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A COMPUTERIZED STUDY ON THE METROLOGICAL PARAMETER CONVERSIONS FOR RURAL AGRIBUSINESS DEVELOPMENT

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ABSTRACT

Bhuiyan MSA, Khan KA, Jabed MA (2012) A computerized study on the metrological parameter conversions for rural agribusiness development. *J. Innov. Dev. Strategy.* 6(2), 94-98.

A series of studies were conducted on the Metrological Parameter Conversions for Rural Agribusiness Development in Bangladesh with the major objectives to know the indigenous agrometrological units, to formulate the respective conversion Coefficients, and to prepare selective Agrometrological ready recorner. The studies were conducted involving primary data collection and analysis and finally developing a ready use software by different sectors of clients including agriculturist and agribusiness professional. Formulae recommendations included: katha, decimal, acre ara, Butha, kani, pura, hectare kuchi, bigha, seer, Dhari, kg, maund, gha, gonda, pon,, kora, nal, hands, tirpi kani, dron, ari, pia, kuri ghati, hali, pakhi, bira, choli, and Bisha etc. The software developed was given detailed trials with users and found acceptable at the precision level. It is recommended that use of this software will increase the competency of beneficiaries significantly.

Key words: *agro-metrology, SI Units, conversion coefficients, indigenous agrometrological units*

INTRODUCTION

The unit of measurement was a subject of invention from time immemorial. What may be said is that the unit of measurement is the mother of all sciences, which has been developed through continuous formulation and conversions using mathematical principles. According to Thompson and Taylor (2008) reported that the conversion of mathematical formulae in the current world was a very important aspect of business modernization specially of agricultural commodities. Thousands of localized units were in use throughout the region in all cases of land area, volume and weight of products, length of materials and routes etc. But for international acceptability as per Standard International (SI), the conversion of local indigenous units has become very much important for quality standards and measurement (Leconte 1904).

Amin (2004) in a publication suggested about metrology and use of metric units in Bangladesh, that the local diversified units need to be mathematically converted to uniform standards. For example there are about 5 types of Bigha, 4 types of Katha, 3 types of Tola and Seer, etc. are available which need to be converted to (SI), about 45 units have been developed though body points of human which are in use in the rural areas of Bangladesh. Practically about 500 types of measurement units may be found in about different 500 Upazila/Thana in Bangladesh which need to be formulated mathematically developing for easy and correct formula for its acceptable conversion. The IT companies of the world are now developing professional calculator, the Google/ Yahoo/MSN which have been developed and served software for instant conversion of units for different countries (Williamson 2008).

Metrology

Metrology is the science of measurement. Metrology includes all theoretical and practical aspects of measurement. The word comes from Greek μέτρον (metron), "measure+ "λόγος" (logos), amongst others meaning "speech, oration, discourse, quote, study, calculation, reason". In Ancient Greek the term μετρολογία (metrologia) meant "theory of ratios".

Metrology is defined by the International Bureau of Weights and Measures (BIPM) as "the science of measurement, embracing both experimental and theoretical determinations at any level of uncertainty in any field of science and technology. The ontology and international vocabulary of metrology (VIM) is maintained by the International Organization for Standardization.

Metrology is a very broad field and may be divided into three subfields:

Scientific or fundamental metrology concerns the establishment of quantity systems, unit systems, units of measurement, the development of new measurement methods, realizations of measurement standards and the transfer of traceability from these standards to users in society.

Applied or industrial metrology concerns the application of measurement science to manufacturing and other processes and their use in society, ensuring the suitability of measurement instruments, their calibration and quality control.

Metrological traceability

A core concept in metrology is metrological traceability defined by the BIPM as "the property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, all having stated uncertainties.

Applied metrology

Metrology laboratories are places where both metrology and calibration work are performed. Calibration laboratories generally specialize in calibration work only.

Both metrology and calibration laboratories must isolate the work performed from influences that might affect the work. Temperature, humidity, vibration, electrical power supply, radiated energy and other influences are often controlled. Generally, it is the rate of change or instability that is more detrimental than whatever value prevails.

