Ofia - Innovation applicable in organic farming
Rethinking on household/population anthropometric and real food consumer demand evaluations of eu27/candidates by using per capita (PC) versus per adult human unit (PAHU) method/1999-2010-2020

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Key words: Per Capita (PC), Per Adult Human Unit (PAHU), Organic, Consumer

Abstract

Accurate population and household demographic and anthropometric projections are necessary for proper economic and social planning including organic/conventional food consumption evaluations of EU27-(Candidates-Turkey/Croatia). We must be open to rethinking on how accurately the current methods (*i.e.* PC, Adult Equivalent–AE) are and other estimates that represent the true nature of family/household's gender and the age (Young and old) differences of the consumer potential of EU. We are dealing with a contemporary, developed PAHU methodology that aims to reduce the errors (19.4 percentage units) inherent in PC projections for organic/conventional food and other commodities production and consumptions. The first aim of the developed PAHU (Copyright ©1989) is to standardize EU nations or target populations that will make them comparable. Second aim is to create a platform that would promote a dialogue on statistical policy relevant interactive domains of consumer and consumption potential on one hand and family/household dynamics and socio-economic processes of economic development on the other hand. Application of PAHU method improves the data validation process by providing an alternative to the current "One size fits-all"– PC, accept or reject approach that I call (**Gender and Age Corrected PC^{gac})** that may play an important role in orienting innovation systems, so **PC^{gac}** may better address global challenges in reevaluating real consumer and organic/conventional food consumption potential.

Introduction

Defining, evaluation and interpreting EU27 plus candidates-Turkey/Croatia's demographic structures, family/household and their organic and conventional food security on PC basis is a stubborn and difficult task for the researchers, decision and policy makers. It is extremely important to measure the food consumption of the families/households of developed (EU) and developing (Turkey) countries on a standardized ``**unit**´´ base that will make them comparable. When data are presented on PC basis, (Defined as equal to each individual, per unit of population) for production and consumption of commodities, the assumption is that 0 to19-year-old, (*i.e.* 6.0 month-old baby), and 66 to 80+ year old will produce and consume as much as a mature person-20 to 65-year-old man/woman. Aiming to reduce the magnitude of errors inherent in PC food consumption projections, the PAHU method (Copyright©1989) was developed to eliminate the error bound "one-size–fits–all-accept or reject" approach of PC evaluations.

Material, Methodology, Concept and Key Innovations

State of the art of this paper is implementing PAHU, (Copyright © 1989) to evaluate the real consumer potential of any population or target group and to compare them with other evaluation procedures and approaches (*i.e*. PC and AE). PAHU aims to reduce the errors (19.4 percentage units) inherent in PC projections for food and other commodities production and consumptions, (Hasimoglu, 2001; 2012, 2013). Calculation of PAHU **(20-24-year- old)** based on Basal Metabolic Body Rates (BMR) to obtain the conversion factors for each age group into PAHU (Table 1.) that standardizes any population or a target group. Since PAHU development and its practical use were presented previously (Hasimoglu, 1989; 1999; 2000; 2001; 2012; 2013), the criteria used in the method development are summarized: **1. Nutrition and Energy Expenditure for Human Productivity:** Method deals with primarily the requirement for a standard reference individual (20-24-year-old=Unit) MBR energy which are calculated for each (5-year- interval) age-groups. **2. Age and Gender Structure of a Population/Target Group:** Selected method design correlates to deviant anthropometry that includes defined age and sex structure and other factors (Body weight, height, body frame, environmental temperature etc.) affecting BMR, which are also considered and included in calculations. **3. Selected Anthropometric Criteria:** Cut-off points for indicators were selected carefully, all were based on literature and were documented on research results in order to characterize changes and

