REPORT

TRAINING IN THE PRODUCTION AND MARKETING OF
SOY PANEER/TOFU AT THE COTTAGE LEVEL

New Delhi and Bhopal, India
August 16 - September 15, 1990

Consultant Report by

Steven Demos

Agricultural Research Project (386-0470)
Soybean Processing and Utilization Subproject

Implementation Order No. 55
Contract No. 386-00000-C-00-5039-00

WINROCK INTERNATIONAL
1611 North Kent St.
Arlington, VA 22209
CONSULTANT REPORT ON

TRAINING IN THE PRODUCTION AND MARKETING OF
SOY PANEER/TOFU AT THE COTTAGE LEVEL

SUBMITTED BY

STEVEN DEMOS, PRESIDENT
WHITE WAVE, INC.,
(SOY FOODS PROCESSING COMPANY)

Submitted to: Winrock International
Institute for Agricultural Development
(Contractor USAID)

Date: August 16 - September 15, 1990
New Delhi and Bhopal - India
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>CONSULTANCY OBJECTIVES</td>
<td>2</td>
</tr>
<tr>
<td>SOY PANEER MARKETING</td>
<td></td>
</tr>
<tr>
<td>- Observations</td>
<td>3</td>
</tr>
<tr>
<td>- Conclusions</td>
<td>5</td>
</tr>
<tr>
<td>- Recommendations</td>
<td>6</td>
</tr>
<tr>
<td>- Test Market Experiment</td>
<td>6</td>
</tr>
<tr>
<td>SUMMARY CONCLUSION</td>
<td></td>
</tr>
<tr>
<td>- Privatization</td>
<td>10</td>
</tr>
<tr>
<td>APPENDIX</td>
<td></td>
</tr>
<tr>
<td>MAKING SEQUENCE AND STANDARDS</td>
<td>14</td>
</tr>
<tr>
<td>PREVENTIVE MAINTENANCE RECOMMENDATIONS</td>
<td>18</td>
</tr>
<tr>
<td>SAFETY RECOMMENDATIONS</td>
<td>19</td>
</tr>
<tr>
<td>EQUIPMENT RECOMMENDATIONS</td>
<td>20</td>
</tr>
<tr>
<td>SANITATION RECOMMENDATIONS</td>
<td>21</td>
</tr>
<tr>
<td>FURTHER TEST RECOMMENDATIONS</td>
<td>21</td>
</tr>
<tr>
<td>OPENING PROCEDURE CHECKLIST</td>
<td>22</td>
</tr>
<tr>
<td>CLOSING PROCEDURE CHECKLIST</td>
<td>23</td>
</tr>
<tr>
<td>ECONOMIC ANALYSIS SOY PANEER PRODUCTION</td>
<td>25</td>
</tr>
<tr>
<td>DAILY ACTIVITIES SUMMARY</td>
<td>29</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>31</td>
</tr>
</tbody>
</table>
INTRODUCTION

India is a country of over 800 million inhabitants. Indian government statistics report that over 40% of these people fall below the poverty level. One serious consequence to this fact is a shortage of quality protein foods.

During the past 15 years, the population of India has increased approximately 50%. Harvested tonnage of India's primary protein source, (legumes), has during this same period remained relatively constant at 12 mm tons per year. Thus the per capita availability of protein in India has actually decreased 50% within the past 15 years.

The prospect of soybeans being used as a source of human food in India has shown great promise in helping supply a portion of this needed protein. While soy has been raised in India for sometime, over 99% of the crop is devoted to the oil extraction industry with the left-over protein rich cake or meal being exported for animal feed. Soy crops fit well in India's growing seasons, require very little 'chemical maintenance', enrich the soil with nitrogen and supply a higher quantity and quality of protein than the current legume crops. Using a portion of India's current soy crop as a food source instead of oil source indicates a potential which will help alleviate the country's protein deficiency if the soy foods could be successfully integrated into the Indian diet.

BACKGROUND:

The Soybean Processing and Utilization Project, (SPU) is a jointly funded US-Indo Project whose goal is to facilitate the processing of soy protein in cottage and small plant industries which effectively produce soy protein foods for human consumption.
The SPU Project has been in effect for approximately 5 years. During this time specific foods have been identified as potential points of entry into the Indian diet. One of these products is soybean curd, commonly known as tofu. Tofu very closely resembles a basic form of dairy cheese known in India as paneer.

