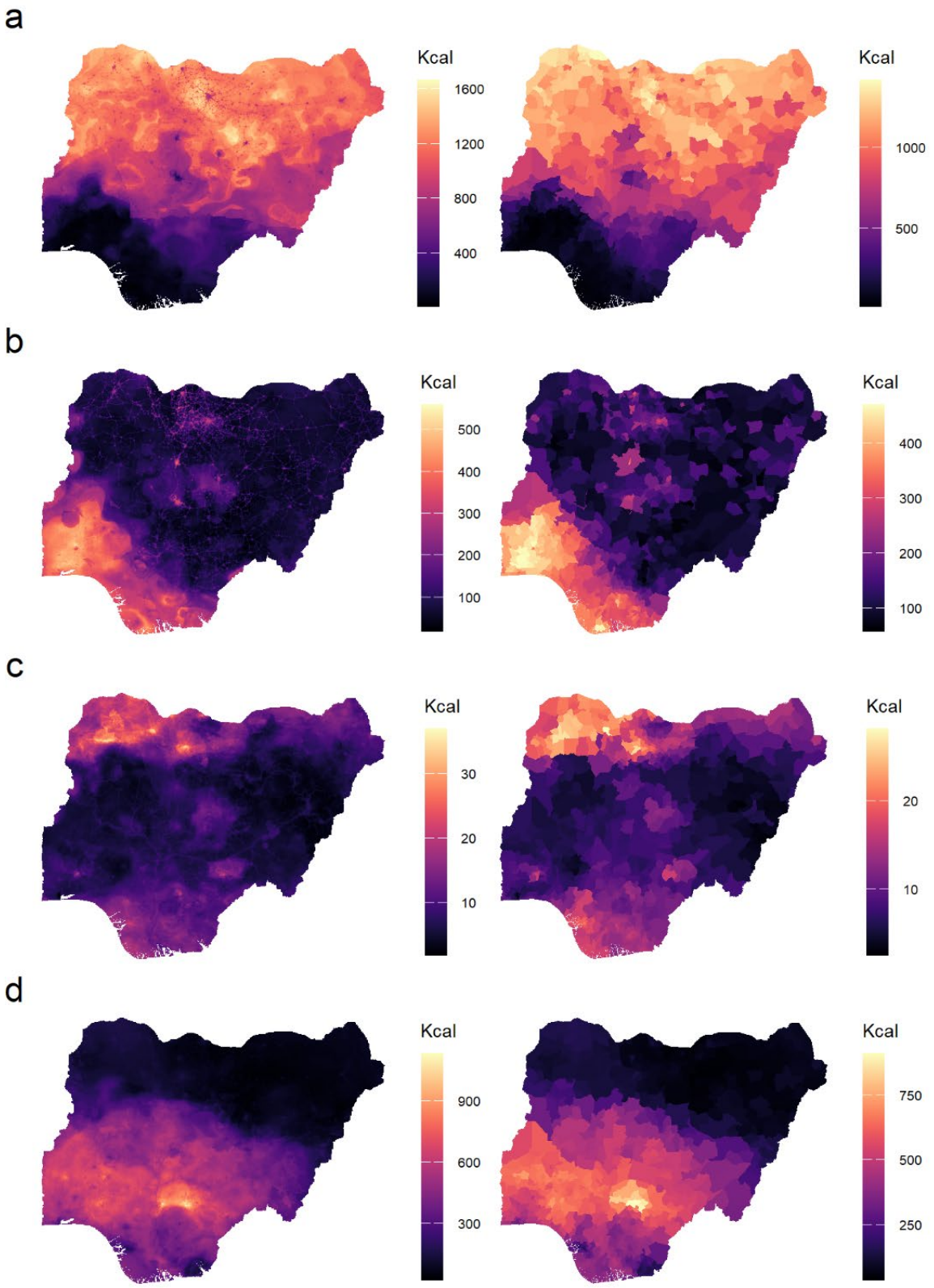
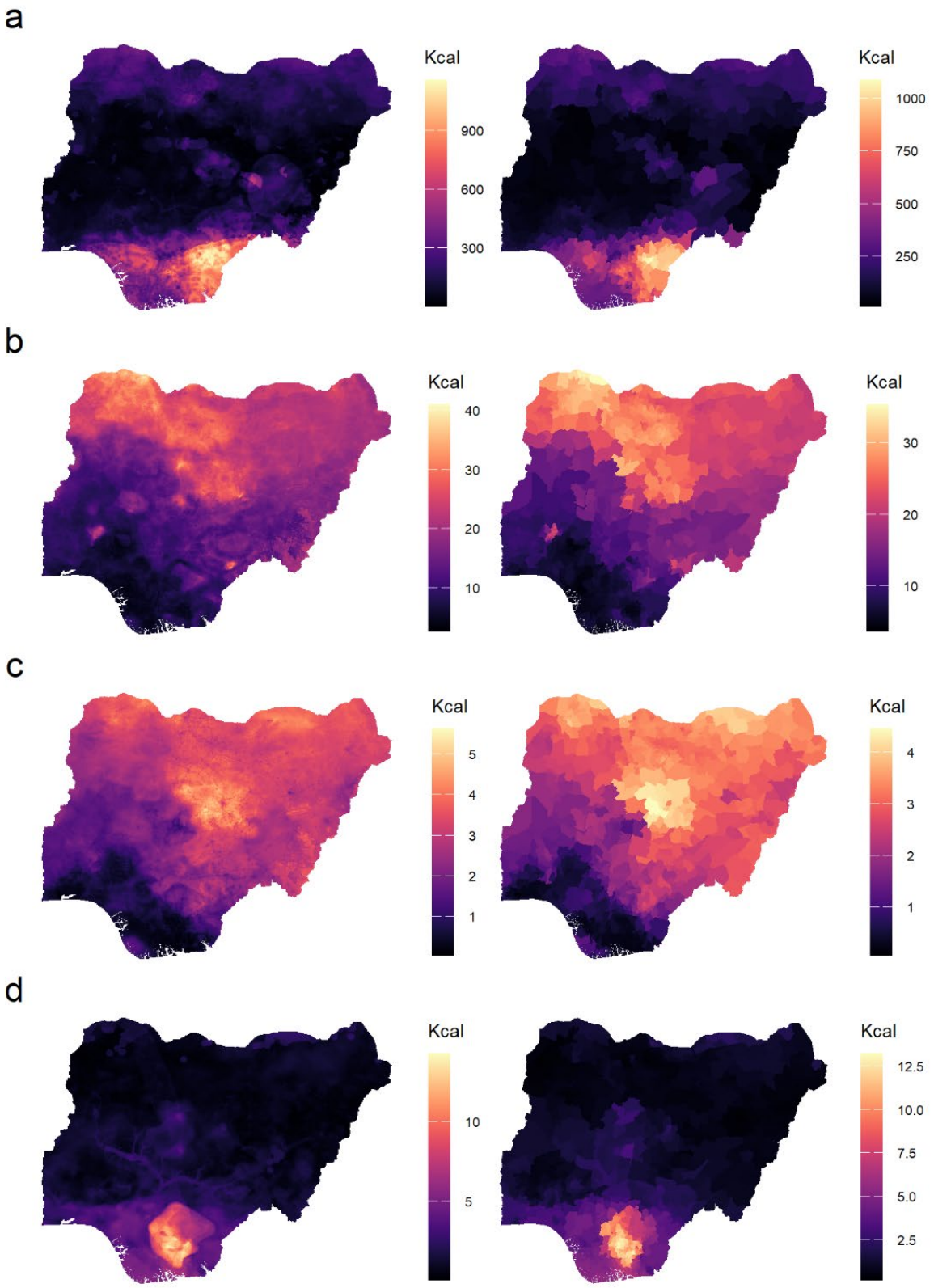
Machine learning can improve the mapping of food consumption and diet quality

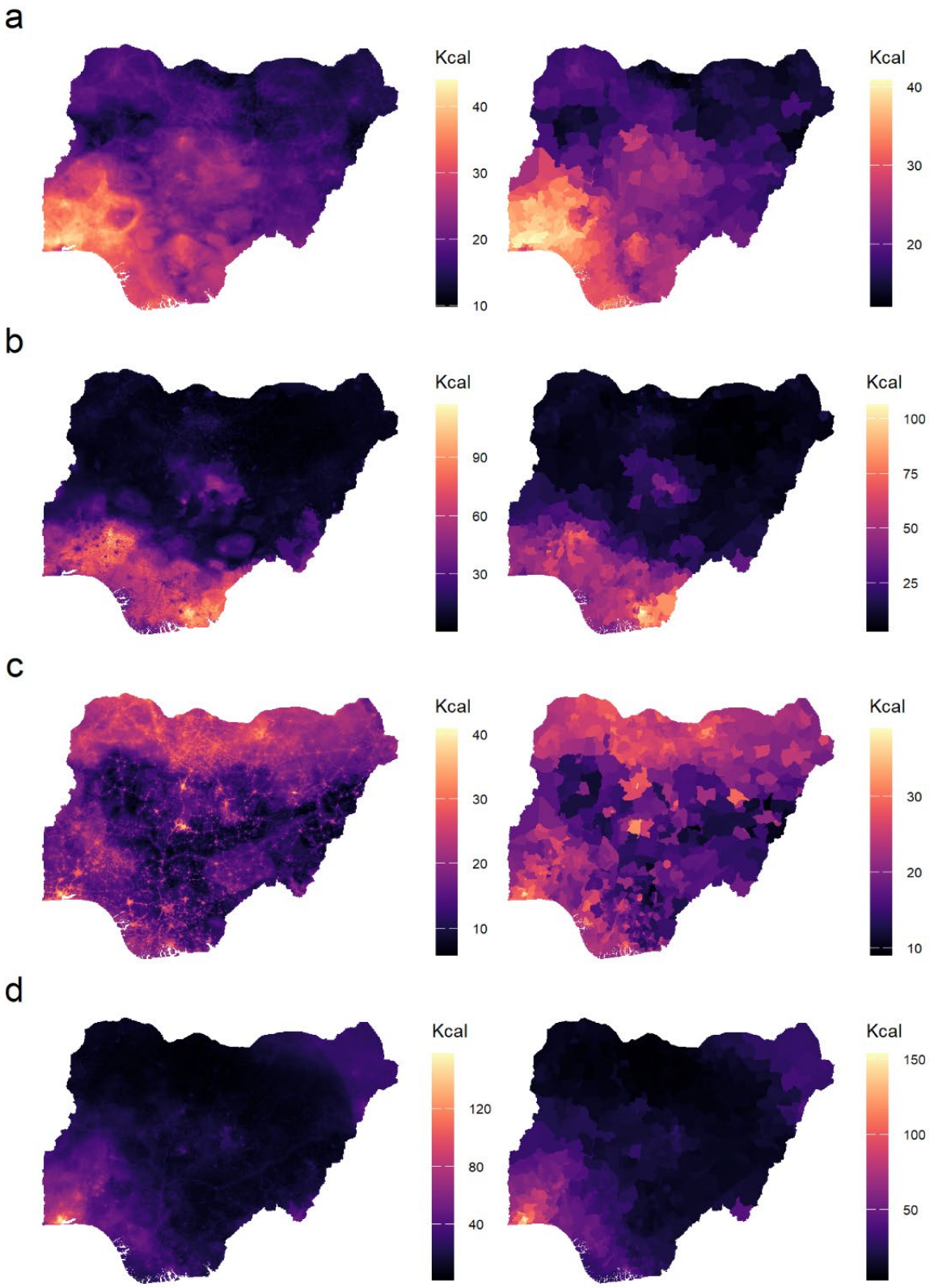
Supplementary Information



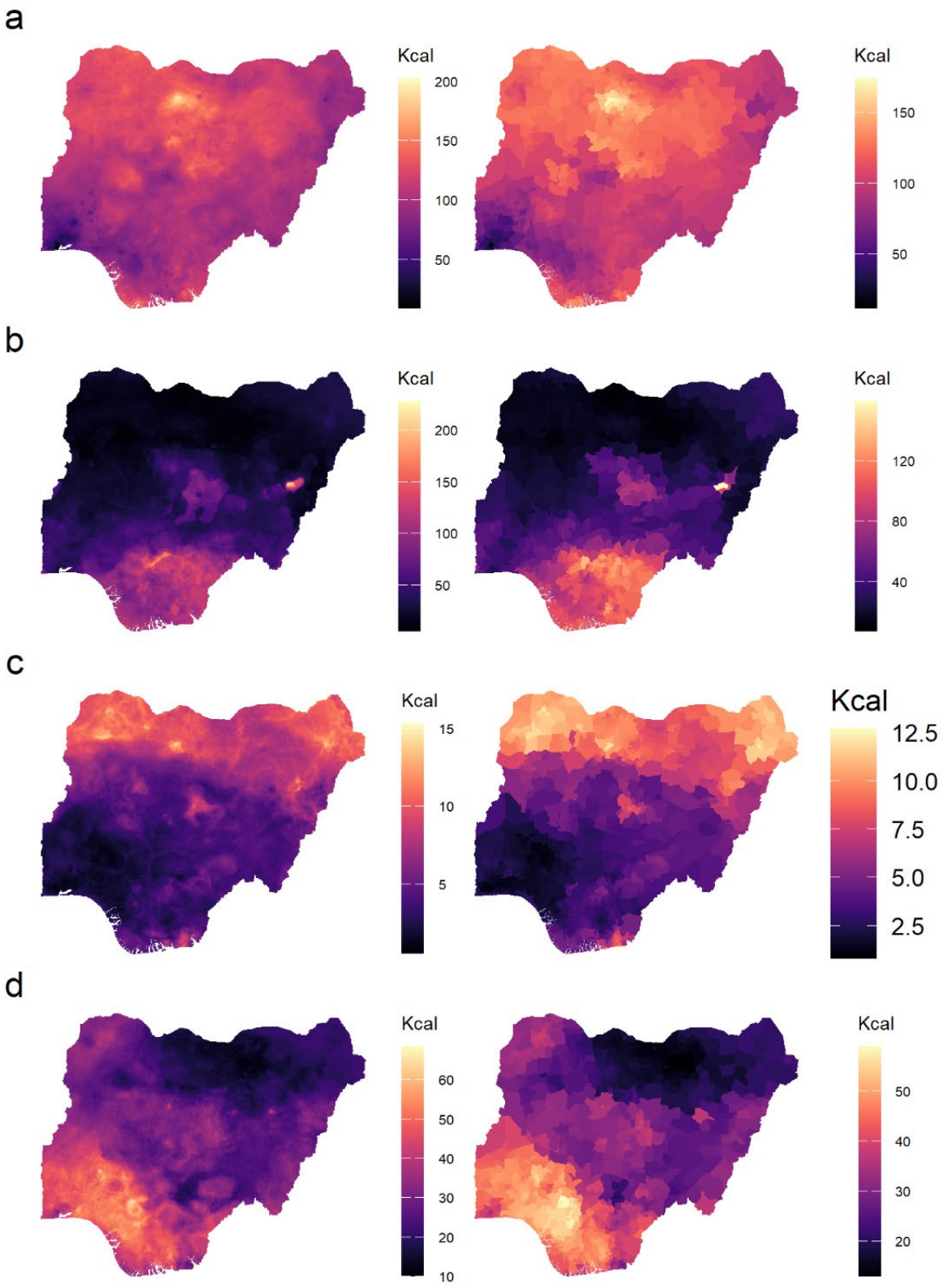
Supplementary Fig. 1: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (right) for grains 1 (**a**), grains 2 (**b**), grains 3 (**c**), roots and tubers 1 (**d**).



