END OF PROJECT EVALUATION

NCDC COOPERATIVE OILSEED PROCESSING MANAGEMENT

(OPG # AID-386-02127)

Thomas R. Carter, Consultant

Cooperative League of the USA

April 2, 1982

TABLE OF CONTENTS

END OF PROJECT EVALUATION

NCDC COOPERATIVE OILSEED PROCESSING MANAGEMENT

(OPG # AID-38602127)

EXECUTIVE SUMMARY

The National Cooperative Development Corporation (NCDC), the Cooperative League of the U.S.A. (CLUSA), and the United States Agency for International Development (USAID) collaborated on a three year project to improve management of cooperative oilseed processing plants. USAID provided grant funding in the amount of U.S.$ 475,200 for the project which, as amended, ran from August 30, 1978 through April, 1982. The NCDC committed counterpart personnel and funding equal to $130,000. CLUSA provided two technical advisors, the part-time services of the CLUSA Permanent Representative to coordinate the project, and the voluntary participation of CLUSA's Oilseed Advisory Committee both in India and in the United States.

The project proposed to improve the effectiveness and viability of present and future cooperative oilseed processing plants through introduction of modern management systems and training of cooperative personnel in their use.

Underlying the project was the assumption that viable and efficient cooperative oilseed processing plants would benefit the farmer-member by ensuring a fair market price for his oilseeds while stabilizing oil prices for the consumer.

Evaluation

The Evaluation was conducted between February 22 and March 13, 1982. A team comprised of representatives from NCDC, USAID and CLUSA conducted

the evaluation. Interviews, review of source materials, and field visits to "model" project plants as well as "non-model" plants, were done to assess project results. The evaluation attempted to:

1) Assess results in relation to project objectives and to identify both successes and failures as well as their respective reasons;

2) Assess the appropriateness and effectiveness of the project strategy; and

3) Offer such recommendations and suggestions as are consistent with the evaluator's limited knowledge and ability.

Evaluation of Project Objectives:

Inputs:

The project envisioned the following inputs:

- 53 personmonths of expatriate consulting service plus 6 months of Advisory Commitee Participation.

  51 personmonths of expatriate consulting services were provided; the six months of Advisory Committee participation was exceeded.

- U.S. In-Service Training of approximately 5 personmonths.

  Approximately 9 personmonths were achieved.

- Two full-time and one-part time counterpart would be available from NCDC over 2½ years.

  While the personnel were available, the time spent on field work with the expatriate consultants was substantially less than planned.

- Consulting and supervision by CLUSA Permanent Representative at approximately 50% of his available time.

  Approximately 15% of Permanent Representative's time was spent on the project.

- Provision of cooperative facilities, personnel

and materials for testing.

A total of 101 days were made available by five cooperative oilseed processing plants for trial operations under the project.

- Financing of personnel, travel, office space, supplies/equipment, printing, communication and training costs by the NCDC.

  NCDC records show project funding at Rs. 11.83 lakhs (US$130,000).

Summary Observations:

1) The work of Carl Petersen, technical advisor for management was exceptional, directly returning to model plants increased revenues, savings, and production valued at many times the cost of the project; the work of the second consultant was less valuable.

2) Participants in the U.S. In-Service Training indicate it was of considerable value to them in their work and, in the instance of Phase II training resulted directly in a saving of as much as U.S.$200,000 in equipment purchases.

3) While the counterpart personnel were not able to invest the time in the field initially planned, the team considers them conversant with the innovations developed and tested and able in large part to introduce and support their adoption in other plants.

4) The CLUSA Permanent Representative did not anticipate the major time investment required to support a second CLUSA endeavor, the NDDB Oilseed Project, which substantially reduced the time available for consulting and supervision of the NCDC OPG. At the same time, the direct and indirect qualitative contribution made was significant and the decreased input did not appear to adversely affect the project.

5) The willingness of cooperative plant managers and production personnel to accept the risk entailed in making their plants available for trial operations represents the single most important input in the project.

6) NCDC Financing was at, or greater than, the level anticipated.

Project Outputs

The project proposed three major outputs, described as below:

- Publication and distribution of at least one set of operational manuals to each operating cooperative processing unit.

A draft manual in three volumes has been prepared and distributed to the majority of processing units. It is not considered a "final" version, nor does it include, per se, the training materials envisioned.

- At least six professionals trained and capable of providing training and consulting services to others; system trainers/consultants formally employed by the central organization.

  Two professionals (one NCDC Consultant and one Project Manager with the Gujurat Oilseed Growers Confederation) are equipped to provide the training/consulting services envisioned; two other NCDC professionals and one plant production manager (Anand) can provide training/consulting in some elements of the systems developed. None are formally employed by the central organization (NACOP).

- Not less than 32 General Managers trained in application of all systems developed with a published training program and schedule covering all units.

  At the time of the evaluation the majority of General Managers had been initially exposed to the systems in a February workshop; a total of 6 plant personnel had undergone training in groundnut processing at Bhavnagar with an additional 12 anticipated to take part in a scheduled program in Vijayawada.

Summary Observations

While the limited achievement of outputs might tempt the evaluator to rate the project a failure, this would fail to take into account the remarkable achievements that have been produced, not to mention the even greater potential created. The initial design appears to have substantially underestimated the complexity of moving from problem identification to solution to testing/confirmation to, and through, the process of dissemination through training and technical support. The major time invested was required for problem identification and the development, testing and confirmation of solutions. Efforts to develop and implement training were, therefore, compressed into the latter stages which left far from adequate time.

It was the team's judgement that effective prosecution of training

design, development and implementation, combined with a systematic program of technical assistance, requires and deserves a period equal to that of the initial three-year effort. Only through carrying through in this way can the full benefits of the project be realized.

It should be noted that the project assumed the creation of a National Association of Cooperative Oilseed Processors (NACOP) which would have become the vehicle for this element of the project. NACOP personnel would, presumably, have had greater time and direct responsibility for training development and technical support to processing units. However, unanticipated obstacles arose that have delayed NACOP's registration and formation, which undoubtedly had a negative impact on these outputs.

Project Purpose:

The purpose of the project included:

- Development of the methods necessary to make substantial improvements in management of cooperative oilseed processing units.

  The project envisioned addressing ten categories of systems related to the management and operations of cooperative processing units. While initial study and draft manual sections were prepared on elements of all ten categories, an early--and justifiable--decision was taken to concentrate on production planning/control, raw material grading/storage, and processing efficiency/reliability. In these three areas major achievements have been realized in the development, testing and confirmation of methods necessary to make more than substantial improvement in both management and results.

- Development of NACOP capability to continue developmental activity and carry out training of cooperative personnel.

  As noted above, NACOP was not formed as anticipated. While a great deal of work remains to be implemented in further development of management and operational systems and in their extension through training and technical assistance, the team believes that the core capability exists in the persons of NCDC staff and personnel of model cooperative units.

