the census. The result was a second compilation of data that was made public in a second version of *Medidas regionales*, published in 1937, which contained three times as much information as the first edition.⁴⁰ For the first time, this metrological census helped to discern in great detail the real status of metrication in the country—40 years after the first effective metric campaign was launched. The findings were discouraging.

In 31 (out of 32) states in the country, the existence of non-metric measures was recorded. In total, 244 different units of measurement were listed in the whole country. The entire range of units used in colonial times appeared alive and kicking on the records of *Medidas regionales*. It seemed like in some municipalities the metric system had not existed at all. For dry measures there were *carga*, *fanega*, *almud*, and the like; for liquids, *barrica*, *barril*, *botija*, *toro*, *chochocol*, etc.; for flow units, *buey*, *naranja*, *real*; for length, *cuerda*, *vara*, *mecate*, *cordel*; and for surface, *caballería*, *solar*, *criadero de ganado*, *fundo*, *parcela*. There were also a host of other measures whose names, to the ears of contemporary Spanish speakers, hardly relate to units of measure at all: *perra*, *sarta*, *tajo*, *chavo*, *yunta*, *tarea*, *mazo*, *acción*, *cubo*, *maquila*, *mano*, *haz*, *labor*, *topo*, *madeja*, *jícara*, *atado*, *garrapata*, *estado*, *cajón*, and many more.⁴¹

35. Dirección General de Estadística, 1933, p. 4.

36. On the case of France during the French Revolution, see W. KULA, 1986, p. 228–264; D. GUEDI, 2000, ch. 15; K. ALDER, 2002, p. 74.

37. Censuses, as Mara Loveman points out, enable nation states “to demonstrate and document their existence as such.” Through them “all nations could be equated with others,” while also underlining their own distinctiveness. M. LOVEMAN, 2014, p. 28.

38. See, for instance, Dirección General de Estadística, 1956.

39. There were general censuses of population in 1895, 1900, 1910, 1921, and 1930.

40. Dirección General de Estadística, 1937a.

41. For more information on the results of the census of regional measures, see I. SANTACRUZ & L. JIMÉNEZ-CACHO, 1977; H. VERA, 2007, p. 167–175; *id.*, 2014a, p. 80–82.

Some of these weights and measures were used in some towns and provinces only, but others had a nationwide scope—particularly dry measures such as *fanega* and *almud*. It was troubling not only to realize that there were more than two hundred old units of measurement circulating among the rural population (which at that time was the vast majority of the population), but also that there were many variations in their magnitudes—i.e., units with the same name actually represented different sizes from town to town. Considering these regional variants, the census listed over 15,000 variations. For example, in three municipalities in the center region of the country, a *cuerda de leña* was equal to 10 m³ in Atlacomulco, 3.6 m³ in Huixquilucan, and 1 m³ in Ixtlahuaca. All doubts about the lack of uniformity among the customary measures in Mexico were convincingly confirmed. Customary measures seemed to be indestructible. After decades of work to bring the metric system to the people, there was still too much to be done.

But these issues were not as severe in all regions of the country; some states were in worse shape than others in terms of their progress in implementing the metric system. In the northern states, the lack of standardization was not as pronounced in comparison to the rest of the country. The wealth of the surviving colonial measures was concentrated in a region from the states of Jalisco and Veracruz to Chiapas; nine out of ten states with the highest number of non-metric measures were in this geographic block (the tenth was Yucatán). Among these, Puebla, Veracruz, and Oaxaca were the least homogenous: they were not only the states with the highest number of units of measurement but also showed the highest variations per unit. Oaxaca in particular was extraordinarily rich in metrological diversity, with 71 units of measurement and 3,230 variations (averaging 45 variations per unit).

Census data indicate that even if the metric system had made important advances among the urban population, in rural areas the colonial units of measurement were widely used. A newspaper editorial, in the state of Jalisco, claimed that “in the states, or at least in ours, it has been many years since anybody has talked of *varas*, *libras*, and *reales*. Young people aged 25 have no idea of what a *cuartillo* was, nor of how much three *tlacos* are.”⁴² Assertions like this may give some idea of what had happened among the urban youth, but they seem too optimistic compared to census information. According to the census, Jalisco itself was one of the top five states with the largest number of non-metric units registered (51 in total).

Were the results of the 1930 census a sign that the policies to introduce the metric system in Mexico were disastrous? Not necessarily. The data certainly show that the government’s projects hardly ever fulfilled their ambitious objectives. But contrasting Mexico with other countries that also tried to enforce the metric system during the nineteenth and early twentieth century,

42. *El Informador*, May 28, 1926.

the Mexican transition does not seem particularly calamitous. Although not so many details are known about how quickly or effectively the policies for introducing the meter progressed in many European countries (where the metric system was adopted more or less at the same time as in Mexico), studies show that there were similarities with the Mexican case.⁴³ First, despite the fact that several decades had passed since the official implementation of the new system, the conversion had not been completed even in the first third of the twentieth century. Second, it was also in the rural areas that customary measures were most tenaciously rooted. Not even in its native France had the metric measures entirely displaced the medieval units more than a century after the transition had begun.⁴⁴

5. One More Push for Metrication

After the second volume of *Medidas regionales* appeared in 1937, during the administration of emblematic president Lázaro Cardenas, it was decided to make a last push to complete the introduction of the metric system. In that year, the government printed new propaganda promoting the use of metric units. One of those materials handed out to the public was the booklet *El uso de un solo sistema de medidas*, which was produced, like *Medidas regionales*, by the General Bureau of Statistics in the Ministry of Development.

