



# Reply to Berti: Relationship between production and consumption diversity remains small also with modified diversity measures

In his letter (1), Berti argues that our failure to find a relationship between farm production diversity (PD) and household dietary diversity (DD) may be due to the fact that PD and DD were measured using different scales. First, we would like to clarify that the main result of our article is not a zero relationship. What we find is a relatively small relationship between PD and DD (smaller than often assumed) that is significant in some but not in all cases (2). We also show that the effect of increasing PD is smaller than the effect of improving market access. Second, we would like to stress that using different scales was not an oversight. We used common measures of PD from the agrobiodiversity literature and of DD from the nutrition literature. Sensitivity analysis confirmed that the findings are robust to changes in the measurement scales.

Berti (1) is correct that in the article we did not try to measure PD by using the same food groups as those considered for DD. We agree that this might change the results under certain conditions. Especially in subsistence farm households, where food is only produced for home consumption, the relationship between PD and DD would increase when both are

measured using the same scales. However, pure subsistence farms are rare in reality. Almost all farm households are involved in market interactions to some extent. Even in Ethiopia and Malawi, where the degree of commercialization is still relatively low, farm households acquire 55% and 61% of the foods consumed from the market, respectively (2). Hence, the role of markets cannot be ignored.

Following Berti's (1) suggestion, we reran some of the models by considering the same food groups for PD and DD. In certain cases the estimates increase, and in other cases they even decrease. In all cases, the effect of PD on DD remains small, especially in comparison with the more significant market access effect. This is in line with our original results (2). Households with better market access cannot only buy more diverse foods, they also gain higher incomes by growing and selling food and cash crops for which they have a comparative advantage. In contrast, a strategy to increase PD in terms of the number of different food groups produced would rather foster subsistence, act against comparative advantage, and thus be associated with possible income losses.

Our results should not be misinterpreted such that promoting PD cannot contribute to improving DD in certain situations, especially when combined with suitable nutrition education. However, increasing PD is not always the most effective way to improve DD and should not be promoted at the expense of improved smallholder market integration.

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<sup>1</sup> Berti PR (2015) Relationship between production diversity and dietary diversity depends on how number of foods is counted. *Proc Natl Acad Sci USA* 112:E5656.

<sup>2</sup> Sibhatu KT, Krishna VV, Qaim M (2015) Production diversity and dietary diversity in smallholder farm households. *Proc Natl Acad Sci USA* 112(34):10657–10662.

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