Summary Observations

The concentration on three categories of operating systems reflects the judgement that these represented the most critical problem areas and that unless and until these were substantially corrected, cooperative processing units would not be able to achieve and maintain viability. The evaluation team concurred in the appropriateness of this judgement. Nonetheless, as progress is made in extending the results of the project in these areas to all NCDC-financed cooperative processing units, there will be a need to address, develop and extend innovations related to the remaining seven categories identified in the initial project design.

Project Goal

The stated goal of the project was development of effective management within the cooperative oilseed processing sector, as measured by: 1) improved operating peformance; 2) increased capacity utilization; 3) improved financial performance; and 4) newly created units viable in reduced time.

With regard to the first three indicators, all "model" plants worked with during the project have shown substantially improved performance. It was clear to the evaluation team that as a result of the project there were close to dramatic increases in capacity utilization--not only approaching, but exceeding rated capacities. The project innovations also reduced operating costs in key areas as well as increasing revenues, thereby substantially improving their financial performance. The project did not succeed, as previously indicated, in the attempt to extend the model plant results to other cooperative units, existing or new. This task remains the major challenge and opportunity.

Significant Accomplishments

The project focussed on five model plants which included cottonseed

processing (Anand and Gidderbaha); groundnut processing (Fatehnagar and Bhavnagar); and rice bran processing (Vijayawada). In each model plant a number of operating modifications/innovations were introduced. In most instances these had the result of both increasing capacity well beyond manufacturer ratings (160% in the case of expellers; up to 300% in the case of solvent extraction), and significantly reducing both total and per ton operating costs in power, fuel, solvent, and fixed costs. The text of the evaluation report details each of these innovations, their impact on a single plant, and the Rupee/Dollar value of extrapolating those results to all processing units in the cooperative sector. The following chart highlights some of the major innovations and their "benefit" if successfully adopted by all NCDC financed plants.

Innovation	Result	Benefit Rs.	US$
Improved raw material storage	5% reduction in losses from deterioration/pests	3.3 crores	$33,000,000
Improved delinting of cottonseed	Higher fly-lint recovery	24 lakhs	265,000
	3% increase lint recovery	90 lakhs	810,000
Improved decortication of cottonseed	Oil content in hulls reduced by 1%	31 lakhs	340,000
Improved hull/seed separation of cottonseed	Reduce meat/fines in hulls by 2.1 to 2.4%	8 lakhs	82,500
Modify expeller operations	Increase production from 218,750 to 350,000 MT/day	NE	NE
	Reduce power consumption	15 lakhs	165,000
Increase temperature for solvent extraction and oil % in miscella	Increase capacity to between 437,500 and 656,250 MTs per year	17-26 crores	18,000,000
	Lower steam consumption as much as 60%	NE	NE
	Hexane consumption/ton reduced 12-15 litres	325 lakhs	3,700,000
Eliminate/reduce storage cottonseed cake	Reduce FFA increase by 3% to 3.5%	1.3 crores	1,400,000
Modify expeller operations for groundnut	Increase capacity from 227,000 MT to 340,500 MT per year.	NE	NE

Innovation	Result	Benefit Rs.	U.S.$
Increase temperature for solvent extraction + oil % in miscella	Increase capacities and oil production from between 17,900 MT and 47,000 MT Increase DOC by between 236,000 MT and 620,000 MT	51 crores to 144 crores	56,000,000 to 158,000,000

As can be seen, the potential for increased revenues through production enhancement and cost reductions is close to staggering. Full adoption of all the innovations developed during the project would have the effect of more than doubling the current oil production capacity in the cooperative processsing sector with what is effectively a marginal additional investment. However, it should be clearly recognized that the full adoption of these and other technological modifications is part of an extraordinarily complex total process and requires not only extensive training and technical support to plant personnel but major increases in the financing of working capital; vastly improved financial management systems; and extensive development of procurement, storage and marketing processes.

Unexpected Developments and Benefits

Three unexpected developments and benefits occurred during the project:

1) With the rapid expansion of soybean cultivation and NCDC financing of relatively large processing complexes, the background and skills of the project advisors--both of whom had worked extensively with soybean processing--proved valuable in the pre-project planning of these efforts.

2) NDDB involvement in the oilseed processing field created an an additional institutional beneficiary for the lessons learned during the project; this benefit has been strengthened by Carl Petersen's subsequent assignment as an advisor to the NDDB project.

3) Dr. Walter Gibble made a persistent effort to promote the concept of blending vegetable oils. It now appears that the Government of India may approve this concept within certain bounds. If this approval takes place, it will have a major economic impact through use of available (and lower cost) oils, blending with oils preferred by consumers to produce a lower total cost and more widely acceptable product.

Significant Unfinished Tasks

While the team felt that the project accomplishments more than justified the investment, there remain some major tasks on whose completion rests the ultimate success of the project's potential. These include:

1) Development and testing of the systems and procedures targetted by the project but not fully addressed;

2) Development and testing of three related, but unanticipated systems:

   a) Planning and financing of procurement;
   b) Planning and maintaining integration of equipment capacities;
   c) Management synthesis of production planning, technology and financial planning/management.

3) Further development and extension of project systems and innovations through training and technical support of cooperative processing units.

Evaluation of Project Strategy

While the evaluation team felt the project strategy was logically sound, it appears that there was a significant underestimation of the complexity and the time required for full implementation. With hindsight it might have been preferable to:

1) Initially focus on three major categories of management and operational systems, rather than the ten incorporated in the project design;

2) With a more sharply focussed definition of systems, it might have been possible to better define--and limit--advisor tasks, resulting in recruitment and selection of an advisor who would have better complemented Petersen and been more directly appropriate to the critical, yet unfinished, tasks identified.

3) Build in a contingency should the assumed creation of NACOP fail to take place; as it was, the fact that NACOP was not established hampered achievement of the extension/training aspect of the project--an alternative plan that anticipated this possibility might have seen more results in this area.

Recommendations

Recognizing that their study was of short term and based on limited

information, background and analytical skills, the team offered the following suggestions--not as a prescription to be followed but in the hope that they stimulate further thought, appropriate conclusions, and where indicated, action.

1) The design and implementation of a systematic approach to the communication of the innovations developed by the project including: a) creation of awareness; b) promotion of interest; c) support for evaluation of the innovations by responsible cooperative unit officials; d) training and technical support during the trial stage. It is noted that while this would entail a significant investment of money and personnel, that investment pales before the potential return.

2) The proposed National Association of Cooperative Oilseed Processors appears to be the logical vehicle for the activities recommended above. The team would recommend its rapid registration and formation. If this does not appear feasible or practical in the near future, we would recommend that the NCDC establish and staff a technical cell to undertake this task on a full-time basis in the anticipation that the staff and its achievements could be transferred to NACOP once it is established.

3) It is recommended that NCDC explore the question of financing of working capital at levels that will permit processing operations at the full potential capacity of individual units. This would potentially include raising margin money allocations, resolving problems with commercial and state cooperative banks, and identifying alternatives such as pooling and procedures which can be employed by General Managers to leverage available funds to the maximum.