Calibration technicians execute calibration work. In large organizations, the work is further divided into three groups:

Standards

Standards are objects or ideas that are designated as being authoritative for some accepted reason. Whatever value they possess is useful for comparison to unknowns for the purpose of establishing or confirming an assigned value based on the standard. The design of this comparison process for measurements is metrology. The execution of measurement comparisons for the purpose of establishing the relationship between a standard and some other measuring device is calibration.

The ideal standard is independently reproducible without uncertainty. This is what the creators of the “meter” length standard were attempting to do in the 19th century when they defined a meter as one ten-millionth of the distance from the equator to one of the Earth’s poles. Later, it was learned that the Earth’s surface is an unreliable basis for a standard. The Earth is not spherical and it is constantly changing in shape. But the special alloy meter bars that were created and accepted in that time period standardized international length measurement until the 1950s. Careful calibrations allowed tolerances as small as 10 parts per million to be distributed and reproduced in metrology laboratories worldwide, regardless of whether the rest of the metric system was implemented and in spite of the shortfalls of the meter’s original basis. Thus the present piece of research for mathematical conversion of rural diversified units of Bangladesh has been conducted with the main following specific objectives to know the indigenous agrometrological units, to formulate the respective conversion Coefficients, to prepare selective Agrometrological ready recorner.

MATERIALS AND METHODS

The methods and materials of the studies mainly included survey for collection of localized units, developing the codes for formulae invention and finalizing the compatible units and the software parameter series. The questionnaire formats were outlined and structured according to the suggestion given by different workers (Alder 2002; Anon. 2008; Anon. 2010; Majcen and Taylor, 2010 and Warwick 2007).

The major study tools were: i. Survey through a technical questionnaire for priority scores; ii. Agrometrological engineering calculations for determining coefficients; iii. Characterizing measuring tools with document evidences avoiding Duplications; and iv. Populations: In all 55 sites covering local math and business units.

Questionnaire Format:

A. Respondent’s characteristics: Name, District, Upazila, Qualification, Profession, Age, Training received on, and Others related.
B. Questions:
1. Which unit you prefer for your land area measurements (any 2 prioritizing it by 1 and 2). Bigha and katha, Decimal and acre, Acre and hector, Pakhi and Bigha, Kani and acre, Decimal and katha, Khata and acre, others related.
2. Which unit you prefer for weight measurements (any 2 prioritizing it by 1 and 2). Seer and maund, Kg and ton (metric), Maund and ton (matric), Seer and dhara, Pound and kg, Kg and maund, and others related.
3. Which unit you prefer for wt-volume measurements rice/paddy/wheat/maize/sorghum (any 2 prioritizing it by 1 and 2). Kg and Bushel, Kg and sack, Seer and maund, Kg and Maund, Kg and ton, Kuchi, Khata, Pura (seer based) and others related.
4. Which unit you prefer for length measurements (any 2 prioritizing it by 1 and 2). Yards hand and meter, Inch, centimeter and meter, Centimeter, millimeter, til and meter, Foot and meter, Centimeter and foot, Finger, Bighot and inch and others related.
5. Which unit you prefer for Time measurements (any 2 prioritizing it by 1 and 2).

Til, pal, hour, prohor, day, night, season. Second, minute, hour, day, year. Second, hour, year(360), decade, era. and others related. Technical Explanations: (Bigha-Bog, Bigha-gen, Bigha-Dhak, Katha-Myn, katha-Net, katha-Dhak, Katha-gen) Duplications: Harhi, Deshiree, Other Explanations by the researcher.

RESULTS AND DISCUSSION

The results obtained from the studies are sequentially mentioned here. The results and its outputs are presented here in both tabular and graphical forms.

Characteristics of the respondents

The profiles of some respondents selected at random are mentioned in the Table 1. The results show that about 88% of the respondents were minimum graduate. About 27% respondents were science graduate. The characteristics of the respondents indicate that the data and conversion elements thus collected were in the acceptable level.

