

Value Addition via Lime Pickle Semi-Processing

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Abstract

As a January 2007 Indicorps Fellow, I partnered with the Yerala Projects Society, an NGO based in Maharashtra, India, to develop a food processing unit that semi-processed limes during the monsoon season of 2007 in the Sangli District.

In the first section, titled *Introduction*, this paper will detail the socioeconomic situation and agricultural characteristics of the community within which I worked.

In the second section, titled *Theory*, this paper will detail avenues I explored to market processed food in India, the lime market in India, and the value-addition opportunity for limes. In the third section, titled *Application*, this paper will specifically discuss the means of marketing semi-processed lime pickles, steps for setting up a semi-processed lime pickling unit and the process for producing semi-processed lime.

This paper is intended for anyone interested in adding value to limes and will give specific knowledge on both the backward linkages (processes, supply chain, etc.) and the forward linkages (finding buyers) to set up a semi-processed lime pickling unit.

As this paper will show, the semi-processing of limes is a simple and effective means for farmers, NGO's, and entrepreneurs to add value to limes via a process that minimizes investment, improves quality, and generates substantial rural employment.

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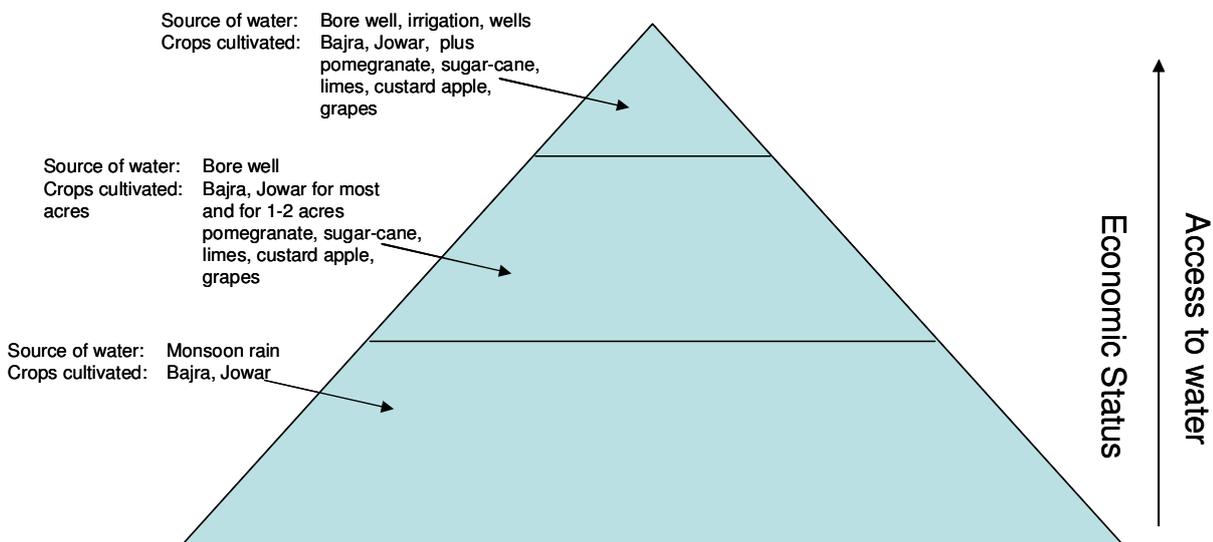
1.0 Introduction

The Yerala Projects Society (YPS) is a Non-Governmental Organizational based in the Sangli District in Western Maharashtra. The Sangli District is a mainly agricultural area with farmers growing crops such as *bajra* (pearl millet), *jowar* (sorghum) and sugar-cane for their livelihoods. YPS works on projects in two locations: first, the city of Sangli itself, where they work mostly on AIDS-related issues and second, in Jalihal, a cluster of 22 villages in the Jath Taluka of the Sangli District.

The Jath Taluka lies precariously on the border of two states: Karnataka and Maharashtra. Although Jalihal politically lies in Maharashtra, the predominant culture and language spoken in the Jalihal region is of Kannada (Karnataka) origin. The distance of Jalihal from the policy center of the Sangli District, 150 km., and its distinct culture from the rest of the state, has resulted in Jalihal being mostly neglected by policy-makers on the district and state level.