4) It is recommended also that NCDC assess the technical and financial feasibility of bulk storage, and, if the findings warrant, work with concerned agencies and cooperatives to finance such storage on a pilot basis.

5) It is recommended that CLUSA make effective continued use of its investment and expertise in oilseed processing cooperatives by continuing to work with NCDC, NACOP, and other agencies presently or potentially involved in cooperative oilseed processing and marketing.

6) Manufacturers and vendors of equipment represent a present obstacle and potential asset to the sector. It is recommended that all parties concerned develop a strategy to educate and develop manufacturer/vendor capacity to contribute to the sector.

7) USAID/India, which made this project possible through its grant and flexible responses to its amendment, has gained considerable expertise in the oilseed processing sector. It is recommended that as efforts are undertaken to exploit and expand on the potential created by this project, USAID continue to provide limited financial support to the agencies and cooperative organizations involved.

8) We would recommend that a final evaluation be conducted in 1984/85 in order to more fully and accurately assess the impact of the project.

9) Last, but not least, we would recommend that present efforts be accelerated to: a) increase the equity participation of members in ownership of the cooperative oilseed processing plants; b) promote ways and means to link producers directly with the processing cooperatives in contrast to present reliance on open-market purchase of raw materials. Although not central to the objectives of the project, these recommendations are pertinent to the basic goals and purposes of the cooperative movement and should not be ignored or undervalued.

The evaluation team had the benefit and counsel of a great many people who kindly spared their time from busy schedules and more important activities. We would like to express our appreciation to the Managing Director, Mr. V.B.L. Mathur and General Manager, Mr. K.J.S. Bhatia, of the NCDC and to the many members of their staff who assisted us. It is also appropriate to thank Mr. P.S. Kohli for sparing the time to review the findings of the evaluation. The team very much appreciated the time taken by Mrs. Priscilla Boughton and her staff of USAID/New Delhi to discuss and comment on the evaluation and its findings. We are indebted to the management and staff of the Anand Taluka Cooperative, the Bhavnagar Processing Unit, and the Gadag Cooperative Textile Mills for both their hospitality and kindness in working with us on the evaluation. Last, but certainly not least, we must thank the CLUSA Representative, Rex Wingard, and his staff for patience, forbearance and generosity in both easing our task and our stay in India.

END OF PROJECT EVALUATION

NCDC COOPERATIVE OILSEEDS PROCESSING MANAGEMENT

PROJECT (OPG # AID-38602127)

PROJECT SUMMARY

The NCDC Cooperative Oilseeds Processing Management Project was initiated in August 1978 as a USAID Operational Program Grant to the Cooperative League of the USA (CLUSA) in support of National Cooperative Development Corporation (NCDC) efforts to improve management of NCDC-financed cooperative oilseed processing plants. A grant of U.S. $475,200 for three years (August 30, 1978 and August 29, 1981) amended to run through April 1982 was awarded to CLUSA for the project.

The grant's purpose was to improve the effectiveness and viability of present and future cooperative sector oilseed processing units through introduction of modern management systems and training of cooperative personnel in their use. As such, it represented the manpower development component of NCDC's larger 5 year plan for cooperative oilseed processing development.

Implicit in the grant's purpose was the assumption that viable, efficient cooperative oilseed processing plants would serve both the producer and consumer of oilseeds: 1) the producer would benefit by receiving a fair market price for his produce, both increasing his income and encouraging additional production by providing an incentive for investment; 2) the

consumer would benefit as the market share of cooperative oilseed processing plants increased to the point where they become a moderating influence in India's vegetable oil market.

Summarized, the objectives of the project called for:

1. development and testing of management systems and techniques, appropriate both to the technology and conditions of cooperative oilseed processing plant operations in India;
2. translation of these systems into operations manuals and appropriate training materials;
3. ultimate transfer of the technology to the appropriate cooperative organization(s) in India to ensure their ongoing modification, improvement and broad dissemination.

The project strategy assumed a progression from problem identification to tentative solution; from solution identification to testing and confirmation; from solution confirmation to documentation; from documentation to development and implementation of training both for cooperative personnel directly responsible for processing plant operations and for those who would provide their training and technical support.

The project included several components integral to the strategy:

1. Technical assistance through CLUSA long-term technical advisors (2 for an estimated 2 years each plus the CLUSA Permanent Representative approximately half-time);

2. NCDC Counterpart staff for a period of approximately 2½ years each (2 full-time plus 1 part-time);

3. Planning and evaluation of training, and specialized short-term technical support by members of CLUSA's cooperative oilseeds advisory committee;

4. Orientation and participant training of NCDC and cooperative processing plant personnel in the U.S. in collaboration with U.S. cooperatives operating oilseed processing plants.

EVALUATION APPROACH

This evaluation is viewed as an "End of Project" as opposed to a "Final" Evaluation. The initial project proposal suggested, and the Evaluation Team concurs, that the type of effort involved can best be measured several years after the formal end of the project. The major portion of the project's investment has been in development of methods and systems to improve plant viability and efficiency; the project anticipated neither the time nor resources necessary to extend the lessons learned to all 32 NCDC-financed cooperative oilseed processing plants, much less the additional 26 plants proposed for the next five years. Further, while it is premature at this time, it is ultimately of real importance to assess whether improved performance of oilseed processing in the cooperative sector proves to be of positive and significant benefit to producers and consumers.

It is important to note that an interim evaluation of this project was conducted by John Hatch, CLUSA Consultant in September 1979. It is

recommended that Hatch's evaluation be read as a companion piece to this report which will not repeat Hatch's observations or judgements, except as they are germane to the subsequent progress or ultimate success of the project.

Evaluation Objectives

The body of this evaluation represents an attempt to:

1. Assess the results of the project in relation to the stated Goal, Purpose, Outputs and Inputs; to note successes and their reasons; to identify failures and their relationship to ultimate project success.
2. Assess the appropriateness and effectiveness of the project strategy and methods as they relate to present achievements and potential long-term success;
3. Offer such recommendations and suggestions as are consistent with our limited knowledge and ability.

Evaluation Methods

Participants:

The Evaluation Team included representatives of the National Cooperative Development Corporation, and the U.S. Agency for International Development as well as a member of the CLUSA Advisory Committee, and a CLUSA consultant. Team members included:

1. Mr. D.K. Agarwal, Consultant (Finance), National Cooperative Development Corporation, New Delhi
2. Mr. R.N. Trikha, Oilseeds Project Coordinator, Food for Development Office, USAID/New Delhi;
3. Dr. Frank J. Young, Deputy Chief, Program Office, USAID/New Delhi;

4. Mr. C. Richards Rathbone, CLUSA Advisory Committee (former President, Ranchers Cotton Oil, Fresno, California);

5. Mr. Thomas R. Carter, CLUSA Consultant.

Approach

Individually and collectively, the Team employed the following methods to conduct the evaluation:

1. Review of Documentation including: project proposal; grant agreements and amendments; memoranda of agreement between CLUSA and NCDC; quarterly, annual and end-of-tour reports prepared by CLUSA personnel involved in the project; NCDC and CLUSA files on plant operations; oilseed processing cooperative financial data; and related correspondence between organizations involved with the project.