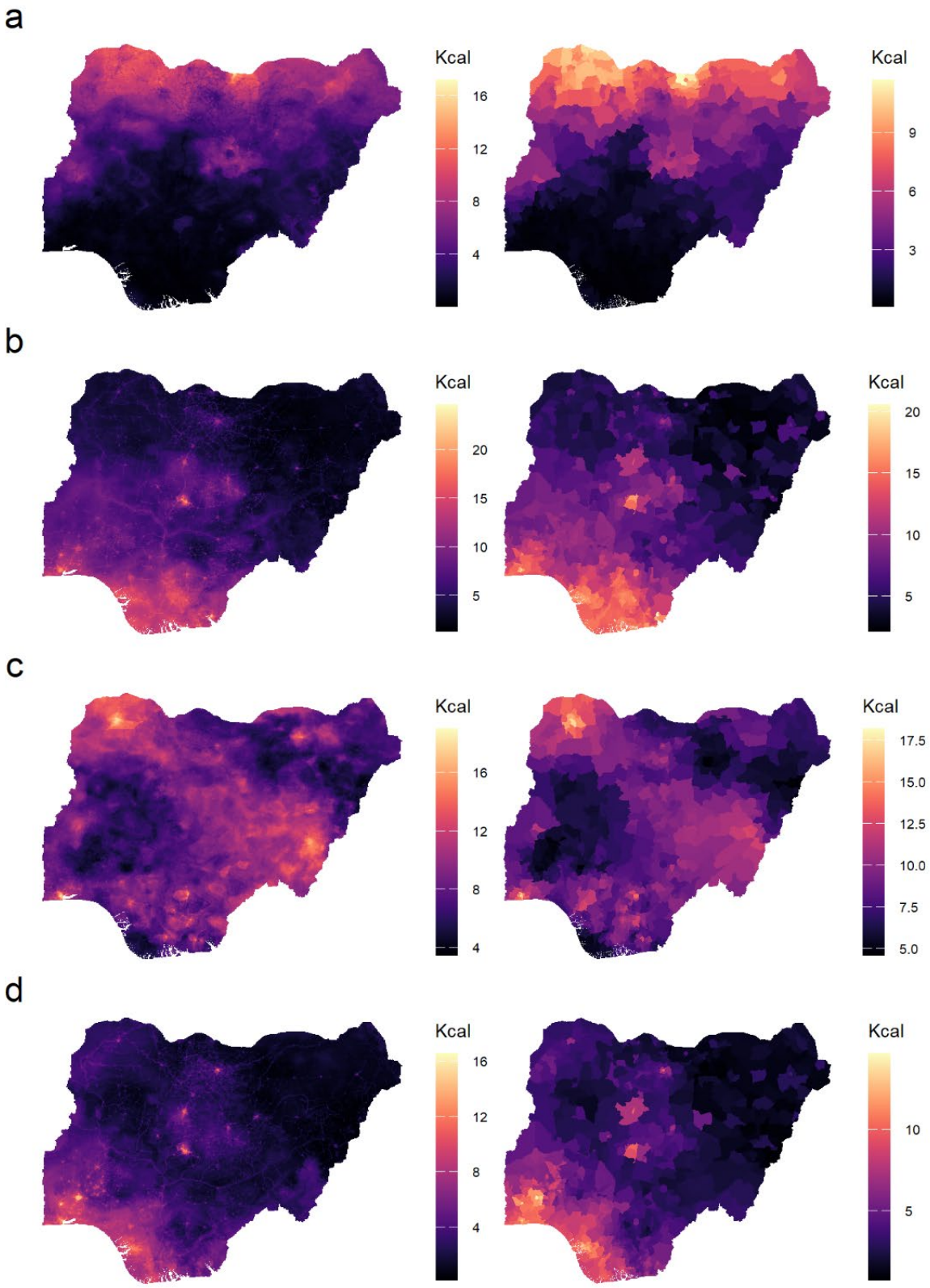
Supplementary Fig. 2: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for roots and tubers 2 (**a**), roots and tubers 3 (**b**), vegetables 1 (**c**), vegetables 2 (**d**).



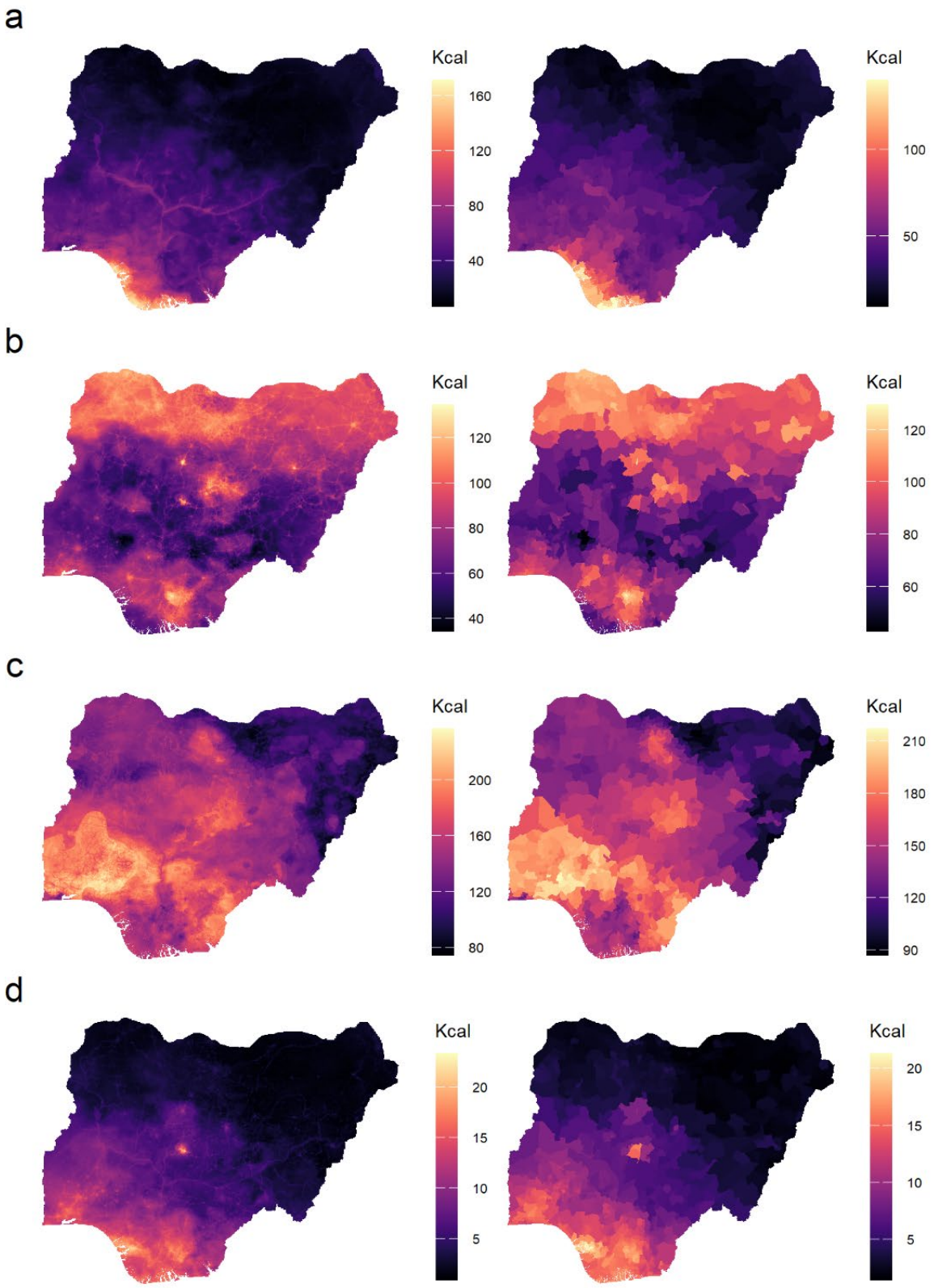
Supplementary Fig. 3: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for vegetables 3 (**a**), fruits 1 (**b**), fruits 2 (**c**), legumes 1 (**d**).



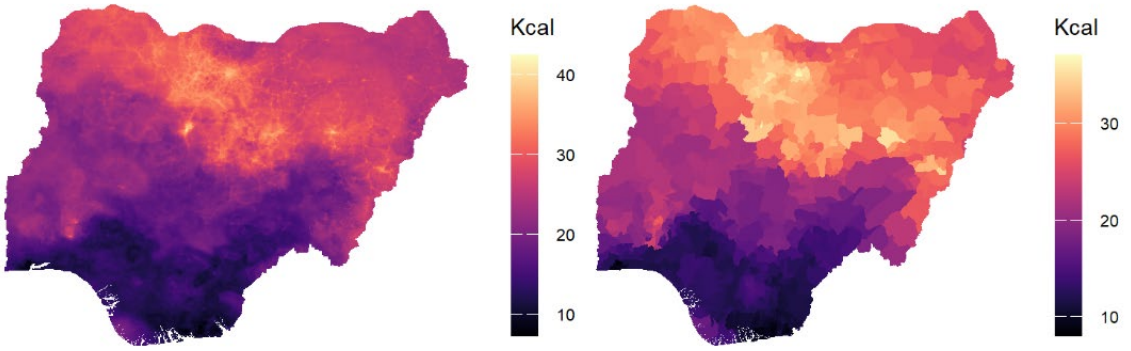
Supplementary Fig. 4: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for legumes 2 (**a**), nuts (**b**), red meat 1 (**c**), red meat 2 (**d**).



Supplementary Fig. 5: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for dairy 1 (**a**), dairy 2 (**b**), poultry (**c**), eggs (**d**).



Supplementary Fig. 6: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for fish (**a**), unsaturated oils (**b**), palm oil (**c**), sweeteners 1 (**d**).



Supplementary Fig. 7: Predicted per capita daily food consumption (kcal) in adult female equivalent (AFE) at 30 arcsecond grid level (**left**) and on local governmental area (LGA) level (**right**) for sweeteners 2

Table 1: Mapping food items to food categories and food groups

Food item	Food category	Food group
GUINEA CORN/SORGHUM	Grains	Grains 1
MILLET	Grains	Grains 1
RICE - LOCAL	Grains	Grains 1
RICE - IMPORTED	Grains	Grains 2
MAIZE FLOUR	Grains	Grains 1
YAM FLOUR	Roots and tubers	Roots and tubers 1
CASSAVA FLOUR	Roots and tubers	Roots and tubers 1
WHEAT FLOUR	Grains	Grains 2
MAIZE (UNSHELLED/ON THE COB)	Grains	Grains 3
MAIZE (SHELLED/OFF THE COB)	Grains	Grains 1
OTHER GRAINS AND FLOUR	Grains	Grains 2
BREAD	Grains	Grains 2
CAKE	Grains	Grains 3
BUNS/POFPOF/DONUTS	Grains	Grains 3
BISCUITS	Grains	Grains 3
MEAT PIE/SAUSAGE ROLL	Grains	Grains 3
CASSAVA - ROOTS	Roots and tubers	Roots and tubers 2
YAM - ROOTS	Roots and tubers	Roots and tubers 1
GARI - WHITE	Roots and tubers	Roots and tubers 1
GARI - YELLOW	Roots and tubers	Roots and tubers 2
COCOYAM	Roots and tubers	Roots and tubers 2
PLANTAINS	Roots and tubers	Roots and tubers 2
SWEET POTATOES	Roots and tubers	Roots and tubers 3
POTATOES	Roots and tubers	Roots and tubers 3
OTHER ROOTS AND TUBER	Roots and tubers	Roots and tubers 2
SOYA BEANS	Legumes	Legumes 2
BROWN BEANS	Legumes	Legumes 1
WHITE BEANS	Legumes	Legumes 2
GROUNDNUTS (UNSHELLED)	Nuts	Nuts
GROUNDNUTS (SHELLED)	Nuts	Nuts
OTHER NUTS/SEEDS/PULSES	Nuts	Nuts
COCONUT	Nuts	Nuts
KOLA NUT	Excluded	Excluded
CASHEW NUT	Nuts	Nuts
PALM OIL	Palm oil	Palm oil
BUTTER/ MARGARINE	Dairy	Dairy 2
GROUNDNUTS OIL	Unsaturated oils	Unsaturated oils
OTHER OIL AND FAT	Unsaturated oils	Unsaturated oils
ANIMAL FAT	Red meat	Red meat 2
BANANAS	Fruits	Fruits 1

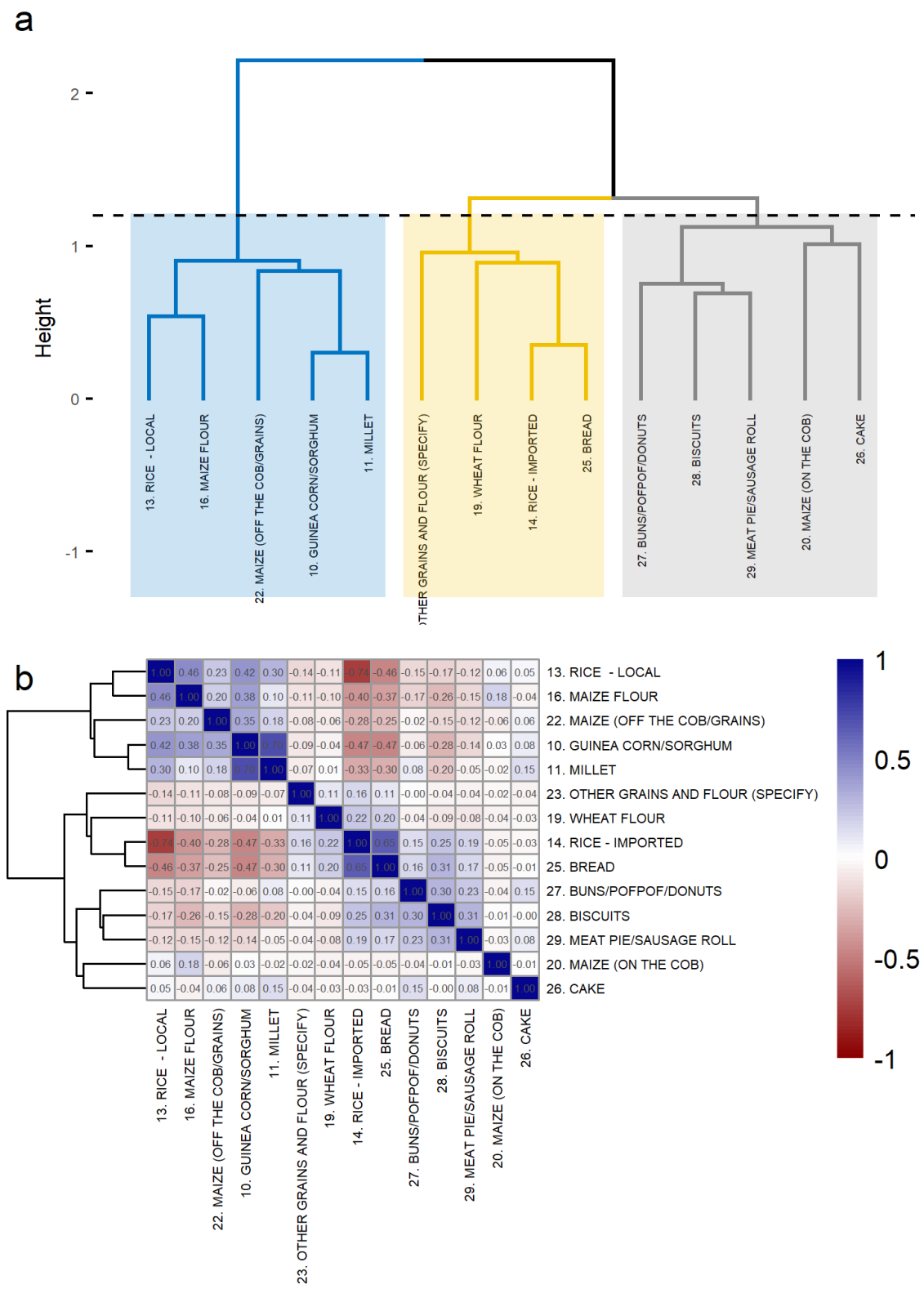
Table 1: Mapping food items to food categories and food groups, continued

