Areca Nut Farming in Southern India: A Case Study

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Abstract

Areca nut, the seed of the Areca palm, is cultivated in East Africa, the Pacific Islands and South Asia and is chewed as a stimulant by at least 5% of the world's population. The largest producer within India is the state of Karnataka (in Southern India), which contributes approximately 47% to India's annual output. This paper examines the production, processing, and marketing stages of the areca nut farming in Karnataka. A number of issues, including the impact of asset fixity, limited risk management options, and a shrinking labor supply, are discussed in the context of the challenges facing areca nut farmers. We also examine a unique auction mechanism design which allows sellers to choose the quantity supplied to the winning bidder in a first-price, sealed bid auction.

Keywords: areca nut, risk management, auction, labor markets, Karnataka

1. Introduction

Areca nut, the seed of the Areca palm, is cultivated in East Africa, the Pacific Islands and South Asia and is chewed as a stimulant by at least 5% of the world's population. The annual worldwide areca nut (heretofore also referred to as 'areca') crop is valued around $300 million. The world's largest producer as well as the largest consumer of areca nut is India, which produces just over 50% of the world market. The largest producer within India is the state of Karnataka (in Southern India), which contributed approximately 47% to India's annual output of areca in 2009-2010 (Murthy, p. 28). Our case study is focused within anarea (Sirsi) of this state.

It takes approximately five years for an areca nut palm to mature and bear fruit. Once mature, the palm can provide nuts annually for up to fifty years. Each areca palm is harvested once a year, which limits the areca farmer's ability to change crop mix as the relative prices of crops change. The areca nut is considered to be a cash crop; there are thousands of households in the state of Karnataka that depend entirely on the income from their areca orchard. Over time, there have been considerable fluctuations in the market price of areca (see Figure 1). Facing such risk, the areca farmer is not at a luxury to alternate crops to alleviate price volatility, as might the typical farmer, due to the asset specificity[1] of his crop. This leads to the question: how do the areca farmers handle this variability in income? Does the fixed asset (the areca palm tree) have any impact on their risk management choices? Finally, what does (or should) the government do to help these marginal farmers?

When it comes to managing income variability, farmers in the western world typically have many options, such as crop insurance and commodity futures markets. In many countries, the government provides subsidized yield and revenue insurance to help the farmer limit his exposure to risk. Yield insurance protects the farmer against adverse weather conditions, while revenue insurance also protects him against an unfavorable movement in prices.

[1] Asset specificity is the idea that a particular capital asset cannot be used for alternative production, due perhaps to location or prohibitive cost.

For example, the United States provides premium subsidies to the buyer of yield or revenue insurance and reinsurance to the private seller of the policy for a variety of crops, ranging from wheat and cotton to apples and blueberries. While weather index crop insurance is available for some crops and in some states in India, it is not currently available for areca farmers in Karnataka.

Farmers can also reduce income variability by rotating their crops, based on forecasted prices. In most instances, farmers base their planting decisions (crop mix and planted acreage) on either the expected profitability of the crops that can be grown on the land or environmental and sustainability criteria, such as rotating soybeans and corn to maintain adequate soil nitrogen levels. The longevity of the areca palm prevents farmers from taking advantage of temporary changes in prices. Even if the price of the areca nut falls and another crop becomes more profitable, the farmer is constrained by the fixed nature of the asset. The exception is of course a crop that can be mixed in with the areca orchard, which was the case with vanilla beans in the early part of the 2000s[2]. Crop rotation is a risk management tool that would be virtually impossible for the areca farmer to employ.

Another option for reducing income variability is to engage in a futures market. For many major commodities in the U.S. and other countries, farmers can buy futures contracts to guarantee a price for their crop. The existence of such markets is typically supported by a large number of speculators who provide liquidity. Such an option also does not exist for areca farmers in India, due to lack of a futures market. The absence of such options for areca farmers, and the fixed nature of the areca orchard, creates some unique issues with respect to the management of price and weather risk.

The topic of risk management, especially for farmers in developing economies, is very timely. The current world economic situation has adversely affected many households' income. This is particularly true of farm households, whether here in the US or in rest of the world. Farm households in developing countries are particularly vulnerable to such uncertainty, especially since it adds to their existing income variability. Given the increase in globalization, the reliance on cash crops (e.g., areca nut) as the primary source of income, and accompanying debt when crops fail or market prices plummet, many farmers in India have turned to suicide as a way to cope with increasing despair. In the decade 2000-2010, it has been reported that approximately 410 areca farmers committed suicide in two (Shimoga and Chickmagalur) of Karnataka's twenty-four districts (Ramappa, p. 58).