Economically, most residents of the Jalihal region depend on the agriculture for their livelihoods. Geographically, Jalihal is part of the rain shadow of the Deccan Plateau, thus it is shielded from many of the monsoon rain-showers that fall in the surrounding regions. The economic status of farmers in the Jalihal region is highly correlated to the availability of water. The majority of farmers in the Jalihal region are dependent upon monsoon rains for water, which is used to grow the grains *bajra* and *jowar*; these farmers form the bottom of the economic pyramid of the Jalihal region. With the unreliability of monsoon rains in the rain shadow of the Jath Taluka, farmers are often forced to migrate to the nearby sugar-factories of Sangli to earn their livelihoods.

Some farmers have access to a bore well which they use to cultivate one to two acres of horticulture crops including pomegranate, sugarcane, limes, custard apples and grapes. The farmers at the apex of the economic pyramid are those that have multiple bore wells, tube wells and irrigation available from a local lake. These farmers cultivate multiple acres of horticulture crops and use multiple cropping patters to diversify their revenue sources.



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Despite receiving over 550mm of rain per year, Jalihal is considered a drought-prone area, as the water from these rains is not available for agricultural use or storage for 10 months out of the year. The preponderance of rain comes during a two month window; because of low soil quality and the high evaporation rate of water due to heat, most of the water percolates through the soil and is not available for later use.

Despite poor soil quality and minimal rainfall, water-rich farmers in the region are still able to cultivate horticulture crops. Three crops are relatively well-suited for the poor soil quality and low rainfall in the region: limes, grapes and pomegranates.

Over the course of my tenure in Jalihal, I worked with lime farmers to develop means to add value via processing.

2.0 Theory

2.1 Market for Processed Foods

2.1.1 Overview of processing market in India

Despite being the second largest producer of horticulture crops in the world, India processes only 2% of her produce. Indian women, in both rural Jalihal and urban Mumbai, take pride in processing their own fresh pickles, jams and fruit juice at home. With women increasingly joining the work-force and with the influence of Western culture and diet on India, the demand for processed food in India is increasing rapidly. Additionally, with the abundant availability of raw produce, there is increasing opportunity for exporting processed foods to international markets.

Due to a lack of cold-storage facilities and high transportation costs, there is a massive amount of loss in raw agricultural goods in India. It is estimated that over 30% of all horticulture crops grown in India is wasted; this provides for a unique opportunity for processors to buy “wastage” crops when crop prices are low and preserve these crops for sale when the price of crops stabilize at a higher level.

2.1.2 Avenues searched for marketing processed foods

In trying to ensure the most efficient use of raw produce and to leverage the demand for processed goods, I looked at multiple avenues for marketing including the following:

(a) Multi-National Organizations

The typical buyer of processed goods is an upper-middle class or upper-class person in urban India. An increasingly popular place for India's urban elite to purchase processed goods are large multi-national retail outlets such as Godrej, Food Bazaar, and Reliance Fresh. In seeking to develop a food processing facility, I spoke to numerous big box retailers to understand the demand that consumers have and the current holes in the marketplace.

From meeting with consumers and purchasing managers at retail outlets, I learned a few lessons:

First, the Indian consumer highly values homemade food so if they purchase processed food, they want the food to be natural and to have natural ingredients. For example, in meeting with a Godrej manager, I found that the best selling pickles were the ones that had the least amount of preservatives in them and those that were marketed as home-made or home-style.

Second, Indian consumers are increasingly interested in buying homemade or home-style foods that are marketed by Non-Governmental Organizations. Indian consumers perceive food made by NGO's to be with the same level of care as food that would be made by their mothers or grandmothers at home so consumers place a higher premium on these products and seek them out. For example, the head of the private labels group at Food Bazaar was in the process of marketing pickles that were made by Self-Help Groups (SHG's), which were formed by NGO's, in Mumbai.

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Large retailers want to leverage the increasing social consciousness of urban Indian consumers by supplying food processed by NGO's and especially SHG's.

Third, processed food in India must cater to the regional tastes of the consumer. Therefore, each region in India has its own technique for processing food and these big retailers seek to cater to people's differing regional tastes. For example, pickles in Punjab may have oil as their base, while pickles in Karnataka may have sugar as their base; consumers in Punjab generally have minimal demand for Karnataka style pickles, thus retailers need to consider regional taste in determining purchasing decisions. Purchasing managers at larger-retailers are generally very interested in products that are based upon traditional recipes native to each region. The regional tastes of consumers really benefits smaller organizations, entrepreneurs or NGO's as they can carve out a niche to cater to a specific region with traditional recipes; this is an especially good means of competing with larger pickles manufacturers who cannot accommodate the tastes of every type of consumer.

