Marketing Cooperatives in Developing Countries: Who Joins Them and How Can They Do Better?

Benoît Malan  
Assistant Professor  
University of Cocody – Abidjan  
malanben@yahoo.fr

Tina L. Saitone  
Project Economist  
University of California, Davis  
saitone@primal.ucdavis.edu

Richard J. Sexton  
Professor and Chair  
University of California, Davis  
rich@primal.ucdavis.edu


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Marketing Cooperatives in Developing Countries: Who Joins Them and How Can They Do Better?

Agricultural marketing cooperatives have the potential to enhance the rate of economic development in poor countries and improve the lot of small farmers because the economic problems that are potentially addressed through cooperatives (Sexton 1986; Sexton and Iskow 1988; World Bank 2008; Soboh et al. 2009) are widespread in developing country settings. For example, cooperatives can enable small farmers to agglomerate production and jointly capture the benefit of downstream scale economies in value chains that are beyond the reach of individual producers. Marketing cooperatives also enable farmers to avoid selling to for-profit buyers who may exercise monopsony power due to the farmers’ limited access to outside selling options (Sexton 1990).

However, cooperatives in developing countries were traditionally creations of the government, staffed and controlled by government employees, and generally unsuccessful (World Bank 2008). Liberalization beginning in the 1980s led to the creation of voluntary cooperative organizations at the volition of producers. For example, nowadays on the African continent seven percent of the population belongs to a cooperative, and 50% of all cooperatives are for agricultural marketing purposes (Develtere, Pollet, and Wanyama 2009). This cooperative movement within developing countries has received considerable attention by researchers, international development agencies, and donors (e.g., Uphoff 1993; Berdegué 2001; Rondot and Collion 2001; Bosc et al. 2002).

Empirical evidence suggests that the potential of cooperatives has been fulfilled in at least some instances, with cooperatives paying a price premium to their members, relative to what can be earned in the open market. For example, Shiferaw et al. (2009)
showed that producer marketing groups in Kenya paid 22-24% higher prices than other buyers of pigeon pea, while Bernarda, Taffeseb, and Gabre-Madhina (2008) found that cooperatives in the cereal sector in Ethiopia paid 7.2-8.9% higher prices than private traders.

However, despite their emergence and strong raison d’être within developing countries, there are widespread concerns that marketing cooperatives have not fulfilled their potential (e.g., Braverman et al. 1991). In this paper we examine two related considerations endemic to cooperatives that can impede their effectiveness in developing-country settings. One key concern is the delay with which cooperatives make payments. While private buyers pay farmers cash at the time of delivery, cooperatives usually do not. Instead payment is often delayed for several weeks after delivery to the cooperative, until the crop has been marketed and related expenses have been paid. Such delays in payment can be very problematic, particularly for the most cash-constrained and, thus, impatient households, and may constitute a significant barrier to cooperative membership for them.

Delay in payments has been found to be an important problem for cooperatives in many African countries (Calkins and Ngo 2005; Shiferaw, Obare, and Murichio 2008; Shiferaw et al. 2009; Markelova and Mwangi 2010; Mujawamariya, D’Haese, Speelman 2012; O’Brien, Banwart and Cook 2013; Theriault, Serra, and Sterns 2013; Verhofstadt and Maertens 2014). Shiferaw, Obare, and Murichio (2008) found, for example, that the time lag for producer marketing groups to make payment after delivery could reach five weeks in the case of the grain marketing in Kenya, while Calkins and Ngo (2005) reported delays by cooperatives of three weeks in payment to cacao farmers in Cote
d'Ivoire. In the case of cotton marketing cooperatives in Mali, the delay in payment averaged about six weeks, but ranged from less than one week to 25 weeks (Theriault, Serra, and Sterns 2013).

A delay in receipt of the promised payment means, of course, that farmers will discount its value when considering their marketing options. Discount rates and types of discounting have been studied in various developing-country settings, mostly through experiments (e.g., Pender 1996; Botelho et al. 2006; Tanaka, Camerer, and Nguyen 2010). Although the specific results from such studies differ widely, consensus conclusions are that people discount future payments at rates above market interest rates and that considerable heterogeneity in discount rates exists across individuals.