Food item	Food category	Food group
ORANGE/TANGERINE	Fruits	Fruits 2
MANGOES	Fruits	Fruits 2
AVOCADO PEAR	Fruits	Fruits 2
PINEAPPLES	Fruits	Fruits 1
FRUIT CANNED	Fruits	Fruits 2
OTHER Fruits	Fruits	Fruits 2
PAWPAW	Fruits	Fruits 1
WATERMELON	Fruits	Fruits 2
APPLES	Fruits	Fruits 2
TOMATOES	Vegetables	Vegetables 3
TOMATO PUREE (CANNED)	Vegetables	Vegetables 2
ONIONS	Vegetables	Vegetables 3
GARDEN Eggs/EGG PLANT	Vegetables	Vegetables 2
OKRA - FRESH	Vegetables	Vegetables 3
OKRA - DRIED	Vegetables	Vegetables 1
FRESH PEPPER	Vegetables	Vegetables 3
DRY PEPPER	Excluded	Excluded
LEAVES (COCOYAM, SPINACH, ETC.	Vegetables	Vegetables 3
OTHER Vegetables (FRESH OR CAN	Vegetables	Vegetables 1
CHICKEN	Poultry	Poultry
DUCK	Poultry	Poultry
OTHER DOMESTIC POULTRY	Poultry	Poultry
AGRICULTURAL Eggs	Eggs	Eggs
LOCAL Eggs	Eggs	Eggs
BEEF	Red meat	Red meat 2
MUTTON	Red meat	Red meat 1
PORK	Red meat	Red meat 2
GOAT	Red meat	Red meat 1
WILD GAME/BUSH MEAT	Red meat	Red meat 2
CANNED BEEF/CORNED BEEF	Red meat	Red meat 2
OTHER MEAT (EXCL. POULTRY)	Red meat	Red meat 2
4400. Fish - FRESH	Fish	Fish
4400. Fish - FROZEN	Fish	Fish
4400. Fish - SMOKED	Fish	Fish
4400. Fish - DRIED	Fish	Fish
SNAILS	Fish	Fish
SEAFOOD (LOBSTER, CRAB, PRAWNS	Fish	Fish
CANNED Fish/SEAFOOD	Fish	Fish
OTHER Fish OR SEAFOOD	Fish	Fish
FRESH MILK	Dairy	Dairy 1

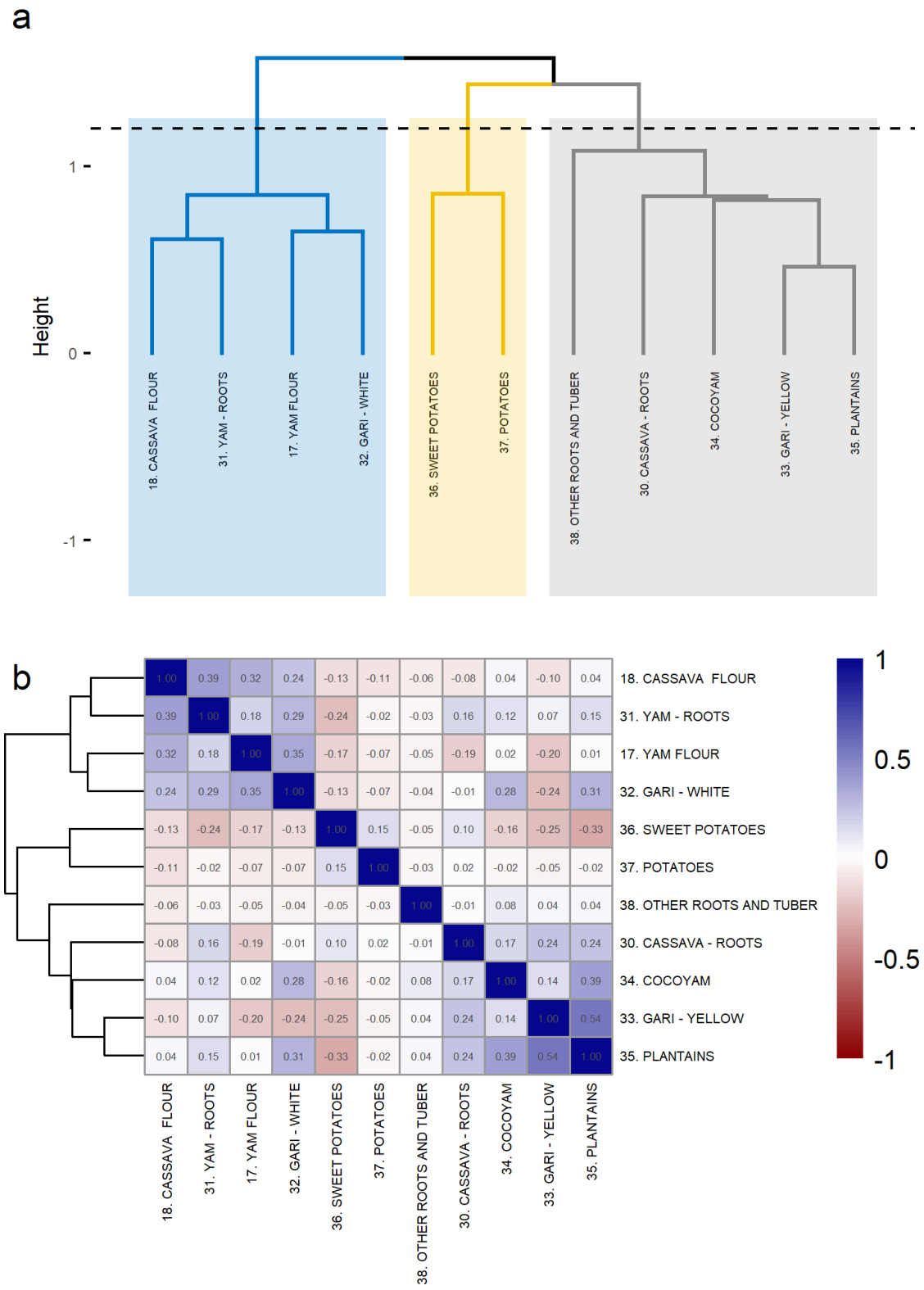
Table 1: Mapping food items to food categories and food groups, continued

Food item	Food category	Food group
MILK POWDER	Dairy	Dairy 2
BABY MILK POWDER	Dairy	Dairy 2
MILK TINNED (UNSWEETENED)	Dairy	Dairy 2
CHEESE (WARA)	Dairy	Dairy 1
OTHER MILK PRODUCTS	Dairy	Dairy 2
COFFEE	Excluded	Excluded
CHOCOLATE DRINKS (INCLUDING MI	Sweeteners	Sweeteners 1
TEA	Excluded	Excluded
SUGAR	Sweeteners	Sweeteners 2
HONEY	Sweeteners	Sweeteners 2
OTHER SWEETS AND CONFECTIONARY	Sweeteners	Sweeteners 2
CONDIMENTS (SALT, SPICES, PEPP	Excluded	Excluded
SALT	Excluded	Excluded
UNGROUND OGBONO	Nuts	Nuts
GROUND OGBONO	Nuts	Nuts
GROUND PEPPER	Excluded	Excluded
MELON (SHELLED)	Nuts	Nuts
MELON (UNSHELLED)	Nuts	Nuts
MELLON (GROUND)	Nuts	Nuts
OTHER SPICES	Excluded	Excluded
BOTTLED WATER	Excluded	Excluded
SACHET WATER	Excluded	Excluded
MALT DRINKS	Excluded	Excluded
SOFT DRINKS (COCA COLA, SPIRIT	Sweeteners	Sweeteners 1
FRUIT JUICE CANNED/PACK	Sweeteners	Sweeteners 1
OTHER NON-AlcoholIC DRINKS	Excluded	Excluded
BEER (LOCAL AND IMPORTED)	Excluded	Excluded
PALM WINE	Excluded	Excluded
PITO	Excluded	Excluded
GIN	Excluded	Excluded
OTHER AlcoholIC BEVERAGES	Excluded	Excluded
GUAVA	Fruits	Fruits 1

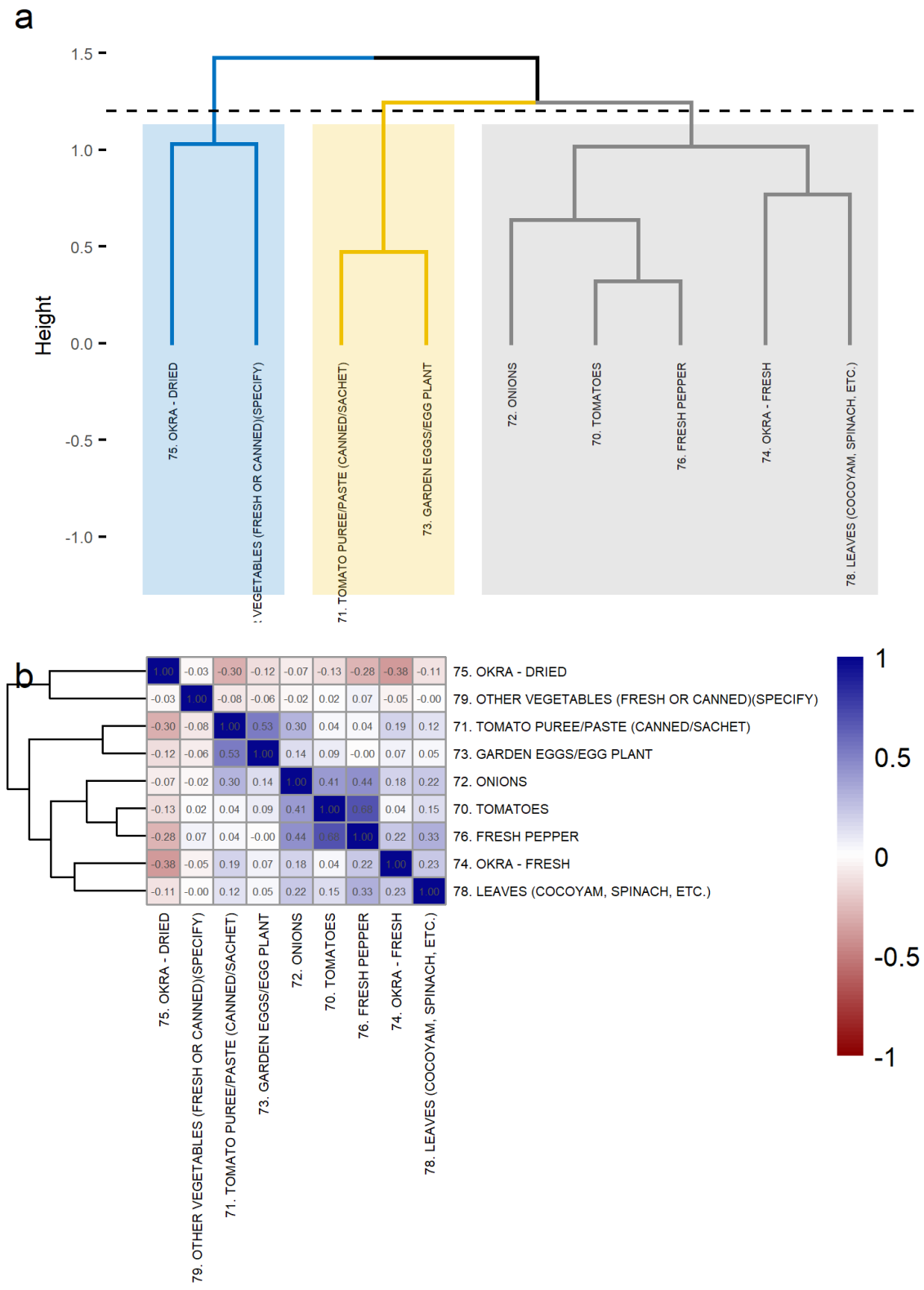
Note: Of the more than 160 food items, consumption values were reported for 112 food items. Food items not falling in the EAT-Lancet food categories[1] were excluded from this analysis such as non-sweetened beverages (e.g. tea, coffee and bottled water), alcoholic drinks and condiments. This resulted in 95 food items were included in this analysis.



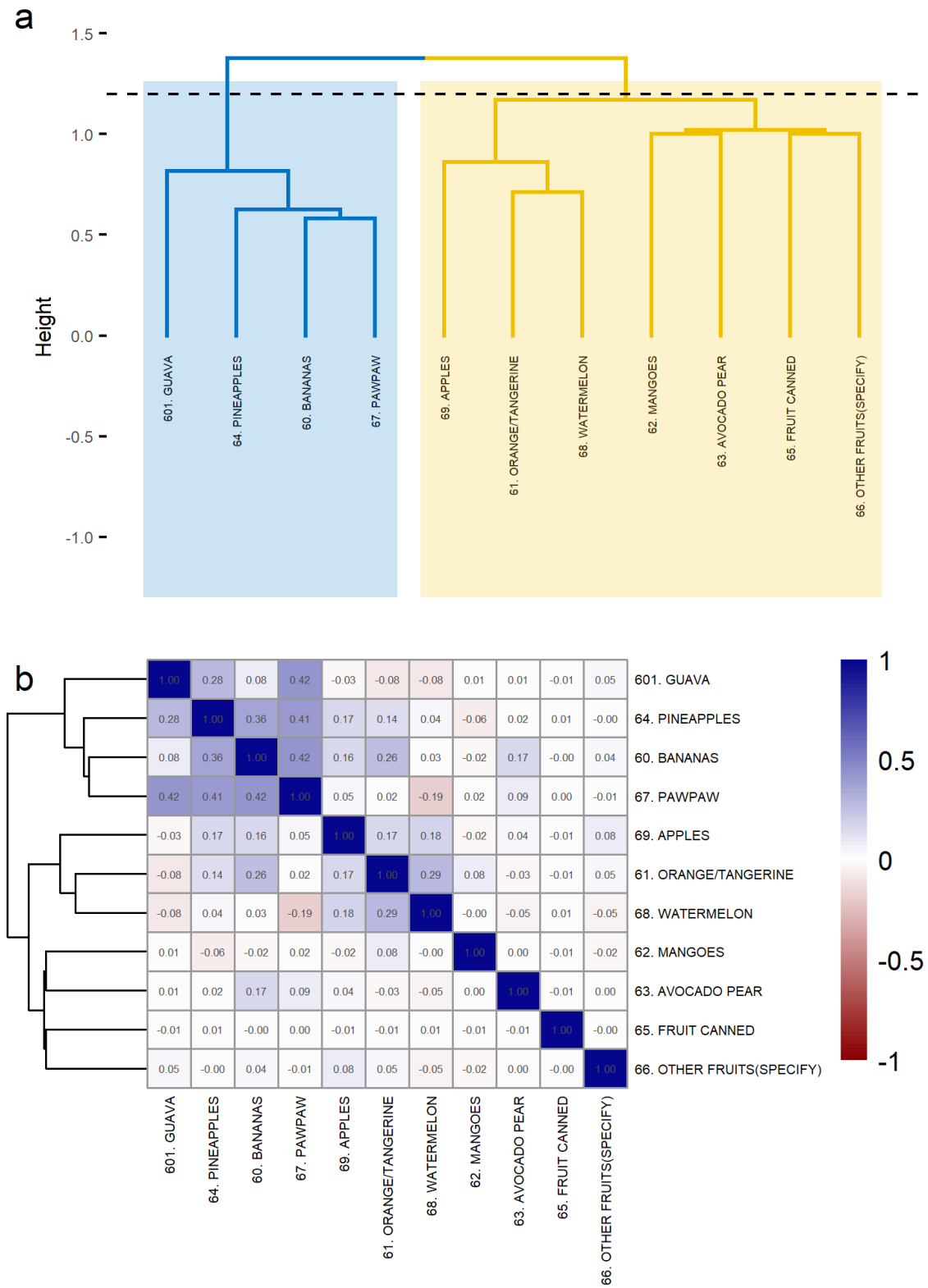
Supplementary Fig. 8: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for cereals. **b,** Heat maps based on the pairwise Pearson's correlation between food items for cereals.



