

Contract Farming in Agriculture and Host Country Effects: Development Policy Insights from Alternative Models on Land Deal

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Abstract

Empirical literature on the effect of Contract Farming (CF) on economic development of a Less Developed Economy (LDC) is divided on the basic issue of concern for the policy makers in LDCs: should CF be encouraged, and if so, under what circumstances? Broadly, there are both intermediate (yield, price etc.) and ultimate (mainly household income and food security) benefits. However, the implication of the outcomes on welfare are not unidirectional. For instance, in most cases yield per hectare and household income of farmers increased along with rise in prices of crops. Also, there is no homogeneity in the sample of crops or the country of occurrence. Since most of these contracts are private in nature with objective of profit maximization, the estimates could have self-selection biases, which is rarely controlled for. Additionally, these are mostly in the nature of treatment/control group studies (though not RCTs). A fundamental issue is that **spillover effects (SOEs)** bias outcomes in these methods and it should be controlled for. This implies that there is virtually no empirical literature on it. Looked at it differently, these studies conclude that *in the absence of SOEs* CF appears to be conditionally beneficial to LDCs. Given this background, this paper researches: what are the nature of these conditions? To what extent do spillover effects relax them? Constructing a **three-sector-four-factors General Equilibrium model: agricultural with contract farming, traditional agriculture, and manufacturing**, we derive the conditions under which it is conducive for low-income farmers. The objective is to prescribe a clear set of recommendations to the governments of the LDCs that are experimenting with CF on the nature of priors that they need to ensure for significantly increasing the probability of net benefit.
JEL Classification: F22, J31, O15; **Keywords:** Self-selection Bias, Spillover, Welfare.

Extended Framework for Post-CF Analytics

Features: Introduce 2 non-homogeneous land types: V_F (for CF sector) and V_A (for non-CF) on top of Benchmark. **Returns:** as **Marginal productivity of V_F higher, $R > r_A$** (respectively). Firm **self-selects (in-built model) V_F** because of higher returns. **Spillover (SOE) Mechanism:**

$$X_F = X_F(V_F, L), X_A = X_A(V_A, L), X_M = X_M(K_M, L) \quad (1)$$

$$\text{Full-employment condition: } a_{LF}X_F + a_{LM}X_M + a_{LA}X_A = L; a_{VF}X_F = V_F; a_{VA}X_A = V_A, a_{KM}X_M = K_M \quad (2)$$

$$\text{Price Equation: } P = AC \Rightarrow a_{LF}w + a_{VF}R = P_F; a_{LM}w + a_{VM}r_M = P_M; a_{LA}w + a_{VA}r_A = P_A \quad (3)$$

Equations of changes:

$$\text{Comparative Statics--} \theta_{LF} \hat{w} + \theta_{VF} \hat{R} = \hat{P}_F; \theta_{LA} \hat{w} + \theta_{VA} \hat{r}_A = \hat{P}_A; \theta_{LM} \hat{w} + \theta_{VM} \hat{r}_M = \hat{P}_M \quad (4)$$

Tied Spillover Mechanism:

technological coefficients: $a_{ij}(w, R, r_A, r_M), i \in \{L, V, K\}, j \in \{X_F, X_A, X_M\}$

$\hat{a}_{VA} = \theta_1 \hat{a}_{VF}; \hat{a}_{LA} = \theta_2 \hat{a}_{LF};$ where $\theta_i (i=1, 2)$ is **tying threshold**.

technical progress $\Rightarrow \hat{a}_{VF} = -\beta_1, \beta_1 > 0; \hat{a}_{LF} = -\beta_2, \beta_2 > 0 \Rightarrow$

$$\hat{a}_{VA} = -\theta_1 \beta_1, \hat{a}_{LA} = -\beta_2 \theta_2 \quad (5) \quad \hat{X}_F > 0, \hat{X}_M < 0, \hat{X}_A > 0$$