A second and related concern among developing-country farmers regarding selling through cooperatives is the problem of default in payments. Inherent to the fact that the payments to members are not made upon delivery is a possibility that the cooperative will default and not pay the member at all (Braverman et al. 1991), creating a problem of risk and uncertainty for farmers selling through these cooperatives.

A large number of studies have established that farmers in developing countries are generally averse to such risk, but that there is considerable heterogeneity among a farmer cohort as to the degree of risk aversion (Moscardi and de Janvry 1977; Dillon and Scandizzo 1978; Binswanger 1980, 1981, 1982; Binswanger and Sillers 1983; Wik et al., 2004; Yesuf and Bluffstone 2009; Harrison, Humphrey and Verschoor 2010; de Brauw and Eozenou 2014). However, no consensus has emerged as to the form of risk aversion and its relationship, if any, to wealth. Accordingly, risk of default can be a considerable deterrent to marketing through a cooperative for at least the most risk averse farmers.
Thus, a typical developing-country setting is that a risk-averse and cash-constrained farmer can sell either on the spot market to a private trader who has monopsony power but who pays at the time of delivery or through a marketing cooperative which promises a premium above the trader’s price, but delays the payment and carries the concomitant risk of default.

We construct a microeconomic model to study this decision and cooperative marketing among a group of heterogeneous, developing country farmers. The goal is to understand what types of farmers will choose to join a marketing cooperative and sell some or all of their production through the cooperative. We show that this decision can be expressed as a function of the farmer’s relative impatience (i.e., discount factor), initial wealth, and degree of risk aversion, and as a function of the price premium offered by the cooperative relative to the open market, the length delay in the promised payment, and the probability of default risk.

We then construct a simulation model that is parameterized to fit, as best possible, a profile of farmers within a prototype developing-country village, and study the optimal decisions of this heterogeneous group regarding marketing production, in all or part, through a cooperative vs. a private trader. The goal is to understand the factors that limit the size and market share of cooperatives and, ultimately, restrain their effectiveness, and thereby identify policies to improve marketing cooperatives’ performance in developing-country settings.
The Model

We assume each farmer $i$’s impatience can be represented by a unique exponential discount function, with discount parameter, $\delta_i \leq 1$.\(^1\) We further assume that each farmer is characterized by a von Neumann-Morgenstern utility function, $U_i(W_i)$, where $U_i' > 0$, and $U_i'' \leq 0$, and where $W_i$ is the farmer’s wealth, which is comprised of $W_i^0$ in initial wealth and net income received from farming.\(^2\) We also assume that each farmer’s degree of risk aversion can be represented by the Arrow-Pratt coefficient of absolute risk aversion $\lambda_i = -\frac{U_i''}{U_i'}$ where $\lambda_i \geq 0$.\(^3\)

Each farmer, $i$, thus, is characterized by the triple $(\delta_i, W_i^0, \lambda_i)$, and produces one unit of commodity that can then be marketed in any share, $0 \leq \alpha_i \leq 1$, through a cooperative, with the remaining share marketed through a private trader.\(^4\) For simplicity we assume that there is a single co-op marketing alternative for farmers within the village.

We normalize the price offered by the outside trader net of farmers’ variable production costs to be 1.0. The trader makes payment immediately, at time $t = 0$. The net

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\(^1\) The exponential discounting model does not allow the discount function to decline at a greater rate in the short term than the long term, an outcome which has found support in some experimental settings and is incorporated in hyperbolic or quasi-hyperbolic discount models (Laibson 1997; Frederick, Loewenstein, and O’Donoghue 2002; Angeltos et al. 2001). Whereas this consideration is of paramount consideration in some instances, e.g., models of life cycle consumption, it is less important here where delays in payment by a cooperative are typically only a few weeks. Further, empirical evidence in support of exponential vs. hyperbolic discount models in developing-country settings is mixed (Botelho et al. 2005, Tanaka, Camerer, and Nguyen 2010).