Most areca farmers have parcels of land no more than one acre on which they farm. This is partly due to the traditional Indian inheritance practice of dividing equally the property among the male heirs of an individual. Given the limited size of plot for farming, areca trees are planted about six feet apart. Each planting requires an area of one square foot. So the typical one-acre farm can contain approximately 600 trees, each with an average yield of 4 kg, resulting in a net profit of roughly Rs. 37, 970[3] (see Table 1 for further details). Given the variability in prices (see Figure 1) and the limited profit opportunities per acre, the small size of the typical areca farm adds to the economic pressures on the areca farmer.

Although the literature on this small but very important market is very sparse, there are a number of issues, in addition to the limited risk management options available to areca farmers, which warrant study. As in many areas of the developing world, India (including the region of Karnataka) has experienced rapid migration, particularly by young adults, from rural to urban areas. Since areca nut production is very labor intensive, this migration pattern creates a labor shortage that impacts the viability of this enterprise in a very negative manner. In particular, certain stages of the production process (see a full description of the labor requirements in the Section 2) require very specialized and skilled labor that cannot be replaced with machinery. Any reduction in the supply of these skilled workers will drive up wages (and thus reduce profits) or create bottlenecks as the limited supply of workers ration their services across many farms. The impact of these migration patterns, particularly with regard to the skilled labor requirements, on wages and labor allocation decisions warrant additional study.

In addition to income variability due to asset fixity and limited risk management options and the rapid changes in the supply of labor, the areca nut distribution process is somewhat unique (see Section 3 for more detail), particularly with regard to the auction mechanism used to sell the areca nut. The areca nut is sold in a first-price, sealed-bid auction, but with a twist. Once the high bid is determined, the seller reserves the right to sell any portion of his output at the bid price.

[2]The world price of vanilla had reached about $230 per kg in 2003, from a low of $25 per kg in the late 1990s.
[3] This compares to the average per capita income in India (2010) of approximately Rs. 56,000 (World Bank).

This creates a situation where the bidder must decide what price will win the bid, in addition to meeting the seller's reservation price for the buyer's desired quantity. This game-theoretic aspect of the auction process raises two important questions. What is the optimal bidding strategy for the buyer in the areca nut auction? Is there any evidence of collusion on the part of buyers in the auction? The remainder of this paper will describe the areca nut production and distribution process and elaborate on the issues of research interest.

2. Production and Labor Requirements

In the past, labor used in areca orchards tended to be generational, often with the same landlord-household. While successive generations were free to leave, most tended to continue in the ways of their parental generation, perhaps due to lack of other opportunities. More recently, the opportunity cost of working on the farm has increased dramatically. The younger generation for the most part is better educated and more willing to entertain off-farm employment. This has led to a shortage of labor, especially skilled labor, on areca orchards. As such, average wages for all farm occupations have risen. This is especially true of harvesters.

The harvester is the most skilled labor on the areca nut orchard. He also has the riskiest task among all labor. Areca nuts grow in clusters at a height of roughly 50 to 60 feet and are manually harvested, given the limited spacing between trees in the typical orchard. In order to increase efficiency, harvesters jump from tree to tree while harvesting areca clusters, thus adding an element of risk to their occupation. The skills of harvesting are traditionally handed down between generations, typically from father to son[4]. This is a skill that requires a master-apprentice relationship. Most start their training as early as the age of fourteen. There is usually a three-year apprenticeship, followed by an average twenty-five year career. Given the risk involved in harvesting, this occupation pays the highest wage among all areca labor. Next down in the hierarchy of areca labor wages is the *handler*. He[5] is at the receiving end of the harvested areca. The cluster is slid down a rope tied to the harvester's waist. The handler, who is on the ground a few feet away from the tree, receives the cluster and places it in a basket. Given the weight of the cluster and the speed at which it travels, the handler needs to be someone who is fairly strong. Possible risks for the handler range from small scrapes and bruises to dislocated shoulders. As such this wage also comes with a risk-premium, albeit substantially smaller than that received by the harvester. The person assigned the task of carrying the clusters from where they are harvested to a central location to be processed is the next highest paid person. While this is also typically done by men (the average basket holds about 30 kg of areca), women are also allowed to participate. The least paid are those who are assigned the task of gathering errant areca nuts, displaced from their clusters during harvesting.

