



Patterns and Drivers of Agricultural Biodiversity in South Asia

A preliminary overview of
a regional dataset

Data Note 1, Work Package 5
December 2022

SUMMARY

Food systems face multifaceted challenges ranging from inadequate supply of nutritious food products to a range of negative environmental impacts (Fable et al., 2020; Rockström et al., 2020; Willett et al., 2019). Functional agricultural biodiversity has emerged as an important consideration that, if carefully managed, could help to improve food system outcomes through several pathways including production risk mitigation, increased and diversified incomes and livelihoods, and potentially as a contributor to healthier diets (Gaitán-Cremaschi et al., 2018; Klerkx & Rose, 2020). However, large-scale regional patterns and drivers of agricultural biodiversity in South Asia remain largely underexplored.

To address this gap, TAFSSA is producing a regional agricultural biodiversity database that will support researchers and policy makers in better understanding diversification in the food system and the relationships between agrobiodiversity and key food system outcomes. The current dataset contains regional district-level production data from 2019-2022, depending on availability, and includes a dietary groupings of food groups. Preliminary results show that cereals are by far the largest food category, but also highlight spatial variation in the diversity of food production. Bangladesh, Pakistan, Northern and Eastern India, and Nepal appear to be more diverse and dedicate larger shares of cultivated land to cereals than Western and Central India. After fully harmonizing the data sources, this dataset will help to identify hotspots of agrobiodiversity including diagnostics and drivers of diversification that can inform sustainable food system transitions.



Photo: Diversity in smallholder farm production landscapes as shown in Bangladesh, Photo credit: Abdul Momin

MAIN RESULTS

Crop production statistics across South Asia are highly heterogeneous – both in quality and resolution – and are associated with high uncertainties in vegetable production. Methods for data collection vary substantially across countries and also at sub-national levels. Nevertheless, most countries provide at least some indicator of production and area of major crops and crop types at the district level. We integrated these into a common dataset and mapped the production patterns at regional scale. The crop area and production data are collected from multiple national level government department’s statistics reports [1-8] from Bangladesh, India, Nepal and Pakistan.

TAFSSA’s preliminary analysis (Figures 1, 2 and 3) visualize the spatial extent and resolution of the regional dataset and highlight current data gaps. The crop

area and production data are shown at district level within the most recent year available, ranging from 2019 to 2021 depending on the country. Importantly, detailed horticulture data for India is not yet fully integrated in this analysis, as the research team is still working to compile available data sources. Data shown in these figures nonetheless does include vegetables as a major crop group.

Figure 1 shows that districts in Pakistan generally have larger cultivated areas than in India and Bangladesh – partially owing to larger district sizes but likely also reflecting land suitability. Conversely, production levels in central and Northern India and Bangladesh are quite high and produce large amounts of food. Production levels in Nepal and Pakistan are lower, which may reflect lower production intensity (number of crops grown per year).