\(^2\) Prospect theory (Kahneman and Tversky 1979) presents itself as an alternative to expected utility theory. See Tanaka, Camerer, and Nguyen (2010) for a study that evaluates prospect theory and expected utility theory in an experimental setting. We opted to use expected utility theory due to its analytical simplicity relative to prospect theory.

\(^3\) See Binswanger (1981) for a discussion and comparison among alternative measures of risk aversion.

\(^4\) The special case where cooperatives require exclusive membership can be readily characterized by restricting $\alpha \in \{0,1\}$. 
price promised by a cooperative is \( \mu > 1 \), where \( \mu - 1 \) represents the percentage margin premium promised by the cooperative, and its discounted value to the \( i^{th} \) farmer is \( \mu \delta_i^T \), where \( T > 0 \) is the number of time periods scheduled for the delay in payment. A cooperative also has a positive probability, \( 1 - \rho > 0 \) of defaulting on the payment. A co-op, \( j \), is thus characterized by the triple \((\mu_j, T_j, \rho_j)\).

We assume a farmer seeks to maximize expected utility with respect to the allocation of his crop between market outlets. A farmer’s optimization problem is the following:

\[
\text{(1)} \quad \max \{0 \leq \alpha \leq 1\} \psi((\alpha|\rho, \mu, W^0, \lambda, \delta, T)) \\
= \rho U(\alpha \delta^T \mu + (1 - \alpha) + W^0) + (1 - \rho) U((1 - \alpha) + W^0).
\]

The first expression on the right-hand side of (1) reflects the utility from marketing \( \alpha \) share of production through the cooperative in the no-default case. The second term represents the utility in the case of co-op default.

Let the solution to (1) be denoted as \( \alpha^* \). The optimum may lie at either “corner” of the admissible range for \( \alpha \), i.e., \( \alpha^* = 0 \), marketing exclusively through a trader, or \( \alpha^* = 1 \), marketing exclusively through the cooperative. Interior solutions, \( 0 < \alpha < 1 \), are also possible, however, as farmers seek to balance the promised higher payment from the cooperative with the risk that the cooperative may default.

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5 Marketing cooperatives in developing countries sometimes provide free or subsidized inputs to their members. Our model readily handles such cases given the interpretation of prices as net of production costs. Thus, the margin premium, \( \mu \), offered by a cooperative may consist of both a price premium and lower input costs compared to marketing through a private trader.

6 Although we characterize \( 1 - \rho \) as a default probability, its function in our model is very similar to a parameter to measure “present bias” in models with quasi-hyperbolic discounting (Angeletos et al. 2001, Tanaka, Camerer, and Nguyen 2010). Present bias measures the degree to which people prefer an immediate reward to one that is deferred at all. One explanation for present bias is the belief that a future reward will not materialize, for whatever reason, but in our specific context because the cooperative may default on the promised payment.
The first-order condition for an interior solution to problem (1) is the following:

\[
\frac{d\psi}{d\alpha} = U'\rho(\delta^T\mu - 1) - U'(1 - \rho) = 0.
\]

**Lemma 1:** The condition \(\rho\delta^T\mu > 1\) is necessary and sufficient for a farmer with discount factor \(\delta\) to market production through the cooperative defined by \((\rho, T, \mu)\), i.e., for \(\alpha^* > 0\).

**Proof:** The derivative \(\frac{d\psi}{d\alpha}\), when evaluated at \(\alpha = 0\), simplifies to \(\rho\delta^T\mu - 1\). Thus, \(\rho\delta^T\mu > 1\) establishes that expected utility is increasing in \(\alpha\), when evaluated at \(\alpha = 0\), and, therefore, that the farmer can increase utility by selling some production to the cooperative if and only if this condition holds.

Lemma 1 establishes that even a highly risk averse farmer will market positive production through the cooperative as long as the expected discounted net price promised by the cooperative exceeds the certain and immediate net payment offered by the outside trader.

**Lemma 2:** The derivative \(\frac{d\psi}{d\alpha}\) is non-increasing in \(\alpha\) whenever \(\rho\delta^T\mu > 1\), and it is strictly decreasing in \(\alpha\) for a risk-averse farmer.