In this new generation of government advertising materials to promote the meter, the arguments justifying its importance changed with regard to nineteenth-century campaigns. By now the metric system had lost much of its scientific aura; it was no longer an innovation that would astonish intellectuals and scholars. This time around, scientists and engineers were not leading the campaign. In the scientific world, the meter was at this point a given, with no need to be publicized. Nor did the new campaign stress which measurement systems the “civilized nations of the world” employed. A new set of values were married to the metric system.⁴⁵

Now the main concern was the “increased complication of human activities” that required uniform and accurate units of measurement. The government’s literature illustrated this idea, for example, the progress made in time measurement thanks to the increased accuracy gained by replacing old customs (such as reckoning time by looking at the sun’s position over the horizon) with clocks. The then more generalized habit among the population of “knowing the weight of one’s body as a source of monitoring the physical

43. See, for example, A. KENNELLY, 1928, p. 84–96.

44. *Ibid.*, p. 28–55; E. WEBER, 1976, p. 30–33.

45. On how certain narratives get embedded into the systems of measurements and reckoning, see M. GEYER, 2001, p. 56; V. OGLE, 2013, p. 1385.

condition of a person” was also mentioned as an illustration of this tendency.⁴⁶ In general, the argument to justify the metric system shifted from appealing to ideas like civilization and science (as in the nineteenth century) to a more nationalistic and pragmatic view.

The government priorities to keep pushing the metric reform were clearly stated in *El uso de un solo sistema de medidas*, particularly around the crucial role of state statistics. The brochure recalls that to standardize the “great many number of measures given by the farmers” in the 1930 census,

a great collective effort was required[;] just the calculations summed up to more than three million[;] that amount of operations represents such an arduous effort that if only one person had to do that alone, armed with a modern electrical calculator, he would have to work at least 25 years nonstop until he would finish. *This circumstance alone should be enough to recommend the generalization of a sole measurement system*, as the agricultural census is to be performed every 10 years and it is certain that the data or information that farmers will provide is going to grow steadily. These censuses would be cheaper and the final results more readily obtained if the great number of regional measures of weight, volume, and area were eliminated.⁴⁷

Practicality, of course, is in the eye of the beholder. No wonder publications produced by the Bureau of Statistics present the standpoint of the petit bureaucrats who spent countless hours calculating the equivalences between liter and *fanega* in Fresnillo, Los Tuxtlas, Cacalchén, and hundreds of other small towns. For state agents, the widespread use of the metric system represented an efficient tool to process information about the country’s productive capacity and this was, from their perspective, a good thing in itself. Needless to say, for millions of Mexicans it was preferable that a handful of pencil pushers should have to work harder on their calculations than to put themselves through the fastidious process of learning a new measurement system.

Overall, the message of this new campaign emphasized the application of a *sole* system of measurement—whether this would be metric or another one seemed like a secondary issue. What stood out was *uniformity*—so useful for the census and other state matters. With their eyes on the 1940 census, the personnel of the Bureau of Statistics were under pressure to lessen its workload and avoid the numerical quagmire produced by metrological diversity. So they tried to put into effect a systematic and long-lasting campaign to convince people of the problems caused by the lack of standardization, and to persuade peasants, industrialists, craftsmen, consumers, and students to observe the metric legislation. The Ministries of Economy, Education, and Agriculture participated in the campaign.

46. Dirección General de Estadística, 1937b, p. 6, 9.

47. *Ibid.*, p. 14 (my emphasis).

Another kind of brochure came out as part of this new metric crusade. It contained more pedagogical content and was illustrated with drawings, like the booklet *Los censos y el sistema métrico decimal: abandone las medidas anticuadas* (The census and the metric system: Abandon customary measures!). The materials were illustrated with caricatures aiming to deliver simple messages (see Figure 1). While this pamphlet was addressed to a wider public, it also had a highly ideological content that linked the meter with Mexico's progress and unity. The slogan "Be progressive, leave behind the old-fashioned measures and adopt the decimal metric system!" could be read on the cover. It appealed to citizens to become daily actors of progress, improving the country with their everyday actions. It called for teachers, traders, farmers, municipal authorities, and citizens to promote the metrification campaign.

Figure 1. *Cartoon—from the pamphlet Abandone las medidas anticuadas (Abandon customary measures!)—emphasizing that selling grain by weight using a metric weighing scale is more reliable than measuring grain by volume.*

Source. Dirección General de Estadística, 1937c, p. 6.