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trends on BME within the age/gender groups of the population. **4. Calculation Procedure of PAHU:** BMR and affecting factors are the criteria used to calculate the PAHU conversion factors for the different age groups to standardize a population or a target group under one unit (Table 1.) because BMR is an essential part of human vitality. The formula and calculations were based on the long-term research findings of Brody (1945) and Kleiber (1947). Kleiber (1961) suggested a three-fourths power of the body weight is the best correlation between body size and resting metabolism thus the calculated value applies not only persons of quite different body builds, but to almost all homeotherms (*i.e*. Mice and elephant). **BMR Calculation: BMR (kcal) = 70 (W kg)$^{0.75}$; c = bW^{n} or log c = log b + log w^{n} where c = kcal : w^{n} = metabolic size and c / W^{n} = Statistical constant b; Conversion Factor Calculation = Male or Female BME kcal/d : 20-24-year old (PAHU) Male or Female BME kcal/d.**

Findings, Results and Discussions

The EU, currently, has to cope with demographic decline, low natural growth and the aging of its population. EU27 policy-makers have to consider looking into the erroneous use of PC and its effects on the results of the decision–making and policy-implications not only in food consumption issues, but also in other economic issues that affect the continuing global and EU economic crisis. To start with, each mini market of EU27, candidate countries, whole Europe's PC and PAHU-real consumer potentials are calculated for 1999, 2010 and 2020 and are tabulated. With the expansion of the EU (1999 – 2010), addition of 187 million PC and/or 156 million PAHU, (Including Turkey/Croatia), the EU-29 population added up to 561 million PC; 469 million PAHU. In 2020, EU27 plus candidate countries-(577 million PC; 486 million PAHU), plus dependency of EU-member states, EFTA, micro states and former Soviet Republics; thus Europe's consumption potential will go up to 701 million PC; 591 million PAHU. Europe will be the world's third largest organized trading, production power and organic/conventional food consumer after China and India.

Further graphic analysis made by using the findings of (Table 1.) by plotting BMR kcal requirement values against age groups, (Figure1.), illustrates deleterious assessments are not less than 7.6 percentage units for the age group less than 20 and 11.8 percentage unit for the age group over 25-year respectively, totalling up to 19.4 percentage units for each PC as compared to PAHU which are confirmed by findings of Hasimoglu, (2001; 2012; 2013).

In addition, there is a significant difference between under 20-year age population of the developed and developing nations (21 percentage unit) when calculations are based on PC; aside from assuming that 0-19/+65-year old individuals consume the same amount of grain as compared.

Table 1. Calculated Conversion Factors of the Age Groups[2]