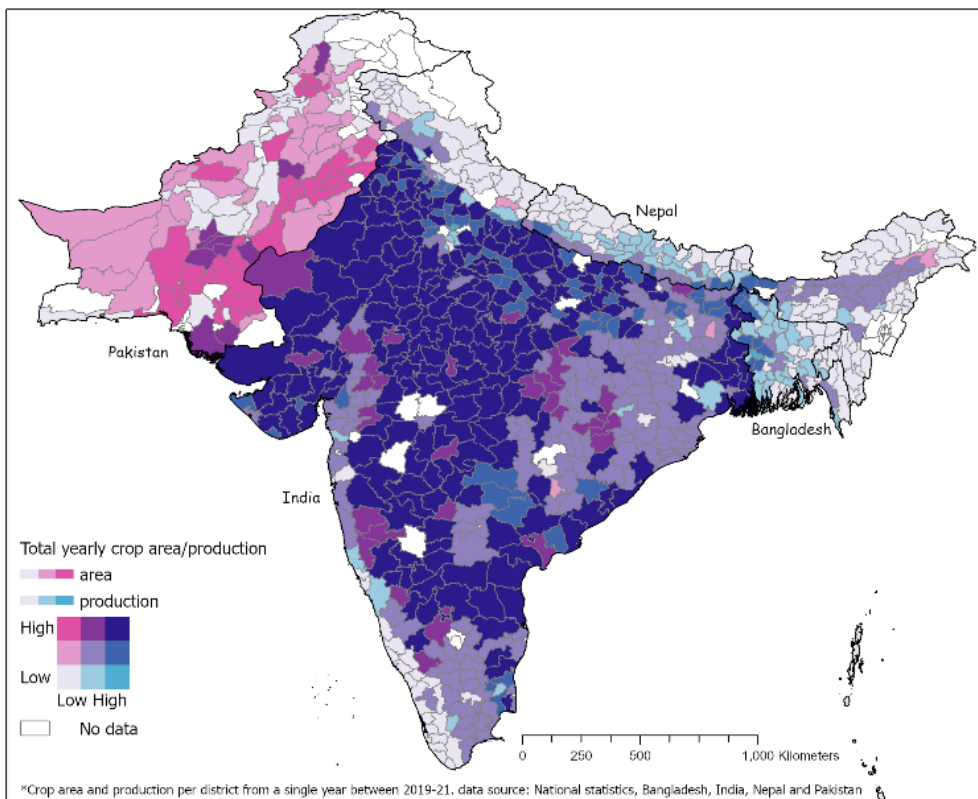
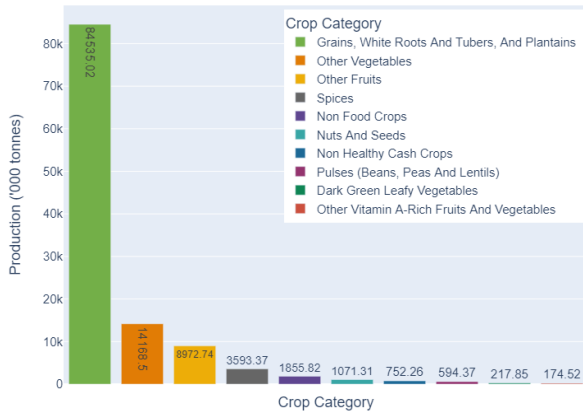
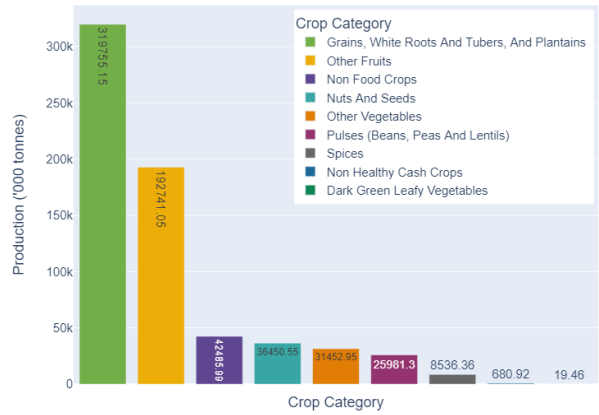


Figure 1. Overview of district-level crop production statistics within regional dataset. Low-medium-high groups were assigned to terciles of the distribution. Production was measured in in tons and area in ha.

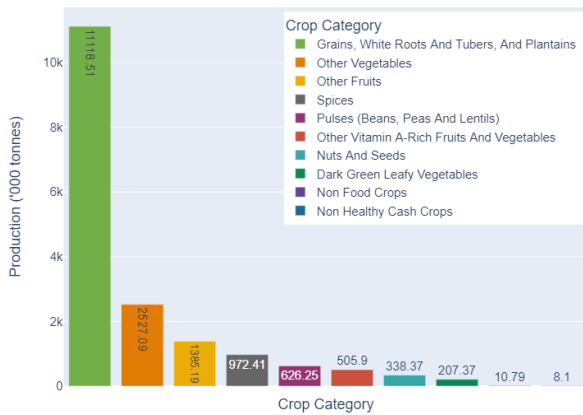
Production by Major Crop Category in Bangladesh (Year: 2020-21)



Production by Major Crop Category in India (Year: 2019-20)



Production by Major Crop Category in Nepal (Year: 2020-21)



Production by Major Crop Category in Pakistan (Year: 2020-21)