**Proof:** The condition \(\rho\delta^T\mu > 1\) establishes that expected discounted revenue is higher for product marketed through the cooperative than through the trader, but \(U'\) is non-increasing in expected income due to \(U'' \leq 0\), and it is strictly decreasing in expected income when \(U'' < 0\), i.e., the farmer is risk averse.

**Lemma 3:** The condition \(\rho\delta^T\mu < 1\) is necessary and sufficient for the farmer with discount factor \(\delta\) to market production exclusively through the outside trader and to not patronize the cooperative defined by \((\rho, T, \mu)\).
Proof: The lemma follows directly from Lemmas 1 and 2.

Lemma 4: conditions \( \rho \delta^T \mu > 1 \) and \( \frac{d \phi(\alpha=1)}{d \alpha} > 0 \) are sufficient for a farmer to market production exclusively through the cooperative.

Proof: Lemma 1 establishes that a farmer will market positive production through a cooperative whenever \( \rho \delta^T \mu > 1 \). The condition on \( \frac{d \phi}{d \alpha} \) establishes that expected utility is increasing in \( \alpha \) throughout its admissible range.

Collectively Lemmas 1 – 4 establish conditions on the model parameters for a farmer to (i) sell exclusively to the outside trader, (ii) sell exclusively to the cooperative, and (iii) sell part of his production to the cooperative and part to the trader. In this latter case the farmer balances the higher discounted expected income promised by the cooperative with the increasing risk exposure due to the default possibility as \( \alpha \) increases. Marketing through the trader in effect works as an insurance policy, with the premium set by the magnitude of \( \rho \delta^T \mu - 1 \). The comparative statics of the model are straightforward; a farmer’s propensity to market some product through the cooperative or increase the share he markets through the cooperative is increasing in \( \delta, \mu, \) and \( \rho \) and decreasing in \( \lambda \) and \( T \).

Figures 1 – 3 illustrate the three possible outcomes for reasonable model parameter values. In each instance we focus on farmers whose income is solely from sale of the crop, i.e., \( W^0 = 0 \). The hypothetical cooperative offers a 25% price premium relative to the trader, consistent with the finding of Shiferaw et al. (2009), delays payment for \( T = 5 \) weeks, consistent with the findings of Shiferaw, Obare, and Muricho (2008), and has a 10% default probability, i.e., \( \rho = 0.9 \). Figure 1 illustrates a highly risk
averse and impatient farmer, with CARA coefficient $\lambda = 10$, and discount parameter $\delta \approx 0.956$, consistent with findings of Tanaka, Camerer, and Nguyen (2010). For this farmer $\mu \delta T \rho = 0.9 < 1$, so the necessary condition of Lemma 1 is not satisfied, and she markets exclusively through the trader.

Figure 2 illustrates a farmer who is only mildly risk averse, $\lambda = 0.25$, and less impatient than the figure 1 farmer, $\delta = 0.99$. This farmer’s optimal marketing decision is to sell exclusively to the cooperative. Figure 3 depicts a farmer with the same discount factor as the figure 2 farmer, but who is moderately more risk averse, $\lambda = 1.0$. This farmer maximizes expected utility with $\alpha^* = 0.44$, i.e., by splitting his crop nearly equally between the trader and the cooperative.

**Simulation Model**

The analytical model is useful in understanding individual farmers’ decisions regarding marketing through a cooperative or a private trader and the factors that influence them. However, even greater interest lies in understanding the decisions of a group of heterogeneous farmers in terms of marketing through a cooperative or a private trader. Such analysis can give us a sense of how the cooperative’s performance, as measured by $(\rho, T, \mu)$, can impact the market share a cooperative can attain and, ultimately, determine its economic viability and the role it can play in the market place. Here we set forth a simulation framework designed to accomplish this objective.

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7 Risk aversion of this magnitude is consistent with findings of Binswanger (1981) for some Indian farmers and also with levels reported by Chavas and Holt (1996).

