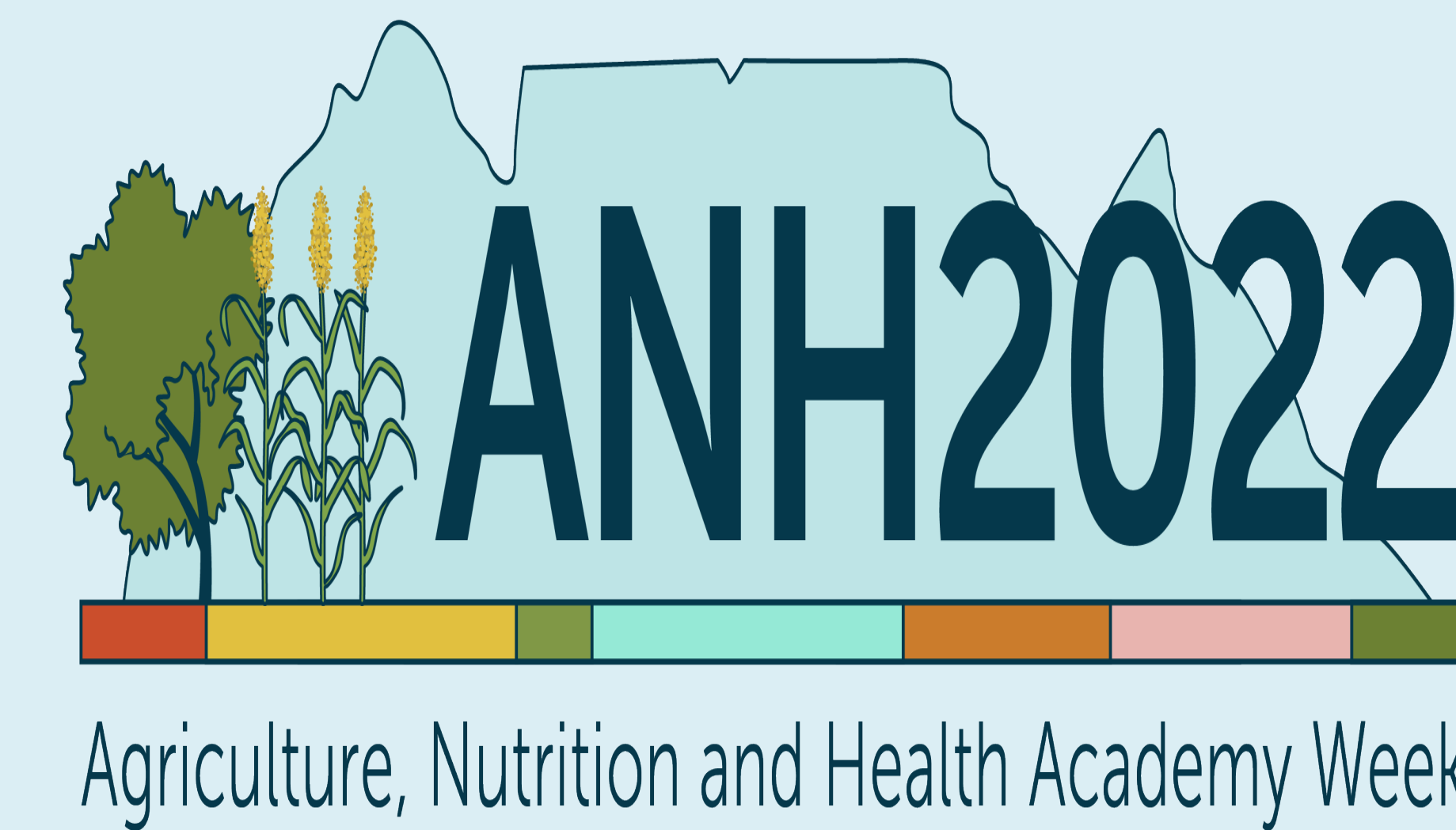




Environmental impact and nutrient adequacy of derived dietary patterns in Vietnam

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INTRODUCTION/BACKGROUND

- Improving diet quality while decreasing environmental impacts is an important challenge for a healthy and sustainable food system.
- More than 800 million people still suffer from chronic undernutrition
- Food systems contribute up to 29% of total global anthropogenic greenhouse gas emissions (GHGE).
- Few studies so far have investigated diet quality in Vietnam and its potential impact on the environment.
- The objectives are to
 - Identify the most common dietary patterns in Vietnam and quantify their GHGEs and blue water use
 - Compared the diet quality (nutrient adequacy and dietary diversity) and environmental impact of these patterns to the average diets, evaluating potential trade-offs between healthy diets and environmental impacts objectives