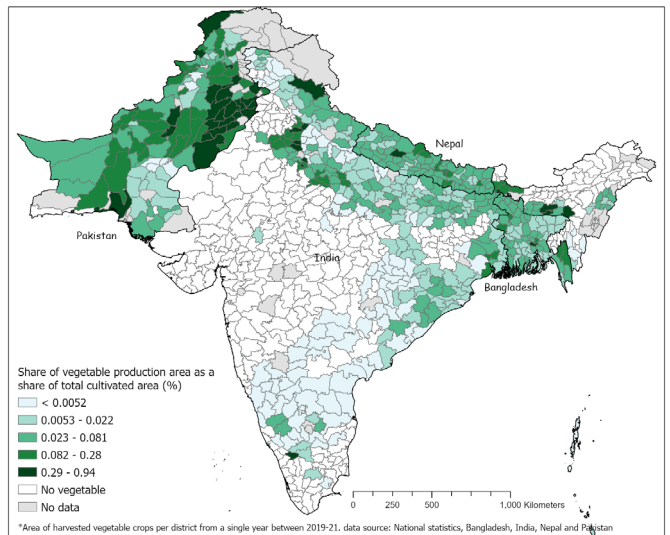
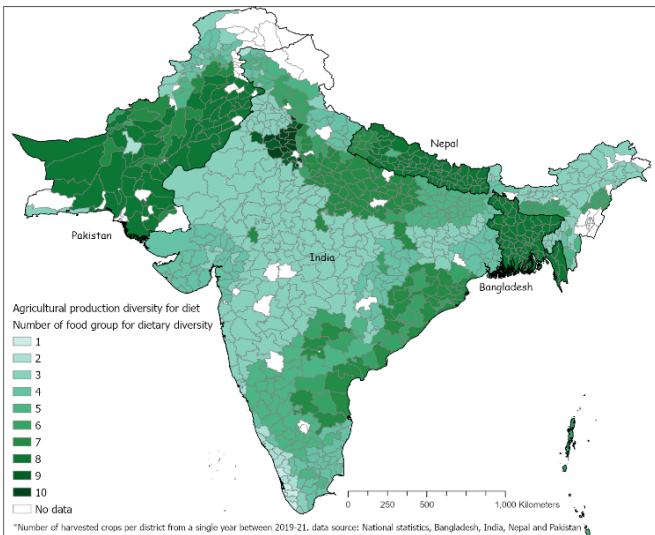
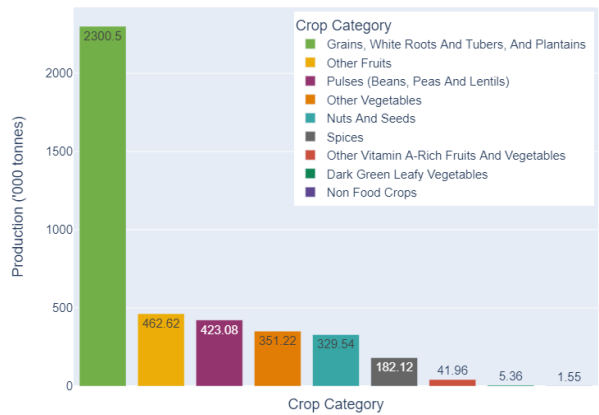


Figure 2. Overview of crop production statistics within regional datasets. National production levels of major food groups for Bangladesh, India, Nepal and Pakistan (top two rows; left to right, top to bottom) and map with the reported number of food groups cultivated per districts left) and share of vegetables of total production (right) in the bottom row.

Figure 2 shows that cereals are by far the largest food group that is being produced in each country of South Asia in terms of production levels, followed by fruits and vegetables. However, many of the surveys from which we compiled data are more representative of farm households rather than the area upon which crops are produced. In other words, all sampling methods reviewed in the assembly of data have some degree of extrapolation, which can increase uncertainty and error in datasets. As such, these results should be treated with a degree of caution.

The farm household focus of many surveys and secondary datasets available can also result in under-reporting of some crop types. For example, plantation and highly commercial crop are potentially underrepresented. Importantly, the share of vegetables of the total area of production shows substantial spatial variation that may be indicative of variation in the ways in which data on horticulture were collected during primary surveys.

Future research will need to grapple with these topics as a unified and defensible dataset for the region is needed. Research will also need to identify how this spatial diversity in agrobiodiversity does or does not affect other food system components, particularly diets. Subsequently, focusing on cases with especially high or especially low diversity could provide avenues for further diagnostic research that helps to understand why some places are already more diverse than others and thus inform food systems transitions.

METHODS

We collected publicly available area and production data at the district level for four countries in South Asia (Nepal, Pakistan, Bangladesh, and India) from official government reported production statistics. We then categorized the crops within the dataset based on major dietary crop categories. Specifically, we used the category list from the Minimum Dietary diversity for women (MDDW) and Household Diet Diversity Score (HDDS).

We further added two categories to meet our crop variety needs for crops like ginger, different spices, cotton, and tobacco that did not fit within the existing categories. These crops roughly fit two classification scheme that we added (1) spices and (2) non-healthy cash crops.

CONCLUSIONS AND NEXT STEPS

This research notes reports on the initial steps for producing a regional and harmonized meso-level dataset on agrobiodiversity across South Asia. Additional research will be required to adequately validate dataset after which it will provide a unique resource for studying agrobiodiversity and its role in the food system within South Asia. Specifically, TAFSSA will be working in the coming year towards representing geographical patterns in nutritional yield (cf. Defries et al. 2015), and examining how the production of key macro- and micro-nutrients varies in time and space across the region.

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ABOUT TAFSSA

TAFSSA is a CGIAR regional integrated initiative to support actions that improve equitable access to sustainable healthy diets, improve farmers' livelihoods and resilience, and conserve land, air, and water resources in South Asia.

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