Table 1. Characteristic features of the contributing respondents

No.	District	Upazila	Qualification	Profession	Age	Training received on
01	Brahman-baria	Akhaura	M. Sc. (TE)	Service	55	PPR
05	Jhenidah	Horinakundu	M. Com.	Service	31	Nil
10	Sunamganj	Doara Bazar	B. A.	Banker	50	Nil
15	Chandpur	Shahrasti	B. Sc. (TE)	Teaching	48	CBT
20	Comilla	Debidwar	B. Sc. (TE)	Teaching	47	Foundation
25	Faridpur	Boalmari	B. Sc. (TE)	Teaching	54	Nil
30	Kishoregonj	Mitamain	S.S.C.	Service	52	Trade Course
50	Manikganj	Manikganj	B. Sc. Eng. (Civ)	Teaching	45	Nil

Scoring Database Sample == B. Questions
Question-1: Which unit you prefer for your land area measurements (any 2 Prioritizing it by 1 and 2)

Code formulae development matrix

The formulae development numeric structures obtained from the studies are given in the Table 2. the results showed that the major codes identified after screening and to be utilized in the process of software development were for land area a. Biga ha, b. Deci ac., c. Acre hector., d. Paki bigha, e. Kani acre. f. Decimal katha., g. Khata acre. Other codes for volume, weight, distance, time etc were alos developed and used in processing the software in a user friendly manner. The mathematical guideline for the conversion were formulated for computer software as per guideline preferred by Amin (1998), Anon. (2006), Loidi *et al.* (2006), and USDA (2009).

Table 2. Code formulae development matrix

Code.	a. Biga ha.	b. Deci ac.	c. Acre ha.	d. Paki bg.	e. Kani.	f. Deci katha.	g. Khata ac.	Formula input parameters
01					**0**			1 kani=1 bigha=30 decimal, 1 dhone=20 bigha
02	**0**						**0**	1 katha=2.25 dec. 1 bigha=46 dec.
03		**0**			**0**			1 kani=30 dec.
06		**0**		**0**				1 pakhi=33 dec. 1 bigha=52 dec.
07	**0**		**0**					1 bigha=33.33 dec.
57		**0**		**0**				1 pakhi=30 dec.
58	**0**						**0**	1 katha=5 dec. 1 bigha=5 katha
59	**0**					**0**		1 katha=2.5 dec. 1 bigha=50 dec.

Software Outputs

The software developed from the research for various parameters including land area weight measure, volume weights, length and distance, time etc are given in the Fig. 1 to 4.