2. Interviews with officials and staff of the organizations and cooperatives participating in the project (see list in Appendix I); these interviews took place both in the U.S. (with cooperative managers undergoing participant training and CLUSA personnel) and India.

3. Visits to two 'model' plants where the Advisor (Management) had worked extensively with the development and testing of methods and systems. These plants included Anand Taluka (financed by the NCDC) and Bhavnagar (financed by the National Dairy Development Board), in Gujurat. Visits were also made to two 'non-model' plants where the Advisor had not worked: Binkadakatti and Gadag, both in Dharwar District, Karnataka.

   Note: in the Team's judgement, the non-model plants--one idle and the other operating at a minimal level--did not offer an ideal comparison; in retrospect it would have been preferable to have visited two plants that operate well in order to have a more valid and useful comparison.

The initial draft of the evaluation report was prepared in New Delhi, discussed with team members and concerned officals of NCDC, CLUSA and

USAID, then revised in light of their comments and suggestions.

The evaluation was initiated February 22, 1982 and concluded on March 13, 1982.

IMPORTANCE OF THE PROJECT

The investment in the project by NCDC, CLUSA and USAID was not large. In such an instance, the evaluation of a project and its achievements is often a perfunctory exercise, briefly noted and consigned to the files. It is the unanimous conviction of the evaluation team that although the project investment was small, the potential returns are substantial both in magnitude and importance. Whether the reader agrees or disagrees with our conclusions and judgements, we hope that this report will stimulate both further thought and the constructive action necessary to realize the potential represented by the project.

Oilseeds and vegetable oil are of critical importance to India, both as a source of protein for the human and animal populations and as a central part of the diet of the majority of India's citizens. While other elements of India's agricultural production have accelerated dramatically, oilseeds and oil production have lagged behind. In 1979/80, India found it necessary to import vegetable oils valued at Rs. 440 cores (US $475 million), a cost exceeded only by imports of petroleum products and fertilizer. The current trend of oilseed production is erratic and does not show evidence of a sustained upward trend, implying that imports must continue to rise if present per capita availability of oil are to be maintained. The

oilseed producer has largely failed to benefit from the increasing importance and value of his commodity. The oilseed market is dominated by traders who profit substantially through purchasing at low harvest prices and releasing oilseeds (often to their own processing plants) only as prices rise rapidly in the months that follow. The consumer fails to benefit from the low prices at which the majority of oilseeds are procured; it has only been through Government import and market intervention that the consumer has been protected from volatile upward swings in the price of oil, a protection purchased at an increasing cost to India's foreign exchange reserves.

During the last several years the NCDC has financed 32 oil processing complexes as part of the overall long-term plan to increase the availability of vegetable oils in India. These complexes use modern processing technology and may include relatively sophisticated equipment for pre-processing, expelling, solvent extraction, refining and preparation of vegetable oil products. ✓ Of the 32 plants organized, 10 process cottonseed; 7, rice bran; 1, salseed; and the remaining 14, other oilseeds, primarily groundnut. The total rated capacity of these plants is 4.31 Lakh (431,000) tons per annum. This sizeable investment will be further increased with start-up of as many as 26 additional NCDC financed plants over the next few years.

A major project result is the demonstration that expeller capacity can be increasedby as much as 60% at no additional investment cost while reducing fuel and power consumption; similarly, manufacturer-rated solvent extraction

capacity can be doubled with a limited investment and with reduction in operating costs per ton. Full implementation of these modifications and procedural changes would enable cooperative oilseed processing plants to double their share of the vegetable oil market: from 6% to 12% of the groundnut oil market and from 18% to over 30% of the cottonseed oil market. These shares could be further increased by operating plants 300 to 325 days per annum instead of 200 to 250, further reducing the cost per ton of production by allocating fixed costs over the longer period and higher volume. Assuming availability of raw material necessary operating at these expanded capacities would benefit farmer producers (whom cooperatives pay as much as Rs. 1,000 to Rs. 2,000 more per ton of groundnut); benefit consumers through substantial reduction of production costs; and accelerate the financial viability of the cooperative processing plants.

Against this optimal picture, the present position of NCDC-financed oilseed processing cooperatives suggests mixed results. The majority do not operate at full daily capacity, nor do they operate even the minimum 200 to 250 days per annum. There are factors unrelated to the project that contribute to this situation. In some cases local production of oilseeds is inadequate to meet the needs of the plants; in more cases the cooperatives have not developed the methods of managing working capital necessary to procure adequate supplies. Problems such as power outages, shortage of hexane, non-availability of spare parts, and delayed fuel supply all contribute to the operating difficulties faced by the plants. However most, if not all,

these problems can be resolved, a process that should be stimulated by introduction of the technological and management changes developed by the project.

It is the evaluation team's judgement that the potential impact of fully utilizing the NCDC-financed plants is of great importance to the oilseed and vegetable oil production in India. For these reasons we feel that the involved organizations should make every effort to ensure the maximum return on the investment made. The additional costs are small relative to the direct and indirect benefit that will be returned.

EVALUATION OF PROJECT OBJECTIVES

The basis for evaluation of project objectives is the Logical Framework included in the project agreement. The Logical Framework summarizes the project inputs which, as anticipated in the design, would produce certain outputs that would, in turn result in achievement of the project purpose and, ultimately, the project goal.

Project Inputs

The project called for eight major inputs which are listed below with a summary of the status at the time of the evaluation:

INPUT	STATUS	
1. Approximately 53 man-months of expatriate consulting service plus 6 months Advisory Committee.	1. Carl Petersen:	32 months
	2. Walter Gibble:	19 months
	TOTAL	51 months

	Advisory Committee In India 1. David Owen 2. Kenneth McQueen 3. Joe C. Givens 4. C. Richards Rathbone In United States 1. Joe C. Givens, formerly Land O'Lakes 2. Lloyd Smith, Soy-Cot Sales 3. Robert H. Squires, Plains Cotton Cooperative 4. Fritz Bloomberg, formerly Riceland Foods
2. U.S. In-Service Training of approximately 5 person months	1. V.B.L. Mathur 6 weeks 2. A. Ramanathan 4 weeks 3. B.S. Shekhawat 4 weeks 4. N.S. Rajagopal 4 weeks 5. V.K. Sharma 8 weeks 6. U.R. Sahasranaman 6 weeks 7. R.D. Bedi 4 weeks
3. Counterpart personnel: 3 counterparts working with program over 2½ years in association with consultants and Advisory Committee members.	1. R.D. Bedi 1 month 2. B.S. Shekhawat 7 months 3. A. Ramanathan 4 months
4. CLUSA Representative consulting and supervision (approximately 50% of time during duration of OPG).	1. M. Rex Wingard 5 months
5. Indian consultants	No data available
6. Cooperative facilities, personnel and materials for testing.	1. Anand: 42 days trail operations 2. Gidderbaha: 24 days trail operations 3. Vijayawada: 17 days trial operations 4. Fahtenagar: 10 days trial operations 5. Bhavnagar: 8 days trial operations
7. NCDC Financing	1. Personnel Rs. a. Management 15,000 b. Consultants 72,000 c. Other Professionals 1,000 d. Support 1,20,000