Under certain condition: $\theta_i (i=1, 2) > 1. \quad (6)$

Evidence and Meta-analysis

Wang et al (2014): and conclude that more than 75 percent of the studies show an increase in income from CF. This has resulted in increasing popularity of CF in many underdeveloped countries (Martin (2015)). However many of these empirical results suffer from **inherent weaknesses** (Ton et al. (2018)). As **Bellemare and Bloem (2018)** point out "(A) particularly challenging limitation of these studies is selection bias, or the fact that farmers choose whether to participate in contract farming on the basis of factors that are both unobserved by researchers and highly likely to be confounders". **Many authors argue that contracting farmers have special characteristics (Minot and Ronchi, 2015; Barrett et al., 2012). The nature of these characteristics is reported in Michelson (2013) as availability of irrigation facilities, farm size and human capital and others.** A recent study controls for this self-selection bias and finds a negative impact of CF on profits from production (Ragasa (2018)). Bellemare and Bloem (2018) conclude that the euphoria on CF and empirical evidence suffers from many limitations. In the presence of such self-selection bias CF land is expected to be more productive than non-CF land. Several studies have shown that CF leads to undesirable outcomes like increases relative poverty (inequality) in many countries (see Glover, 1987, Key and Runsten, 1999, Miyata et al., 2009, Simmons et al., 2005), income inequality and concentration of wealth (Bellemare and Bloem (2018)).

Lacunae, Research Question, & Alternative Models

The empirical literature on Contract Farming (CF) has pointed out many of its **lacunae:** CF arrangements do not always include the poorest households, can only include a limited number of households, or may even increase relative poverty (Miyata, Minot, & Hu, 2009; Simmons, Winters, & Patrick, 2005), pointing to the fact that one of the main problems with contract farming is the **self-selection bias (SSB)** of the incumbent firms (Bravo-Ureta and Pinheiro, 1997; Begum et al., 2012).

Assuming that contracts are private in nature with an objective of profit maximization the contracting firm is likely to choose the most efficient of the agricultural farms. Being efficient the owners of these farms are relatively less poor. Thus, relatively less poor farmers get better off and **wage inequality (relative poverty)** in the rural sector rises. Also since a large proportion (or even the whole amount of) output produced by these contracting firms is exported, domestic supply of these goods falls leading to food insecurity and prices of agricultural goods rise increasing poverty for the non-participating poorer households (**non-CF**, henceforth).

One possible way out of this unfortunate outcome is to focus on **spill-over effects (SOEs)** of CF. **SOE** increase the efficiency of the non-CF farms increasing their marketable surplus, increases the absolute income of the poorest farmers (Minten et al (2007)) and also tends to reduce the extent of price rise and mitigate food insecurity. Theoretically, if spill-over effects are substantial then net welfare of the agricultural community as a whole can be improved. Relative poverty will however continue to increase as long as the SOEs do not outweigh the increase in efficiency of the participating firms (an unlikely outcome). **Given the above scenario the success of CF depends on SOEs. The extent of spill over can be modelled, inter alia, via: (1) technological spill over (2) spill overs depend on the extent of information asymmetry between the CF and non-CF farmers.** Literature abounds: Minot and Ronchi, 2015, Bellemare and Bloem (2018).

In the former case the threshold level of spillover is determined under which net welfare increases. The latter case assumes that CF imparts some technical knowledge to the participating farmers that are unavailable to the non-CF. The government can play an important role in designing a mechanism for guaranteeing the spillover by turning unskilled to skilled workers, which facilitates **Shared prosperity (inclusiveness) under Sustainable Development Goals (SDG).**

Literature supports: spill over effects do occur and are often substantial (Minten (2006) for Madagascar, Klaus et al (2006) for Mozambique, and Bielik (2017) for Slovakia. Ragasa (2018) specifically shows in Ghana's context of necessity of tech adoption to overcome input costs.