Once the harvesting is complete[6], the next stage is the de-husking of areca nuts. In order to facilitate de-husking, areca nuts are separated from their clusters, with the use of minimal technology. A rope is fastened through a cluster, which is then pounded upon a wooden block until all of the nuts are freed from their clusters. The de-husking stage involves the separation of the husk from the areca nut. The areca husk is very fibrous, not unlike that of a green coconut. De-husking is the domain of female labor. It is virtually unheard of for a man to de-husk areca nuts. De-huskers are paid by the weight of de-husked areca nuts. Measurements are typically conducted using a large and a small tin container. The large container holds an average of 15 kg, while the small container can hold approximately 8 to 10 kgs of de-husked areca. De-huskers are paid approximately Rs. 4/kg of de-husked areca[7]. The average worker can de-husk approximately 5 kg/hr. Payments to all farm laborers are typically made bi-weekly.

Labor scarcity, particularly with regard to the harvester and the handler, create severe problems for the areca nut farmer. Already facing volatile prices and little opportunity to offset that risk, the areca farmer must now pay higher wages to attract the labor to harvest and process the areca nut. In a survey of arecanut farmers in the Dakshina district of Karnataka, only four percent of 300 respondents felt that they were getting sufficient labor to successfully undertake all of the needed production and processing activities. Forty percent of the respondents felt that they could not get sufficient labor, while 56% found it difficult to get the necessary labor at all times (Murthy. p.58). Although data on the wage rates of areca nut workers is not available (at least to the author's knowledge), agricultural wages in Karnataka have been rising over the last few years.

[4] Social norms restrict this occupation to males only.
[5] This activity is also restricted to men.
[6] Harvesting can last anywhere from one week to a couple of months, depending on the availability of the harvester.
[7] Milk costs Rs. 13/ liter as a means of purchasing power comparison.

Agricultural wages rose by 25% between December of 2010 and December of 2011. One explanation given was the increase in other opportunities available to the agricultural worker, such as construction and factory work (Gupta).

3. Processing and Auction

De-husked areca is processed one of two possible ways: either sun-dried; or boiled and then sun-dried. The former method of processing requires the drying of areca upon harvest (prior to de-husking). Under this method, harvested areca are sun-dried for seven sun-days[8], after which they are de-husked and bagged for sale. Such processed areca are known as*bili* (white) areca variety. Those that are boiled and then sun-dried for are known as *kempu* (red) areca[9]. Upon completion of the drying phase, areca nuts are sorted into different grades based on color, shape and other characteristics.

Connecting the grower and the buyer are commission agents and traders. Commission agents provide growers with warehousing, auctioning and banking services. Processed areca is brought from farms to commission agents, who store them in large warehouses known as *godowns.* Within a *godown,* each grower has a specific area where his product is stored until being auctioned to traders. Each bag is marked by a unique number identifying its respective grower. Auctions are held twice weekly at a designated time, all fifty-two weeks of the year. Some of the larger commission agents hold the auctions on their facilities. Auctions are done on a tender basis. Traders offer bids (tender) for lots of areca, the price based on sample quality, weight of nut, color and other characteristics (almost a hedonic pricing process).

Prior to each auction, a grower contacts the agent, indicating his/her desire to offer some or all of his output for auction. The agent arranges for samples of the product to be available for inspection to traders. On auction day, traders place bids for lots to be auctioned based on quality characteristics, including texture and color. They do so by submitting a sealed bid either for whole or partial lots up for sale. The bid specifies the grower identification number[10], lot number, desired quantity and price offered. All bids are placed in a locked box. At the designated time, a representative of Agricultural Produce Marketing Corporation (APMC) opens the locked box and notes down all entered bids. The highest bid is awarded the respective lot. The price information is then passed along to growers, who have the option to either accept or reject the bid. Should the bid be accepted, the grower can offer for sale either the entire lot or a portion thereof. Typically traders buy the amount that is being sold, even if it is more than the quantity they had bid. In these cases it seems that the traders are more concerned about the price they pay rather than the quantity they are able to purchase. Part of the reason for this could be the nature of the market. The traders then sell their lots to wholesalers, the market for which is large enough to absorb such quantities. Upon sale, the traders are responsible for the payment of sales tax (4%), fee to the APMC (1.5%), agent commission (2%) and labor costs (0.5%). Traders usually add 2% for their own commissions and sell to a wholesaler at a price roughly 10 – 12% higher than their bid price. The traders typically have one week to make their payment in full to the agents. However, if they are unable to do so, commission agents typically act as creditors and extend a 60 – 90 day credit to the traders. Growers can claim their share the day after delivery is settled. However, agents make money available to the growers immediately following the agreed upon price.