Historically, the tofu (soy paneer), cottage cheese, industry can trace its roots to supplying the protein requirements of the peoples of China and Japan as well as other Southeast Asian countries. Today this industry can still be found operating successfully at the most basic cottage level in areas where little electricity and mechanization exist. Additionally, it can also be found operating in large modern factories in Japan and America.

Because the product so closely resembles its dairy counterpart, paneer, and because it can effectively and profitably be made on the simplest level as well as the most automated level, the use of soy paneer shows great promise of succeeding in both the Indian diet and business environment.

Currently the Central Institute of Agricultural Engineering (CIAE) in Bhopal has been the focal point of the SPU's work on soy paneer. The institute in 1999 purchased and installed a semi-automatic soy paneer making system in its pilot plant facility. To date the equipment has not been made fully operational.

Consultancy Objectives:

It is the focus of this consultancy:

1. To make operational the soy paneer system by
   a. Establishing production parameters for soy paneer and to demonstrate them.
   b. Training SPU staff in Soy paneer production.
c. Recommending sanitation, safety and preventive maintenance systems and improvements.

2. To evaluate and suggest distribution and marketing channels for the integration of soy paneer in the Indian market place.

3. To evaluate the economic feasibility of operating the Japanese semi-automatic soy-paneer making system.

4. To analyze and recommend effective packaging for soy paneer.

5. To analyze and recommend effective means of extending soy paneer shelf-life in a tropical environment.

6. To suggest a vehicle or means by which this project can be transferred from the public research sector to the private entrepreneurial market place.

SOY PANNEER MARKETING

DATA COLLECTION

OBSERVATIONS:

1. Sensory evaluations from SPU research show that a firm textured tofu - 75% moisture - closely resembles dairy paneer texture and is acceptable to the Indian taste.

2. Sensory evaluations from SPU research indicated that there were objectionable 'beany' flavours found in soy paneer.
3. Dairy paneer is considered a luxury item in India with only 2% of the population consuming the product. Current consumption patterns among this 2% indicate usage of 1-2 times per month per household. Primary reason for limited usage was price - 38-40 Rupees per Kg.

4. Current dairy paneer is produced almost exclusively in small cottage shops making 10-100 kg per day. All product made is sold within 48 hours. It is presumed that all product is consumed within 72 hours. Product sold in these shops is not pre-packaged. Average sale per consumer is 200 grams.

5. The use of refrigerated storage in India is very limited. Refrigeration of product (any product) among the 98% of the population who do not consume dairy paneer is assumed to be virtually non-existent.

6. NO RETAIL OR WHOLESALe Distribution network exists for dairy paneer other than one local shop selling to local residents, hotels and restaurants.

7. Indian staple protein, legumes (dahl), currently costs 12 Rupees per kg.

8. Business experiments by private sector enterprises selling shelf stable soymilk sold in tetra pak cartons has failed. When the product was packaged in only polyethylene bags the price was reduced substantially and the product recognized greater consumer acceptance.

9. SPU has installed a semi-automatic soy paneer system with a capacity range of 30-220 Kg. per hour. Capital investment for this facility is 1,000,000 Rupees. There is no establishment of a basic, non automated paneer system with a capacity range of 5-20 Kg per hour at this time.
SOY PANEER MARKETING

Conclusions

1. Successful integration of soy paneer will occur only if the 'beany' flavor can be eliminated during production and storage or masked during home preparation in the final dish.

2. The target market for soy paneer is that 98% of the population who cannot afford dairy paneer. There is no evident motivation for a consumer of dairy paneer to switch to soy paneer. The target market will be reached only if the cost of soy paneer is equal to or less than the current cost of protein. (Pulse or dahl costs approximately 12 Rupees per Kg). As the price of soy paneer increases above this point the motivation to purchase this new product will proportionately decrease.

3. The ideal production facility for soy paneer in India must correspond in size with the amount of product sold in a 48 hr period. Because there is virtually no refrigeration or distribution system, long shelf life paneer at this time seems inappropriate. Additionally, any costs associated with packaging, distributing or extending shelf life would automatically push the product's final retail price above the attractive target price for the common individual.

4. Currently, the dairy paneer shops which operate on a cottage industry level throughout India indicate the appropriate size and technology level for initial integration of soy paneer. (Shop Size: 10-100 Kg/Soy).