2.	Travel and Transport	
	a. Vehicles	85,000
	b. CLUSA Travel and Transport	50,000
	c. NCDC Travel	20,000
3.	Office Space	5,10,000
4.	Air Conditioning and Office Furniture, et.	50,000
5.	Printing & Stationery	30,000
6.	Communications	50,000
7.	Training	80,000
8.	Misc. Expenses	1,00,000
	Total	Rs. 11,83,000

8. Personnel & Expense for Training: See items "3", "7.1.b." and "7.7"

Comment: There is a risk in simply tabulating inputs quantitatively without recognizing that they represent the designer's best but fallible judgement as to the best forms of project investment to produce the desired final results. A better test is determination of whether the presence or absence of given inputs or combination of inputs appears to have significantly affected the project results. This report will attempt to identify such relationships.

1. Expatiate consulting personnel:

In terms of level of investment and potential contribution, this represents a major project input. The John Hatch evaluation deals at length on this contribution. We will not repeat Hatch's observations other than to note that: 1) We concur with Hatch's judgement that Carl Peterson

represents an advisor of rare ability and commitment, as demonstrated by the results he has achieved in collaboration with NCDC counterparts and cooperative plant personnel. He provides compelling evidence that hands-on skills and the willingness as well as the ability to translate experience into practical and appropriate application is a far more important qualification than a string of academic degrees, 2) based on a review of Volume III of the NCDC Draft Oilseeds Processing Manual and discussions with plant and NCDC personnel, we would concur with Hatch's judgements on the limited contributions of Dr. Walter Gibble. However we would note that his active efforts to encourage blending of oils appear to be close to success. If blending of oils is approved, the economic impact should more than justify the costs entailed in providing Dr. Gibble's services. With the advantage of hindsight, we would suggest that a more detailed definition of the tasks appropriate to refining and processing of vegetable oil products in India, might have produced a position description that would have permitted recruitment and selection of an individual with different and more appropriate skills.

2. In-Service Training

"Seeing is believing" goes the old saw. Interviews with those who participated in the U.S. in-service training component of the project would appear to bear this out. Messrs. A. Ramanathan and B.S. Shekhawat indicate their observation and experience with U.S. cooperative oilseed processing created an important frame of reference for their subsequent work on the project: having seen many of the principles on which proposed changes were

based in operation, they were able to both conceptually grasp, accept and contribute to the operational recommendations that were developed during the course of the project.

The third consultant who participated in the first phase in-service training, Mr. R.D. Bedi, subsequently retired. It was anticipated at the time of the visit that Mr. Bedi would play a key role in the proposed National Association of Cooperative Oilseed Processors (NACOP); that NACOP did not materialize during the life of the project was unforeseen and does not in itself disqualify the validity of the decision to include Mr. Bedi.

The second phase in-service training (early 1982) included the NCDC Managing Director, Mr. V.B.L. Mathur; Dr. N.S. Rajagopal, consultant; Mr. V.K. Sharma, Manager, Haldwani Cooperative Soybean Processing Plant; and Mr. U.R. Sahasranaman, Project Manager, Soybean Processing Project, Madhya Pradesh State Cooperative Oilseed Growers Federation.

The Evaluation Team Leader conducted an extensive telephone interview with Mssrs. Sharma and Sahasranaman during the latter stages of their in-service training (see appendix for detailed description). In summary they found the training of great value in: 1) helping them to assess the appropriateness (or otherwise) of the machinery and equipment required for their plants. The visit confirmed several judgements in this respect and also resulted in the elimination of unnecessary equipment at an estimated savings of Rs. 18 lakhs (U.S.$200,000); 2) enabled both participants to work with plant managers and operational personnel in all phases of soybean oil processing from purchase of raw material to marketing, providing what they described as a

uniquely valuable experience in terms of their responsibilities for plant construction, equipment layout, plant operations and management. The value of the training is best expressed by one of the participant's comments that: 'Prior to leaving I had discussions with Carl Petersen and regarded much of what he said as simply theoretical; now, having seen plants in operation here, I understand and accept as practical application a great deal of what I heard then.'

The NCDC Managing Director, Mr. V.B.L. Mathur, participated in both the phase one and phase two visits. While this no doubt provided the Managing Director with a frame of reference and perspective that has contributed to NCDC's leadership in oilseed processing, it is only fair to indicate that these visits were probably more beneficial to CLUSA and AID/Washington as a result of his contributions to their understanding of the project; to the motivation and subsequent effective collaboration of U.S. oilseed processing cooperatives and the Advisory Committee; and in the identification and selection of consultant and advisory personnel. Mr. Mathur's participation in the first visit was also instrumental in the design and very effective exploitation of the second orientation opportunity.

3. Counterpart Personnel

The John Hatch evaluation stressed the limited involvement and participation of the NCDC counterpart personnel with particular emphasis on their limited work in the field with 'model' cooperative oilseed processing units. There can be little doubt that the future exploitation of project potential depends directly on the elaboration and extension of the work done by the project advisors, a subject that will be discussed at some length in a subsequent

portion of this report. However, Hatch's observations may have been misleading to some extent.

First, while the chronological time committed by NCDC counterparts may not have been extensive in terms of field visits, the visits provided the basis for that personnel to support and extend the innovations developed in the model plants. We would draw attention praticularly to Mr. B.S. Shekhawat who has a solid grounding in the full range of recommendations developed and who, we believe, has both the ability and interest necessary to introduce them successfully in other NCDC financed plants. Our discussions with Mr. A. Ramanathan also indicated his conversancy with the theory, operational nature and results of the recommendations, as well as his ability to relate these to the overall management of oilseed processing facilities. It is our judgement that while the field work of NCDC counterpart personnel was not as extensive as Mr. Petersen's that this work, combined with extensive involvement at Headquarters, produced a qualitative result of substance, a fact that might be overlooked by merely measuring days rather than outcomes.

Second, the project assumed formation and registration of NACOP (National Association of Cooperative Oilseed Processors). For the last several years NCDC has, in fact, anticipated budget support for NACOP (envisioned on a 20% per annum declining basis over 5 years until the Association reaches self-sufficiency). It was believed that NACOP would play the major role in training and technical support of cooperative oilseed processing personnel and that NACOP would be the logical location for counterpart

personnel. The difficulties encountered in registering NACOP were not--and could not realistically have been--anticipated at the time the project was designed.

