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*NATURE SUSTAINABILITY* Editor

Dear Dr Contestabile,

Please find attached, our manuscript titled “Food production shocks across land and sea”. Sudden and unexpected losses (or ‘shocks’) to food production represent significant challenges for meeting hunger targets through their capacity to disrupt the supply of domestic or traded food at local or national scales. To date, research investigating shocks to food production have addressed seafood and agricultural sectors in isolation, using different methodologies and spatial or temporal scales, making comparison across sectors impossible. In this primary research article, we bridge the land-sea divide and aim to understand the different geographies and causes of food production shocks across both aquatic and terrestrial food sectors globally from 1961 – 2013. We aim to build a more representative picture of exposure to such disturbances and the challenges they pose for effective food-system policy.

We identify shocks in crop, livestock, capture fisheries, and aquaculture production data using a pre-published statistical approach, detecting breaks in the autocorrelation structure of production time-series. We compare geographies and temporal trends in the frequency, size and duration of shocks to food production, and combine this information with a qualitative analysis of literature, news and reports to identify causes. We find some regions far more shock-prone than others, particularly on land. We show that extreme weather conditions caused over half of all shocks to crop systems and a third of livestock production shocks. Yet geopolitical crises, particularly violent conflict, were the cause of most sudden losses of livestock (and the largest shocks across all sectors). In contrast, overfishing in capture fisheries and disease in aquaculture were the single most significant drivers of shocks to seafood production. Further, we illustrate how a single stressor may reach across multiple food sectors, reducing capacity for adaptation. Critically, we highlight that shock frequency is increasing across all sectors through time.

For many regions, this means agricultural production is likely to become more uncertain under climate change as extreme weather events increase, and particularly if we start to see stronger interactions between environmental hardship and conflict. Therefore, the need for more robust social protection measures may be the only way for many communities to cope with environmental crises into the future. Greater dependence on aquatic production for animal protein is also another important mechanism under global change, but tackling overfishing and stemming aquaculture disease will be critical to both meeting demands, and achieving food security in fisheries-dependent nations. We believe this study to be the first standardised comparison of the different socio-ecological stressors causing food production shocks across land and sea and of broad relevance to the aims and scope of *Nature Sustainability*.

We confirm this manuscript is not under consideration or been published elsewhere and all authors have approved the manuscript and agree with its submission. We hope you will consider it for publication in *Nature Sustainability*.

Sincerely,

Richard Cottrell