8 Panel B is a blow up of Panel A, which depicts the full range of $\alpha$. 
The simulation model involves structuring a synthetic developing-country village consisting of 100 farmers, who grow a particular crop such as cacao or raise a particular type of livestock. We draw the village population from distributions for $\lambda$, $\delta$, and $W^0$ constructed to be representative of such settings based upon the prior literature, i.e., a village, $V$, is defined by $V = \{(\delta_1, \lambda_1, W^0_1), (\delta_2, \lambda_2, W^0_2), ..., (\delta_{100}, \lambda_{100}, W^0_{100})\}$. We then construct a synthetic marketing cooperative, $j$, by defining a set of values for $(\mu_j, T_j, \rho_j)$ consistent with results from the prior literature.

For each farmer, $i$, we then determine her optimal share of product, $\alpha^*_i$, to market through cooperative $j$, and aggregate across all 100 farmers to determine the cooperative’s market share within the village and compile information on the types of farmers who market exclusively through the cooperative, exclusively through the private trade, or who divide sales between the two market options.

By repeating the simulations for alternative characterizations of a cooperative in terms of $(\mu_j, T_j, \rho_j)$ we can determine how the cooperative’s performance interacts with farmer characteristics to determine cooperative market shares and, implicitly, its economic viability. We can consider various policies in terms of the parameters that define the model. For example, policies to improve capitalization of a cooperative reduce $\rho$, policies to improve cash flow and cash management reduce $T$. Similarly improved access to credit on the part of farmers increases $\delta$. Policies to help farmers attain greater financial reserves or crop diversification may reduce $\lambda$ and increase $\delta$. The impacts of any such policies on a cooperative’s share in the relevant market can be evaluated within this framework.
Model Parameterization

We assume farmers’ utilities can be represented by the negative exponential utility function, \( U(W) = -e^{-\lambda W} \), where \( W \) consists of initial wealth, \( W^0 \), plus income from farming. This utility function exhibits constant absolute risk aversion (CARA), with \( R_A = \lambda \) and increasing relative risk aversion \( (R_R = \lambda W) \). Empirical results are mixed as to whether CARA is an appropriate characterization of risk preferences in developing country settings, but it is virtuous in our setting due to the simplicity of utility formulations, like the negative exponential, that embody CARA.

Absolute risk-aversion parameter estimates in the literature vary widely. Most estimates are in the range of \( \lambda \in [3, 5] \), e.g., Saha, Shumway, and Talpaz (1994), although Chavas and Holt estimated \( \lambda = 12.17 \) for U.S. corn and soybean producers. To fully capture heterogeneity in farmer risk aversion, we simulated values for \( \lambda \) chosen from a uniform distribution with supports \([0.5, 8.0]\).

Estimates of discount rates for developing-country settings vary widely. Early work by Pender (1996), using experiments conducted in rural India, found median annualized discount rates that ranged from 26% to 119% (implying a range of weekly discount factors of \( \delta \in [0.9850, 0.9956] \)), depending upon the experiment, with most rates falling in the range of 40 – 70% \( (\delta \in [0.9898, 0.9936]) \). Botelho et al. (2005), however, estimated a much lower average exponential discount rate of 12.7% per annum across a group of 30 college students in Timor-Leste, which implies \( \delta = 0.9977 \). More recently Tanaka, Camerer, and Nguyen (2010) estimated a continuous-time discounting model from a market experiment in Vietnam and obtained parameter estimates of
\( r = 0.021 \ (\delta = 0.9790) \) for exponential discounting, i.e., \( e^{-rt} \), and of \( r = 0.046 \ (\delta = 0.9594) \) for true hyperbolic discounting, i.e. \( 1/(1 + rt) \).

Importantly, each of these studies found considerable heterogeneity in impatience among study participants. Pender, depending upon the specific experiment, found several participants with discount rates below 20% (including some that were negative), while other participants were bunched at the maximum implied discount rate that was allowed by the experimental design (usually 80% or more).\(^9\) Wealthier respondents had lower discount rates in all of Pender’s experiments. However, wealth was not a statistically significant explanatory variable for Botelho et al., but participant age was found to be inversely related to discount rate (positively related to \( \delta \)), as was living in one’s own home. Tanaka, Camerer, and Nguyen found age, income, and education to be negatively correlated with the discount rate.