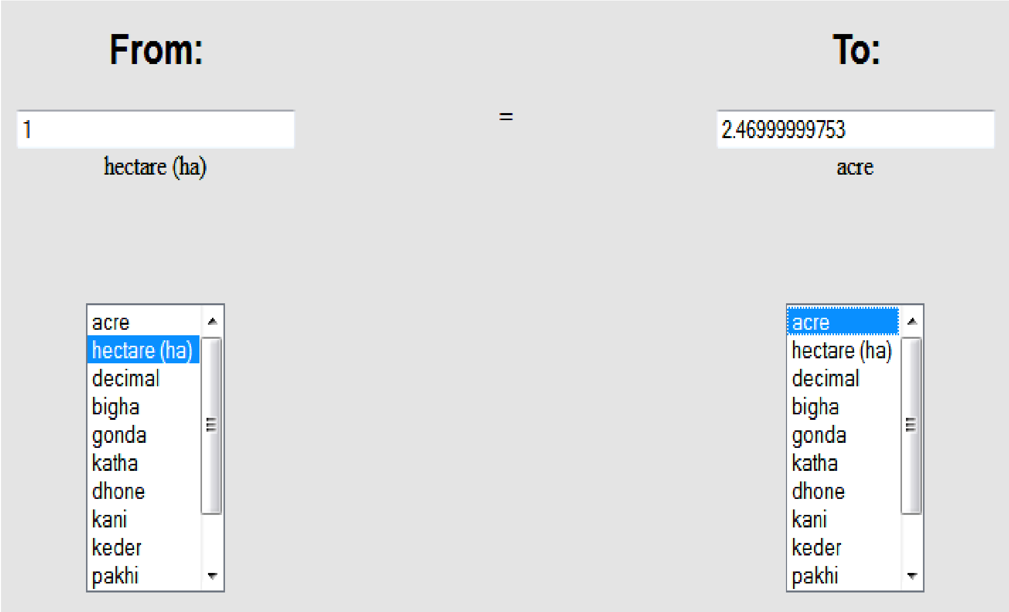

Fig 1. Land area conversion parameter matrix

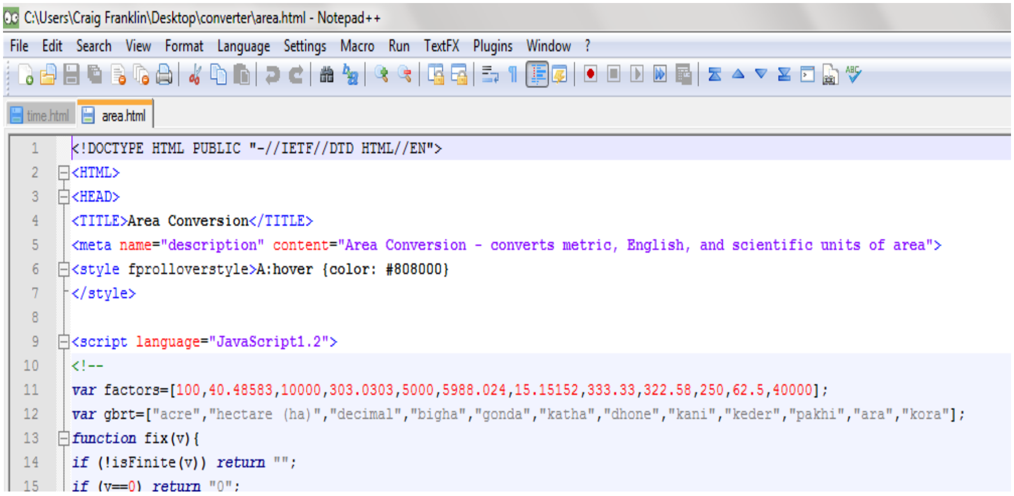

Fig. 2. Land area conversion software language

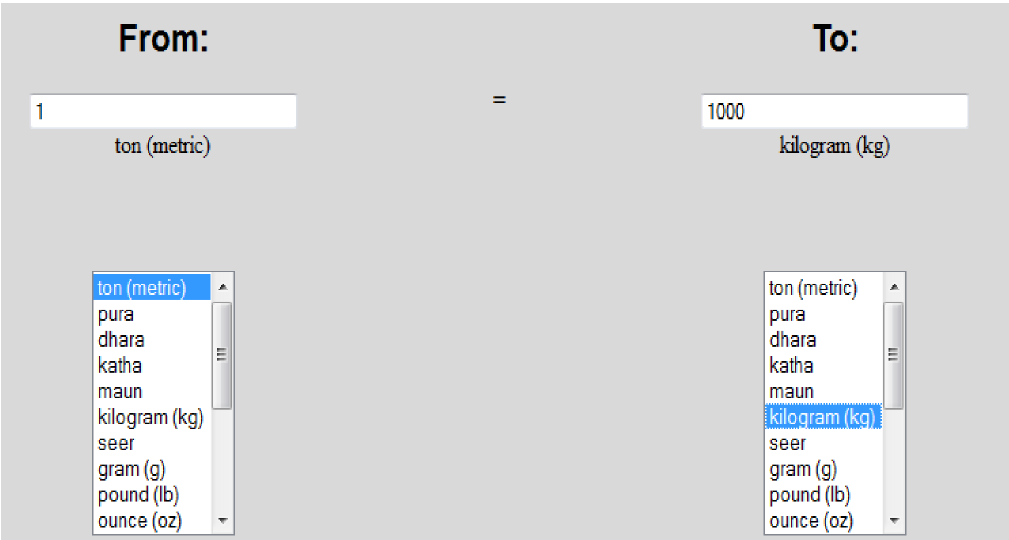

Fig. 3. Metrology weight unit conversion format

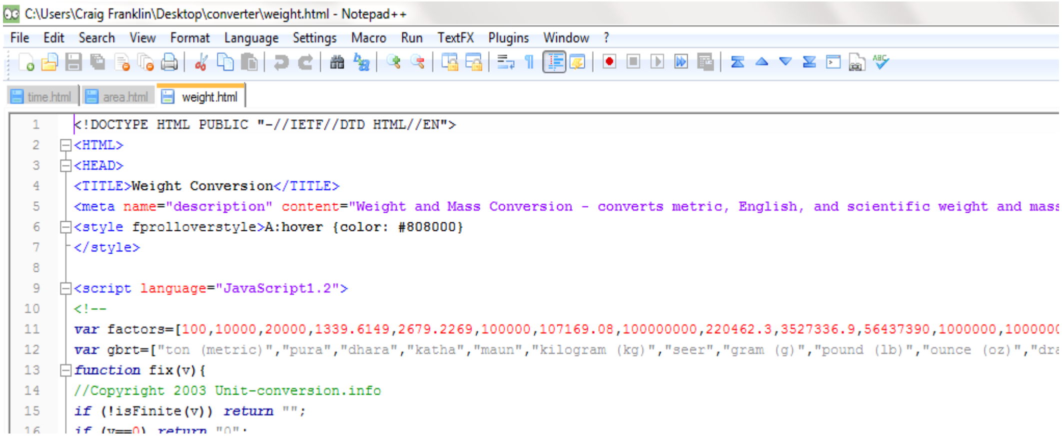

Fig. 4. Metrology weight unit conversion software language

CONCLUSION

It is strongly recommended to prepare a ready reconer both in printed and electronic forms using the outputs of this research. Formulae recommendations include: 1 Katha = 10 decimal, 1 Acre = 10 Katha, 1 Ara = 16 Katha = 160 Decimal, 1 Butha = 5 Katha = 50 Decimal, 1 Kani = 33.5 Decimal, 1 Pura = 16 Ara, 1 Decimal = 0.1 Katha, 1 Hectare = 24.7 Katha, 1 Katha = 4 Kuchi, 1 Bigha = 33 Decimal = 5 Katha, 1 Katha = 6.75 Decimal, 1 Khuchi (Paddy) = 1.75 Seer, 1 Pura = 33/30 Decimal, 1 