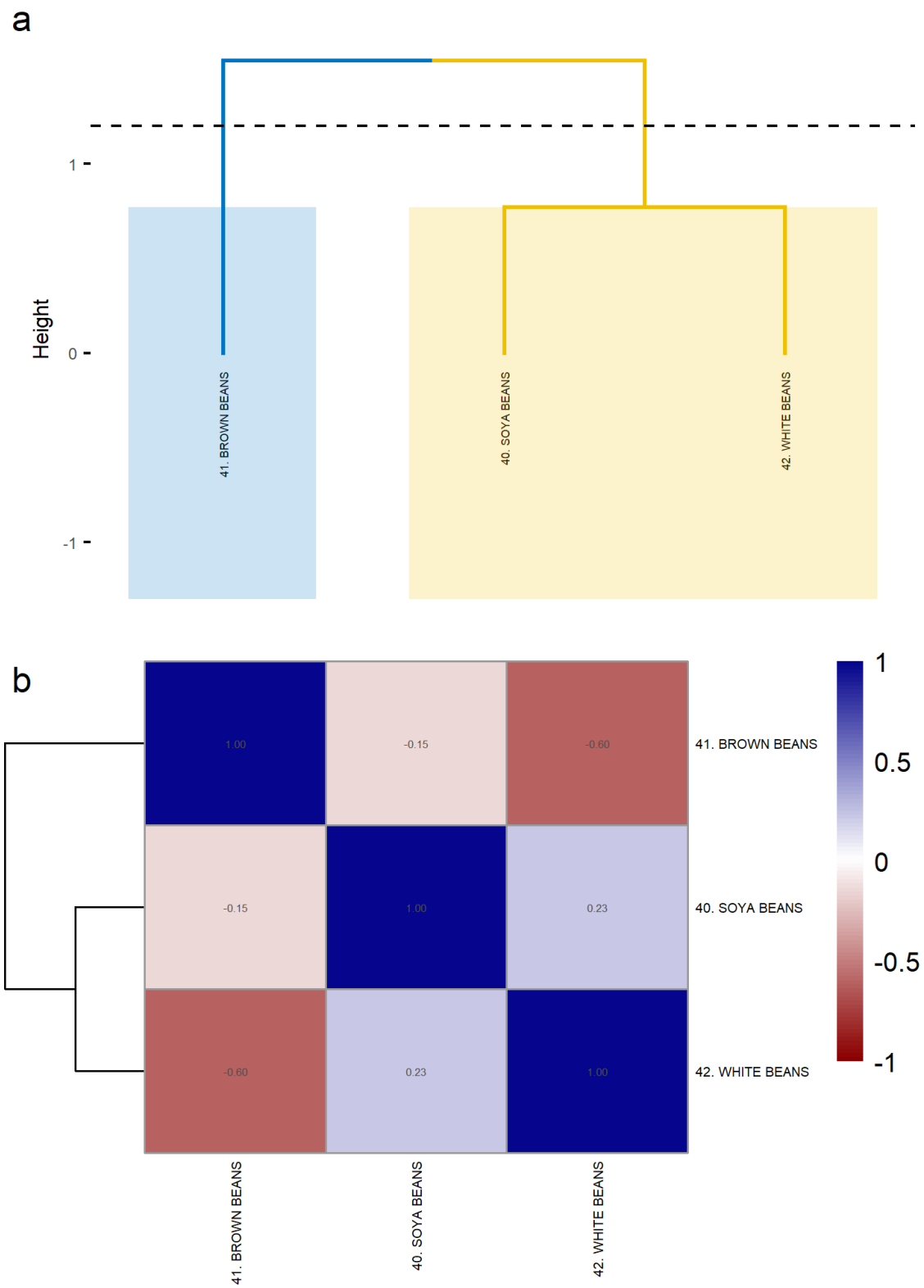
Supplementary Fig. 9: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for roots and tubers. **b,** Heat maps based on the pairwise Pearson's correlation between food items for roots and tubers.



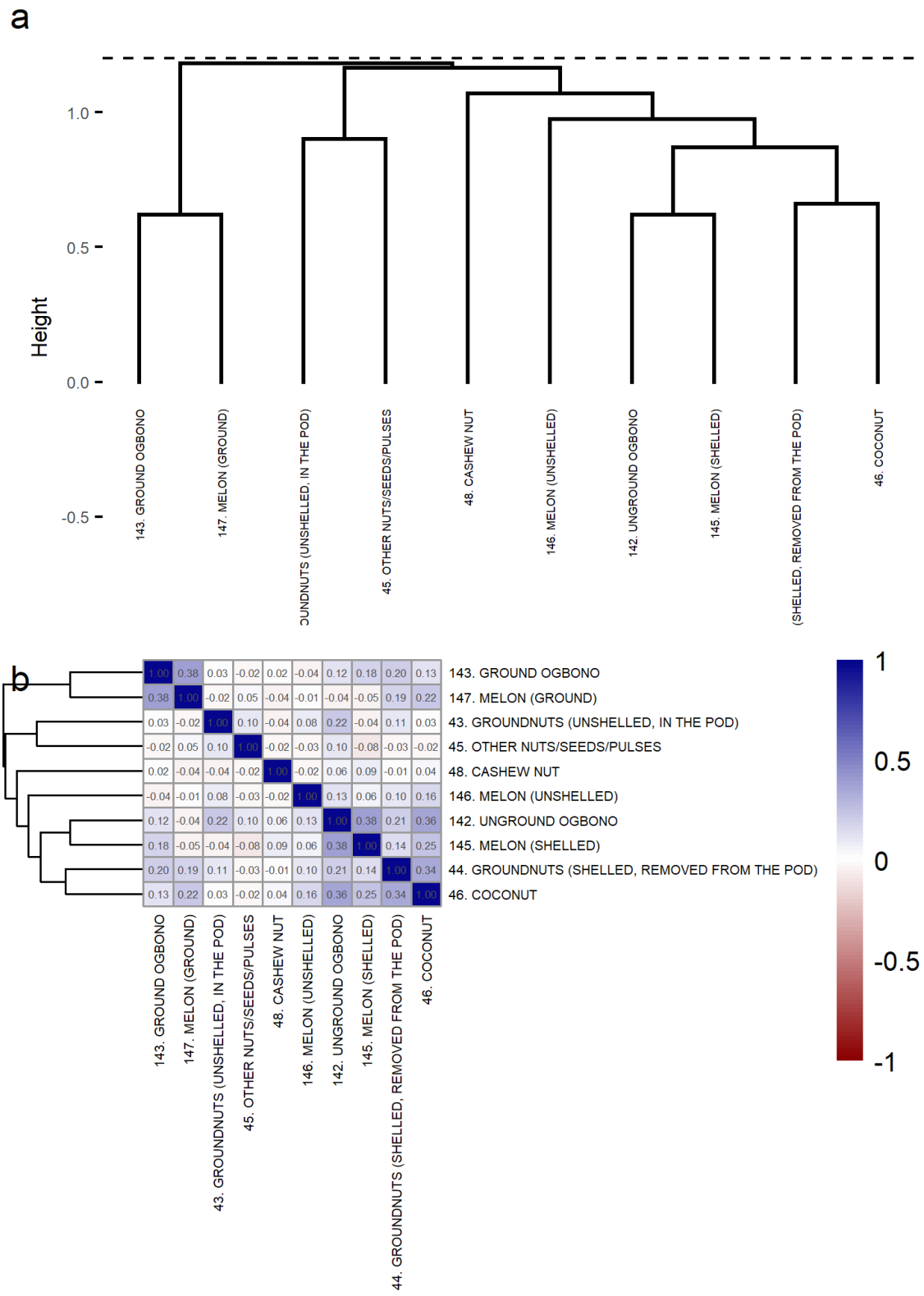
Supplementary Fig. 10: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for vegetables. **b,** Heat maps based on the pairwise Pearson's correlation between food items for vegetables.



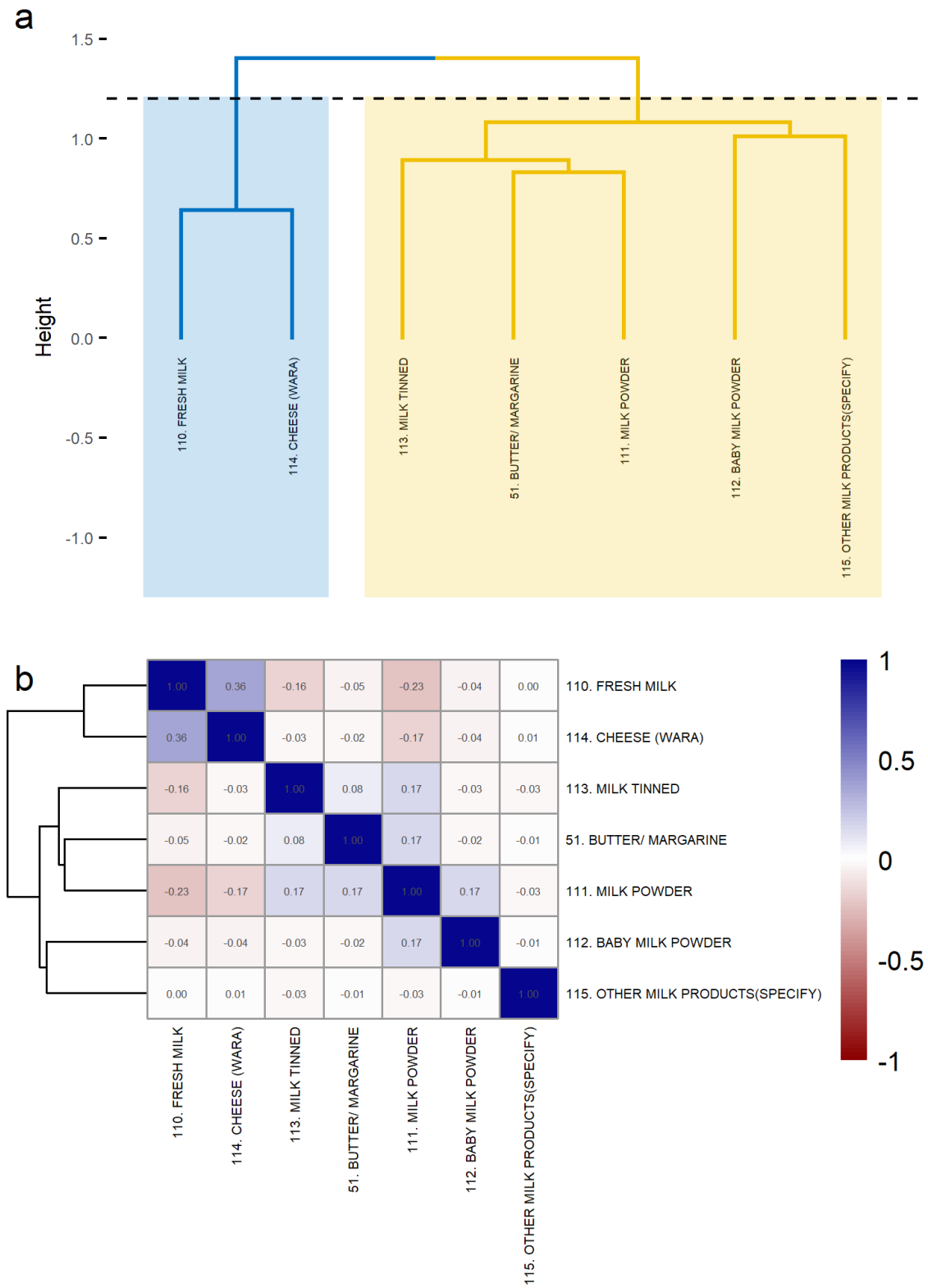
Supplementary Fig. 11: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for fruits. **b,** Heat maps based on the pairwise Pearson's correlation between food items for fruits.



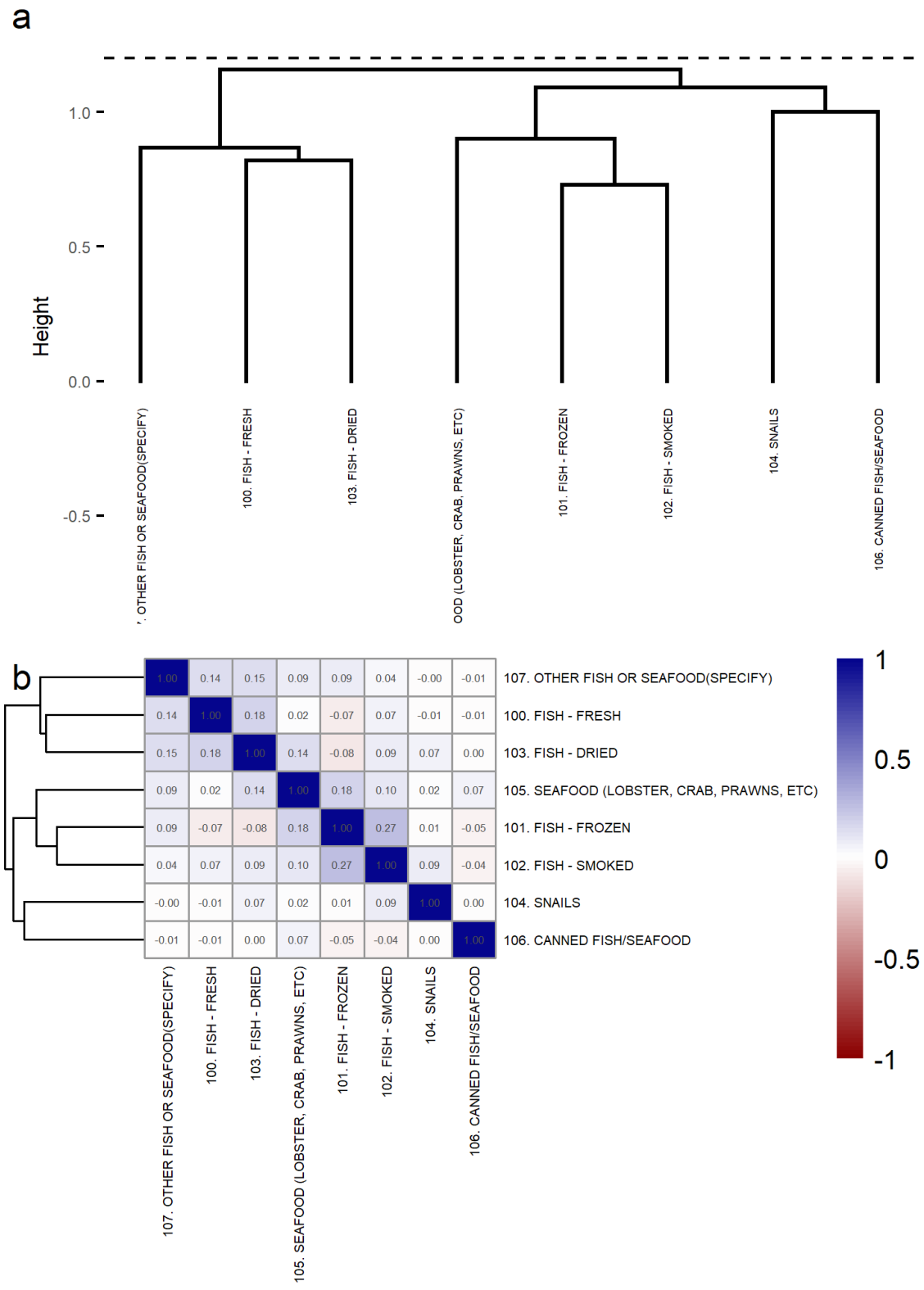
Supplementary Fig. 12: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for legumes. **b,** Heat maps based on the pairwise Pearson's correlation between food items for legumes.