5. The case study of tetra pack soymilk failing while polyethylene bagged soymilk succeeded supports the conclusion that the target market is critically price sensitive. No introduction of a replacement food product will succeed in India unless that replacement product holds a price advantage.
SOY PANEER MARKETING

RECOMMENDATIONS

A. All consumer tests should be done using a cross section of the target market. Use of those individuals who presently purchase paneer is valuable and necessary but will not indicate true response from the target market.

B. Identify three (3) specific uses for soy paneer which are found most acceptable in texture and flavor by the consumer test group. Suggested use in promotion of the product should initially center around these specific uses. It is important that the initial exposure of the product be met with a favourable response that is pre-tested via popular dishes.

C. Experiment with cubing and frying the soy paneer prior to the consumer using the product in the identified dishes. This may make the product more familiar to the home cook thus overcoming initial resistance to new products.

D. Identify one specific urban market, presumably Bhopal, and contact all oriental restaurants, businesses, trade offices, schools or government extensions and develop a relationship with these groups to form a base or 'ready market' for soy paneer when actual production of the product begins.

E. Confirm that the word(s) Soy Paneer, (Soy paneer), are protected and part of the public domain. Thus, no single entrepreneur can trademark these words. If possible have SPU or CIAE trademark the words for use by the public sector.

Test Market Recommendations

Establish a Bhopal test market experiment making use of the semi-automatic pilot plant already installed. The test market study should accomplish
the following:

1. Guarantee the quality of the initial soy paneer being introduced to the market via production at CIAE-Bhopal.

2. Control the price point at which the consumer is first introduced to soy paneer.

3. Verify that there is an available and ready market for this product. (necessary for private sector capital financing).

4. Establish a training and information center for actual soy paneer production.

The test market experiment would logistically work as follows:

Make soy paneer at CIAE - Bhopal several times per week. The small quantity required would easily and efficiently be produced on the pilot plant level and could be appropriately stored under refrigeration when necessary. Over time, this kind of repetitive making of soy paneer would perfect the SPU staff knowledge and experience in making the product. This experience will be essential in the later training of interested private sector entrepreneurs.

To distribute the soy paneer contact one or several paneer shops and stimulate their interest in selling the soy paneer. This interest can be stimulated by guaranteeing the shop that all soy paneer not sold by them in a 24 hour period would be purchased back by the SPU project and replaced with fresh product. Further, supply the distributor with pre-printed, kitchen tested recipes (no more than 3 dishes) which the consumer test group identified as most promising. Further stimulate interest with the shop owner by selling the shop owner soy paneer at SPU's cost, presumably 7-8 Rupees. The soy paneer should be
sold to the distributor in bulk unpackaged form. The distributor in turn will sell the soy paneer in small pieces the way he currently sells dairy paneer. Thus, the distributors (shop owners) costs for the soy paneer will be very little and his profit margin very attractive.

To guarantee a fair price to the consumer for proper introduction of soy paneer into the marketplace, have the selected distributors sign an agreement that so long as the SPU project supplies soy paneer the shop owner will not sell the product for more than 12 Rupees (over 25% net profit). When the shop owner produces his own soy paneer let market demand establish the price. Finally, use the previous contact relationship established with the Oriental community to stimulate the product sales by informing them of which dairy paneer shops now sell soy paneer. (Orientals familiar with the product are a ready customer base).

Additional interaction with Indian government food agencies which support feeding the target market would be advisable. This can function as a communication channel to inform the target market of this new product and its availability.

This market experiment should go on for a minimum of 6 months. The introduction of a new food product is a very slow process which normally evolves via world of mouth. A slow start should not be discouraging.

While the test market experiment is going on, data regarding the rate of growth, the number of repeat customers and their actual consumption patterns should be kept. This information will be useful later. (see final conclusion)
Special Note: I would be remiss in not strongly emphasizing the following:

Soy paneer has no history on readily available market in India. The great promise for soy paneer is to offer the common man a paneer product that to date was outside his financial reach. There appears to be no incentive for the current dairy paneer eater to switch to soy paneer. Thus, the target market must be those with very limited discretionary income. It is essential that this target market be attracted to soy paneer because of its low price.

Traditionally as a market grows entrepreneurs enter and innovate on ways to extend shelf life and thus gather greater and greater market share by distributing product to a large geographic area. This requires a well developed infrastructure containing reliable refrigeration systems, transport systems and retail outlets. The changes required to expand a market invariably increase the price of the product due to additional procedures to extend shelf life, materials required for packaging, personnel to ship and sell the product. This price is normally born by the increased market demand for the product because it is popular. This is NOT THE CASE AT CURRENT IN INDIA.