Framework and Pre-CF Benchmark Model

ASSUMPTIONS: General Equilibrium a la Jones (1965, 1971). Caves and Jones (2006), Krugman & Obstfeld (2007). **Small Open Economy** (Price-taker), **Perfect Competition**, Production: **Constant Returns to Scale (DMR)**, **Specific capital** (return R_f and R_m) and **Mobile labor (w)** enter into Farm and Mfg sector such that $X_f = X_f(K_f, L); X_m = X_m(K_m, L)$. **Rise in World Price of Farm sector (P_f)** causes reverse migration, **contracting Mfg (X_m)** and **expanding Farm sector (X_f)**: Returns to Farm rises, such that **Ex post $\Delta\% R_f > \Delta\% P_f > \Delta\% w \geq 0$. Real wage** in terms of Farm sector output (**W/P_f**) falls. **Returns to contract farmers increase. Welfare loss.**

$$\hat{X}_F > 0, \hat{X}_M < 0, \hat{X}_A < 0$$

Analytical Results

Proposition I: In the absence of SOEs, Rise in P_f (world price) causes contraction in non-CF agriculture sector and Mfg, causing Food insecurity, rise in Relative poverty, fall in real wage, decline in returns to non-CF land. Assuming relative budget shares of consumption items unaltered, this causes food deficit and welfare loss, causing 'Immiserizing Effects' and 'Dutch Disease resemblance'. Without Export tax, more of Farm sector output is exported, more is food insecurity. **SSB effect dominates.**

Proposition II: With spillover effects where land productivity (and for labor as well) is tied--via a threshold parameter--to productivity rise (technical progress) in CF sector, this **SSB effect is counteracted**, translating into rise in real wage, fall in relative poverty, increase in total welfare as both non-CF and CF sector conjointly expands with growth in GDP. The effect of spillover is 'Magnified' for a threshold value exceeding one, mitigating adverse impacts of SSB; otherwise, it's damped diffusion to non-CF.

Proposition III: Amplification of productivity spillover to non-CF could occur via offering premium to CF; however, that is possible **iff** rate of technical progress exceeds the threshold value of parameter (both exceeding unity) while share of land under CF might increase less than proportionally. Thus, incentivising CF could augment welfare and be beneficial only if extent of spillover more than outweighs fraction of land under CF.

Alternative Model (2): Further Works and Conjectures

1. One of the key findings in the literature is that CF reduces transaction cost of agricultural production. This includes cost for procurement of input and marketing costs. This will be incorporated into the model.
2. CF farmers acquire information regarding more sophisticated production techniques by participating in CF. They thus become skilled compared to non-participating farmers. This results in asymmetric information and market failure in the agricultural sector. Optimum government intervention to correct these information asymmetries will be incorporated.
3. Skill and unskilled farmers will allow us to address the issue of wage inequality more directly.
4. By assuming a continuum of land types self-section can be endogenized.
5. Increase in input/transactions cost due to CF often result in higher yields but lower profits for participating farmers. This has to be taken care of.
6. **Framework: Extension of above by splitting labor into non-homogeneous Skilled (SL) and Unskilled (UL), K mobile across Farm and Manufactures. Similar experiments with Comparative Statics as above:**

Proposition I: Pre-CF benchmark, wage inequality and relative poverty rises in the absence of SOE as SSB dominates.

Proposition II: With SOEs, threshold for welfare of UL rises and total welfare augments.

Proposition III: Skilling and training (agricultural extension, etc.) via Government supports causes wage inequality to decline towards non-CF and concomitantly, welfare of both rises rel. to CF. Thus, joint spillover reinforces each other to counteract strong SSB.

Conclusion and Policy insights

Highlights are: (i) Encouragement of CF to invest in lands with high PDV and less in relatively infertile land; (ii) SOEs could be encouraged by offering risk-premia so that spillover effect dominates the detrimental effects of SSB via labor-pooling, labor-training spillover and diffusion to non-CF firms; (iii) Export tax (punitive) to control exports by CF farm for addressing food insecurity/deficit, and ensuring GDP growth via all firms; (iv) to reduce farm distress, Subsidy schemes or insurance policy to cure market failure induced by asymmetric information (skilling the unskilled, computerized/digitize land maps via GIS, cash subsidy or minimum support prices are suggested.

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