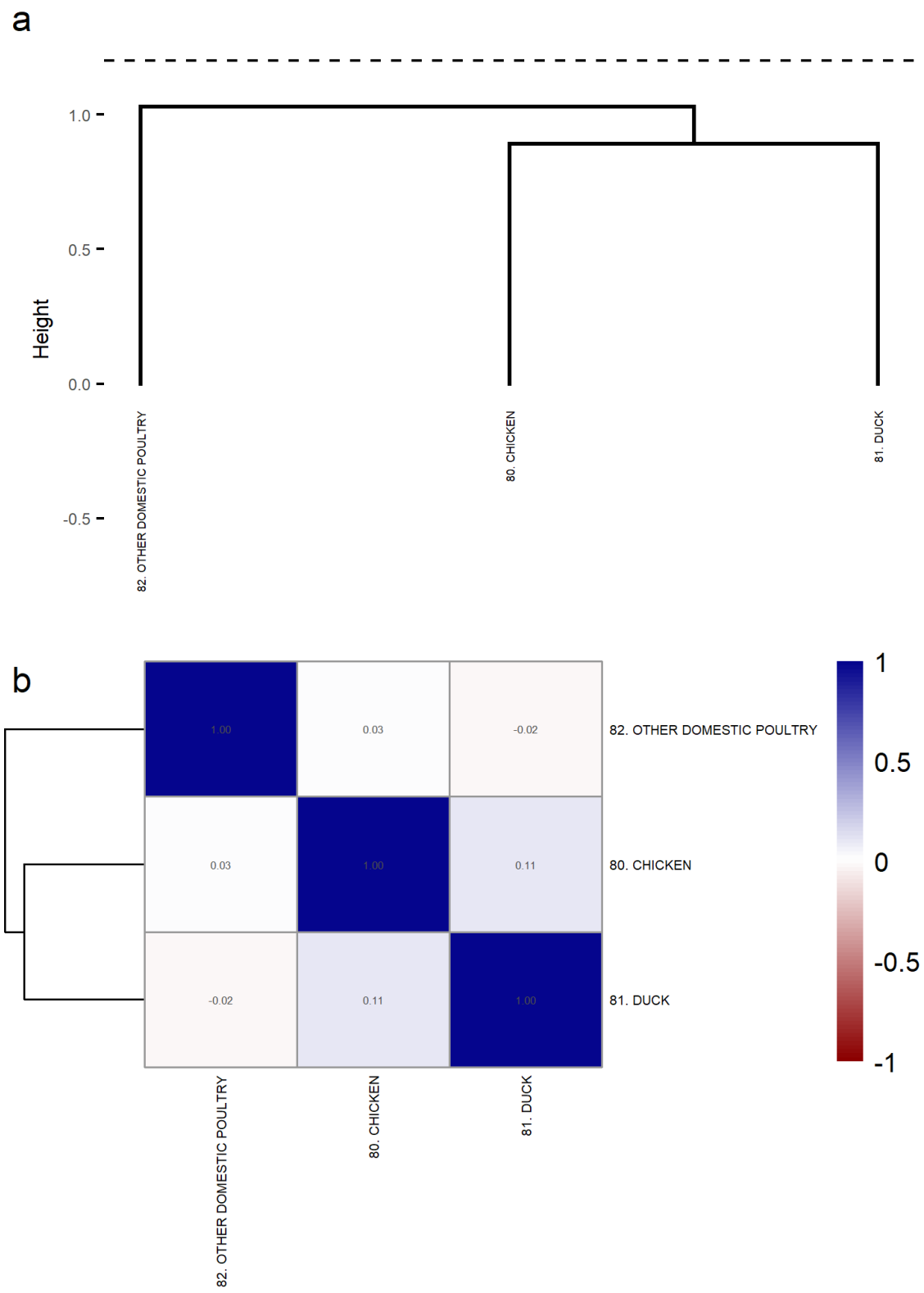
Supplementary Fig. 13: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for nuts. **b,** Heat maps based on the pairwise Pearson's correlation between food items for nuts.



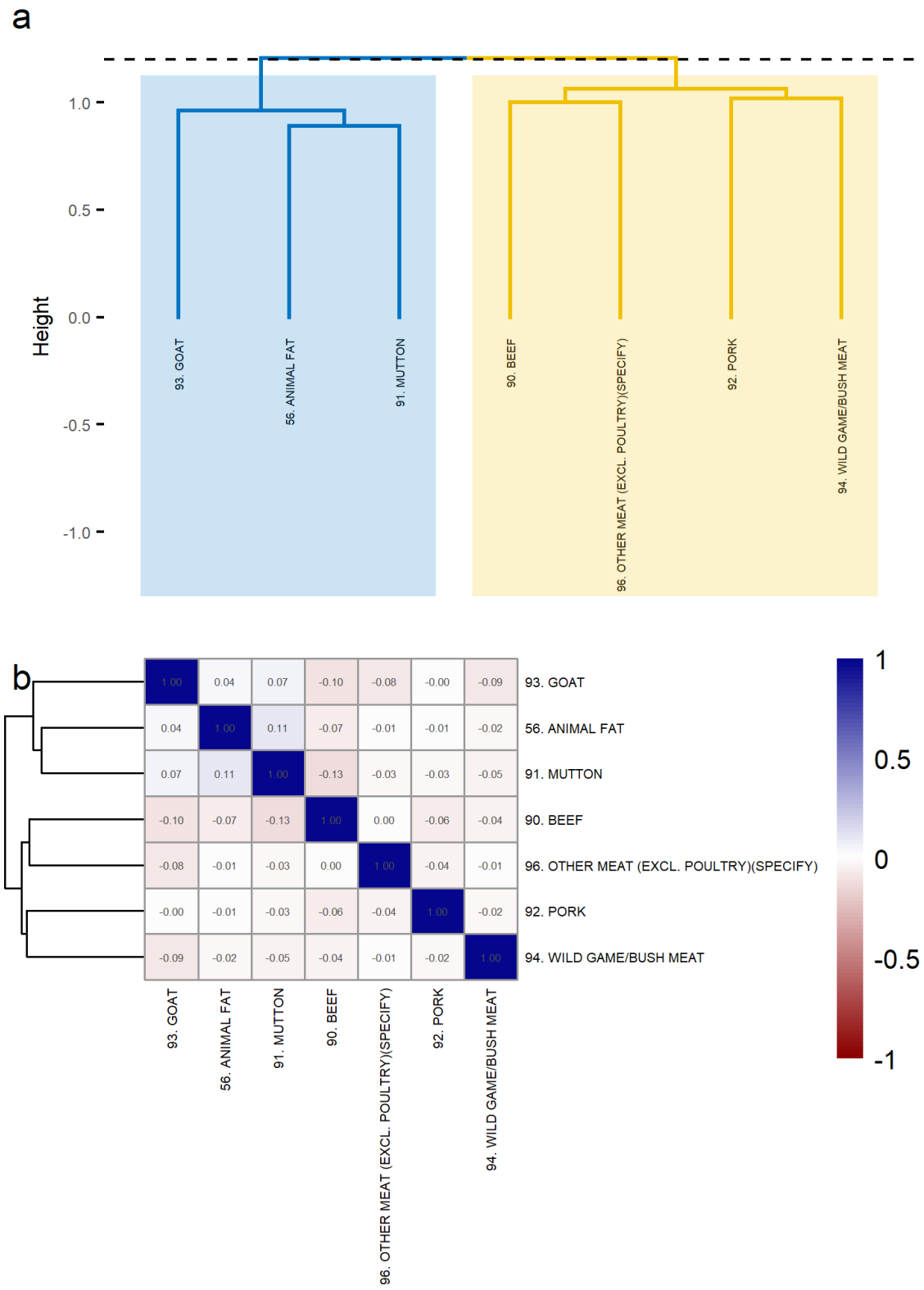
Supplementary Fig. 14: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for dairy. **b,** Heat maps based on the pairwise Pearson's correlation between food items for dairy.



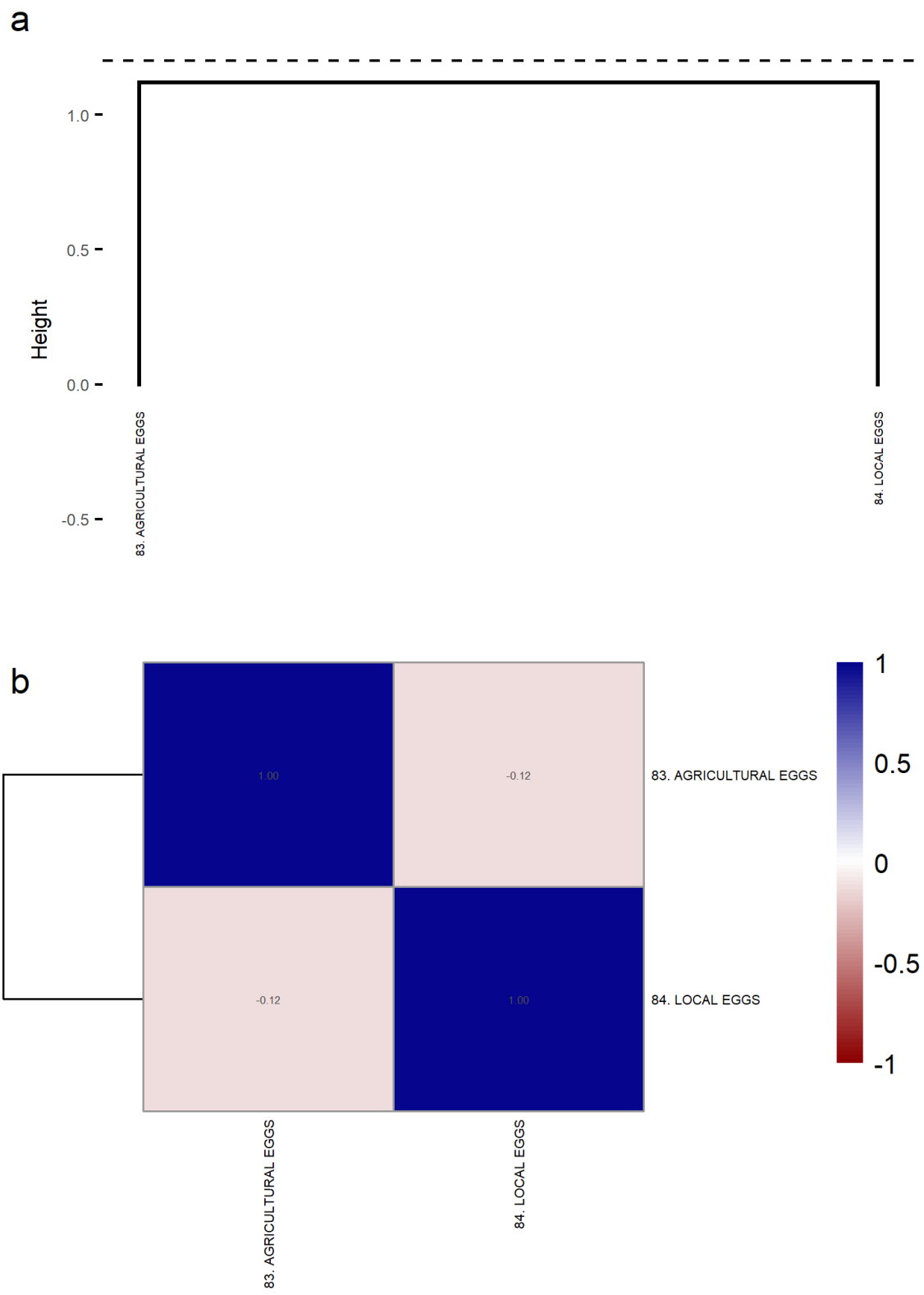
Supplementary Fig. 15: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for fish. **b,** Heat maps based on the pairwise Pearson's correlation between food items for fish.



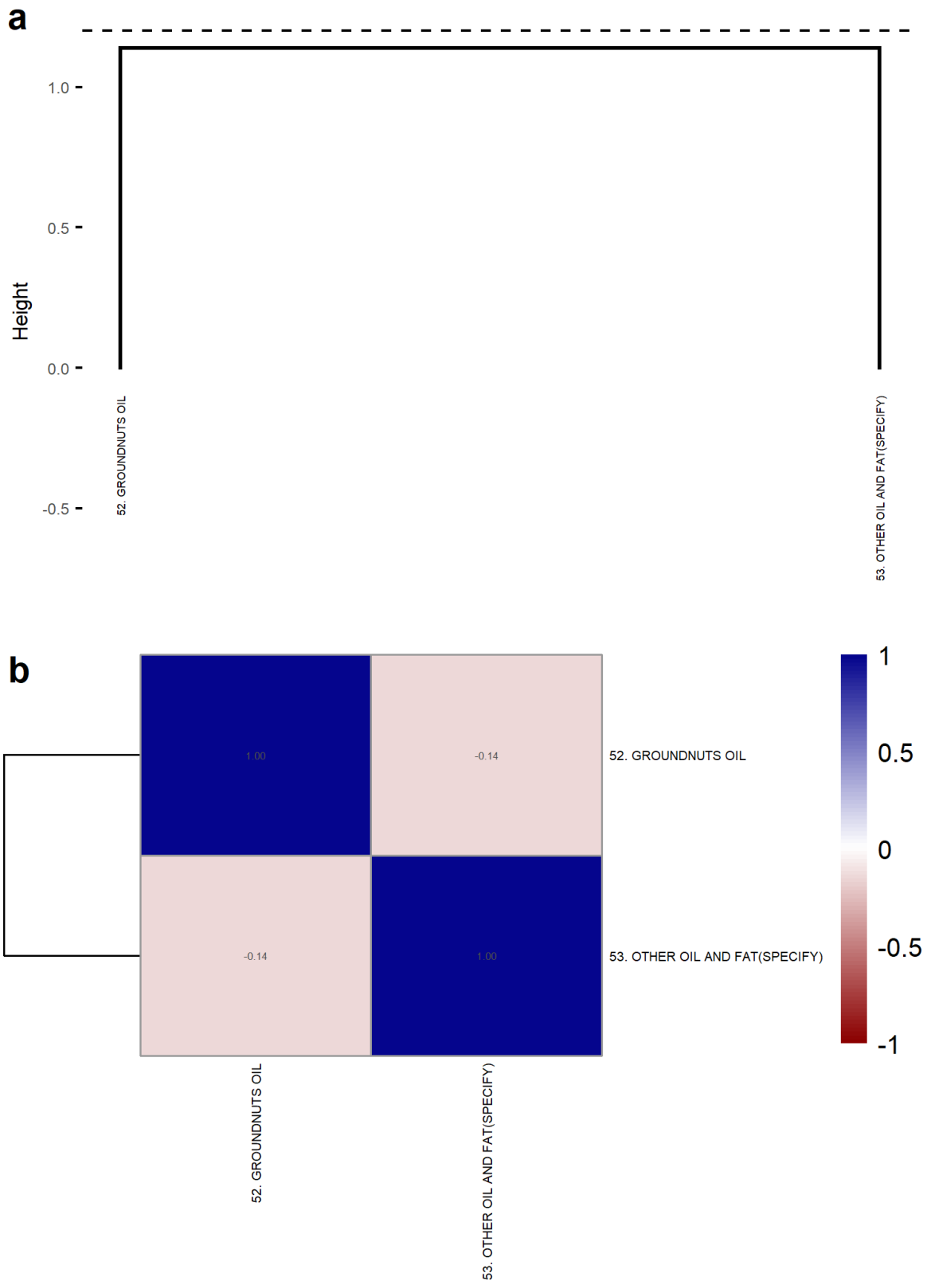
Supplementary Fig. 16: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for poultry. **b,** Heat maps based on the pairwise Pearson's correlation between food items for poultry.