The ideal scenario for successful introduction of soy paneer at this time is a cottage level business operating with very little 'modern technology'. This shop operates out of the front of the entrepreneurs home supplies, income for his family and soy paneer to the market on a daily basis thus not requiring packaging or refrigeration. (The way dairy paneer currently is sold). As the market evolves and customer demand increases ingenious entrepreneurs will step forward and sophisticate the industry. The goal of the SPU project must be to enter the market at the most appropriate level: the cottage industry level.
Summary Conclusion - Privatization

Upon conclusion of the Bhopal test market the research part of the project will have completed its data collection phase. This data includes:

1. the products' background information.
2. the cost for purchase, installation and operation of small and medium soy paneer facilities.
3. training on how to operate and maintain these systems as well as product quality.
4. economic analysis of the cost and profit margins for the product and
5. a realistic market study on available consumer markets and consumer acceptance patterns.

This collection of data, while being thorough and complete does not in itself accomplish the goal of integrating soy paneer into both the business environment and diet of the Indian culture. For this goal to be accomplished the soy paneer project must complete one more step. The establishment of a private sector liaison or Project Marketing Department.

It should be the specific responsibility of the private sector liaison to effectively stimulate the entrepreneurial community in establishing a profitable soy paneer business in India. The liaison must 'sell' the project concept to the private sector.

Funding: I suggest the funding for this department come from any financial resources left over from the initial budget allotment for scientific staff personnel which were not hired in 1985-86. Funding for this department should be for a minimum of 1 year.
Job Description:

1. Private sector liaison should first consolidate, organize, and articulate the data collected into a formal business plan. This business plan should additionally include pro-forma financial projections and profit/loss income statements. (all of this information can be extrapolated from the market study).

2. Develop a short term (1-week) training seminar for the production of soy paneer. The training program should be on both the cottage and small industrial level. The major areas to be covered should be:

   1. Production Parameters and Techniques.
   2. Sanitation and Shelf Life Control.
   3. Equipment Maintenance
   4. Safety.

3. Approach several private sector banks or financing institutions and have their key loan or investment officers review and analyze the two preceding documents. This will not only perfect the document but will begin the process of building the necessary business relationship with the financial community.

4. Sell the project to the business community. While this may prove to be the most difficult aspect of the entire project it will also be its culmination. With all of the data and verification complete the focus of the liaison shall be to find, stimulate and facilitate the establishment of the business. Once the entrepreneur is identified the liaison shall act as temporary intermediary between the banks and the entrepreneur and the training centre (CIAE-Bhopal) and the entrepreneur.
It is my firm opinion that if these steps are thoroughly completed successful integration of this project into the private sector will be a logical and predictable completion of the project.
TAKAI EQUIPMENT

SOY PANEER – MAKING SEQUENCE AND STANDARDS

1 BATCH = 14-16 KG PANEER
1 COOKER FULL = 28-32 KG PANEER

**After sanitation batch**

* Set up sanitary bucket for gloves (Dilute chlorine or iodine solution).

1. Close bean gate on grinder hopper.
2. Close gate for catch barrel drain.
3. Open cooker exhaust port.
4. Close cooker exit drain and open entry line.
5. Measure 15 kg soaked beans and put in hopper of grinder.
6. Measure 135 grams CACl or MgCl and add to 4 litres hot H O.
7. Turn on grinder and turn on grind water to form free flowing smooth slurry.
8. Grind all beans and turn off grind water – (Grind with cold water is recommended).
9. Turn on ring water and fill to 30 mark and turn off water.
10. Open cooker entry line, inject slurry into cooker, confirm all exit ports are closed, use additional 5 L. Water to rinse barrel.
11. Cook slurry to .8 - 1.0 Kg/CM2 108-110 C – After reaching 90 C. close exhaust vent until finished.

(Microbial test

a. Expel immediately = CFU
b. Hold 1 minute = CFU

14
   a. All exit ports (except barrel port) are closed.
   b. Test Okara for grind efficiency (taste) – Okara should be 'fluffy'.

13. Capture soymilk in barrel (use pot liner to confirm there are no holes in the extractor screen) and measure exit temperature (should be 82 - 85 Degree C for firm tofu).