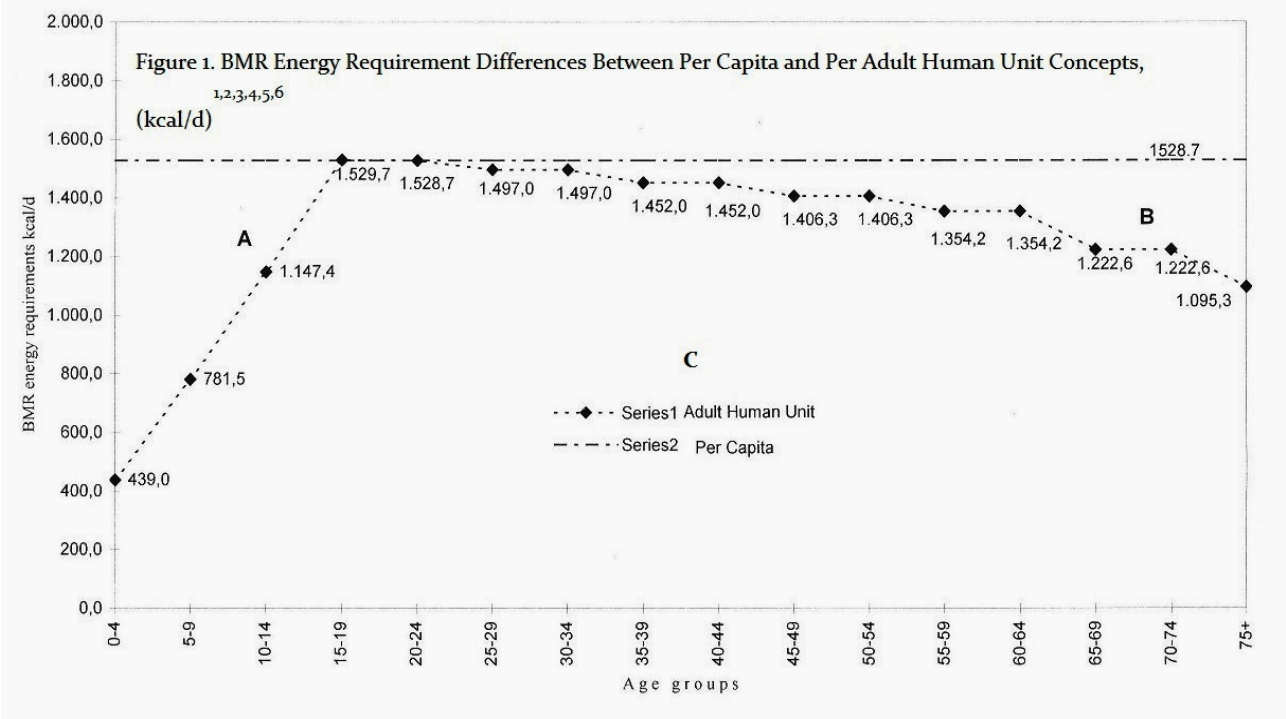
	Calculated BME[3] Requirements kcal/day			PAHU Conversion Factors		
Age Groups	Male	Female	Average	Male	Female	$\bar{X}$
0-4	445,1	432,7	438,9	0,262	0.,317	0,287
5-9	782,1	780,5	781,4	0,462	0,572	0,511
10-14	1138,6	1156,1	1147,4	0,672	0,848	0,751
15-19	1571,5	1487,9	1492,5	0,974	1,091	0,976
20-24[1]	**1694,0**	**1363,3**	**1528,7**	**1,000**	**1,000**	**1,000**
25-34	1659,0	1336,0	1494,5	0,979	0,979	0,980
35-44	1609,0	1295,0	1452,0	0,950	0,950	0,950
45-54	1558,5	1254,0	1406,3	0,920	0,920	0,920
55-59	1473,8	1234,5	1354,2	0,870	0,906	0,886
60-64	1473,8	1234,5	1354,2	0,870	0,905	0,886
65-74	1354,6	1090,6	1222,6	0,800	0,800	0,800
75+	1218,0	972,6	1095,3	0,719	0,713	0,716

[1] Standard Adult Human Unit (Age 20-24) for male and female BME requirements are 1694.0 and 1363.36 kcal/d respectively, averaging 1528.7 kcal/d. [2] PAHU calculation = Population of the age group x Age group's conversion factor. ***Conversion Factor Calculation = Male or Female BME kcal/d : 20-24-year old (PAHU)***

Male or Female BME kcal/d. [3] *Basal Metabolic Energy (BME) is the minimum energy cost of body process, representing the excess of endothermic over exothermic reactions in the body.*

to 20-24-year old. To emphasize the difference between developed and developing countries, two almost equally populated countries are considered: Belgium 10,423,493 and Chad with 10,543,464 populations for the year 2010. Although the population numbers (PC) are quite similar (0.98 % difference), the PAHU numbers showed huge differences (8,784,050 and 7,840,591 respectively), that are due to differences, especially in the age groups, under-20 (22.0% and 57.4% for Belgium and Chad respectively). On the basis of 200 kg world PC grain consumption (Hasimoglu, 2012), both Belgium's and Chad's total grain requirements would be almost the same, 2,084,698 t and 2,108,692 t respectively. However, on the PAHU basis the requirements would be 1,756,810 t and 1,568,118 t respectively. Percentage unit deviations of PAHU grain consumption from PC (Savings) were 16.6% and 26.9% for Belgium and Chad respectively. These findings illustrate the presence of the big gap between PC and PAHU from the standpoint of projecting grain consumption of developed and developing states.