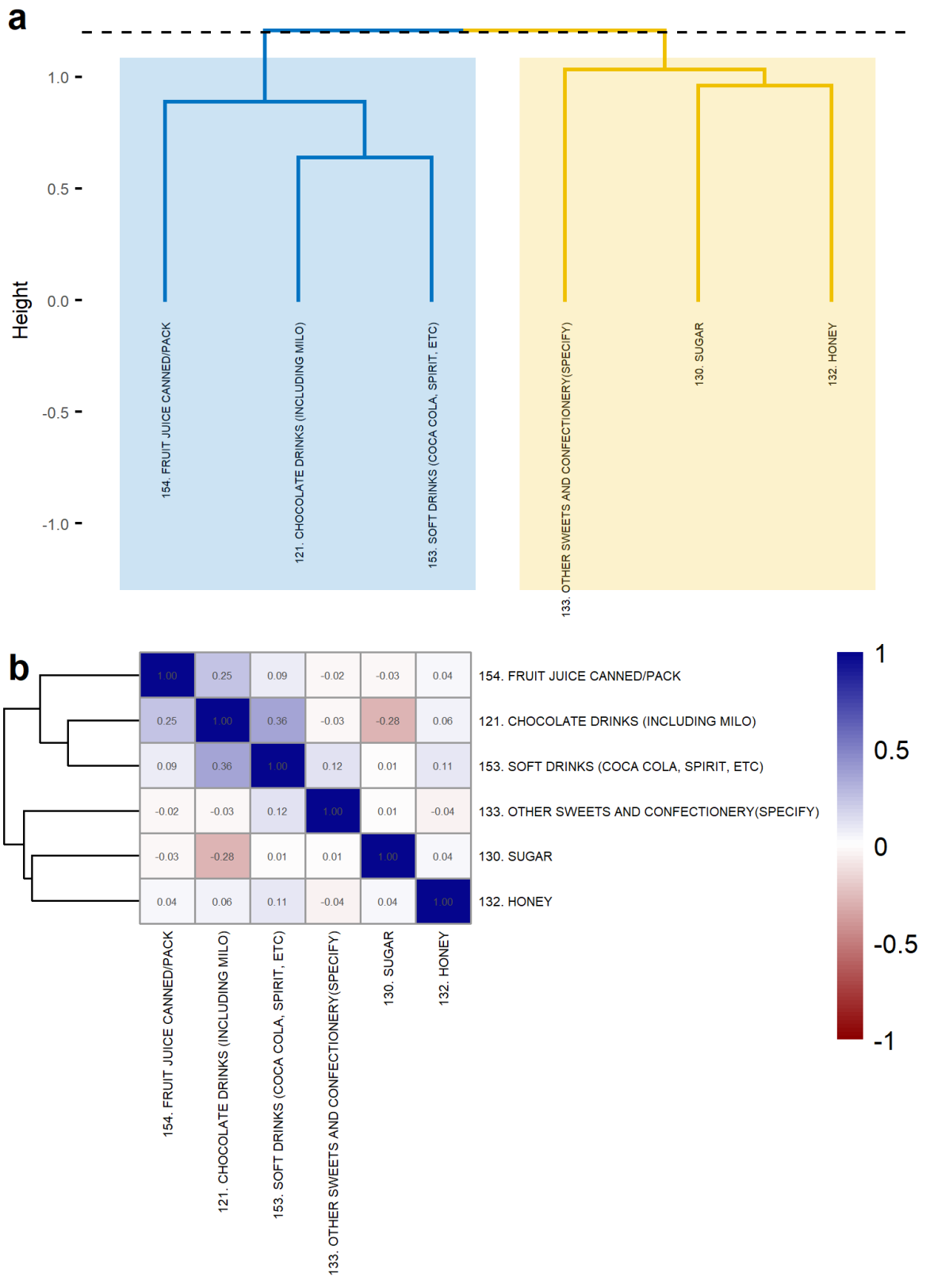
Supplementary Fig. 17: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for red meat. **b,** Heat maps based on the pairwise Pearson's correlation between food items for red meat.



Supplementary Fig. 18: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for eggs. **b,** Heat maps based on the pairwise Pearson's correlation between food items for eggs.



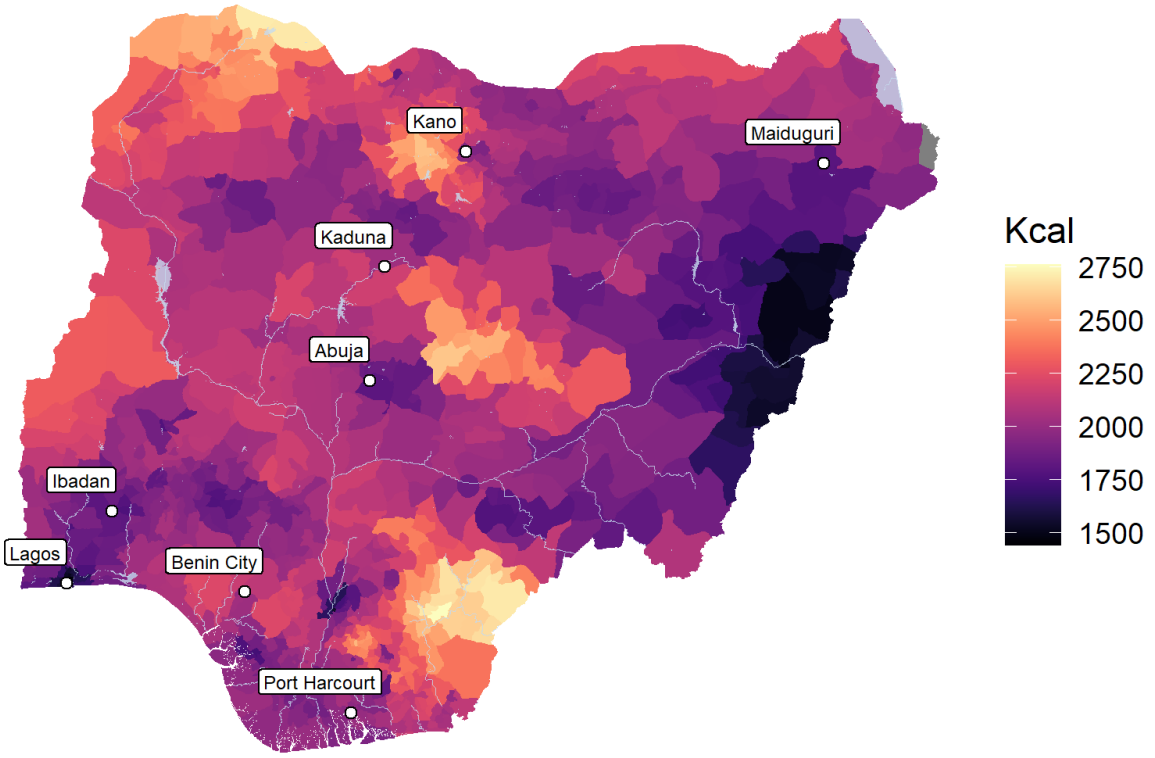
Supplementary Fig. 19: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for unsaturated oils. **b,** Heat maps based on the pairwise Pearson's correlation between food items for unsaturated oils.



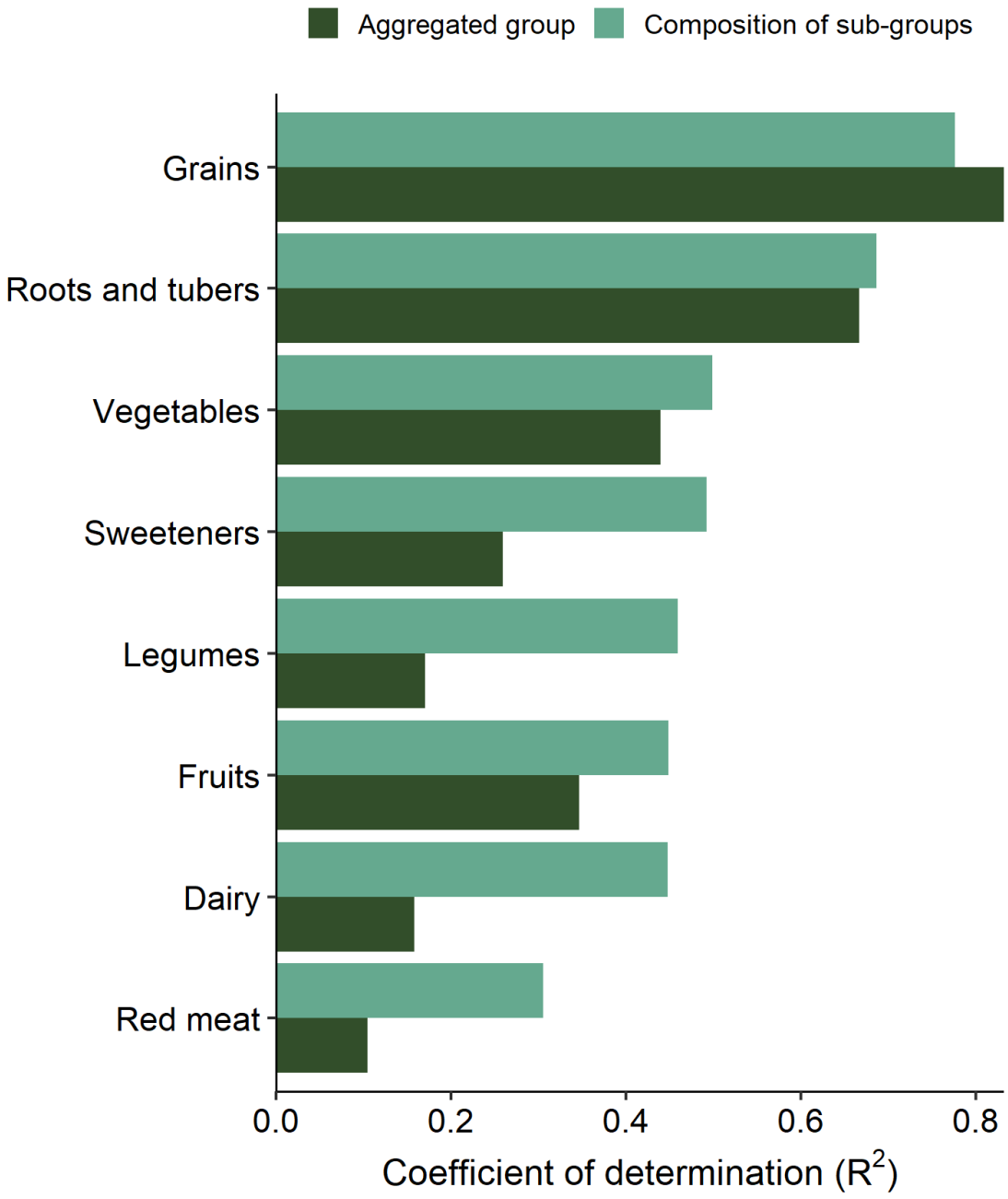
Supplementary Fig. 20: **a**, Dendrogram based on Ward's minimum variance method using the used the pairwise Pearson's correlation between the food items as a distance measure with a cut-off point of 1.2 clustering height for sweeteners. **b,** Heat maps based on the pairwise Pearson's correlation between food items for sweeteners.

Table 2: Model performance (R^2) and the percentage of total kcal consumption (%) of the analysed 25 food groups, categorised under 14 EAT-Lancet food categories.

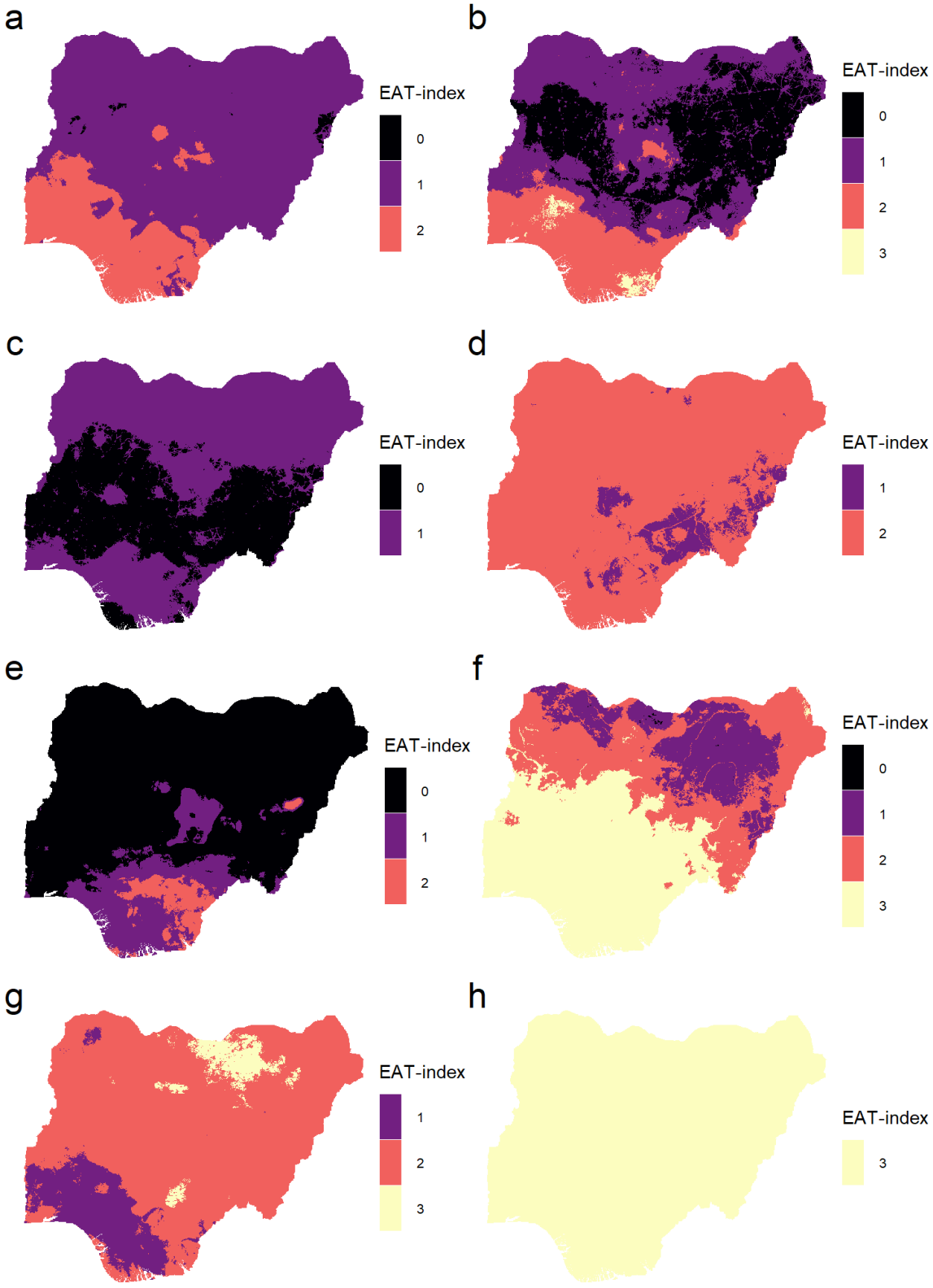
Food category	Food group	R^2	Percentage of total kcal consumption (%)
Dairy	Dairy 1	0.52	0.04
Dairy	Dairy 2	0.44	0.79
Eggs	Eggs	0.39	0.5
Fish	Fish	0.61	2.71
Fruits	Fruits 1	0.56	1.88
Fruits	Fruits 2	0.31	1.53
Grains	Grains 1	0.88	13.46
Grains	Grains 2	0.72	17.71
Grains	Grains 3	0.1	0.49
Legumes	Legumes 1	0.42	4.32
Legumes	Legumes 2	0.51	3.63
Nuts	Nuts	0.59	2.48
Palm oil	Palm oil	0.42	8.37
Poultry	Poultry	0.13	0.67
Red meat	Red meat 1	0.34	0.19
Red meat	Red meat 2	0.3	2.18
Roots and tubers	Roots and tubers 1	0.74	20.28
Roots and tubers	Roots and tubers 2	0.58	9.32
Roots and tubers	Roots and tubers 3	0.43	0.58
Sweeteners	Sweeteners 1	0.49	0.69
Sweeteners	Sweeteners 2	0.5	0.93
Unsaturated oils	Unsaturated oils	0.42	5.46
Vegetables	Vegetables 1	0.39	0.05
Vegetables	Vegetables 2	0.72	0.17
Vegetables	Vegetables 3	0.48	1.57