14. Measure density of soymilk - Goal 7.5 - 8.0.
   a. Clear distinct line in refractometer = proper cooking.
   b. Cloudy line in refractometer = Undercook.
   c. Jagged line in refractometer = Over cook.
      * Bubbles in milk on refractometer lens will distort reading.
      ** Holding milk on refractometer for some time will distort reading.
      *** Clean refractometer with water immediately after each reading.

15. Add diluted coagulant mixture to center of soymilk barrel and mix with perforated mixing plate.
   a. Very fast motion = small/hard curds, no cohesiveness.
   b. Very slow motion = large soft curds.

16. Let coagulated mix sit 10 minutes and check with paddle.

17. Roll curds with inverted colander, verify 100% coagulation.
18. Place colander in barrel and trap yellow whey - discard whey.

19. Continue to roll curds and discard whey until total volume is reduced 60%.

20. Adjust cloth in press to fit snugly. Wet with whey.

21. Add curds to box being sure to break down large lumps and not trapping excessive liquid. (Too little whey or very dry curds will leave pockets in product).

22. Cover curds with cloth and press lid and press 5-8 min. Low pressure (2 Kg/cm sq).

23. Open press and pull up on cloths to aid drainage, re-wrap and press on high pressure 20 minutes (6 kg/cm sq).

24. Open press, un-wrap and invert paneer onto lid. Remove cloth, wash with water, cut and submerge in cold water for 1-1/2 hr. Or until core temperature matches water temperature.

25. Package and refrigerate.

OPTIONAL - PASTEURIZATION - will produce 50 day shelf life if chilled rapidly to 2 degree C and stored at this temperature.

26. Package 500 gram or 250 gram pieces in plastic bag filled with hot water.

27. Seal bag and totally submerge in 85 degree C water.

28. Hold until core temperature is 77 degree C, hold for 15 minutes.

29. Submerge in flowing cold water until core temperature reaches temperature of water.

30. Refrigerate at 1 degree - 4 degree C.
SOY PANEER - MAKING NOTATIONS

1. Opening and closing checklists should be followed religiously and expanded upon. These checklists guarantee safety, sanitation and product quality.

2. Optimum milk density is 7.5-8.0. When grinding with cold water. More water will be added via the cooking steam this way. When grinding with hot water less water is required. Compensation should be made according to which method is used.

3. When adding the co-agulant the solution of salts with water should be as hot as is practical coming out of the hot water heater. This prevents the temperature of the milk dropping rapidly during the curding process.

4. Varying milk densities indicate variance in either the quality of the soak or the added water quantity. Adjustment to coagulant quantity or concentration by an experienced operator will solve this.

5. Assuming that all cooking steps are followed properly the milk temperature coming out of the extractor will be around 80-85 degree. If this temperature falls it may be an indication of:

   a. the upper screen of the extractor is not cleaned properly and is clogged. Consequently the milk is circulating longer and not being extracted properly. In this case, soak the screen in a strong caustic soda solution after production and clean thoroughly.

   or   b. the temperature and/or the pressure gauge are not calibrated properly. Adjust after production.

   or   c. the cooker was overfilled. This will be evident by an instant drop in pressure when the exit valve is opened.

6. Soy paneer is approximately 75% moisture. It requires over 2 Kg. of water to produce 1 Kg. of soy paneer. It is imperative that the quality of the water used is superior. This effects not only taste but also shelf life.
PREVENTIVE MAINTENANCE RECOMMENDATIONS FOR TAKAI SYSTEM

The preventive maintenance system should be set up as a regular check system and followed properly. It is intended that as the operators become more familiar with the system the chart will be expanded.

I  DAILY

2. Drain water from press table trap.
3. Check oil level on air compressor.
4. 

II  WEEKLY

1. Inspect lower drum screen for cracks.
2. Bleed water from compressed air tank.
3. 
4. 

III  MONTHLY

1. Grease all bearings on roll press extractor - 12.
2. Inspect packings on steam valves of pressure cooker.
3. Inspect grinding stones for even wear - Inspect shaft bearing for looseness.
4. Calibrate internal thermometer of cooker (Bring open cooker filled with water to boil, thermometer should read 98-100 degree C).
5. Fill press table oiler with lubricant (light gude oil).
7. Safety training on the equipment for all operators is essential. This system can be very dangerous if not properly operated due to high steam pressure.

8. Post a sign behind the cooker on the wall which reads 'GLASS AND PORCELAIN CUPS FORBIDDEN'. At no time is glass permitted anywhere near the food production area. Replace all glass thermometers with metal, replace all gauge face plates which are glass with plastic. This is very important!

