



# Profits from participation in high value agriculture: Evidence of heterogeneous benefits in contract farming schemes in Southern India



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## ABSTRACT

This paper assesses the variable impact of participation in high value agriculture through contract farming arrangements in southern India. Using survey data for 474 farmers in four commodity sectors, gherkins, papaya marigold and broiler, an endogenous switching model is used to estimate net profits from participation. Findings suggest that average treatments effect vary widely across contract commodities. Papaya and broiler contracting offer clear net gains for participants whereas marigold contracting leaves participants worse off. For gherkins, while contracting holds net gains for participating farmers overall, this is true of contracts with some firms but not others. The standard deviations of point estimates of treatment effects are quite large indicating variability in profit gains even within the same commodity sectors. Thus, notwithstanding the sign of average treatment effects, contract farming arrangements have diverse impacts on income for individual farmers and these could have implications for sustained participation of farmers in high value agriculture.

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## Introduction

The issue of income gains to small farmers from participation in agro-food supply chains in developing countries, specifically in contract farming arrangements, has acquired much significance in recent times (Minot, 2008; Swinnen, 2007; Reardon and Gulati, 2008; Barrett et al., 2012; McCullough et al., 2008). Should participation in these chains lead to net gains, there exist credible opportunities for farmers in these countries to transform their livelihoods. While existing work has been largely successful in addressing methodological issues to measure welfare impacts, most notably the profits from participation in high value agro-food supply chains, a majority of works confine themselves to assessing whether or not participant farmers benefit on average (reviewed in Barrett et al., 2012, for example). An aspect that has faced relative neglect has been the heterogeneity of impacts associated with participation, both within and across schemes. This assumes importance in the context of high mortality of contract farming schemes in developing countries and widespread prevalence of disadoption or exit from contract participation. In India, for example, the study on which this article is based recorded high farmer attrition rates in the sample villages surveyed (Narayanan, 2013).

Further, among attrition farmers who were interviewed, as many as 20% of them stated economic losses from contracting as the reason for exiting the system and this was the single most important reason for exit. Thus, while, on average, participating farmers benefit, the heterogeneity of farmer experiences bears ingredients of churning and attrition in these schemes. This study uses unique survey data of farmers in multiple commodity schemes to answer the following questions: Do contracting farmers in high value supply chains do better than those who do not participate, on average? How much do they stand to gain relative to their counterparts who do not participate? How do these treatment effects vary for participating farmers within a commodity group? Do these patterns differ across contract commodities?

This study tackles a particular difficulty where sometimes the decision to contract coincides with a decision to grow the contract commodity, so that all production of the high value commodity is contract-based and a domestic spot market is absent or too small to offer a credible comparison group. This makes it impossible to identify the impact of contracting separately from that associated with growing a high value commodity. This is not the case with most of the previous literature on welfare impacts from contract farming, where typically there exists a spot market for the contracted commodity or traditional marketing channels for the commodity in question. The presence of an appropriate counterfactual and a close comparison group in those cases enables use of techniques such as propensity score matching (Maertens and Swinnen,

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2009), Heckman's selection models (Miyata et al., 2009), instrumental variable approaches.<sup>1</sup>

In the somewhat exceptional context described in this study, there is no precise counterfactual for contract participation per se. This study maintains that it is nevertheless possible to assess the impact of participation in contracting arrangements for high value commodity chains in totality relative to the counterfactual of persisting with a status quo of cultivating 'traditional' crops and/or marketing channels. The counterfactual in these cases would have to be defined as not participating at all in the high value commodity chain in question. Alternatively, where there are a number of firms with whom farmers can contract for the high value commodity, it might be possible to assess the impact of contracting to a specific firm versus supplying to other firms also procuring the same commodity on contract or not being part of the supply chain altogether, as the case might be. Whereas the former assesses impact of growing the high value commodity under contracts versus the status quo of growing persisting with the traditional cropping pattern, the latter assesses impact of contracting with the subject firm, relative to other options, including contracting for the same commodity with another firm(s) or growing another crop altogether.

To address this issue of coincidence of cropping choice and contracting choice, the study adopts an endogenous switching model where farmers sort themselves into two very different but comparable regimes, contracting for growing the high value commodity and not contracting (and therefore not growing the high value commodity). The sorting is based, in part, by the perceived differential welfare gains between the two regimes. While this enables assessment of profitability of participation in the two distinct regimes, it also allows me to comment on the differential returns to factors across these regimes and see if different regimes reward key factors of production differently. I then explore the variation in estimated treatment effects across schemes and across farmers, the treatment here referring to participation in high value agriculture through contract farming.