METHODS

- This study used the data from the nationally representative General Nutrition Survey (GNS) of Vietnam which is conducted every 10 years by the Vietnam National Institute of Nutrition.
- The final dietary intake data included 8225 households and all persons responsible for preparation of food in the household were interviewed in-person to recall the food they purchased and the food consumed by all household members in the preceding 24h.
- To estimate the individual intake from household data, the adult female equivalent (AFE) approach was used.
- To determine the dietary patterns, the 18 food groups were used as input variables in a principal component analysis (PCA) by using the PROC FACTOR function in SAS v9.4.
- Mean probability of nutrient adequacy (MPA) and dietary diversity score (DDS) were used to assess the diet quality of the derived diet patterns
- Greenhouse gas emission (kg CO₂-eq) and water use (m³) were selected to explore the environmental impact.
- The Clune dataset was used to calculate GHGE for all food items. BW use for food was linked to the existing values from a database made publicly available by the Water Footprint Network (WFN) and Springmann et al.

RESULTS

- Three dietary patterns were identified (the Omnivorous, Traditional and Pescatarian patterns).
- The Omnivorous and Pescatarian patterns were positively associated with the wealth index, whereas an inverse association was observed with the Traditional dietary pattern (Table 1).
- The Red River delta adhered most to the Omnivorous dietary pattern, the population from the Northern mountainous region most to the Traditional dietary pattern, and the Coastal region consumed mostly to the Pescatarian pattern.

RESULT

Table 1: Participant characteristics, diet quality and environmental impact of three dietary patterns of household (per AFE) in Vietnam General Nutrition Survey 2009-2010 dataset (n=8225)

	Total population	Omnivorous pattern		Traditional pattern		Pescatarian pattern	
		Q1	Q5	Q1	Q5	Q1	Q5
	n=8225	n=1645	n=1645	n=1645	n=1645	n=1645	n=1645
Wealth index (%)							
Lowest	20	39.0	7.4 ⁱⁱ	11.4	31.2 ⁱⁱ	20.6	16.5 ⁱⁱ
Second	20	26.6	9.5	17.6	24.7	19.8	18.1
Third	20	19.0	15.3	20.3	17.7	19.6	20.0
Fourth	20	10.8	25.2	23.2	15.7	19.0	22.1
Highest	20	4.7	42.6	27.5	10.8	20.9	23.3
Region (%)							
Red river delta	16.9	9.0	25.1 ⁱ	6.9	23.5 ⁱⁱ	19.9	16.0 ⁱⁱ
Northern mountainous	24.4	23.8	20.7	3.8	55.1	33.5	13.9
North Central and Coastal	24.6	32.7	15.6	40.9	9.0	20.2	27.4
Central Highland	7.1	10.3	5.5	6.1	5.0	2.6	11.0
Southeast	8.5	3.8	16.1	11.8	2.4	6.3	10.7
Mekong delta	18.5	20.7	17.1	30.6	5.0	17.6	21.0
Diet Quality							
MPA	0.38 (0.23)	0.30 (0.19)	0.51 (0.21) ⁱ	0.33 (0.24)	0.45 (0.18) ⁱ	0.24 (0.22)	0.51 (0.19) ⁱ
DDS ^a	4.4 (1.3)	3.5 (1.0)	5.4 (1.3) ⁱ	3.9 (1.2)	4.8 (1.3) ⁱ	4.0 (1.3)	4.8 (1.3) ⁱ
DDS ≥ 5 (%)	42.8	14.7	71.6	27.8	56.5	32.7	54.2
Environmental Impact							
GHGE per 2000kcal	4.82 (2.49)	3.87 (0.69)	6.14 (3.57) ⁱ	5.12 (2.47)	4.48(1.81) ⁱ	4.94 (3.40)	4.88 (2.09) ⁱ
Blue water per 2000kcal	0.13 (0.02)	0.11 (0.01)	0.14 (0.04) ⁱ	0.12 (0.03)	0.13 (0.02) ⁱ	0.13 (0.03)	0.12 (0.02) ⁱ

^{i,ii} The letters indicated significantly different values ($p < 0.001$ and $p < 0.0001$ respectively) by performed CMH test for homogenous / linear regression of environmental impact regressors over all quintiles. ^a Dietary diversity score (DDS) was created based on the indicator Minimum Dietary Diversity for Women (MDD-W). The DDS was reported with the amount of consumption was greater than 15 grams of each food group.