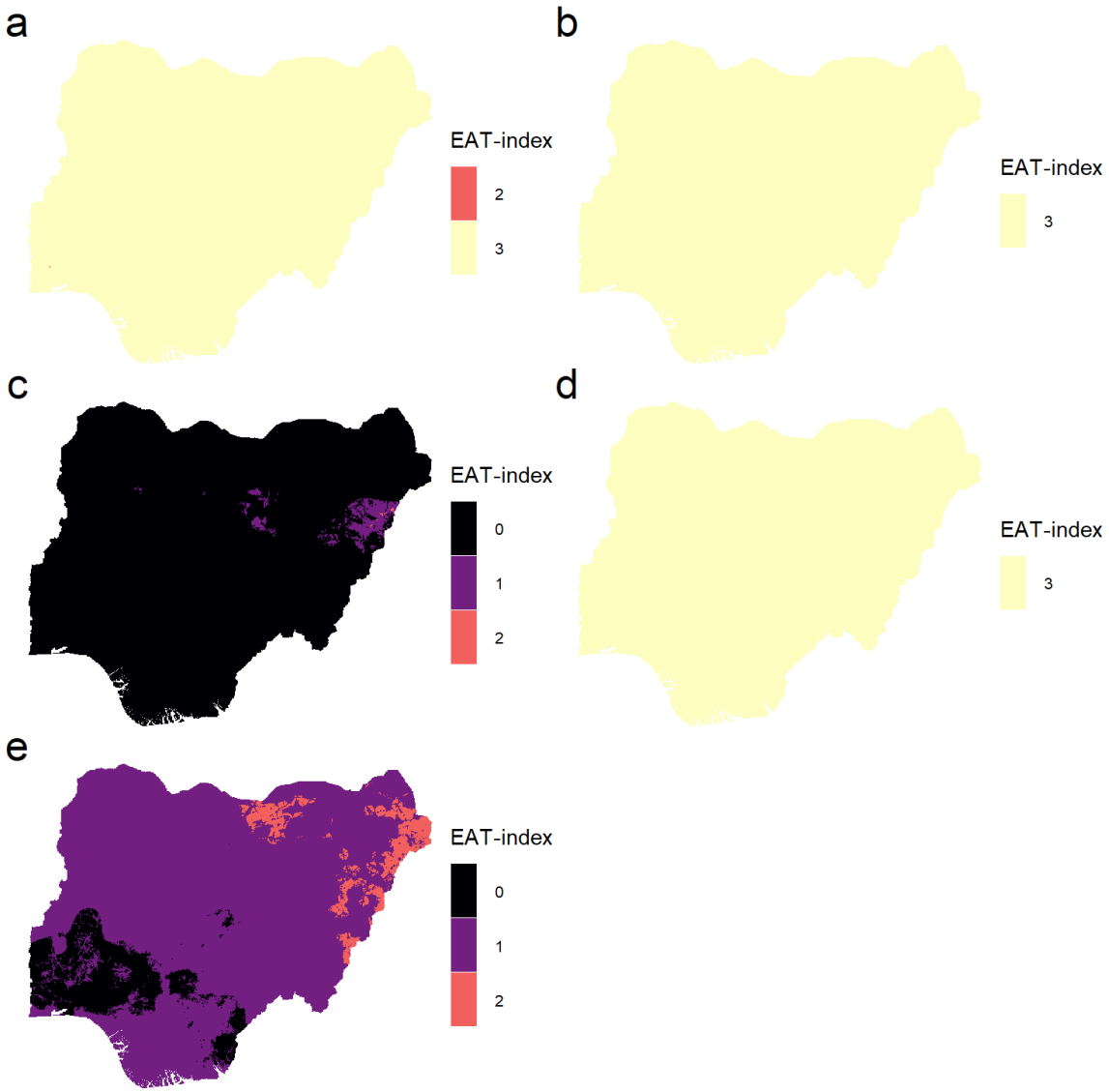
Supplementary Fig. 21: The sum of the predicted daily per capita energy (kcal) consumption (AFE) of the 25 food (sub)groups at local governmental area (LGA), which are administrative level 2 units.



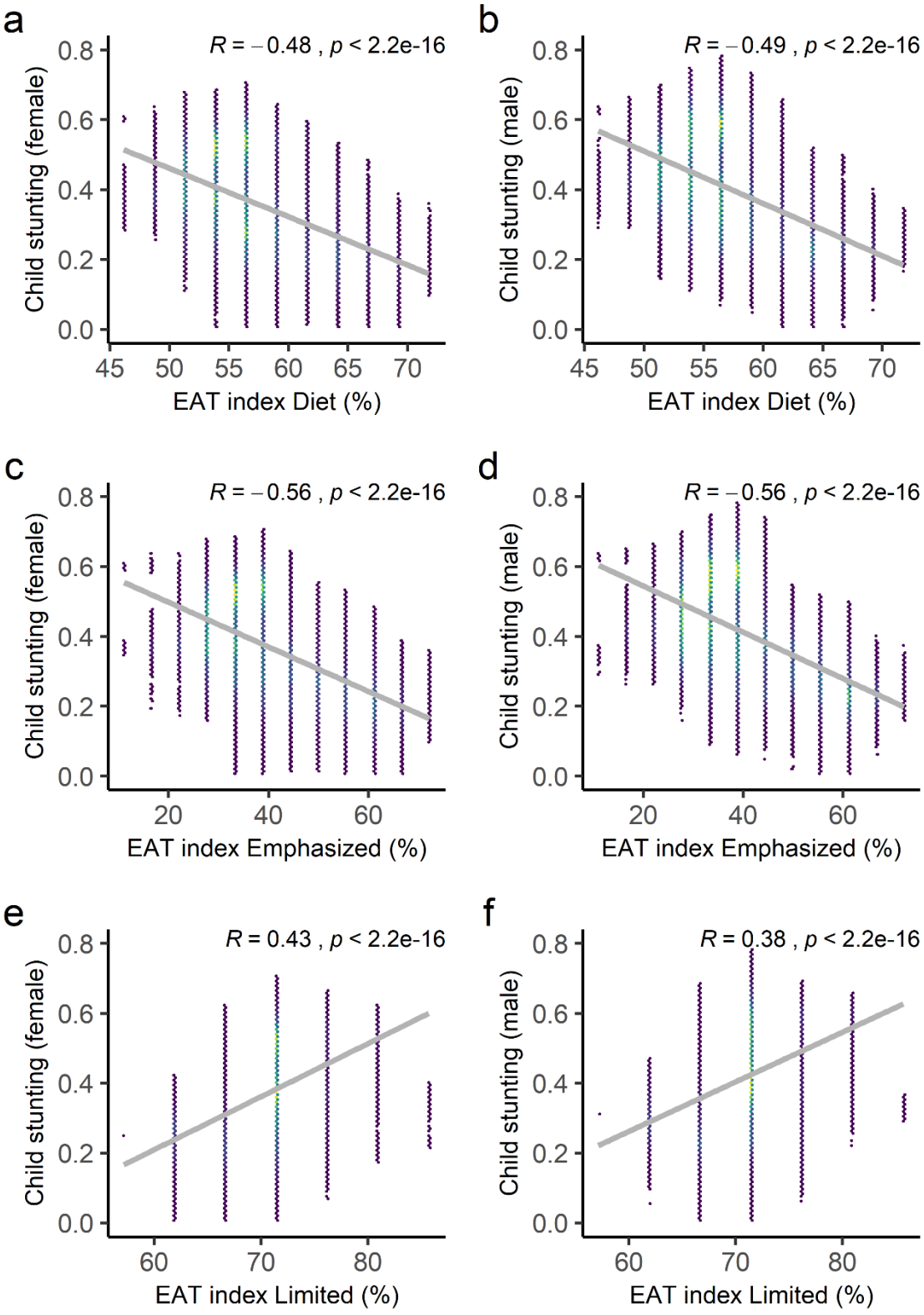
Supplementary Fig. 22: Comparison of the model performance of the weighted mean of the coefficient of determination (R^2) of the sub-food groups and of the food group directly. For the eight food groups grains, root and tubers, vegetables, sweeteners, legumes, fruits, dairy and red meat the weighted mean of the coefficient of determination of the sub-food groups were taken. For the weights, the mean kcal consumption of the sub-food groups was used. The subdivision of these eight food groups into two or more sub-groups was the result of the conducted hierarchical cluster analysis on the 14 major food groups (Supplementary Fig. 8-20). The model performance is compared with the model runs of the direct food groups.



Supplementary Fig. 23: EAT-Lancet (EAT) index at grid level (30 arcsecond) for vegetables (**a**), fruits (**b**), unsaturated oils (**c**), legumes (**d**), nuts (**e**), fish (**f**), red meat (**g**), poultry (**h**). Per food group the score ranges from 0 to 3 (See Supplementary Table 4).



Supplementary Fig. 24: EAT-Lancet (EAT) index at grid level (30 arcsecond) for eggs (**a**), dairy (**b**), roots and tubers (**c**), sweeteners (**d**), palm oil (**e**). Per food group the score ranges from 0 to 3 (See Supplementary Table 4).



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138 Supplementary Fig. 25: Scatterplot of proportion of female (**a,c,e**) and male children (**b,d,f**) under 5
139 years of age classified as stunted from [2] versus the EAT-Lancet Index of the overall diet (**a,b**), the
140 emphasized food group (**c,d**), and the limited food groups (**e,f**).

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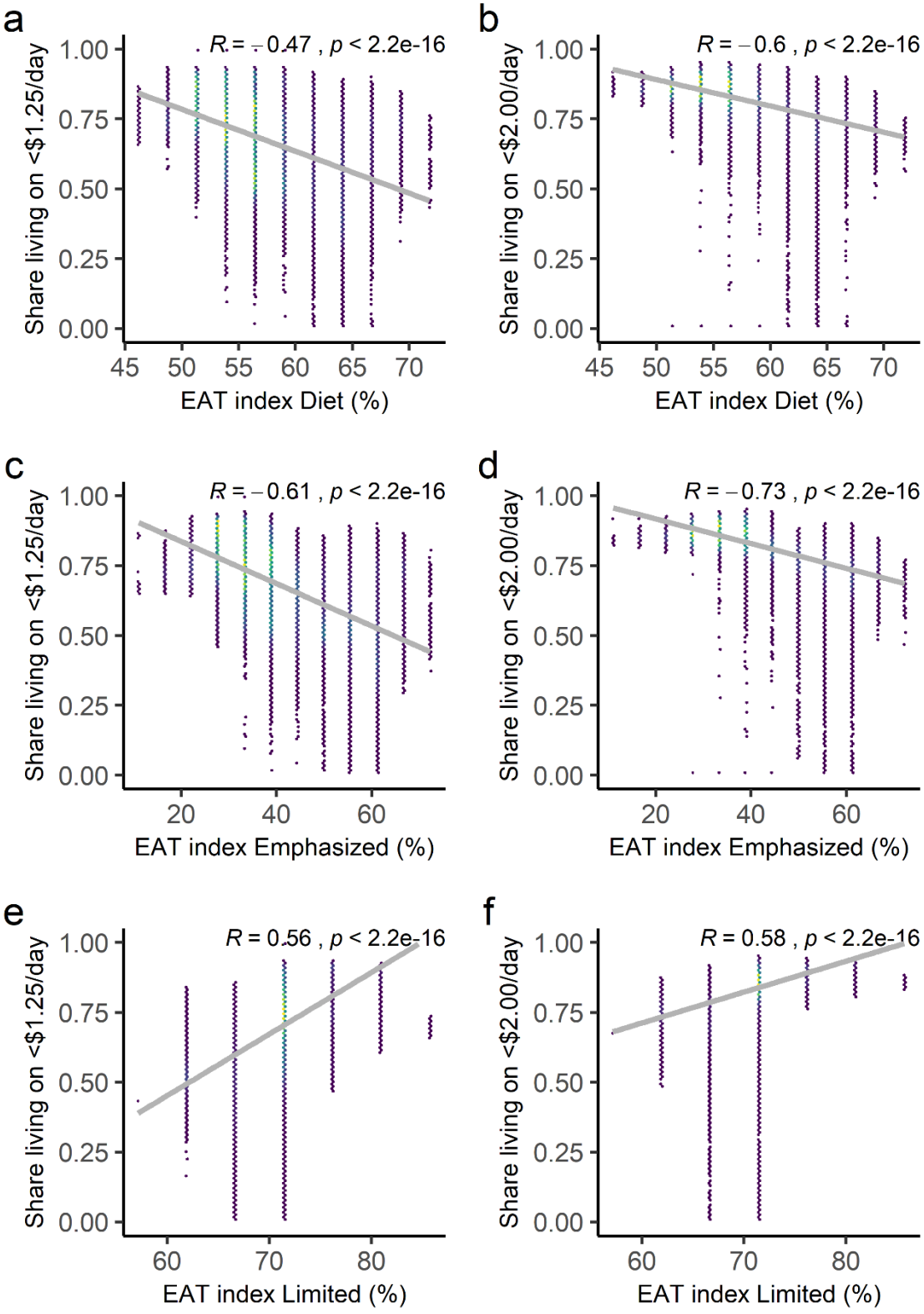
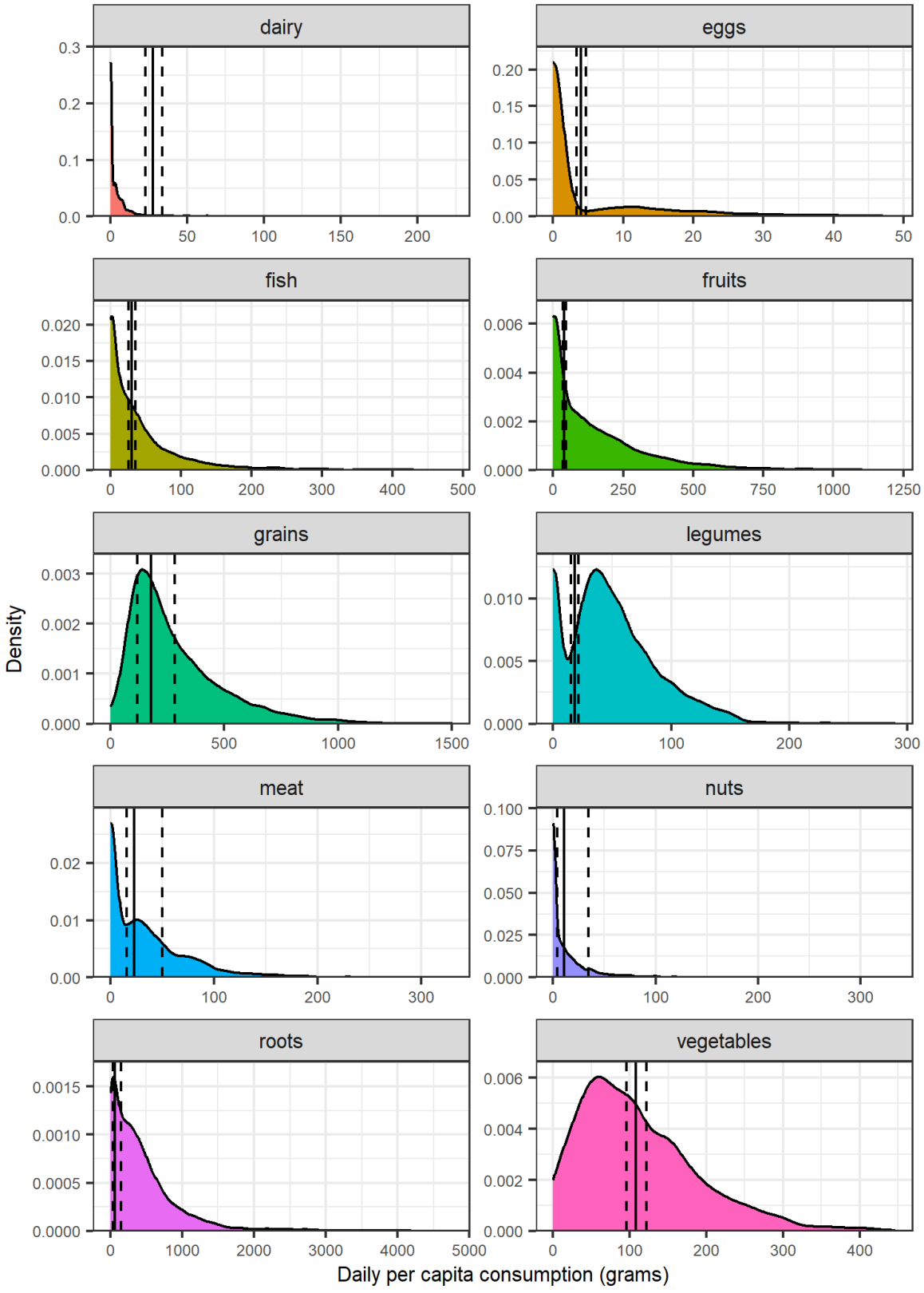
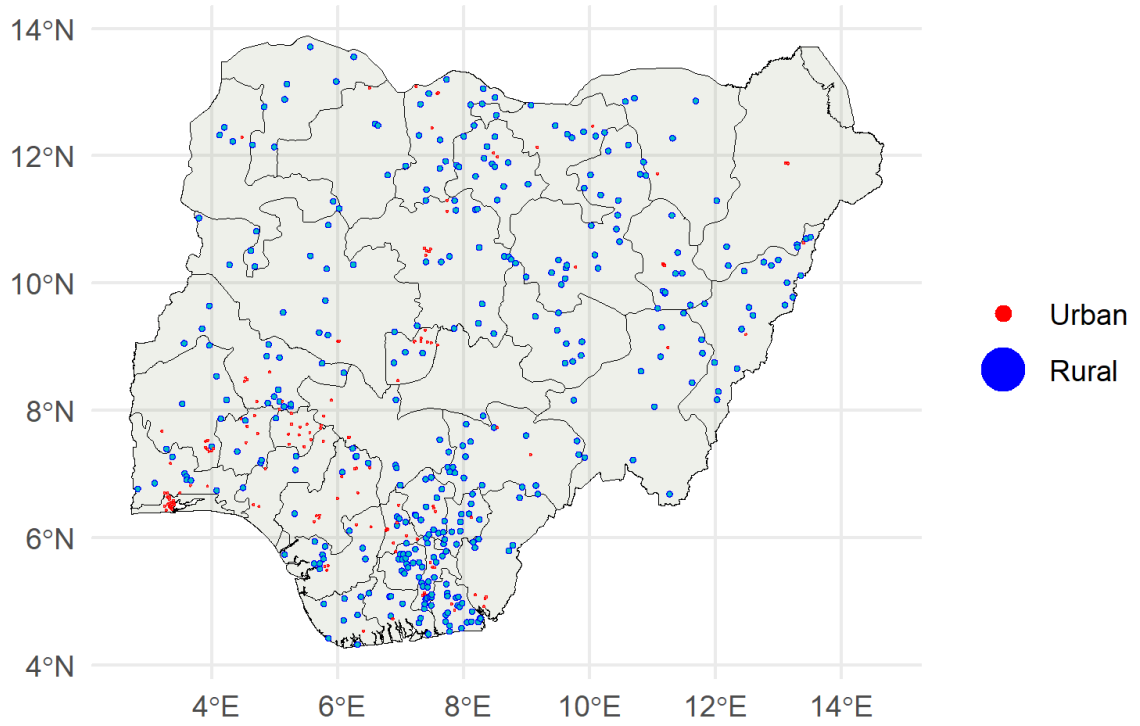