I found that working with larger retailers is a great means of expanding a brand and increasing the capacity utilization of an existing facility. For smaller entrepreneurs, NGO's and other organizations, targeting large retailers is not feasible due to the large quantity required from these retailers. As a food processing unit matures, however, targeting these retailers can be a good way to expand operations.

(b) Local Wholesalers

Another avenue that I explored to market processed goods were wholesalers of goods. In working to sell products to wholesalers in Bijapur, a medium-sized city in Northern Karnataka, I found the following:

First, wholesalers are extremely price conscious. Wholesalers receive numerous offers to buy products and therefore can be very price conscious, as the supply of materials is very large. Additionally, since the wholesalers I spoke with cater to the needs of retailers that serve mostly lower- and middle-class Indians, the consciousness of the wholesalers reflect the mind-set of the product's ultimate consumers.

Second, retailers demand the proper registration of products that would be sold to the wholesaler, contradicting the perception that many smaller wholesalers in India disregard Value Added Tax (VAT) and Food Process Order (FPO) regulations. Some wholesalers were in fact unwilling to even discuss possibly buying products that may be produced without a FPO license or a VAT registration number. For more information regarding gaining FPO license, please see their website.

By marketing to wholesalers in Bijapur, I found that the profit margins of a food processing facility were minimal. I also found that national brands are strongly favored by consumers in a small market such as Bijapur, with a perceived superiority of these highly branded products.

(c) Restaurants and hotels

Another means of selling processed goods is to directly sell to restaurants and hotels. In the limited market research that I did with lower-end restaurants in Bijapur, I found the following:

First, restaurants are looking for very low-priced pickles as they are not a central part of a customer's meal. These restaurants are ambivalent about the quality of the product and value price over everything else.

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Second, restaurants are starting to make their own pickles in their restaurants so the traditional demand from these restaurants for external supply is decreasing. These lower end restaurants hire employees whose cost of labor is exceedingly low, thus they can make pickles at a very low cost to the restaurant.

Overall, I saw selling to restaurants and hotels to be an interesting way to start a business for entrepreneurs.

(d) Door-to-door sales

An increasingly popular way for new food processors to sell their products and build their brands is to sell their products door-to-door. This mode of selling requires a great deal of coordination, a large sales team, a good understanding of local areas and a large amount of working capital. For the requirements listed above, I decided not to pursue this selling strategy. However, this strategy has worked in Bijapur to build a brand over a long period of time and to develop customer loyalty to a specific product.

(e) Large food processing manufacturers

In my search for avenues to sell food products, I found that large food processors had a strong demand for processed goods that met a high level of quality specifications. These large food manufacturers require a FPO license to work with them and perform visits to their contractors to ensure the quality and consistency of the manufacturing process.

I found working with food manufacturers to be of greatest benefit because of three main reasons.

First, food manufacturers seek products only during specific seasons in the year. Therefore, a farmer can sell the raw produce in the auction markets when prices are high and semi-process the produce when prices are low. This allows farmers to maximize their profits and minimizes their wastage of produce during seasons when there is minimal demand for their products.

Second, manufacturers have a virtually unlimited demand for processed goods. A food processing facility can try to meet as much of this demand as possible.

Third, working with food manufacturers initially allows entrepreneurs, NGO's and other entities to improve their processes of production before marketing their products elsewhere. This focus on providing a consistent and high quality product ensures that one can perfect processes and production issues before concentrating on solely marketing to producers.

The specific processing activity that we chose, semi-processing, has some additional benefits. First semi-processing of lime pickles is a very simple process involving cutting the limes into multiple pieces and adding salt and sodium benzoate. The simplicity of the process allows the employees to concentrate more on cleanliness, hygiene and following procedure and thus minimizes the time spent understanding and implementing an exceedingly complicated process. Second, since semi-processing of pickles is a very high volume (and low margin) business, from the lens of social upliftment; this process can generate significant employment opportunities in rural regions. Last, the semi-processing of pickles requires minimal capital expenditure, which can be below Rs.15,000. Especially for small entrepreneurs and NGO's where capital is not readily available, this low capital investment threshold makes this concept attainable to many entrepreneurs in rural areas.