To capture fully the range of discount rates observed in the experimental literature and the heterogeneity among respondents, we drew \( \delta \) values for each farmer from a uniform distribution with supports [0.9600, 0.9975], with the lower support consistent with Tanaka, Camerer, and Nguyen’s findings for Vietnam and the upper support consistent with values reported by both Pender and Botelho et al.

We found no useful information in the literature to characterize a distribution of ex ante wealth, which clearly will vary widely across countries, regions, and crops. Since our interest is primarily in cooperatives as a tool of economic development for the poorest farmers, it made sense to consider small values for ex ante wealth. Accordingly we drew ex ante wealth from a discrete distribution of \( W^0 \epsilon \{0, 0.5, 1.0\} \), i.e., ex ante wealth.

\(^9\) Among a set of explanatory variables that included wealth, age, education, and gender, the only factor found to be significant in explaining variation in discount rates was wealth, with wealthier participants tending to have lower discount rates in most experiments.
wealth that ranged from none to the equivalent of one-year’s crop income in savings and other assets.

To construct synthetic cooperatives for the simulation, we need to define sets of plausible values for \( \mu, \rho, \) and \( T \). Comparative statics experiments can then be performed by adjusting these parameters in turn and observing how participation in the cooperative is impacted. For \( \mu \) we considered values in the range of 1.07 to 1.25, which represents a range of premiums consistent with findings in the literature (Bernarda, Taffeseb, and Gabre-Madhina 2008; Shiferaw et al. 2009). We chose values for \( T \) in the range of 1 to 8 weeks. These bounds encompass most findings in the literature, but stop short of the lengthiest delays reported by Theriault, Serra, and Sterns (2013).

We were unable to locate objective information on default probabilities, \( 1 - \rho \), but some hints can be gleaned from the “present bias” parameters estimated for quasi-hyperbolic discount models in the experimental literature, given the similarity already noted between those parameters and the default risk in this model. Tanaka, Camerer, and Nguyen (2010) generated statistically significant estimates of this parameter of 0.644 and 0.820, depending upon the form of discount model being estimated. Botelho et al., however, estimated a much higher value, 0.963. Setting values of \( \rho \) in the vicinity of Tanaka, Camerer, and Nguyen’s lower value would cause no one to market through a cooperative, given the plausible range of price premiums. Thus, we chose values for \( \rho \) in the range \([0.82, 0.97]\).\(^\text{10}\)

\(^\text{10}\)Our model treats \( \rho \) as an objective parameter that is known by market participants. However, unlike values for \( \mu \) and \( T \), which can be known, e.g., from a cooperative’s past behavior or from objective reports by the cooperative, it would be difficult for farmers to objectively evaluate \( \rho \) because it is almost certain to be a one-time phenomenon, i.e., a cooperative that defaults is unlikely to resume business. Nor is it likely that an industry’s structure would permit calculating \( \rho \) from the behavior of a cross section of similar cooperatives. Thus, an alternative formulation of the model could involve farmers forming subjective
Preliminary Simulation Results

Figure 4 shows marketing decisions for the simulated village for a cooperative defined by $\mu = 1.25$, $T = 5$, and $\rho = 0.97$, i.e., a 3% default rate. The comparatively high probability that this cooperative will not default makes the villagers’ degree of risk aversion a less important explanatory variable in explaining the marketing choice than their discount rate, given the relatively lengthy delay in payment. Thus the 23 most impatient villagers market exclusively through the trader. Only eight villagers market exclusively through the cooperative. They are characterized by low degrees of risk aversion and high values for $\delta$.

The remainder, 69 villagers, market through both the cooperative and the private trader. However, most of this group, 60 villagers, markets less than half of their production through the cooperative. These villagers, depicted by green rectangles in figure 4, have comparatively high degrees of risk aversion but are less impatient than the farmers who marketed exclusively with the trader. The nine villagers who marketed a majority of their production with the cooperative have a similar set of discount rates as those who marketed exclusively with the cooperative, but are moderately more risk averse. Despite the fact that 77 of the 100 farmers marketed some production through this cooperative, its share of the available market output is only 29%.

