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Sowing for food security: A case study of smallholder farmers in Bolivia

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ABSTRACT

This paper explores the role that agriculture can play in the food security agenda. To meet this objective, this study measures the impact of the “Programa de Apoyos Directos para la Creación de Iniciativas Agroalimentarias Rurales” (CRIAR), an agricultural technology adoption program implemented in highly food insecure areas of rural Bolivia. The paper analyzes whether changes in food security are due to improved food availability (production and local sales) and/or greater food access (income and production used for home consumption). To this end, data from a sample of 1287 households–817 beneficiaries and 470 controls – interviewed specifically for this purpose are used. To address self-selection issues, the program’s impact is estimated using an instrumental variable model. The results present evidence that program participation improved food security. Specifically, positive impacts on agricultural productivity, agricultural sales and household income are found. These findings confirm the importance of considering agricultural programs as policy tools to address food insecurity.

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1. Introduction

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2002). Food security has three key dimensions: (i) food availability, (ii) food access, and (iii) food use (World Bank, 2008; FAO, 2006).¹ Food availability refers to the supply of food at the national or regional level which ultimately determines the price of food. Enhanced food availability can be obtained through greater domestic production or through imports. Despite significant advances in global agricultural production and productivity, and

even with improvements in caloric intake per capita across the globe (Wik et al., 2008; Fuglie and Nin-Pratt, 2012), hunger, malnutrition, and poor health remain widespread (IFPRI, 2012; WHO, 2014). Improved availability of food is necessary to reduce food insecurity and hunger but is insufficient to completely end malnutrition, particularly because access to other services such as potable water, sanitation and health services is also required.

Food access refers to the ability to obtain food and it requires households to have adequate resources. This can be achieved through increases in income that allow food to be purchased, through direct food production or through other sources such as transfers, or in-kind payments for labor. Even if food is available at the national, regional and local level, it does not mean that all households have the ability to access it since they may be constrained in their capacity to command food through income, own production, wage earnings, transfers or other means. Given that a large portion of the poor worldwide are farmers, there remains considerable attention to promoting agriculture as a means to

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E-mail addresses: lsalazar@iadb.org (L. Salazar), julian.aramburu@yale.edu (J. Aramburu), mgonzalez@iadb.org (M. González-Flores), winters@american.edu, p.winters@ifad.org (P. Winters).¹ A fourth consideration often included is food stability, which incorporates the idea of having food access at all times.

enhance food access (Levitt et al., 2011; FAO, 2012b; IFPRI, 2012; Herforth et al., 2012; Fan and Pandya-Lorch, 2012). The emphasis on an agricultural pathway to increase food access is twofold, since increased agricultural production provides income to purchase food as well as direct access to food for consumption obtained from own production.

Lastly, *food use* refers to the level of nutrition obtained through food consumption. Specifically, nourishments must be of high quality, safe and diverse in order to provide an adequate diet in terms of energy and nutrients. Carletto et al. (2015) analyze pathways to improved nutritional status by systematically measuring the impact of eight agricultural interventions implemented in Asia and Africa. The general conclusions from this analysis provide evidence of association between increased agricultural production and positive nutrition outcomes. However, causality is not always established.

Given the limitations of agricultural growth to address food security on its own, the most effective strategy appears to be a multi-sector approach (FAO, 2014; IFPRI, 2014; IDB, 2015; Timmer, 2015) that combines the promotion of broad-based, agricultural growth and rural development with programs that directly target the food insecure (Devereux and Guenther, 2009; de Janvry and Sadoulet, 2009; IFPRI, 2014; Timmer, 2015), as well as programs focused on nutrition with a gender approach (IFPRI, 2014; Talukder et al., 2010). Generally, agriculture plays a significant role in improving food systems and nutrition (FAO, 2013; Carletto et al., 2015) but its scope can be broadened to reach full potential (Ruel and Alderman, 2013).

Despite hundreds of agricultural programs and policies implemented to address food insecurity, and the high expectations on the potential of agriculture, there is limited rigorous empirical evidence on the best way to achieve this (Berti et al., 2004; Girard et al., 2012; Masset et al., 2012; Ruel and Alderman, 2013; Webb, 2013). Meta-reviews of the literature on agriculture and its link to food security come to similar conclusions (Webb, 2013).

