Policy Brief

Farm Production Diversity for Better Nutrition Outcomes: Evidence from Uganda's National Panel Survey

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Executive Summary

Food insecurity and poor nutrition remain notable global challenges, yet these are areas of strategic importance regarding the United Nations Sustainable Development Goals. A significant population remains chronically hungry. Farm production diversity (FPD) is a potentially viable pathway through which household nutrition can be improved. We use panel data from Uganda to analyze the degree to which livestock diversity and crop diversity are associated with dietary diversity, energy, and micronutrient intake. Results from panel data models reveal that crop species count and animal species count are differently associated with household dietary diversity scores (HDDS) and available energy, iron, zinc, and vitamin A per adult. The crop species count was more positively and strongly associated with available energy, iron, zinc, and vitamin A. The findings suggest that in Uganda and similar contexts, inclusive and pro-nutrition policies that promote crop species diversification could more widely improve household nutrition.

Key words: Uganda, panel data, food security, micronutrients intake, nutrition.

I. Introduction

Food insecurity and poor nutrition remain serious challenges in much of the developing world despite a call for Zero Hunger in the United Nations Sustainable Development Goals. Nearly a billion people globally are chronically hungry owing to inaccessibility of food (FAO, IFAD, UNICEF, WFP & WHO, 2019). Access to food is determined largely by food availability and people's financial ability to purchase it (Van Campenhout et al. 2016). Widespread chronic poverty puts food from markets out of reach for many, especially in countries where market infrastructure is inadequate (Sekabira & Nalunga, 2020). One potential approach to enabling millions of the world's poorest people to have access to nutritious food is farm production diversity (FPD) (Sekabira & Nalunga, 2020). The nature of associations between FPD and key nutrition outcomes is subject to knowledge gaps, and available evidence is mixed. Some evidence suggests market access is more important for better nutrition (Sibhatu et al. 2015), while others points to farm diversity (Sekabira & Nalunga, 2020). We contribute by addressing the following questions:

1) Are the two sub-components of FPD—crop and animal species count—differentially associated with household dietary diversity and daily energy, iron, zinc, and vitamin A available per adult?
2) Which of the two FPD sub-components is associated with better nutrition gains?

Our results can inform pro-nutrition and food security policies in Uganda, such as the Uganda Nutrition Action Plan II (UNAP II), the Uganda Food and Nutrition Policy (UFNP), the Uganda National Agriculture Policy (UNAP), the Uganda Multisectoral Food Security and Nutrition Project (UMFSNP), and others. They may also be relevant to other countries with a similar context.

II. Research Overview

We hypothesized that FPD has a positive influence on food security and thus nutrition outcomes. We follow Sekabira & Nalunga (2020), who assert that policies influence the diversity of crops and animals species grown, which farm households either consume themselves or sell to earn income so they can purchase food from markets. We use nationally representative data on about 3,200 households from the Uganda National Panel Survey (UNPS), publicly available from the World Bank (World Bank 2021). FPD was measured using the biodiversity index, a simple count of all crops and livestock produced on farm. We generated FPD sub-components consisting of counts of crop and livestock species. Dietary diversity was measured using the aggregated food index, which tallies the number of food groups consumed in the household (out of 12 food groups: cereals; white roots and tubers; vegetables; fruits; meat and its products; eggs; fish; legumes, nuts, and seeds; dairy and its products; oils and fats; sweets and sugars; and spices, condiments, and beverages). Energy, iron, zinc, and vitamin A available per adult per household were measured by computing quantities of food items consumed by households in kilograms and then computing edible proportions for each available food item. From edible quantities, we computed quantities of energy in kilocalories and respective micronutrients. For comparability of nutrition outcomes across households, we standardized household size into adult equivalents. Edible quantities of energy and micronutrients were then divided by respective adult equivalents to produce comparable nutrition indicators available across households. To analyze the data, we used panel model with a Mundlak (MK) approach (Mundlak, 1978).

III. Main Findings

Results show that each additional animal species kept within a household is associated with a significant increase in the household dietary diversity score (HDDS) of 0.4 percentage points,[1] but the association was insignificant with crop species (Table 1). Farmers largely grow staple cereals or roots and tubers (Sekabira & Nalunga, 2020), as also shown in figure 1, so it may not be surprising that a crop species count may negatively or minimally positively be associated with HDDS, an indicator of dietary quality. Moreover, Muthini et al. (2020) adds that producing animals gives households access to a range of nutrition benefits such as energy, proteins, fats, and micronutrients. When the data are further disaggregated, they reveal that the animal species count is consistently and significantly more positively associated with energy and micronutrients sourced from own-farm consumption (Table 2). Small animals like poultry, rabbits, or goats and sheep, which formed most of the animal species count, can be easily consumed within households any time of the year. Larger animals like cattle, and even small animals, can regularly provide products like milk and eggs, enhancing household nutrition. The crop species count is consistently and highly significantly positively associated with daily energy and micronutrient intake regardless of the source (own farm or markets), except for vitamin A sourced from markets, where the association is positive but insignificant. In fact, the association is stronger for energy sourced from markets, while the association is stronger for iron, zinc, and vitamin A sourced from own-farm produce. The strong positive association of the crop species count with energy and micronutrients sourced from own-farm produce is not surprising since most smallholder farmers are engaged in subsistence agriculture. Since they consume mostly what they grow, a crop species count should bear a strong positive association with nutrition outcomes, as has been established (Muthini et al. 2020). On the other hand, the crop species count's positive and highly significant association with energy, iron, and zinc intake sourced from markets may be further confirmation of the importance of households' income from selling their crops.

