



Can governments promote homestead gardening at scale? Evidence from Ethiopia

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ABSTRACT

Low intake of fruits and vegetables is a major cause of micronutrient deficiencies in the developing world. Since the 1980s, various non-governmental organizations have promoted homestead gardening (HG) programs, first in Asia, but now increasingly in Africa. Longstanding concerns with HG programs are: (1) they lack scalability, particularly for governments; (2) they only work in areas with/without good access to markets; and (3) they are only suitable for more water-abundant ecologies. We assess these concerns by analyzing a large and novel survey on the adoption of a nationwide HG program implemented by the Ethiopian government. We find that better market access encourages HG adoption; so too does greater public promotion of HGs, but only in more water-abundant ecologies.

1. Introduction

Malnutrition and poor diets rank first and second among level-2 risk factors for disability-adjusted life years in the 2015 Global Burden of Disease Study (Forouzanfar et al., 2015). One area where diets are widely deficient is in the consumption of fruits and vegetables (FVs), which are associated with increased risk of micronutrient deficiencies, heart disease, cancer, and obesity (Forouzanfar et al., 2015). As a result, nutritional guidelines recommend the consumption of at least two servings of fruits and three servings of vegetables per day, amounting to 400 mg (WHO/FAO, 2003). However, most people in lower income countries do not meet these requirements (Del Gobbo et al., 2015; Hall et al., 2009), largely because of affordability constraints. One recent study of FV prices in 18 low, middle and high-income countries estimated that low-income populations would need to spend half their daily income to meet recommended servings (Miller et al., 2016). A global study of 175 countries found that vegetables are especially expensive: dark green leafy vegetables (DGLVs) are 11–14 times as expensive a source of calories as staple cereals in sub-Saharan Africa, and 5–9 times as expensive in Asian regions (Headey and Alderman, 2017). In isolated rural areas, physical access to fruits and vegetables can be further limited by seasonality and lack of trade, especially for more

perishable foods such as DGLVs.

Cognizance of the inadequately low intake of fruits and vegetables in rural areas of poor countries has long been recognized. In the 1980s, Helen Keller International (HKI) developed a homestead gardening (HG) program to increase FV consumption after a national blindness survey revealed that households with gardens were less likely to have children with night blindness. Over time, HKI's programs expanded and evolved into its *Enhanced Homestead Food Production* (EHFP) programs, which incorporate promotion of animal sourced foods (since the late 1990s), and an expanded set of behavioral change communication (BCC) components to improve child feeding and care practices (since the mid-2000s) (Haselow et al., 2016). HKI implemented EHFPs in a number of Asian countries, including Nepal, Cambodia, the Philippines, and more recently in Burkina Faso where a cluster-randomized control trial (cRCT) found significant and sizeable impacts on anemia, wasting and diarrhea in young children (Olney et al., 2015). And while HKI pioneered this approach, many other non-governmental organizations (NGOs) have adopted HGPs or EHFPs in different settings. In sub-Saharan Africa alone, NGO-led HG programs have been implemented in at least 22 countries.

Despite their popularity, reviews of these programs emphasize the lack of high quality experimental evidence of impact (i.e. randomized

Abbreviations: AEW, Agricultural extension worker; BCC, Behavioral change communication; DGLV, Dark green leafy vegetables; EA, Enumeration Area; EHFP, Enhanced Homestead Food Production; HEW, Health extension worker; HG, Homestead garden; HKI, Helen Keller International; IYCF, Infant and young child feeding; NGOs, Non-governmental organizations; PSNP, Productive Safety Net Program; SNNP, Southern Nations, Nationalities, and Peoples' Region; WHO, World Health Organization

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control trials), but also point to potential concerns over external validity and longer-term sustainability (Girard et al., 2012; Iannotti et al., 2009; Masset et al., 2012; Ruel et al., 2018; Webb and Kennedy, 2014). These are issues of significant concern for several reasons.

First, scalability and sustainability of HG programs is uncertain given that virtually all homestead food production programs have been implemented by NGOs. NGO staff are generally well trained and highly motivated to ensure the program is well implemented. It is therefore not certain that scaling up the program – or extending it to implementation by public officials – may have the same impacts (Deaton and Cartwright, 2018). Public health workers in developing countries often have multiple responsibilities that compete for their limited time and resources and are often subject to relatively weak monitoring and incentive mechanisms (Scott et al., 2018).

Second, the external validity of HG evaluations is questionable on ecological grounds. FVs are typically water-intensive crops, and reviews of HG programs have noted poor uptake in water constrained villages or dry seasons (Haselow et al., 2016). HKI's original FV programs were implemented in Asia, where rainfall levels are higher and small-scale irrigation much more widespread. In contrast, much of sub-Saharan Africa is water scarce, small-scale irrigation is rare (You et al., 2012), and much of the region is vulnerable to drier conditions due to climate change (Giannini et al., 2008). It is therefore unclear whether the lessons from programs implemented in areas characterized by good water access are directly exportable to water-scarce areas.