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2.2 Lime Market in India

Most farmers in Jalihal sell their limes at the Bijapur APMC market, which is about 35 kilometers from the Jalihal region. The demand and supply of limes varies by season and the ensuing price of limes also varies greatly by season.

Limes are grown in abundance in the Jalihal region because they need relatively little water and they grow well in the local soil conditions. Limes are a unique crop in that they are harvested around the year and sold in terms of number rather than kilograms of limes.

A unit of limes sold in the Bijapur market is referred to as a “dag” and they are sold in batches of 1,100 limes per dag. During the summer season between February and May, the demand for limes is very high from juice vendors because of the hot temperatures; therefore the price of limes is very high at around Rs.700-1,400 per dag. In the rainy and winter seasons, June/July – September and November – December, there is a huge supply of limes because of the monsoon rains and limited demand because of the wet and cold weather. The price of 1,100 limes during the rainy and winter seasons falls to between Rs.10-200. Because the cost of harvesting, transporting, and purchasing bags is higher than the price of limes in the market-place, farmers end up letting their limes fall on the ground and use them as fertilizer. The chart below shows the effective price that farmers receive during the monsoon season for their limes. As can be seen in the chart below, the break-even point for farmers to sell their limes in the auction versus allowing the limes to spoil is Rs.49.44/dag. Unfortunately, this price is sometimes not reached during the monsoon season. Additionally note that the labor costs and implicit costs of attending the auction noted below are quite conservative estimates.

Effective Price Received by Lime Farmers at auction during Monsoon Season	Price per dag			Rps.
	= 200 rps.	= 80 rps.	= 49.44 rps.	
1 Sales Price of Limes (per dag)	120	80	49.44	Rps.
2 Auctions Costs	10	10	10	%
3 Effective price received at auction	108	72	44.496	Rps.
4 Cost of bag	8	8	8	Rps.
5 Transportation expense	15	15	15	Rps.
6 Unloading dag	1.5	1.5	1.5	Rps.
7 Labor costs to farmer for picking limes and quality-grading	10	10	10	Rps. (est)
8 Implicit costs of farmer attending auction in Bijapur	10	10	10	Rps. (est)
Net to farmer excluding fertilizer, pesticide and depreciation costs	63.5	27.5	0.00	Rps.

2.3 Value-Addition Opportunities for Limes

By adding value to and preserving limes during the rainy and winter seasons, farmers can increase their incomes and reduce the unnecessary wastage that is so prevalent in agriculture in India and Jalihal today.

Some of the processing activities possible with limes include making pickles (lime, mixed, semi-processed), juice, squash, citric acid and pectin.

Processing lime pickles is a fairly simple activity that is done on a daily basis in villages across India. These lime pickles can be preserved for over one year with the length of preservation dependent upon the ingredients, the packaging and conditions in which the pickles are stored. The market for lime or mixed pickles is vast with small and large enterprises competing with each other for market share. Small processing units that cater to regional tastes can develop a lucrative niche in the market-place. The semi-processing of limes will be discussed in detail in the next section of this paper.

The market for ready-to-serve lime juice is extraordinarily large with demand being highest from March through May. Lime juice can last for about 7-10 days and is generally stored in a plastic or glass bottle. There is a great deal of competition from MNCs that participate in this market.

The market for lime squashes is comprised mostly of urban households and other juice manufacturers. Most large scale manufacturers use a very expensive process for making lime squash that requires

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prohibitively expensive machinery for most manufacturers. Small processors use a warm process for making lime squash, thus they do not need to purchase new equipment and can provide lime squash to larger manufacturers at competitive rates. Given that warm processes for making lime squash are very labor intensive and require minimal capital investment, lime squash processing can prove to be a lucrative product for entrepreneurs and NGO's to pursue.

Limes can also be processed to yield chemicals such as citric acid and pectin. There is great demand for these products but the investment required to make these chemicals in mass quantities runs in the tens of millions of rupees, so large scale production would not be feasible for entrepreneurs or NGO's. There are natural ways to extract the citric acid from limes by putting them outside in the sun, allowing one to isolate the powder. I did not pursue this avenue, although it may make sense for very small scale production.