Household income is the main factor that determines the level of nutrition of the inhabitants and poverty. EUROSTAT's approach is the household's consumption and income divided by the household size (number of persons-PC) living in the household (EUROSTAT, 1995, 1999 and 2005). Micro-economic analysis of the household must be situated within a larger structural analysis of gender and age based inequalities within the world economic system. One should not forget that household numbers and the number of occupants in the households have great impact on economy and on food consumption. Last ten years, increasing single and low number person households changing structures are important consumer segments. They tend to consume more PC compared to those living in larger households who share resources, resulting in higher domestic consumption in EU and in the world. This increase is seen in developed, emerging and developing economies (Turkey) that impacts the consumer spending patterns. In EU, average household occupant is 2.6 however this number in Turkey is 4.2. In Eastern Anatolia average household number is 5.2 and in the rural areas, goes up to 7.2 (Euro-monitor-International, 2012). In order to



1. PAHU, BMR energy requirements are the average of males and females of each age group, (Table 1. PAHU calculated conversion factors). **2.** Rectangle is PC area = (A+B+C) = 100%; Triangle A is < 20 - age group = 7.6% of rectangle; **3**. Triangle B is > 20-24 age group = 11.8% of rectangle; **4.** Difference from PC = A+ B = 7.6 + 11.8 = 19.4%; **5.** PAHU = C - (A+B) = 100 - (7.6+ 11.8) = 80.6% of PC.

illustrate the effect of gender and age differences between equally numbered two households were picked from the real world of two developing countries. Equal numbered two households with different age and

gender structure (Table 2.) shows that PC and AE calculations can result in unintended deleterious assessments of food (Grain) consumption projections as compared to PAHU.

Table 2. Comparing Household-Aboubakar-Chad and Household-Çelik-East Turkey

Gender (Age)	PC	AE	PAHU	x	Gender (Age)	PC	AE	PAHU
Woman (49)	1	1.0	0.920	x	Woman (65)	1	1.0	0.800
Boy (15)	1	0.5	0.974	x	Man (45)	1	0.5	0.920
Girl (12)	1	0.3	0.848	x	Woman (38)	1	0.5	0.950
Boy (10)	1	0.3	0.672	x	Girl (18)	1	0.5	1.091
Girl (7)	1	0.3	0.572	x	Boy (16)	1	0.5	0.974
Girl (3)	1	0.3	0.317	x	Boy (9)	1	0.3	0.461
Total	**6**	**2.7**	**4.303**	x	**Total**	**6**	**3.3**	**5.196**

Grain Req. T/Y 1.2 0.54 0.86 Grain Req. T/Y 1.2 0.66 1.04
T=Tons; Y=Years; PC= Per Capita; AE= Adult Equivalents; PAHU= Per Adult. Human Unit
AE: First adult in the house=1; other adults, >13 = 0.5 and child (13 or under)=0.3.Gender is not considered nor the >66 age group,(EUROSTAT, 1999; 2005; 2008); PAHU values, Table 1.

Suggestions, Conclusions

The idea to develop a single composite indicator-**PAHU/Gender and age corrected PC = PC^{gac}**-has so far not taken into work list in scientific community. This deficiency should now be covered. As Albert Einstein ones put it "We can not solve problems by using the same kind of thinking we used to create them". Thus it is time to develop a new society-wide single composite indicator (PAHU) that describes welfare in more sophisticated way than old and primitive PC-GDP and/or organic/conventional food consumption-measure. This composite may also guide us in next decades towards sustainable world where economy does not exceed the global limits and endanger global ecosystems as today. **PAHU=(PC^{gac})** evokes innovation playgrounds of the researchers. It can well be applied to every country's/target groups' food consumption evaluations. In addition it may have the potential to have an impact on economic evaluations when Genuine Progress Indicator (GPI) and Sustainable Society Indicator (SSI) are used as basis for the societies-replacement of PC-GDP that is needed for the development in economic re-evaluations. The innovative action of **PC^{gac}** may require shifts in government planning by adding its ecological impacts into the equation.

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