Dhari = 5 Kg, 8 Dhari = 1 Maund, 1 Bigha = 48 Decimal, 1 Bigha = 20 Katha, 1 Gha (Betel nut) = 10 (numbers), 2 Gonda = 1 Pon, Hundred (Betel Leaf) = 16 Ganda = 64 (numbers), 4 Kora = 1 Gonda, 20 Gonda = 1 Kani, 80 Kora = 1 Kani, 120 Decimal = 1 Kani, 1 Kora = 1.5 Decimal = 6 Nal ×1 Nal (1 Nal =7 Hands), 1 Ganda = 4 Kora, 1 Kani = 4 Ganda. 1 Kani = 4 Kuni, 1 Tirpi Kani = 20 Ganda = 1.2 Acre, 1 Dron = 16 Kani, 1 Ari = 10 Seer/16 Seer, 1 Pia = 14 Pura, 1 Kuri (Banana) = 24 (numbers), 1 Bigha = 52 Decimal, 1 Acre = 100 Decimal, 1 Ghati = 1 Seer, 1 Pon = 20 Hali, 1 Hali = 4 (numbers), 1 Ganda = 4 Hali, 1 Pakhi = 26 Decimal, 1 Bigha = 3 Pakhi, 1 Katha = 20 Pakhi, 1 Bira (Betel Leaf) = 20 Ganda = 80 (numbers), 1 Choli = 5 Ganda = 20 (numbers), 1 Hundred (Mango) = 112 (numbers), 1 Bisha (Fish) = 32 (numbers).

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