Following this introduction is a description the survey data, its empirical context and the estimation strategy adopted. The next section describes the variables used and presents key results from the estimation of the endogenous switching model, focusing on incremental net profit associated with contracting. I then discuss the structure of costs and returns to highlight the sources of gains and comment on the returns to key factors of production under contracting and not contracting, before concluding the paper.

### The commodities and their contexts

The data for this study come from a survey of 474 farmers covering four commodity sectors, gherkins, marigold, papaya, and broiler chickens, in the southern state of Tamil Nadu and was conducted between 2009 and 2010. The list of contracting farmers for the year of the survey was obtained from one contracting firm (henceforth the subject or sample firm) in each of the commodities

studied.<sup>2</sup> Based on this list, all the hamlets in the sample area were divided into contracting and non-contracting hamlets and their corresponding villages into contracting villages or non-contracting villages. A similar exercise was carried out for the larger administrative units called blocks and then districts. Starting from the largest administrative unit for the study area, contracting districts were sampled, within which contract and non-contract blocks were randomly sampled and then further on, within sampled blocks, contract and non-contract villages were sampled and so too with hamlets. In the hamlets sampled, a census of all households identified four key types of farmers: those currently contracting with the subject firm (Contract farmers); those who were growing the contract crop but for the open market or contracting for other firms (Other Contract farmers); those who had given up contracting with the subject firm and no longer grew the contract commodity (Attrition farmers); and those who had never contracted the commodity with any firm (Never Contract farmers). The sample respondents were randomly selected from each type. If a farmer grew the contract crop for some other firm and quit, they were not sampled at all.

All the contract farming schemes studied operate in rainfed agricultural areas and have diverse arrangements with farmers. Gherkins are a non-traditional export crop with no domestic market, but there are several firms that procure, mostly through contract farming and sometimes through informal procurement by agents. The crop is procured from farmers and processed at small-scale plants by washing, rinsing and preserving in brine, acetic acid or vinegar. These are either bottled and labeled for international clients or shipped out in barrels for bottling. Papaya was introduced in the region in the 1990s for extracting papain, which has wideranging industrial uses. The variety is appropriate, but not ideal, for table consumption, and the fruit is a by-product that is used to make candied fruit or for pureeing. Papaya for papein is procured through contracts but papaya for direct consumption is not. The subject firm is the lone processor of papein. Marigold contracting was initiated by firms for oleoresin extraction for export, mainly as coloring agent for poultry feed. Marigold has a thriving local market, however, for fresh cut flowers that are used for a number of occasions, religious and otherwise. Although three firms procure marigold, in the sample area there were no farmers who contracted with other firms and only a few who grew specifically for the fresh flower market. The broiler industry in the study region is almost completely vertically coordinated, a process that began in the mid-1990s. Day-old chicks are provided by the firm and bought back by the contracting firm. The firm acts as an aggregator-intermediary, but also has its own brand of chicken in various processed forms. In many ways, the four schemes are fairly typical of contract production arrangements elsewhere in the developing world. All contract commodities are cash crops and involve production processes that require farmers to respond continuously to the need to maintain quality. Firms engaged in contract farming thus engage actively in the production process, not only providing critical inputs but also maintaining close supervision from sowing through to harvest and post-harvest handling.

The commodities and firms selected for study represent varying degrees of involvement by the firm in the production process or intensity of contractual relationship, and this varies even across firms within the same commodity complex. Broiler represents high relationship intensity, with the firm's officials visiting contract growers every day to monitor health and status of the birds. These firms provide day old chicks to the farm and have detailed protocols for the feed mix and vaccination schedules. For papaya, the

<sup>1</sup> The efficacy of these approaches invariably depends on the choice of an instrument that enables identification of the parameters of the model. Miyata et al. (2009) treat the distance between a respondents farm and the farm of the village chief as an instrument. Rao and Qaim (2011) use farmer group membership to serve as an instrument and Simmons et al. (2005) choose number of organizations farmers are members of as an instrument. Other instruments include the number of female laborers in the respondents household as well as a dummy for whether a female in the household is a member of a womens organization (Maertens and Swinnen, 2009), farmer willingness to pay (WTP) for a certain return from a randomly drawn level of investment (Bellemare, 2012). Across methods, the central challenge is to find an appropriate instrument that can break any correlation between selection and the unexplained variation in welfare outcomes. Panels using difference-in-differences have also been used (Michelson, 2013).

<sup>2</sup> All firms were approached, who were contracting for the particular commodity in the study area. The firms selected as the subject or sample firms were those that were contracting that year and were willing to share the complete list of contract farmers. The study firms were the first to share these lists.

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