Related to this question is the role of the National Cooperative Development Corporation and its personnel. NCDC is a development finance institution. While development is the end; finance of cooperatives is the primary means. In the current year the NCDC will lend a total of approximately Rs. 80 crores (US $88 million) to cooperative organizations. It has developed a project appraisal, screening and approval process that is recognized by the World Bank and EEC as more than meeting their standards. This process is an extensive and intensive one requiring considerable time and effort on the part of responsible staff. During the project, NCDC counterpart personnel were involved with responsibilities that ranged far beyond the specific objectives of the project. Given this, combined with the anticipation that NACOP would materialize, the level of participation by NCDC counterpart personnel--both in terms of time and quality--was as much or more than could have been reasonably expected.

4. CLUSA Representative consulting and supervision:

The John Hatch evaluation also drew attention to this input, indicating that in quantitative terms the contribution was far less than projected. During the project, a second CLUSA effort, the Cooperative Oilseeds Project with the National Dairy Development Corporation (NDDB) created increasing demands on the Representative reducing the time available for the NCDC OPG. Given the comparative financial magnitudes involved, this allocation of time represented a reasonable decision.

At the same time, the number of person-months devoted to a project is an imprecise measure of contribution. Quality of contribution is far more important than time. This quality is in evidence. First, Mr. Wingard's knowledge of the cooperative oilseed processing sector and of the technology of oilseed processing are extensive. It is clear that this knowledge contributed substantially to the quality of the advisor's orientation and to his becoming rapidly effective. If Mr. Wingard did not physically participate in on-site field consultations, he was a resource for the advisors and for NCDC that was drawn on frequently and with valuable results. In spite of limited available time, Mr. Wingard contributed extensively to the NCDC Oil Processing Manual, both by writing sections and serving as a resource and touchstone for others. He actively participated in NCDC Seminars and Workshops on Oilseed Processing; coordinated Advisory Committee visits; arranged and designed U.S. In-Service Training for the participants; and prepared the series of quarterly and annual reports on the project. (See Appendix III on CLUSA Washington backstopping support).

Given Mr. Wingard's extensive knowledge of the project, it is clear that his greater involvement would have been of benefit; there are also points where his intervention might have brought a more rapid resolution of obstacles to implementation. At the same time, it is also the judgement of the Evaluation Team that the time spent by Mr. Wingard in the project was directly related to several of its achievements, and not directly related to any of its failures.

5. Indian Consultants

No information was obtained for this input.

6. Cooperative facilities, materials and personnel for testing:

In the Team's judgement, the project's most significant results include identification of a series of operational and procedural recommendations that, in sum, can greatly increase the viability and production of cooperative oilseed processing units. Mr. Carl Petersen has received--deservedly so--substantial credit for these achievements. At the same time, they would not have been possible in the absence of what is a truly remarkable collaborative effort involving both NCDC personnel and the General Managers, Production Managers, and personnel of the 'model plants'. The willingness to accept the risk of experimenting with ideas new to India, to commit plant equipment and personnel to the trial of project recommendations, and to work to produce a synthesis of the advisor's skill and their knowledge, represents the single most valuable input in the project.

7. NCDC Financing

While note has been taken in the past of the limited participation of NCDC counterparts in field trials, little note has been taken of the extensive commitment of facilities, personnel and money by the NCDC. It should be clearly acknowledged and appreciated that the NCDC has invested approximately Rs. 1,183,000 (US $130,000) in the implementation of this project.

8. Personnel and Expense for Training

In the Evaluation Team's judgement, this input has been fully met both by the NCDC and by the 'model' plants where training has been conducted.

Project Outputs

The project proposed three 'Outputs' resulting from the 'Inputs' discussed in the preceding section. These outputs and their status at the time of the evaluation are tabulated below:

OUTPUT	STATUS
1. Manuals and Training Materials: publication and distribution of at least one set of manuals and materials to each operating unit.	A draft manual in three volumes has been produced; the manual was distributed to each manager participating in the Workshop for Managers held in February. It is in the process of being distributed to other units. It is not a final manual nor does it incorporate training materials.
2. Minimum of six professionals capable of training others as well as providing consulting: system consultants/ trainers formally employed by central organization.	At present one NCDC Professional and one plant manager (Bhavnagar) are fully able to provide both training and consulting services as envisioned; two other NCDC professionals and one plant manager (Anand) can provide training and/or consulting in some of the elements of the systems developed. None are formally employed by the 'central organization' (NACOP).
3. Not less than 32 general managers of existing units trained in application of all systems developed: published training program and schedule covering all existing units; initial training program completed for general managers at a minimum.	General Managers have participated in a workshop organized by NCDC in February, 1982. 6 plant personnel have participated in training in groundnut oil processing conducted in Bhavnagar in February, 1982. An anticipated 12 plant personnel will participate in rice bran oil processing in Vijayawada, March 16/17, 1982. Excluding 'model plant' personnel, no general managers can be considered trained in application of all systems developed.

Comments:

It is clear that accomplishment of the project outputs has been partial. A draft manual has been prepared, printed and distributed for comment. Those individuals concerned, however, indicate the need for improvement in the manual in terms of format, usefulness of the content in some sections, and to ensure it can be utilized by the different groups for which it is intended. It is a good beginning, but far from a finished product.

While there may be training materials (other than the manual itself) in existence, the Evaluation Team has not seen them or heard them discussed. Given the complexity of some of the technological changes recommended, the need to assess the appropriateness of each in terms of the unique financial and operational situation of each plant, and in terms of the distinctly different training appropriate to each training population (type of plant x function), this output would appear far from achievement.

The general managers who attended the NCDC Cooperative Oilseeds Processing Workshop in Delhi this February have been exposed to the concepts contained in the Manuals and have had a limited opportunity to work with them. This exposure can be expected to create a sense of awareness and interest on the part of the participants; the workshop did not develop the skills necessary to assess the potential of proposed technological change or the implementation of the recommendations.

While the Bhavnagar training can be expected to have developed the skills of at least some participants, there is no training evaluation to initially

validate this assumption. At best Bhavnagar can be seen as an initial step in what should be a sequence of training and technical consulting support efforts. The same can be suggested of the forthcoming training at Vijayawada.

It is tempting to note the lack of achievements in these critical areas and dismiss the project as having failed. To do so, however, would negate the very substantial potential impact of the project discussed in earlier sections of this report. It is important to bear in mind that the work done by the project consultant, his NCDC colleagues and the model plant personnel represent innovations. In this instance they are not only innovations of substantial technical (and in most instances, financial) complexity, but they also entail substantial risk to the adopter both in their evaluation and trial. Few of the changes can be adopted without making substantial commitments of facility and personnel which, if not irrevocable, could be perceived as threatening substantial dislocation of production and equipment.