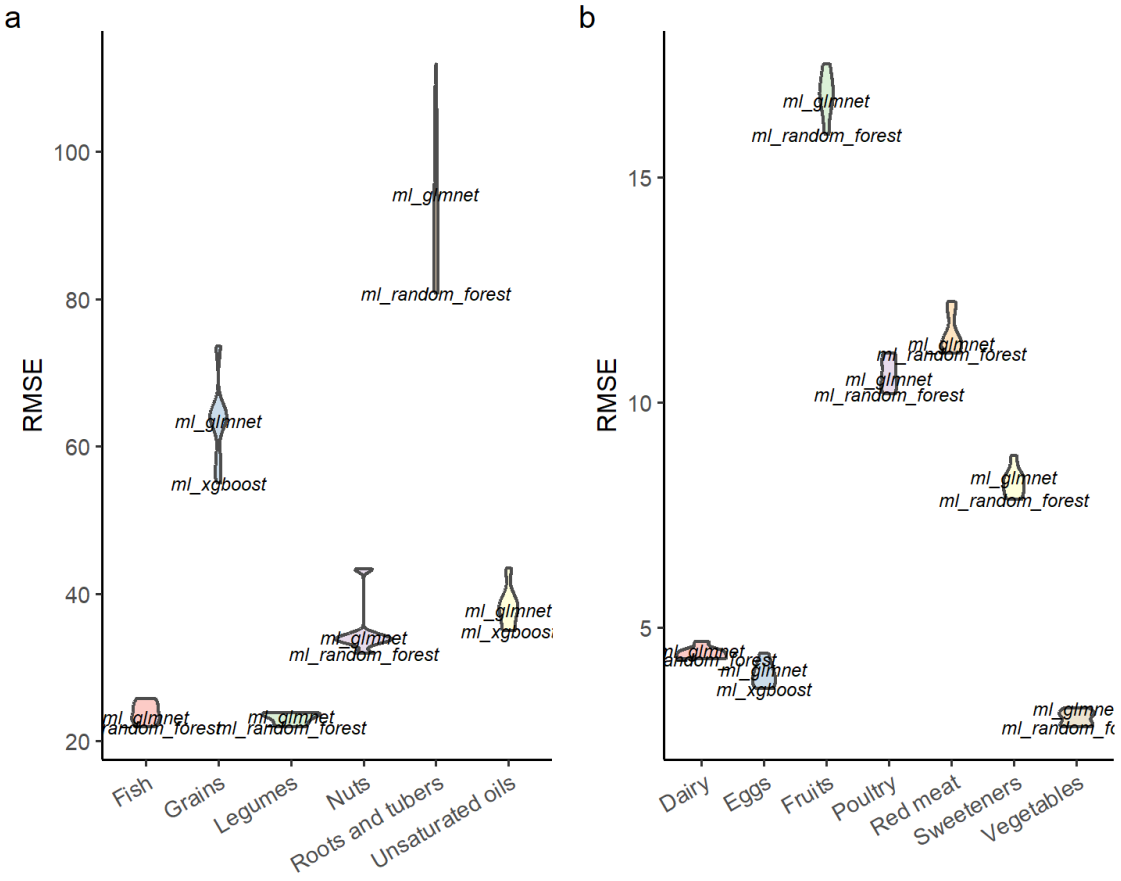
Supplementary Fig. 26: Scatterplot of share of population living on <\$1.25 a day (**a,c,e**) and <\$2.00 a day (**b,d,f**) from [3]versus the EAT-Lancet Index of the overall diet (**a,b**), the emphasized food group (**c,d**), and the limited food groups (**e,f**).



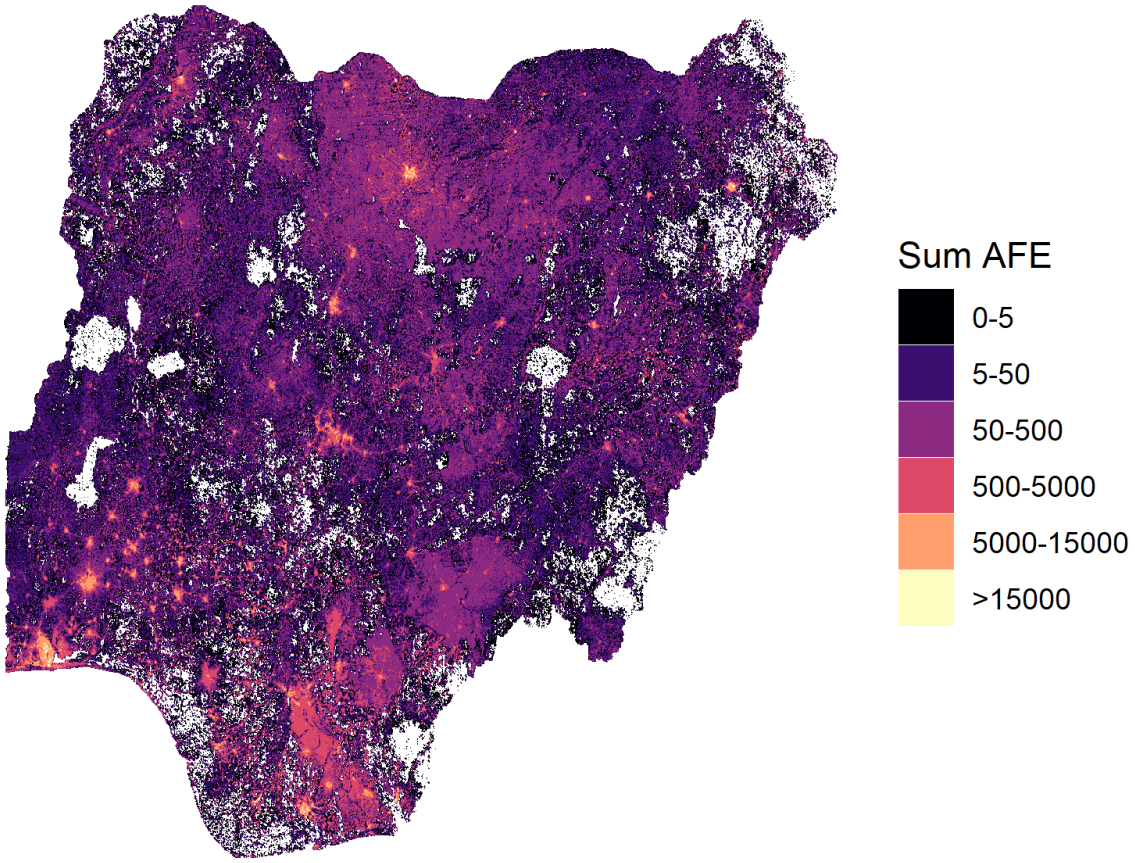
Supplementary Fig. 27: Distribution of daily per capita consumption (grams) at household level for dairy, eggs, fish, fruits, grains, legumes, meat, nuts, roots and vegetables from the LSMS household survey data compared with the mean, 95% lower and 95% upper confidence interval from the Global Dietary Database (GDD)[4].



Supplementary Fig. 28: Locations of the enumeration areas (EAs) as polynomials. The polynominals of the EAs in urban areas has a radius of 2 km and the polynomials of the EAs in rural areas a radius of 5 km.



Supplementary Fig. 29: The root mean squared error (rmse) for the models Support Vector Machine (SVM) with RBF kernel, Support Vector Machine (SVM) with polynominial kernel, Neural network, Random forest, Extreme Gradient Boosting (XGBoost), K-nearest neighbors (KNN) and Generalized Linear Model (GLM) by penalized maximum likelihood for the food groups fish, grains, legumes, nuts, roots and tubers, unsaturated oils (**a**) and dairy, eggs, fruits, poultry, red meat, sweeteners, vegetables (**b**). Only the labels of the models with the lowest RMSE error and the GLM model are shown.



Supplementary Fig. 30: Sum of Adult Female Equivalent (AFE) per 30 arcsecond (roughly 1 km).

Supplementary Table 3: List of selected covariates used for the machine learning models.

Topic	Predictor variable	Description	Source
Land cover	dst_coastline	Distance to open-water coast-line 2000-2020	Worldpop (2018)[5], worldpop.org
Land cover	esaccilc_dst_water	Distance to ESA-CCI-LC inland waters 2000-2012	Worldpop (2018)[5], worldpop.org
Land cover	esalc_11_dst	Distance to ESA-CCI-LC cultivated area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_40_dst	Distance to ESA-CCI-LC woody-tree area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_130_dst	Distance to ESA-CCI-LC shrub area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_140_dst	Distance to ESA-CCI-LC herbaceous area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_150_dst	Distance to ESA-CCI-LC sparse vegetation area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_160_dst	Distance to ESA-CCI-LC aquatic vegetation area edges 2018	Woods et al. (2024)[6], worldpop.org
Land cover	esalc_200_dst	Distance to ESA-CCI-LC bare area edges 2018	Woods et al. (2024)[6], worldpop.org
Topography	srtm_slope	SRTM slope 2000	Worldpop (2018)[5], worldpop.org
Topography	srtm_topo	SRTM elevation 2000	Worldpop (2018)[5], worldpop.org
Infrastucture	osm_dst_road	Distance to OSM major roads 2016	Worldpop (2018)[5], worldpop.org
Infrastucture	osm_dst_roadintersec	Distance to OSM major roads intersections 2016	Worldpop (2018)[5], worldpop.org
Infrastucture	osm_dst_waterway	Distance to OSM major water ways 2016	Worldpop (2018)[5], worldpop.org
Urbanisation	esalc_dst190	Distance to ESA-CCI-LC artificial surface edges 2018	Woods et al. (2024)[6], worldpop.org
Urbanisation	travel_time	Travel time to major cities 2015	Woods et al. (2024)[6], worldpop.org
Urbanisation	built-up surface	Built-up surface 2018	Woods et al. (2024)[6], worldpop.org
Urbanisation	built-up volume	Built-up volume 2018	Woods et al. (2024)[6], worldpop.org
Climate	bio_1	Annual mean temperature	Fick and Hijmans (2017)[7], worldclim.org
Climate	bio_5	Max temperature of warmest month	Fick and Hijmans (2017)[7], worldclim.org
Climate	bio_6	Min temperature of colderst month	Fick and Hijmans (2017)[7], worldclim.org
Climate	bio_12	Annual precipitation	Fick and Hijmans (2017)[7], worldclim.org
Religion	side_v1_198_1	Catholic (share of population) 2013	Müller-Crepon et al. (2018)[8]
Religion	side_v1_198_2	Islam (share of population) 2013	Müller-Crepon et al. (2018)[8]
Religion	side_v1_198_4	Other Christian (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_1	Annang (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_2	Bini/Edo (share of population) 2013	Müller-Crepon et al. (2018)[8]

172 Supplementary Table 3: List of selected covariates used for the machine learning models, continued

Topic	Predictor variable	Description	Source
Ethnicity	side_v1_197_3	Ebira/Igbira (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_4	Esan (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_5	Fulani (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_6	Fulfulde (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_7	Gbaju/Gbagi (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_8	Hausa (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_9	Ibidio (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_10	Idoma (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_11	Igala (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_12	Igbo/Ibo (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_13	Ijaw/Izon (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_14	Kambari (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_15	Kanuri/Beriberi (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_16	Mumuye (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_17	Nupe (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_18	Ogoni (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_19	Other (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_20	Tarok (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_21	Tiv (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_22	Urhobo (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_23	Wurkum (share of population) 2013	Müller-Crepon et al. (2018)[8]
Ethnicity	side_v1_197_24	Yoruba (share of population) 2013	Müller-Crepon et al. (2018)[8]

173 Note: We applied feature engineering on the dataset prior to running the machine learning models whereby covariates
174 correlated with other covariates with 0.9 or higher were removed from the dataset. This resulted in the covariates Built-up
175 surface 2018, built-up volume 2018 and Distance to open-water coast-line 2000-2020 were removed from the dataset.

176

177 Supplementary Table 4: The EAT-Lancet Index criteria per EAT-Lancet food group to evaluate diet
178 quality.

Food group	EAT-Lancet target intake (Kcal per day)	3	2	1	0
Vegetables	78	>78	29-78	19.5-39	<19.5
Fruits	126	>126	63-126	31.5-63	<31.5
Unsaturated oils	354	>354	177-354	88.5-177	<88.5
Legumes	284	>284	142-284	71-142	<71
Nuts	291	>291	145.5-291	72.75-145.5	<72.75
Fish	40	>40	20-40	10-20	<10
Red meat	30	<30	30-60	60-120	>120
Poultry	62	<62	62-124	124-248	>248
Eggs	19	<19	19-38	38-76	>76
Dairy	153	<153	135-306	306-612	>612
Roots and tubers	39	<39	39-78	78-156	>156
Sweeteners	120	<120	120-240	240-480	>480
Palm oil	60	<60	60-120	120-240	>240

179 Note: In this study we made minor modifications to the EAT-Lancet index[9]. We converted the target intake in grams to kcal
180 based on the energy targets Table 1 from Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from
181 sustainable food systems[1]. In addition, we grouped beef, lamb, and pork together as red meat. We included palm oil as an
182 extra food group, while whole grain was excluded from the EAT index because the household survey data does not indicate
183 whether the consumed grains are whole or refined.

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