9. Mark all chemical used for cleaning with skull and crossbones. Store all cleaning chemicals separate for co-agulant chemicals.

10. Mark all food ingredient chemicals in English and Hindi. Store separately in dry area.

EQUIPMENT RECOMMENDATIONS

1. Soak grinding stones once per month in strong chlorine solution to eliminate bacterial build up. You may find more frequent soaking is necessary.

2. Obtain dow silicon rubber sealant for roll press extractor screen. This will delay having to replace the entire screen.

3. With food grade grease, grease roll press extractor pillow boxes daily.

4. When each spare part is used, immediately procure its replacement. Current inventory of spare parts appears adequate. (It is my experience that the winding of Japanese motors is inferior and prove to burn out early. It would be prudent to locate an electrical repair shop early so repairs can be expedited when necessary).

5. Obtain a large 15 cubic foot refrigerator for storage of soy paneer.

6. Obtain a 1/2 meter long stainless or plastic paddle for tofu production.
SANITATION RECOMMENDATIONS

1. Purchase a small mist pump similar to what is used at CIAE to spray crops with insecticide. Fill pump with either a dilute iodine solution or quaternary ammonia solution. Use this solution to spray on equipment daily to sanitize. In a tropical environment the ambient temperature is perfect for constant bacterial growth. Alternate the two solutions monthly. Spraying equipment daily will prevent this from becoming a problem.

2. All employees must be trained to thoroughly sanitize their work gloves and boots and dry out daily. This will prevent staph infection from contaminating personal equipment.

3. Entire production area must be screened into eliminate flies and insects. A small electrical bug evacuator would be advisable to have installed in the production area.

4. Proper disposal of discarded whey and Okara (soy pulp) are essential as they are hot and break down very quickly. This will attract flies and rodents if not removed daily.

5. All employees should be trained to continuously store gloves and dip hands regularly in a dilute iodine or chlorine solution.

FURTHER TEST RECOMMENDATIONS:

I Manufacturing

A. Further tests should be done to reduce or eliminate the 'beany' flavor of tofu.

1. Test different coagulants - acids, salts.

2. Test numerous varieties of soybeans.

3. Test aging the tofu 24 hours soaked in cold water prior to sale. This has a tendency to harden the paneer and shows a distinct reduction in flavor profile.
4. Test adding 23 Butane Diol - a biproduct of bacterial fermentation in milk during the ghee making process. It is reported that this imparts a typical dairy flavor.

5. Test adding various dairy flavor extracts to improve flavor profile.

B. Further tests should be done on extending shelf life of product without additional processing or packaging materials.

1. Test soaking paneer in a 4-5% brine solution. Rinse thoroughly before consumer taste tests.

2. Test adding citric acid or similar acids to paneer storage water to lower the PH below 4.7.

3. Complete microbial tests on holding soy milk for 1,2 & 3 minutes at 110 degree C.

C. Establishment of a prototype, functioning cottage industry shop is essential. This prototype should be installed and made operational.

1. Detailed description of this type of equipment, which requires very little electricity or automation, is available in 'Tofu and Soy milk Production, Volume II' by William Shurtleff and Akiko Aoyagi (I have left a copy of this book with CIAE).

SOYPANNER PRODUCTION

Opening Procedure and Equipment Check

1. Check beans for thoroughness of soaking.
2. Drain and wash beans.
3. Turn on boiler.
5. Set stones.


7. Sanitation of cooker and gasket integrity.

8. Close off cooker, catch barrel and extractor valves.

9. Check all motors are operable:
   a. Grinder.
   b. Slurry Pump.
   c. Cooker fan.
   d. Roller extractor motor.
   e. Cooked slurry pump.
   f. Air compressor.