3.0 Applications

3.1 Marketing Semi-Processed Lime Pickles

The main market for semi-processed limes is pickle manufacturers. These manufacturers can be found throughout India, with the best resources being the following:

1. The local FPO office in your specific region. The FPO offices have a list of all the pickle manufacturers in districts throughout their region and can provide phone numbers, contact names and addresses for the pickle manufacturers in your specific district or region. By speaking to these manufacturers you can determine the market need and supply semi-processed lime pickles during the rainy and winter months.
2. The local agricultural college near you can also be a great resource in helping to find more local contacts in the food processing industry. By speaking with the Dean of the college and asking for guidance in finding buyers of your product, you can develop a connection with commercial interests that have a need for semi-processed lime pickles.

3.2 Steps for Setting Up a Semi-Processed Lime Pickling Unit

One of the reasons that semi-processing pickles is a feasible and attractive opportunity for entrepreneurs and NGOs is because there is little cost and few complications in setting up a unit. The information given below is from a facility that processed approximately 20 tons of limes in two months; the unit can process about 600 kilograms of limes in a day assuming 12 women work for 8 hours a day and each process about 50 kilograms of limes per day. Please note that the materials shown below include what is needed for producing 4 tons of semi-processed lime pickles.

Item	Purpose	Quantity	Cost/unit (in Indian rps.)	Total Cost (in Indian rps.)
Stainless steel cutting boards	To cut the limes	15	75	1125
Trays for under the stainless steel cutting board	Capture juice from lime cutting	15	15	225
50L food quality crates	For cleaning the lime shells	8	500	4000
15kg food quality crates	For putting limes for storage and cleaning	15	150	2250
Salt	To preserve the limes	1000	3	3000
Gloves	For hygiene	15	15	225
Aprons	For hygiene	15	60	900
Hair net	For hygiene	15	12	180
Labels	For labeling shipments	1	25	25
Bleach powder (1kg.)	Cleaning lime shells	1	40	40
Copy book	Writing receipts to farmers	2	15	30
Carbon paper (10)	Having a copy of receipt	10	1.5	15
30kg. Plastic containers for cut limes	For temporary storage and weighing of cut limes	15	200	3000
Plastic mixing table	For mixing limes with salt and preservative	2	400	800
TOTAL				15815

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Equipment: Basic materials are needed to set up a facility which include the following:

(i) *Labor:*

- a. *Lime processors:* In our lime processing unit, we employed women to cut and semi-process the limes as we found that they worked diligently and quickly. Additionally they were more accustomed to, experienced with and interested in processing limes. It is advisable to initially pay the women a fixed daily wage that is marginally higher than the prevailing wage in the region, to recruit employees. The women should be paid this daily wage for a period of 2 weeks as they are trained to cut the limes as quickly as possible. As the women become quicker at processing the limes, they should be paid money for each kilogram of limes that is processed. By incentivizing (creating incentives aligned with the revenue figure), one can improve the speed at which the women work and control the costs of production.

It may be advisable to form a self-help-group (SHG) that would allow the women to save money within the SHG structure and be part of an institution that meets their personal and professional needs. A SHG would also help decrease attrition issues.

- b. *General helpers:* In addition to using 12 women for processing the limes, we had two general helpers who were male and were paid a daily wage. Their responsibilities included quality grading the limes, weighing the limes, washing the limes, mixing the limes and putting processed limes in food quality containers for shipment. These helpers should be paid a daily wage and should be able to lift at least 50 kilograms of limes.
- c. *Manager:* The role of manager or supervisor can also be played by a general helper. This person should take responsibility for coordinating the schedule, hiring the workers, documenting issues, paying the farmers for their limes, etc. This person should be very trustworthy and have the ability to take initiative.

(ii) *Floor plan for unit:*

Below is the floor plan for our food processing facility. Please note that the arrows below indicate the path of the limes. The following floor plan was decided after trying different permutations of placing different processes in different spots. Please note that the building we used was 42 feet in length and 18 feet in width; the building was more than sufficient to meet the needs of our unit. In fact, a building one-half to two-thirds this size would also have been sufficient to meet our needs.