As a comparative static analysis figure 5 repeats the preceding simulation, but with $T = 3$. We can think of this change as being accomplished through various means, including improved marketing efficiency by the cooperative, and providing it access to short-term credit to pay farmers before the crop is fully marketed. The modest reduction estimates of the likelihood that the cooperative will default. This formulation would bring our model into even closer conformity to models with quasi-hyperbolic discounting.
in $T$ from five to three weeks causes the cooperative’s market share of the village production to increase to 46%. Now all villagers market positive production through the cooperative. Seventeen, the least risk averse among the villagers, market exclusively through the cooperative. Another 15, moderately risk averse, combined with relative patience, market the majority of the production through the cooperative, while the remainder, the most risk averse and least patient, market less than 50% of their crop through the co-op.

Figure 6 further explores the relationship between delay in payment and market share for a cooperative with $\mu = 1.25$ for alternative values of default rate. A cooperative that delays payment only one week and has a small default rate of 3% (blue line) can attain a 50% share of the village’s output. However, the share drops to below 30% if this cooperative delays payment by three weeks and to about 15% if the payment delay reaches eight weeks. If this same cooperative’s perceived default rate rises to 10.5% (red line), it achieves only a 20% market share with a one-week delay in payment. The share falls rapidly to near zero as the time delay rises to eight weeks. If the co-op is considered sufficiently unreliable that its perceived default rate is 18% (green line), the co-op attains almost no market share regardless of the delay in the promised payment.

**Conclusion**

Marketing cooperatives are potentially a valuable tool for economic development because the economic functions a cooperative can perform are especially valuable in developing-country settings. Such benefits include extending farmers’ presence downstream in the
value chain and capturing benefits of scale economies, while enabling farmers to avoid selling to private intermediaries who may exercise monopsony power.

This study has investigated two elements of cooperatives’ performance in a developing-country setting that can severely inhibit their market share and, ultimately, their economic viability—delay in payment for a crop relative to a private trader and, concomitant with such delay, the risk of default on payment. Through a series of lemmas the theoretical model established necessary and sufficient conditions for a farmer to market exclusively with a cooperative, exclusively with a private trader, or to sell jointly to both marketing options. A relatively simple condition, namely that the expected discounted payment from the co-op exceed the certain and contemporaneous payment from a private trader, was established as both necessary and sufficient for a farmer, regardless of degree of risk aversion, to sell a positive amount of production to the cooperative.

Simulation analysis involved creating a synthetic developing-country village based upon parameterizations derived from the empirical and experimental literature and investigating these farmers optimal marketing decisions in the presence of different cooperative structures as defined by relative price premium offered, time delay in receipt of payment, and risk of default. Results showed that even modest delays in payment or minor risk of default could drastically reduce a cooperative’s market share in the presence of highly risk averse and impatient farmers, even if the cooperative promised a substantial price premium above the offer by a private trader.

The simulation results provide a guide to improved cooperative performance in developing country settings in that they show how modest improvements in reducing a
default probability or lag in payment can markedly improve the cooperative’s market share and, hence, overall impact on the market and farmer welfare. A variety of policies and interventions can be considered to achieve such improvements.
References


Figure 1. Case 1: Farmer Marketing through Trader Only ($\rho = 0.9$, $\delta^T = 0.8$, $\mu = 1.25$, $\lambda = 10$, $W^0 = 0$).
Figure 2. Case 2: Farmer Marketing through Co-op Only ($\rho = 0.9$, $\delta^T = 0.95$, $\mu = 1.25$, $\lambda = 0.25$, $W^0 = 0$).

Figure 3. Case 3: Farmer Marketing through both the Co-op and Trader ($\rho = 0.9$, $\delta^T = 0.95$, $\mu = 1.25$, $\lambda = 1$, $W^0 = 0$, $\alpha^* = 0.44$).
Figure 4. Marketing Decisions for Villagers ($\rho = 0.97, T = 5, \mu = 1.25$).

Figure 5. Marketing Decisions for Villagers ($\rho = 0.97, T = 3, \mu = 1.25$).
Figure 6. Impact of $\rho$ and $T$ on the Cooperative’s Market Share ($\mu = 1.25$).