10. Sanitation of roll press.


12. Drive belt on properly.

13. Slurry pipe in top screen properly.

14. All connection of pipe are tight. Close all water and steam valves.

15. Verify barrels are sanitary.

16. Verify presses and table are sanitary.

17. Verify colander is sanitary/clothes are sanitary.

18. Boiler is at full pressure? Turn on air compressor.


20. Run sanitation batch - (H2O + Chlorine).

21. Verify correct extractor valves are open.

SOYAPANNER CLOSING PROCEDURE AND EQUIPMENT CHECKLIST

1. Flush grinder with H2O - Drain water.
2. Fill barrel to 35 mark. Add 1 cup caustic soda.

3. Pump to cooker. (Force solution back and forth to clean slurry pump)

4. Rinse barrel and fill to 15 mark.

5. Pump to cooker.

6. Close of cooker and heat solution to .8 kg.

7. Expel to extractor with all valves closed.

8. Circulate in extractor for 10 minutes with upper screen steam on.

9. Drain cleaning batch into milk barrel or soak tank.

10. Remove upper screen and soak submerged in cleaning solution.

11. Close off cooker and test pressure relief valve.

12. Remove pressure gauge, clear line, inspect and replace.

13. Soak all small tools in cleaning solution:

   *Do not soak Aluminium - Press Box tops and whey ladle


15. Wet down surface of all equipment for cleaning crew.

16. Soak clothes from press box in cleaning solution for 15 minutes. Wash thoroughly with cold water.

NOTES:

A. Caustic soda solution is dangerous. Do not use without Rubber Gloves. Care of eyes is imperative. Plastic eye protection is advised. If caustic solution splashes in eyes, rinse with clear water for 10 minutes.
B. If after numerous days of production the press clothes become clogged and tofu does not drain properly the clothes must be boiled in caustic solution.

Economic Analysis of Soy Paneer Production – TAKAI SYSTEM

The equipment purchased from Takai Equipment Company of Japan has been installed at the CIAE facility in Bhopal. The following is a projected cost analysis of producing soy paneer on this automatic system.

Please consult the CIAE Annual Report – 1988 for cottage level system production cost estimates.

I  Assumptions

1. Initial cost of Boiler, Processing Equipment, Piping and a process Refrigerator (yet to be purchased) 928,588 Rupees
2. Cost of Shed construction (75 m2) at the rate of 1000 Rupees/Sq.M 75,000 Rupees
3. Working days per year 300 days
4. Production hours in one day 8 hours
5. Sanitation hours per day 4 hours
6. Cost of one 1 Kg. beans 5.5 Rupees
7. Yield of soy paneer 1 Kg Beans(Dry) (Paneer with 75-80% Moisture) 1.85 Kg Paneer
8. Production capacity hourly (Dry Beans) 30 Kg Daily 240 Kg
9. Daily paneer capacity 444 Kg Paneer
10. Rate of Interest % 11%
11. Life of Equipment (All capital assets rated equally) 7.5 Years
12. Income tax, % of total income
   50%
13. Insurance, Rs./1000
   3.50 Rps.
14. Repairs and Maintenance, % of Gross Revenues
   5.5%

II COST ESTIMATES - DIRECT
Full Day Production of 444 Kg. Paneer

1. Raw materials 240 Kg Beans/Day at the rate of 5.50 Rupees/Kg
   Rupees 1320
2. Labour
   (a) 1 Skilled - 8 hrs at Rs.5/hr
   (b) 1 Unskilled - 8 hrs at 2.5/hr
   (c) 1 Unskilled - 4 hrs at 2.5/hr
   40
   20
   10
3. Cost of Utilities
   (a) Electricity - Plant, Boiler, Refriger.
   (b) Fuel (Boiler)
   (c) Water - (444 Kg Tofu)
   Rupees 20
   420
   18
4. Chemicals
   (a) 240 Kg beans per day requires
      6 Kg MgCl
      Rupees 72
   (b) 1 Kg MgCl = 12 Rupees
5. Packing
   (a) Plastic Bag at Rupee 10/Bag
   (b) Each Customer purchases 200 gms
      2000 bags
      Total one day production Direct Costs: Rupees 2142
      (a) Per Kg Direct Costs = 4.824 Rupees

III COST ESTIMATES - FIXED

* Full Day Production of 444 Kg Paneer
** Pro Rated to 300 Production Days at the rate of YR.

A. Equipment Depreciation
   Rupees 412.70
B. Insurance - Capital Assets
   Rupees 10.83
C. Interest - 11%  
(Based upon Financing 75% of capital equipment investment)  
255.36