C. Process for producing semi-processed limes

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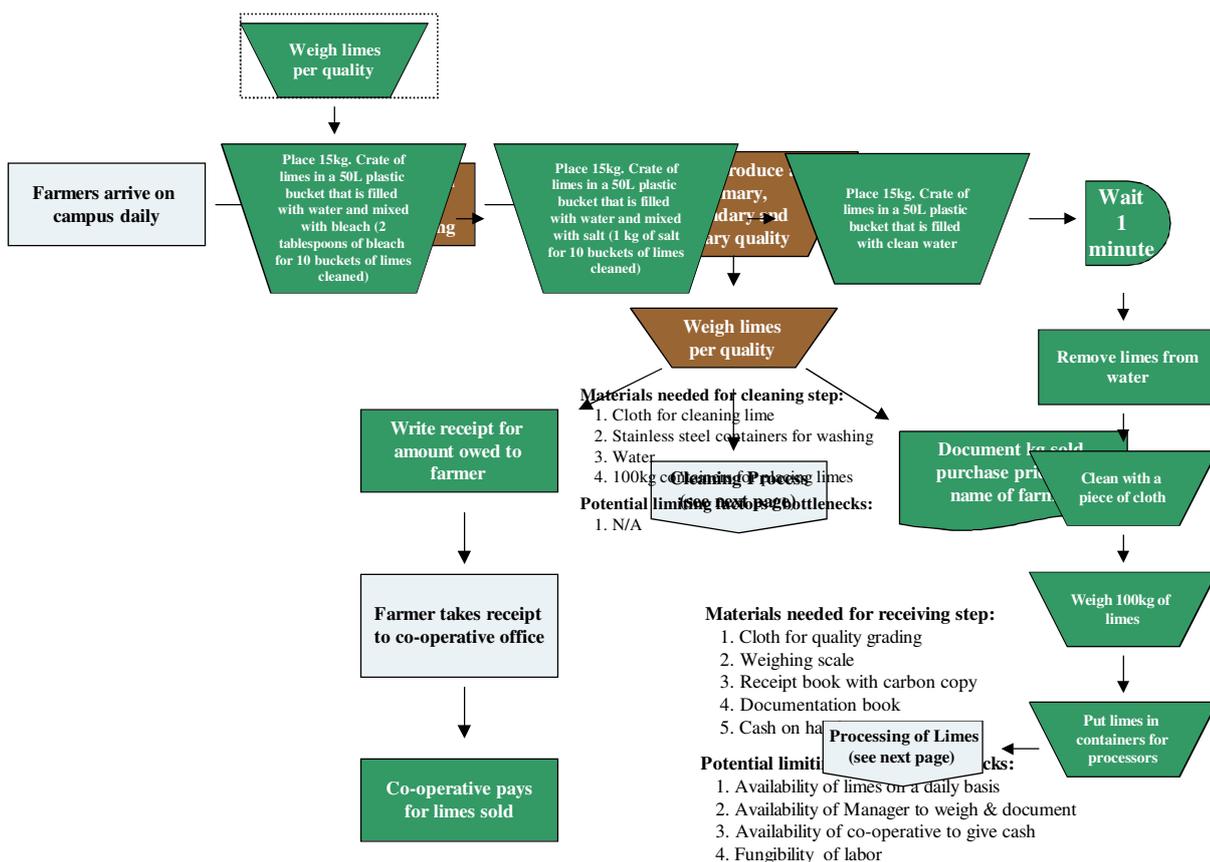
Receiving	Cleaning	Processing	Storage & Quality Control
<ul style="list-style-type: none"> - Farmers come to campus pre-12PM daily - Quality Grading of limes - Weigh limes - Receipt given with amount owed to farmer for limes sold - Receipt taken to co-operative office and money paid same day 	<ul style="list-style-type: none"> - Clean limes by first placing them in bleach water, then salt water and finally clean water. - Remove limes from water and allow to dry - Place limes in containers next to food processors for cutting 	<ul style="list-style-type: none"> - Remove limes from containers - Cut limes into 4 or 8 pieces, depending on the size of the lime - Place in container for mixing - Mix limes with salt and preservatives 	<ul style="list-style-type: none"> - Check quality (pH) - Place limes in containers provided by pickles manufacturer

Brown denotes general helper's responsibility
Blue denotes lime processors responsibility
Green denotes Manager's responsibility