- MPA was low in the total population but Omnivorous and Pescatarian patterns (Q5s) were associated with a better diet quality compared to the Traditional pattern (Table 1).
- The environmental impacts(GHGE and BW use) were considerably highest in Omnivorous pattern (Table 1).
- Within food groups, rice, meat, and meat products contributed the most to the GHGE, and rice was the largest contributor to BW use (Figure 1a,1b)

RESULT

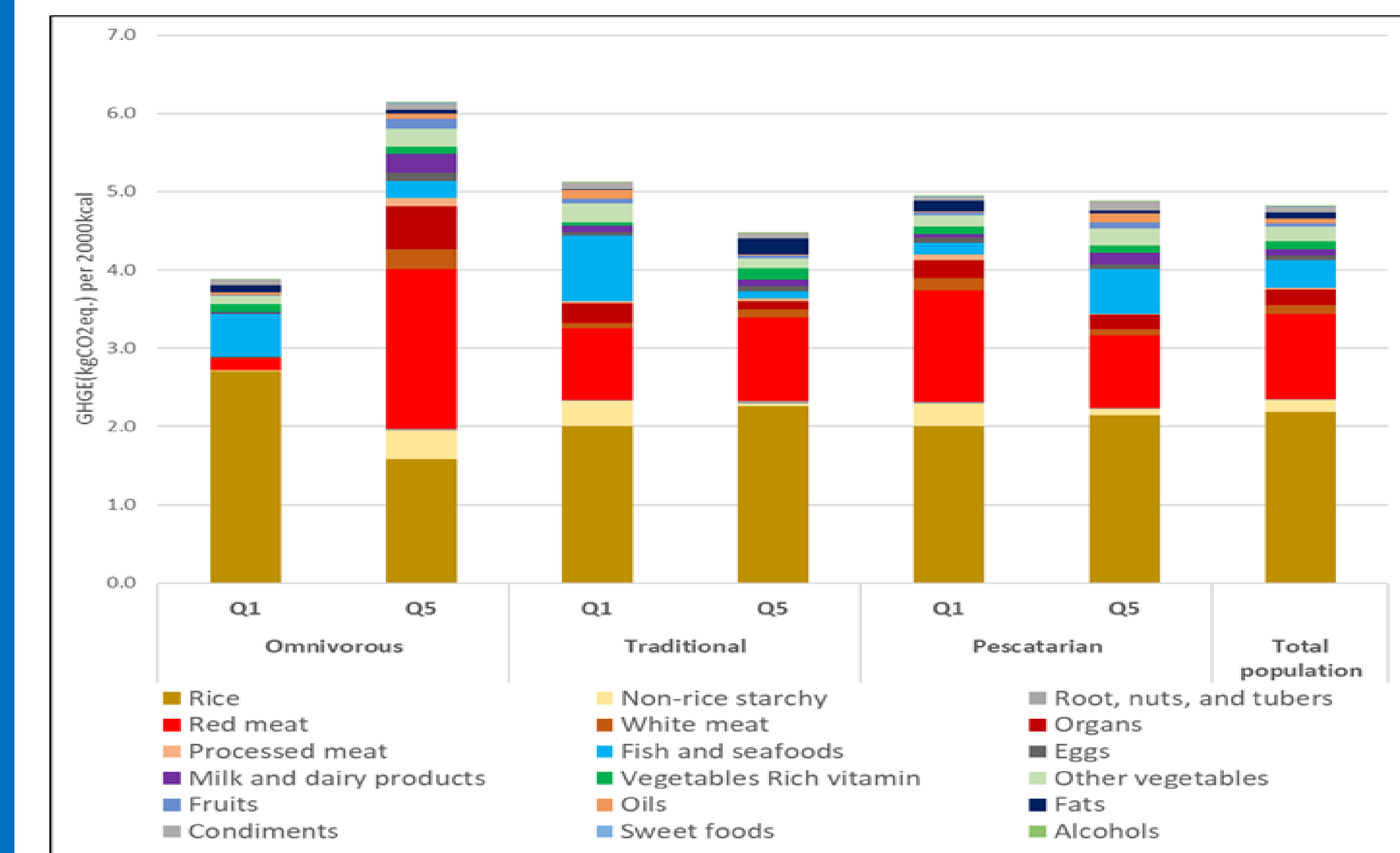


Figure 1a: GHGE per 2000kcal for Q1 and Q5 of 3 dietary patterns for household (per AFE) in the Vietnam General nutrition survey 2009-2010 dataset. n=1645 per each quintile.