D. Land Lease  
24.00

E. Repair and Maintenance

1. Based upon 5% of revenues using sale price of Rupees 12 per kg. Soy paneer  
266.40

2. Represents total equipment placement every 12 yrs. at current cost and product sale price

Total Daily Fixed Costs: Rupees 969.29

IV Total Costs

1. A. Total variable costs  
Rs.2142.00

B. Total fixed costs  
969.29

Total daily cost Rupees 3111.29
Total cost per kg: Rupees 7.02

V Profit

A. Total Gross Revenue:  
1) 444KgxRupees 12 = Rupees 5328.00

B. Total Costs  
3111.00

Rupees 2217.00

C. Income Tax - 50%  
1108.50

Net Profit Rupees 1108.50

VI RETURN ON INVESTMENT

A. Profit % of Gross Revenue  
20.80%

B. Return of Investment %/Year  
35.81%
DAILY ACTIVITIES SUMMARY:

Thursday  August 16, 1990  Depart Denver, Colo and fly to San Francisco, Ca. Depart USA for Bangkok, Thailand

Friday  August 17, 1990  Arrive Thailand, remain overnight.

Saturday  August 18, 1990  Depart Thailand, arrive New Delhi

Sunday  August 19, 1990  Review Aid Project Background material supplied by Winrock International. Met for dinner with Mr. A Cohn, Mr. Chung & Mr. & Mrs. Chung

Monday  August 20, 1990  Visit Winrock offices New Delhi. Met with Mr. John Becker, Chief Agril. Div., USAID & Dr. Surjan Singh, Program Specialist, USAID met with Dr. Alam, Asst. Director General (Mg. Eng.) ICAR.

Tuesday  August 21, 1990  Arrive Bhopal. Meet Mr. Srivastava, Director, CIAE, Dr. Ghandi, Sr. Scientist, and associate scientists. Preliminary tour of laboratory and familiarization with Tofu equipment.

Wednesday  August 22, 1990  Met with Mr. Bisht, Dr. Singh, Dr. Patel, Dr. Jha, Dr. Joshi, Dr. Khare and Mr. Bargale, discussed all specific aspects of CIAE SOY PROJECT. Adjusted floor lay out of Tofu making equipment.

Thursday  August 23  Presentation to SPU concerned scientists on personal and company background. History of low technology industry in U.S. 1975-1990.
- Discussion of success and failures in marketing soy in U.S.

- Preparation of agenda for making of soy paneer and details to be covered.

Friday August 24
- Government of India Religious Holiday.

Saturday August 25
- Met with Dr. Nawab Ali and Dr. Ghandhi. Received instructions from Project Director.
- Inspected, sanitized & tested processing equipment.
- Developed daily checklist for opening/closing paneer plant.

Monday August 27
- Make paneer using specific lot of beans and coagulant. Take samples for microbiological study. Focus on grinding and cooking aspects of process.

Tuesday August 28
- Discussed with Dr. Jha microbiological tests to be run on soy paneer process.
- Reviewed bean soake parameters, worked on boiler problem.

Wednesday August 29
- Discussed with Dr. Jha and Mr. P.C. Bartale packaging systems available for tofu from sophisticated to simple. Met with Dr. Ghandi on Economics and constructed economic analysis for Takai production plant.
Thursday  August 30  - Marketing discussion on noy paneer vs. Dairy paneer. Visit several dairy paneer shops in market and observed paneer manufacturing.

Friday  August 31  - Visited Noble soya plant. Discussed reasons for failure of tetrapak soymilk in India.

- Discussed potential of other soy products in market place introduced at cottage level.

Saturday  September 1  - Safety and Maintenance Training with Mr. Bisht and Dr. Ghandi.

Monday  September 3  - Lab scale production studying the effects of various types of coagulant.

Tuesday  September 4  - Production training with Dr. Ghandi and Mr. Bisht.

Wednesday  September 5  - Production training with Mr. Bisht.

Thursday  September 6  - Travel to Bhopal, Report writing.

Friday  September 7  - Report writing.


Tuesday  September 11  - Depart Delhi arrive Hongkong.

Saturday  September 15  - Depart Hongkong arrive Denver.
ACKNOWLEDGEMENTS:

I am deeply grateful to the following individuals for their help in my stay in India. Dr. Ghandhi for his instruction and aid in all of my accommodations and personal needs, Mr. Dube for his punctual driving me to and from the Institute on a daily basis, Mr. Bisht for his perseverance in solving all of our mechanical and electrical problems, Dr. Jha for his microbial work, Dr. Khare, Mr. Bargale for their technical input, Dr. Hameed Ali without whom this consultancy would not be possible, Dr. McClung and Mr. Srinivasan in Delhi for their help and friendliness in co-ordinating my trip and finally Mrs. Surbhi Bhatt at Winrock Washington for all her help in co-ordinating my travel arrangements and documents.