IV. Conclusions and Recommendations

A greater diversity of animal species kept by a household is positively and highly significantly associated with household dietary diversity and with available energy, iron, zinc, and vitamin A sourced from consumption of own-farm produce. Diversity of crop species is strongly and positively associated with available energy, iron, zinc, and vitamin A irrespective of the source (own farm or markets), clearly highlighting the universal importance of crops for improving nutrition in smallholder farm households. Crops can easily be consumed directly or sold to markets for income to buy other food items. Therefore, efforts at the household or the policy level to diversify crop species production could yield better household nutrition outcomes. Policy can target those crop species that can especially have both high consumption and marketable possibilities, for instance vegetables. Vegetables are very nutritious and can easily be consumed within households but do also fetch a high market value is sold. Policy can also focus on establishing enabling market infrastructure such that producers of such crops can avail them in markets where consumers can also access them. Producers can now buy other nutritious foods from the same markets using the income generated from crop sales.

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[1] Percentage points are calculated based on the sample average of a particular variable, vis-a-vis the coefficient of that variable in the regression estimation. Specifically, we divide the coefficient by the sample average and then multiply the output by 100 to generate the percentage points (equivalents).

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Figures and Tables

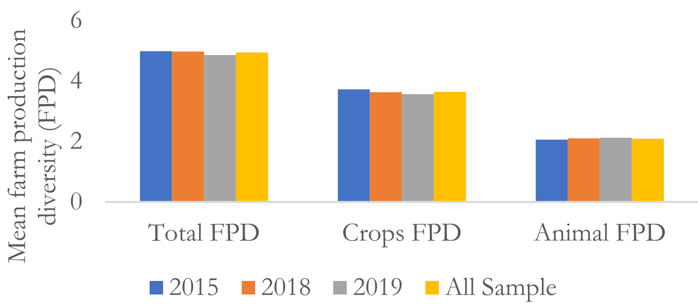

Figure 1: Farm production diversity (FPD) as generated from different sources (crops or livestock)

Table 1: Differential association of farm production diversity (FPD) on household dietary diversity score (HDDS)

Models	RE (1)	FE (2)	RE (3)	FE (4)	MK (5)
Variables	HDDS	HDDS	HDDS	HDDS	HDDS
Animals FPD (bio index)	0.063***	0.067***	0.052***	0.071***	0.041***
	(0.009)	(0.015)	(0.009)	(0.015)	(0.009)
Crops FPD (bio index)	-0.019*	-0.141***	-0.014	-0.182***	-0.016
	(0.011)	(0.021)	(0.012)	(0.022)	(0.012)
Other Covariates /Means	YES	YES	YES	YES	YES/YES

Table 2: Differential association of farm production diversity (FPD) on daily energy and micronutrients intake per adult AE

	Energy (kilocalories/AE)		Iron (milligrams/AE)		Zinc (milligrams/AE)		Vitamin A (rae_mg /AE)	
Models	MK (1)	MK (2)	MK (3)	MK (4)	MK (5)	MK (6)	MK (7)	MK (8)
Variables	Own farm	Market	Own farm	Market	Own farm	Market	Own farm	Market
Animals FPD (bio index)	0.946***	-4.640	0.044***	-0.029	0.052***	-0.007	0.172***	-0.144
	(0.191)	(3.538)	(0.011)	(0.030)	(0.010)	(0.022)	(0.040)	(0.286)
Crops FPD (bio index)	5.989***	18.79***	0.360***	0.105***	0.316***	0.101***	1.066***	0.578
	(0.247)	(4.583)	(0.015)	(0.039)	(0.013)	(0.029)	(0.052)	(0.369)
Covariates/means	YES	YES	YES	YES	YES	YES	YES	YES/yes
Observations	9,069	9,069	9,069	9,069	9,069	9,069	9,069	9,069
No. of hhd	3,446	3,446	3,446	3,446	3,446	3,446	3,446	3,446
Wald Chi2	4904.14***	1508.57***	4708.43***	596.72***	4703.30***	728.01***	3737.22***	704.86***

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; UGX is Uganda shillings (1USD = 3,557 USD); GPS is Global positioning system; RE is Random effects, FE is Fixed effects, MK is Mundlak, hhd is household