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Species Richness: an indicator for measuring biodiversity in food systems

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Background (context and aim): Food system (FS) sustainability is increasingly a global priority, evident bySDG 2's goal to improve nutrition and promote sustainable agriculture. Nutrition and agriculture are disciplines that utilise different indicators, and as such separate targetsare set. Biodiversity is important for sustainability and are commonly used to measure biodiversity in landscapes and ecosystems, however no indicators are proposed to measure biodiversity of individual diets. This research aimed to evaluate if a single biodiversity indicator can measure biodiversity inthe FS.

Methods: Feasibility of applying 3 common biodiversity indicators (species richness [SR], functional diversity, Simpsons)to diets was tested by applying to dietary intake data (24hour recalls) (n=6226), from 7 rural country settings. A random-effects model evaluated ability of biodiversity indicators to predict diet quality.To understand the operational relevance of biodiversity indicators,an analysis of biodiversity in one sites (Vietnam) FS was completed. Acluster randomised controlled trial (N=170) was then conducted in Vietnam to evaluate if promoting increased SR of food groups (through farmer-to-farmer groups) could increase SR of the local FS (in production and diets).

Findings: All 3 biodiversity indicators were successfully applied to dietary intake data and positively correlated with micronutrient adequacy, SRperformed the strongest. The production SR was higher than dietary SR. The number of different species in the local production systems was 231 and total species found consumed was 123. Per farm, average SRof production across the year was 24 and average daily dietary SRwas 4.2. Afterthe 12 month RCT intervention, SR increased in the local FS. The average SR in the production system increased by 2 species ($P<0.05$). The average number of species consumed daily increased by 1 and 4 in women and children respectively ($P<0.001$ for both). In addition, the quantity of the nutritious food groups also increased.

Interpretation: The production data included a recall of all species produced year-round, whereas the diet data only considered the species consumed within two periods of the year when the dietary recall was applied. Analysing SR per food groupidentified opportunities to increase the production and consumption of species from micronutrient rich food groups. It is recommended to apply SR as an indicator to measure biodiversity in production systems and diets for sustainable FS interventions and further evaluate its relevance in different farming and agroecological systems.

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