It is the judgement of the Evaluation Team that the project design substantially underestimated the time and complexity involved in effective diffusion of the innovations it hoped to develop. In implementation, this critical process became, in essence, an add on at the end. There are excellent reasons why this would turn out in this fashion. First, to identify operational problems, devise potential solutions, and work with 'model' plant staff to test, modify and confirm these solutions was a complicated and lengthy process. This complexity was multiplied by the fact that the

project consultant and NCDC counterparts were working with at least four distinct oilseeds (groundnut, cottonseed, soybean and rice bran), each with its own unique characteristics, processing parameters, equipment and financial implications. Second, while Mr. Petersen is a superb technologist and one-on-one trainer, he has not had experience in designing either formal training or with organizing the process of extending innovations. Given this, we can at least tentatively conclude that the design itself may well have been too ambitious and complex to have been realistically achieved in full. Those elements of execution that have been fully attempted have borne exceptional results; what remains is not to detail a criticism of what has not been achieved, but rather to discover ways and means to ensure that they ultimately are achieved. This question will be more fully addressed in the section on recommendations and suggestions.

Project Purpose

The project purpose was twofold: 1) to develop the methods necessary to make substantial improvement in the management of cooperative oilseed processing units; and 2) to develop the capability of a central cooperative organization to both continue that developmental activity and carry out the training of cooperative unit personnel in the systems and methods identified as beneficial. Three indicators were proposed for measuring achievement of project purpose. These are discussed below:

1. Development and testing of systems and procedures

   The project proposed ten categories of systems and procedures to be developed and tested. The status of these is discussed below.

While some work has been initiated on systems and methods related to virtually all these categories, the major accomplishments have taken place in relation to three: production planning and control; raw materials grading and storage; and processing efficiency and reliability. Of these three the greatest investment of time and return has been in the last. Chart number I summarizes the major system and procedure changes identified and their current status in the model plants. In a subsequent section on significant accomplishments, an attempt is made to elaborate on the actual and potential impact of these changes, both on the model plants and should they be fully adopted throughout the cooperative oilseed processing sector. At this point the achievement of the Purpose can be summarized as: 1) modest in relation to all but the three categories listed; 2) useful in relation to production planning/control and raw material grading and storage; and 3) of potentially great importance in processing efficiency and reliability. As will be elaborated in the section on substantial accomplishments, the return in increased vegetable oil production and financial returns to the model unit have far exceeded the project investment; the potential returns represent many multiples of that investment.

2. Training program for cooperative personnel formulated and initiated: A limited training program has been formulated and initiated. Three programs have already been conducted (see above plus one at Anand that attracted only one NDDB participant) with a fourth scheduled for

CHART NUMBER I

RECOMMENDATIONS	Anand	Bhavnagar	Gidderbaha	Fatehnagar	Vijayawada	Binkadakatti	Gadag	Remarks
Storage								
1) Eliminate Open Storage	N	N	N	N	N	N	N	
2) Limit Stack Height to 10 Bags	Y	N	N	N	N	N	N	
3) Adopt Bulk Storage	N	IP	*	N	N	N	N	*Gidderbaha considering
Expeller Operations								
1) Remove Reverse Worm Gear	Y	Y	Y	*	NA	N	N	*Attempting to implement
2) Cook 25-30 Minutes	N	IP	N	N	NA	N	N	
3) Alter worms to suit material	Y	Y	Y	*	NA	N	N	*Attempting to implement
4) Increase expeller shaft speed to 34-38 RPM	*	**	?	**	NA	N	N	*Considering **Under Trial
5) Use expeller as pre-press	*	*	*	*	NA	N	N	*Considering
Solvent Extraction								
1) Increase temp. to 61° C.	Y	Y	Y	Y	Y	N	N	
2) Raise miscella concentration to 24-26%	Y	Y*	Y	Y	Y	N	N	*Presently at 36%
Extractor/D-T								
Add live stream to drops between stages	*	Y	*	Y	Y	N	N	*Use Desolventizer-Toaster
Additional General Recommendations								
1) Increase miscella in first spray	Y	Y	Y	Y	Y	N	N	
2) Use hot hexane vapors to remove hexane from oil in 1st stage evaporation	Y	N	N	N	N	N	N	
3) Use highest final miscella concentration	N*	Y	N*	N*	N*	N	N	*All above 26%
4) Use spray system/cooling tower to decrease water temp./increase condensor efficiency	Y	N	Y	Y	Y	N	N	
5) Establish most economical level for residual oil and operate accordingly	P	P	Y	N	N	N	N	GOI Regulations limit residual oil to maximum of 1%
6) Use laboratory for production control	P	P	P	N	N	N	N	
Oil Quality								
1) Minimize/eliminate storage of expeller cake	N	*	Y	N	NA	N	N	*In process
2) Limit D.O.C. to .8% residual oil or higher	P	P	Y	N	N	N	N	See note on GOI regulation

Y = Full adoption P = Partial Adoption NA = Not Applicable *See Remarks
N = Not adopted

RECOMMENDATIONS	Anand	Bhavnagar	Gidderbaha	Fatehnagar	Vijayawada	Binkadakatti	Gadag	Remarks
Groundnut Processing								
1) Heat for 25-30 minutes	NA	N*	NA	N	NA	N	N	*Requires new equipment; Bhavnagar has ordered and will adopt
2) Kernals at 230°-240° F.	NA	N*	NA	N	NA	N	N	*See previous note
3) Adapt worms to groundnut	NA	Y	NA	Y	NA	N	N	
Cottonseed Processing								
1) Remove lint to 2.5% resid.	P*	NA	P*	NA	NA	NA	N	*Attempting to increase recovery
2) Remove Reverse Worms	Y	NA	Y	NA	NA	NA	N	
3) Convert Expeller to Pre-Press, or	N	*	N	NA	NA	NA	N	* Bhavnagar plans direct extraction on initiation cottonseed processing
4) Eliminate pre-press and use flaking mill	**	*	N	NA	NA	NA	N	**In discussion stage
Rice Bran Processing								
1) Increase Heating Time/ Temperature					Y			
2) Increase Miscella Temperature to 61° C.					Y			
3) Remove cooling cube					Y			
4) Add live steam to desolventizer					Y			
5) Reduce pellet size from ½" to 3/8"					N*			*Present equipment (pellet mill) represents limitation to adoption

Y = Full Adoption
N = Not Adopted
P = Partial Adoption
NA = Not applicable
* = See Remarks

Note: Vijayawada is only Rice Bran Processing Unit

Vijayawada. As indicated in the section on outputs, it is the team's judgement that given the importance and complexity of the system recommendations, a carefully designed and systematically evaluated program of communication (to create awareness and interest), training (to support initial trial) and technical support (to ensure successful evaluation and adoption) is appropriate. Against this admittedly arbitrary standard, the formulation of training cannot be judged as having been achieved.