Finally, an outstanding concern among economists is whether improving homestead production is necessary for increasing consumption in places where markets might work reasonably well. Studies in Ethiopia, for example, find that farm production characteristics are strong predictors of diets, except when households have good access to markets (Hirvonen and Hoddinott, 2017; Hoddinott et al., 2015). Another recent study from Ethiopia shows that rural consumers obtain most of their non-staple foods from markets rather than from own production (Sibhatu and Qaim, 2017). This suggests that market access can substitute for household level production and allow farmers to specialize in producing a smaller set of foods more productively.

Despite these longstanding concerns, remarkably little research has rigorously assessed these issues. In this paper our primary objective is to assess the roles of public extension services, water availability and market access in influencing adoption of HGs in the important context of rural Ethiopia. Micronutrient deficiencies are widespread in Ethiopia, and in 2011 the average household consumed just 42 kg of F&V in a year per adult equivalent (Worku et al., 2017), far below the WHO recommendation of 146 kg per year (Hall et al., 2009). Unlike other contexts where NGOs largely implement HG programs in specific regions of a country (often more water-abundant regions), in Ethiopia the federal government is implementing a nationwide HG program. To our knowledge, this is the first study to evaluate HG adoption of a government-led program across such a diverse array of agro-ecological settings.

2. Methods

2.1. Context

This study focuses on the four most populous highland regions of Ethiopia; Amhara, Oromia, Southern Nations, Nationalities, and Peoples' Region (SNNP) and Tigray. These regions are largely covered by mountains and elevated plateaus that together cover about two thirds of the country and host more than 85% of the total population (CSA, 2013). Agricultural production is largely rain-fed and dominated by cereals and pulses (Bachewe et al., 2017). This study is further constrained to areas within these regions in which the Productive Safety Net Program (PSNP) operates. With 8 million beneficiaries, PSNP is one of the largest safety net programs in Africa. Geographically, the program is targeted to chronically food insecure districts (woredas). Most

PSNP beneficiary households receive cash or food (mostly in the form of cereals) payments for undertaking public works while a small proportion of households with limited labour capacity receive unconditional payments.

Food security in these localities has been improving but remains high. The data underlying this paper show that the prevalence of stunting among children 6–23 months of age is high at 39%. Moreover, diets are extremely monotonous; the mean dietary diversity based on 24 h recall among children 6–23 months was 2.8 food groups (out of 7) and among mothers 2.2 food groups (out of 10). Less than 10% of the children (6–23 months) and mothers reported to have consumed Vitamin A rich fruits or vegetables in the past 24 h.

Homestead gardening has been a part and parcel of tropical food production for millennia (Kumar and Nair, 2004). This is also true in Ethiopia (McCann, 1995), although most small-scale “backyard” production still focuses on staple crops (enset, maize and teff) or stimulants (coffee, khat) (Mellisse et al., 2017), rather than nutrient-rich FVs. The Ethiopian government therefore seeks to promote small-scale FV production as an important tool to increase availability of FVs at the household and community level. Both the *National Nutrition Program* and the *Nutrition Sensitive Agriculture Strategy* set explicit targets for HG adoption: 40% of rural households by 2020, and 25% of urban households by 2020 (GFDRE, 2016; MoANR, and MoLF, 2016). The government's HG activities are implemented as part of a broader package of community-based nutrition-specific and nutrition-sensitive services, including BCC to promote age appropriate feeding practices, improved growth monitoring, treatment of severe acute malnutrition, disease prevention and management, social safety nets, and other agricultural interventions (FDRE, 2016; GFDRE, 2016). Many of the nutrition-specific activities are implemented by health extension workers (HEWs), who are also tasked with promoting household adoption of HGs. Community volunteers, known as the *Health Development Army*, assist HEWs in implementing these services, and agricultural extension workers (AEWs) are further tasked with providing technical support to households that wish to adopt. So far, HG activities have focused on promotion and technical support. The provision of inputs such as seeds and seedlings for HGs by the HEWs or AEWs has been rare. Moreover, the production of poultry or other small ruminants is not yet widely promoted either.

2.2. Data collection and measures

This study uses three types of data: (1) secondary household survey data collected by the authors in March and August in 2017 in PSNP districts in Amhara, Oromia, SNNP and Tigray; (2) community level data collected from HEWs, as well as from community food markets; and (3) Geographic Information Systems (GIS) data on agro-climatic factors.

2.3. Household survey data

The original purpose of these surveys was to obtain information for an evaluation of nutrition sensitive components of the PSNP. To this end, a stratified sample was drawn from areas in which the PSNP operates in the four highland regions. Given the focus of the original evaluation on outcomes related to child nutrition, the sample was restricted to poor households with a child less than 24 months of age in March 2017. Supplemental File S1 describes the sampling strategy in more detail.

While the geographic and demographic restriction is potentially a limitation on external validity, the survey has several useful characteristics. First, this survey is longitudinal and designed to capture seasonal differences. The first survey round was administered 3–4 months after the main harvest season in March 2017 (N = 2635), in what is typically a dry season. A second follow-up survey of the same households was conducted approximately six months later in August

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