Much of the problem then seems to be a general lack of rigorous evaluations of agricultural programs. In 2011, the World Bank (2011) identified only 86 articles that can be defined as proper impact evaluations of agricultural interventions; that is, those which attempt to establish causality through a clearly defined counterfactual. A recent review of impact evaluations over the last decade shows that while the number of impact evaluations of agricultural and rural development programs has grown in recent years, less than 10% of overall evaluations are linked to agriculture and rural development—compared to 65% for health, 23% for education and 15% for social protection (Cameron et al., 2015). Further, the tendency is for evaluations of agricultural programs to consider broader agricultural indicators of impact (value of production, yields) and in some cases final outcomes resulting from food use such as child anthropometrics. Few papers, however, explore food accessibility and availability as pathways to link agriculture to improved food security. In sum, agricultural programs have been primarily assessed on their productive impact without much emphasis on their link with food security.

This paper aims to provide evidence on the link between agricultural interventions and food security as well as on the mechanisms through which this relationship takes place. To date, most of the literature addresses the impact of agricultural interventions on income and productivity, assuming that such findings are translated into food security improvements. This paper addresses this research gap using specific measures to identify such an impact as well as to establish the channels through which food security is improved. For this purpose, we analyze the effects of an agricultural technology adoption program “Programa de Apoyos Directos para la Creación de Iniciativas Agroalimentarias Rurales” (CRIAR), implemented in highly food insecure areas of rural Bolivia.

The remainder of this paper is structured as follows. Section 2 provides the conceptual framework to identify the pathways by which we should expect agricultural interventions to improve food security. Section 3 describes the CRIAR program. Sections 4 and 5 present the counterfactual identification and the econometric methodology, respectively. Section 6 provides descriptive statistics of the data. Section 7 presents the main results, and Section 8 concludes.

2. Agriculture as a pathway to food security

Policies designed to improve food security generally target one of the three aforementioned dimensions of food security: (i) food availability, (ii) food access, or (iii) food use. Since food availability refers to the aggregate food supply, agricultural policies that enhance productivity and increase production are often used to expand the supply and ensure relatively low food prices. While increasing domestic production and lowering prices can enhance food availability, such actions do not ensure access since they do not guarantee that individuals have the means to command food. Therefore, improving food access requires policies that enhance the capacity of households to obtain food through income, production, wage earnings, transfers or other means. Further, having food access does not always ensure the proper utilization of food since this requires that food provides not only an acceptable amount of calories, but also sufficient nutrition. Policies can also focus on improving food use through interventions designed to ensure adequate nutrition such as trainings or access to public services.

This paper focuses on assessing the dimensions of food availability and access by evaluating an agricultural program that was designed with the objective of increasing food supply through greater production and productivity as well as to improve the ability of households to acquire food through higher income.

While the literature suggests a positive link between agricultural production and food security (Maxwell, 1998), productive agricultural programs are not widely assessed as policy tools to enhance food security and even less so to understand the pathways through which food security can be improved. The majority of agricultural programs seek to enhance productivity, increase output, reduce output loss, and/or improve quality of output. These objectives are aligned with increasing food production which is one of the pathways for enhancing food availability, particularly when targeting smallholder producers (FAO, 2006). However, although many agricultural interventions have been evaluated from a productive perspective, the link with improved food security through *food availability* is often ignored.

In the case of policies that enhance *food access* for the food insecure, these can be direct or indirect. Three types of policy instruments that improve direct access to food are: (i) targeted direct feeding programs; (ii) food for work programs; and (iii) income transfer programs (Stamoulis and Zezza, 2003). Direct feeding programs supply food to targeted households either through direct transfers of food or coupons for food purchase. Food-for-work programs provide in-kind payments in the form of food in exchange for public work. Income transfer programs provide cash transfers to poor households often based upon fulfillment of certain conditions, with the goal to increase households' food consumption and nutritional status. Overall, the literature on the impact of these programs in improving food security is inconclusive.² In the case of direct feeding and food-for-work programs this is partly due to lim-

² For evaluations of direct feeding programs see Stifel and Alderman (2006), Ahmed and del Ninno (2002), Kazianga et al. (2014). For food for work programs see Gilligan and Hoddinott, 2007 (2007). The literature on cash transfers is more substantial and some examples include Behrman and Hoddinott (2005), Attanasio and Vera-Hernández (2004), Dufo (2000), and Miller et al. (2011).

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