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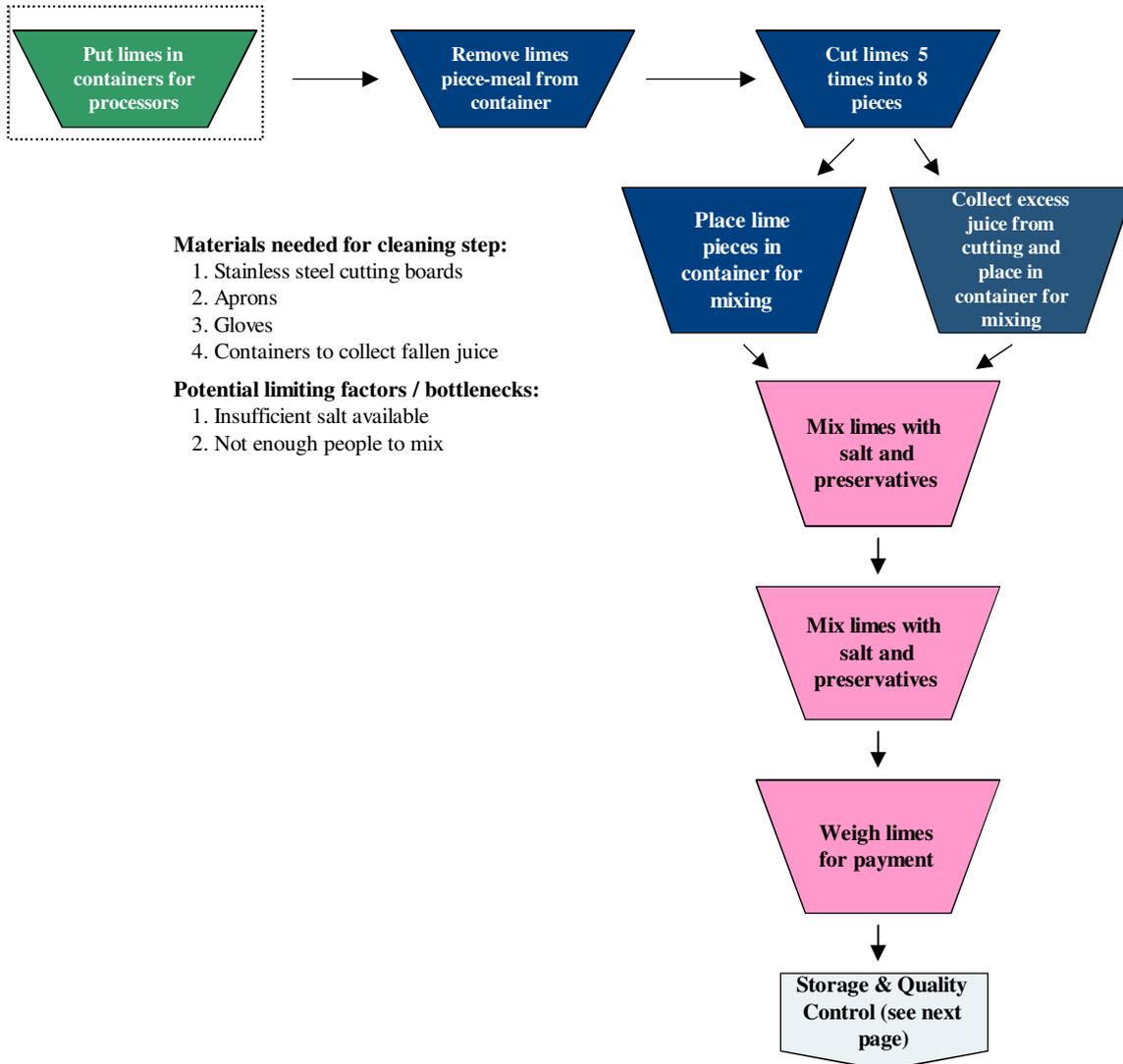
Overview of processes

- (i) Receiving process
- (ii) Cleaning process



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Processing of Limes



Materials needed for cleaning step:

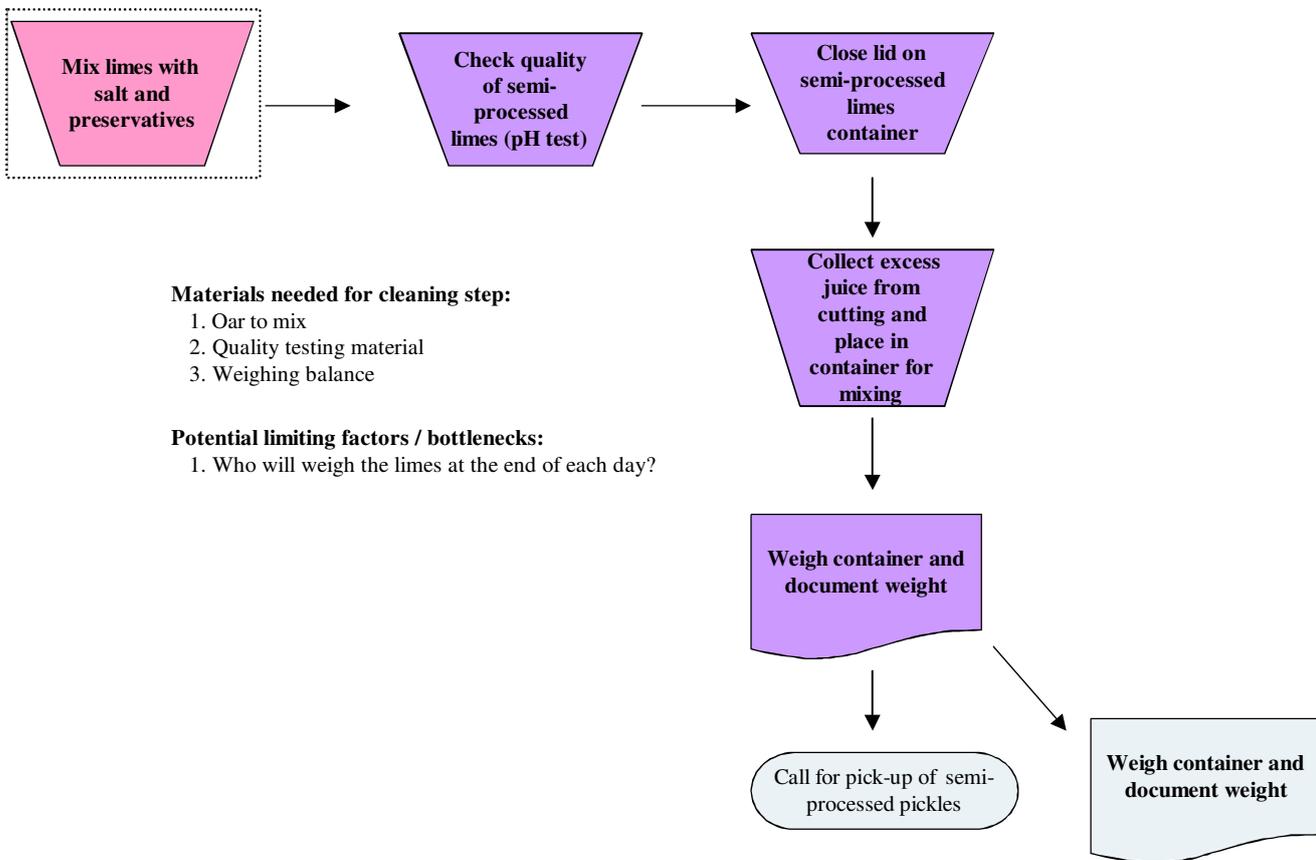
- 1. Stainless steel cutting boards
- 2. Aprons
- 3. Gloves
- 4. Containers to collect fallen juice

Potential limiting factors / bottlenecks:

- 1. Insufficient salt available
- 2. Not enough people to mix

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(iii) Storage & quality control



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4.0 Conclusions

I hope the above was helpful in giving you information about setting up a semi-processing lime pickle factory and in giving you some background knowledge into the market for limes.

In conclusion, below is a list of the benefits from this activity in Jalihal:

1. Employment generation: 14 new jobs
 - (a) 12 female laborers with a wage 25% greater than the prevailing wage in the area
 - (b) 2 male laborers
2. Increase the price earned by lime farmers: farmers went from throwing away their limes during the monsoon season to earning Rs.3/kg of limes.
3. Introduction of the concept of lime processing. This is an especially important point as many farmers currently think of their produce as a commodity to be sold in an auction without thinking of ways to add value to their horticulture crops. Hopefully, this activity had the effect of changing the way that farmers in the Jalihal region approach the value of their produce.

There is immense value in seeking out different and innovative means of adding value to produce in India. With the large and unnecessary wastage of agriculture in India, there need to be more innovative means of preserving goods and marketing these goods for sale. The recent commitment of the Indian Railways to set up cold-storage facilities near railway stations is a positive first step in helping farmers maximize the utility from their produce by decreasing the time to wastage and therefore decreasing wastage. There need to be additional steps taken to enable farmers to maximize the value of their produce, including facilitating marketing channels for export abroad and for processed food.

If you have any questions about processing, please feel free to contact me at the e-mail address below.
In service,

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