The launch of what the government called "Pro-Metric Propaganda Committees" was promoted, urging these voluntary groups to write letters, sketch posters, and lecture in public places to convince fellow countrymen to leave behind the old measures. The Bureau of Statistics stocked the committees with brochures and printed materials. The two main ideas in the propaganda were *progress* and *national unification*. For instance:

The country's unity would gain much if all the people that know only an indigenous dialect could also speak the national language—i.e., Spanish or Castilian. The same benefits can be obtained if the vast diversity in weights and measures that still prevails in small populations disappears and all inhabitants use the sole legal system of weights and measures—the decimal metric system. The social and economic benefits of this would be of great consequence for the republic, as it would also strengthen its unifying factors; unification is power, power means better organization, a leap forward in collective life.⁴⁸

This argument stressed that progress and national cohesion went hand in hand:

The kilogram and the hectare will be enthusiastically adopted by progressive peasants, as they know that the kilogram and the hectare are used all across the country, they are national measures that all Mexicans should know and use. Today, Mexico's national unity is strengthening; peasants from different regions have become acquainted and understand each other better; regional differences and local quarrels, which bring nothing good, are forgotten, and there remain only the natural beauties, and the songs and dances of every region. At the same time, farmers work more, drink less, attend school in greater numbers, go more often to the physician and live better. ... The unification of the nation and the progress of the Mexican people demand that there should be a single system of weights and measures for the whole country.⁴⁹

It is hard to determine how effective this campaign ultimately was, but considering the ideas and values that it wanted to spread, and the materials used to carry it out, it probably had a rather moderate impact among the targeted population in rural areas, who had been unreceptive to the metric system.

This campaign marked the end of the overt large-scale endeavors of the Mexican state to metricate the country. Of course, that was not the end of the administration and regulation of weights and measures, which is an ongoing, never-ending task (i.e., the process of maintaining and reproducing a certain cluster of ideas in the social stock of knowledge).⁵⁰

6. Learning How People Learn to Measure

As mentioned before, the census of units of measurement created an opportunity to see how common people were learning and using the metric system by adapting it to their vernacular methods of quantification and measurement—assuming that they had to develop their own tactics of measurement, since many of them could not learn to use the system in school

48. Dirección General de Estadística, 1937c, p. 6–7.

49. *Ibid.*, p. 10.

50. During the latter part of the century there were some important events, like the creation of the National Center of Metrology, which responded to the technical needs arising from the North American Free Trade Agreement between Mexico, Canada, and the United States.

as the majority of the population was illiterate or had only a few years of formal education.⁵¹

The data in the census allow us to observe some of the cognitive and practical tactics of appropriation that were devised by non-experts to make *translations* (rather than simple *conversions*) between the old and the new system of measurement. For example, according to frequent answers given by peasants and farmers to the census enumerators, people were modifying the magnitude of a customary unit of measurement by slightly increasing or decreasing its value to make it identical to a metric unit (i.e., they were *rounding*). For instance, in rural municipalities in the state of Aguascalientes, a *fanega* became a measure of 100 liters (while in others it remained a measure of 92 or 96 liters). In Baja California Sur, the *carga* (or load) was equalized to 100 kilograms; in Chiapas, the *almud* became 10 liters while *tarea* became one cubic meter of firewood; in Zacatecas, *cuarterones* were turned into an exact measure of two liters, and *cuartillos* became half a liter. It is important to note here that this rounding was not a uniform process across the country: in some regions the *cuartillo* was 1.5 liters, while in other states it was 2 liters.⁵²

In other cases, people were making *functional equivalences*. In order to preserve a specific form of measuring practice, they used a metric unit to measure a different physical dimension than the one for which it was designed. Apparently, this tactic was not used very extensively, but the census shows, for example, that farmers in the states of Nuevo León, Durango, and Colima used the liter and the hectoliter (which are units of volume) as units of *land area*.⁵³ This peculiar use of the liter and the hectoliter actually followed the tradition of measuring fields based on the amount of grain required in a plot (i.e., they there measuring the productivity of that soil, not a geometric area of land).

Contrary to the transition to the metric system in other countries, where these tactics were actually developed as a planned policy to facilitate the adoption of the metric system (like the *système usuel*, used in France from 1812 to 1839), these were unplanned and spontaneous tactics invented and deployed by ordinary people to cope with the demand to use the metric system. The country went through a period of *metrological bilingualism*, something common in countries adopting the metric system, where customary and metric measures coexisted for a long time. It was in these complicated conditions that the new metric measures permeated daily life and Mexicans started to make the decimal metric system their own.

51. On the different logics entrenched in customary and metric measurement systems and the problems that this discrepancy caused for the adoption of the new measures, see D. GUEDJ, 2000, ch. 19; Y. MAREC, 1989, p. 693–696.

52. Dirección General de Estadística, 1933, p. 9, 13, 26–27, 30, 199, 615; *id.*, 1937a, p. 556.

53. *Id.*, 1933, p. 46, 122. See also Instituto Nacional de Estadística, Geografía e Informática, 1989, p. 16.

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