This unique auction provides an opportunity to extend the auction model first introduced by Hansen (2008). In the Hansen model, the lowest bidding seller wins a contract from the buyer. In this case, it is the highest bidder that wins the contract ('lot'). The addition is that the seller can sell anywhere between zero to one hundred percent of his output. The derivation of a theoretical solution for the optimal bid and the use of actual data to verify the optimal bid would contribute to the understanding of the efficiency of this particular auction mechanism.

4. Conclusion

Approximately half of the labor force in the state of Karnataka is engaged in the pursuit of agriculture. The areca crop accounts for approximately 1% of the state GDP. In certain regions of the state, areca production is a major sector affecting thousands of households. As with many other agricultural producers in developing countries, the areca nut farmer is now subject to the pressures of increased globalization (e.g., areca imports for foreign producers) and an increased emphasis on cash crop production, which makes the farmer even more susceptible to price or yield variability.

[8] Cloudy days are not counted as part of the total drying process.
[9] Different varieties garner different prices, with the *kempu* variety typically getting a higher price.
[10] Individual identity beyond the number is unknown to traders.

The areca nut farmer suffers from two additional related problems – the fixed nature of the asset (i.e., the areca nut tree) and the lack of risk management options. These pressures and constraints may have been contributing factors to the increased incidence of farmer suicides.

Although rural-urban migration presents challenges (and opportunities) in most countries, the labor intensive areca nut production process, particularly with regard to the harvester and handler, present severe problems for the areca nut farmer. The combination of yield variability, volatile prices, and import competition already undermine the profitability of the enterprise without the additional pressure on costs as a result of limited labor supply. Finally, the unique aspectof the first-price, sealed bid auction (i.e., fractional lot sales) creates an opportunity to extend the auction mechanism design literature. This interesting market offers opportunities for further study to explore risk management practices, labor issues, and the auction mechanism design.

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Figure 1. Areca Nut Prices in Rupees (1978-2010)

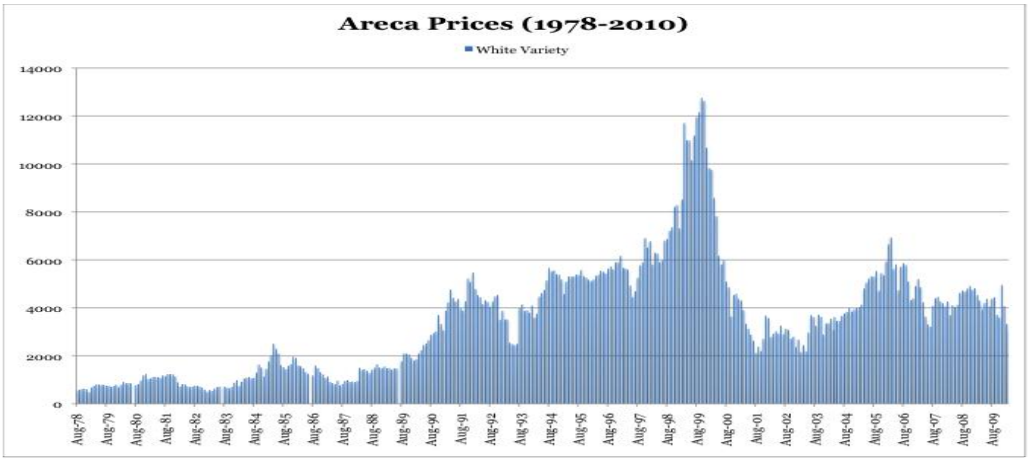

Table 1: Characteristics of Representative Areca Nut Farm in Karnataka

Variable	Quantity/ Freq	Annual Cost (Rs/ acre)
Orchard size (acres)	1	
No. of Trees	600	
Water (Dec - Apr)	10 - 15 days	
Fertilizer (bi-annual)	60 kg/tree	12000
Fungicide	semi-annual	1000
Lime, calcium & curry		3000
Labor		12000
Processing Cost		3270
Harvest Cost		2760
Avg Yield (kg)/tree	4 kg	
Total Yield	2400 kg	
Price: Rs/kg (2010)	Rs 30	
Total Revenue (Rs)	Rs 72000	
Total Cost (Rs)	Rs 34030	
Profit	Rs 37970	

Per capita income in India (2010) was approximately Rs. 56,000.