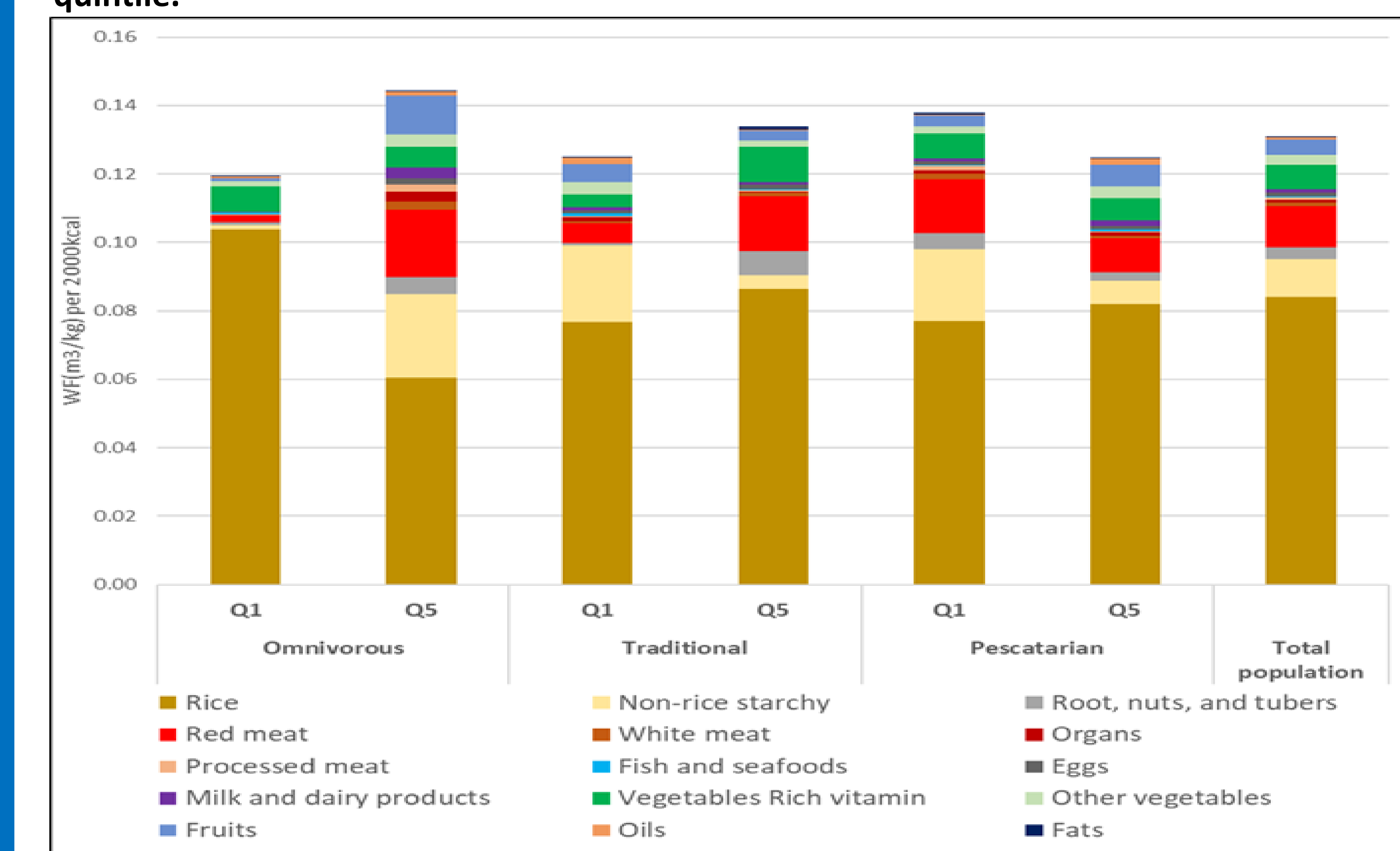


Figure 1b: Blue Water use per 2000kcal for Q1 and Q5 of 3 dietary patterns for household (per AFE) Vietnam General nutrition survey 2009-2010 dataset. n=1645 per each quintile.

CONCLUSION

- First study to characterize the differences in E.I and N.A from derived dietary patterns using national intake data.
- Neither of the recommendations for health or those for environmental impact set by the EAT-Lancet were met by any of the 3 derived dietary patterns at the highest level of adherence (Q5).
- Future research is needed to develop a more optimal diet that considers both diet quality and environmental impact to explore the trade-offs between diet quality and environmental impact.

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