3. Core group of trainers/consultants in place and functioning with the cooperative structure:

This purpose indicator represents the further development of the output calling for formal employment of trainers/consultants by the 'central organization'. As initially envisioned, that central organization, NACOP, remains nascent; it has been developed conceptually, by-laws have been written, financing has been allocated, but it remains unregistered. While both NCDC personnel and some plant personnel have the potential to make a substantial contribution once NACOP is formed, the purpose remains unmet.

It is important to note that limiting project purpose implementation efforts to an intensive focus on three categories of systems and procedures was by no means accidental. Early during the project, Mr. Petersen and his NCDC colleagues reached the conclusion that the major problems and potential impacts were integral to the systems and processes relating to raw material procurement, storage, and processing (pre-processing through solvent extraction).

It was their considered judgement that improvements in these areas were needed, were possible, and would constitute a major step toward operating the plants on a profitable basis. They also judged the failure to reach and sustain a profit virtually precluded successful changes in the other areas. As a result the major portion of time and effort was invested in working with plant personnel in improving each element of those systems. The results support the accuracy of the judgement and, while many anticipated project outcomes have not been achieved, the potential has been created for such achievement, and more.

Project Goal:

The project goal was development of effective professional management within the cooperative oilseed processing sector as measured by four objectively verifiable indicators; improved operating performance; increased capacity utilization; improved financial performance; and new units viable in reduced time.

As the goal relates to the cooperative oilseed processing sector, and not to a limited number of model plants, the team believes that measurement of achievement of the project goal is an appropriate exercise for a 'final' (EOP + 3-5 years) as opposed to 'end-of-project' evaluation.

To support this conclusion we would suggest that effective dissemination, adaptation and adoption of the project's systems and procedural changes would potentially require: 1) three 2-week training sessions (one each for groundnut, cottonseed and rice bran) with as much as twice that time required for design--a total of approximately 18 weeks x at least two trainers;

2) an average of 5 weeks on-site consulting support per plant, a total of 160 person weeks. Assuming continuous implementation, this would involve more than three person years to fully achieve. If this is a reasonable projection, it was unrealistic to assume that the project goal could be achieved during a three year period where at least half the available time was needed to identify problems, develop, test and confirm solutions.

While it is not appropriate to measure goal achievement at this time, it is not only appropriate to do so during a future final evaluation, but an imperative as well. The cooperative oilseed processing sector has the potential to play a critical role in increased vegetable oil production, increased farmer income, and stabilization of consumer prices for vegetable oil. The Goal of the Project remains central to the investment that has taken place to date; its importance is further enhanced by the potential that has been demonstrated in the model plants.

The status of the goal indicators in the model plants will be detailed in the section on significant accomplishments.

Significant Accomplishments

As stated in several preceding sections of this report, it is the team's belief that the project has produced significant accomplishments that are potentially of great benefit to cooperative processing units, their farmer members, and consumers. In this section of the report some of the more significant recommendations developed and tested by the project will be outlined; their direct impact on the model plants summarized; and the

extrapolation of those benefits for the sector explored.

As a preface it should be made clear that the project addressed a slice of a slice of the total vegetable oil production pie. Broadly speaking the sector minimally includes 1) oilseed production which, in turn, entails research into improved varieties, provision of inputs, financing of production, extension support (and feedback to research), and marketing of produce; 2) oilseed processing, including procurement and storage of raw material, pre-processing, expeller and solvent extraction, refining, processing and marketing of oil, meal and related by-products; 3) oil distribution including consumer education, market distribution networks pricing and logistics of supply. These elements are inter-related parts of a total system and the full benefit of changes in each element depends on and contributes to commensurate change and improvement in the others. It is the team's conclusion that the project has produced direct and significant impacts that not only have an immediate benefit but will support positive change in other elements of the total system as well.

As background, the project worked with five model plants: 1) Anand Taluka - cottonseed and soybean; 2) Gidderbaha - cottonseed; 3) Bhavnagar (NDDB) - groundnut; 4) Vijayawada - Rice Bran; and 5) Fahtenagar - groundnut. These represent the major categories of oilseed processing investments by the NCDC. The chart below summarizes the rated/capacity daily and annual for all NCDC financed plants, assuming 250 days of annual operations, optimal production of expeller and solvent extracted oil with the percentage that production would hypothetically represent in relation to vegetable oil production in India in 1979/80.

Type of Plant	#	Rated Capacity Daily	Rated Capacity Annual	Annual Oil Production Expeller	Annual Oil Production Solvent	Annual Oil Production Total	Mkt%
Cottonseed Crushing and Solvent	10	875 MT	218,750 MT	36,312	9,844	46,156	18%
Groundnut Crushing and Solvent	13	908/640 MT	227,000 MT	72,640	7,718	80,358	6%
Rice Bran Solvent	7	152 MT	38,000 MT		5,130	5,130	NA

At present the raw material capacity and annual vegetable oil production figures are purely hypothetical. Few plants operate either at full rated daily capacity or for as many as 250 days per year. The reasons for this sub-optimal performance are many and varied. Adoption of the procedural and systems changes recommended by the project will not in and of themselves resolve all these problems; however, in almost all instances they will contribute directly or indirectly to their solution. It should be stressed that the extrapolation of the results attained in the model plants to a broader universe is merely an exploratory calculation that suggests the dimensions of improvement rather than predicting them. There are clearly too many variables at play within and between individual units to do more than suggest potential impact.

The approach taken by the project replicates a systems analysis from procurement through solvent extration. Major project recommendations are presented below. A few of these have been theoretically calculated but not tested; the majority have in fact been tested in one or more plants. The major systems worked with include; procurement of raw material; storage of raw material; pre-processing (cleaning, decortication, cooking, etc); expeller operations; solvent extraction.

Procurement

Cooperative oilseed processing plants cite inadequate supplies of raw material as the single major reason for under-utilization of capacity. One project analysis and recommendation is that the processing units procure most if not all their annual raw material requirement in the period immediately following harvest. With both cottonseed and groundnut, historical data was developed to demonstrate that in virtually every year since 1974/75, the procurement of full operational requirements in the three to four months immediately after harvest would both ensure full capacity utilization and reduce the total cost of raw material: that is, the costs of storage and interest are substantially less than the increased cost of purchasing raw materials throughout the year. Even were this not the case, given the high fixed costs, the invisible costs of under-utilized capacity argue strongly in favor of such an approach. This recommendation has not been fully implemented by any of the model units. Its wider application would require adequate initial financing (margin money from NCDC plus commercial bank loans), improved management of finances, as well as storage facilities of a capacity and quality not generally available. However, the importance of this recommendation to ensuring full plant utilization and stabilization of prices for farmers argues strongly for further efforts to ensure implementation.

Storage

Present storage of raw material is in gunny bags under covered sheds or in the open. The exposure of the raw material to the elements and pests,

combined with the near impossiblity of adequately aerating the material as well as controlling moisture and temperature, all results both in direct loss through deterioration and destruction as well as diminished oil quality. This cost is substantial:

> At present cooperative groundnut processing units have an annual rated capacity of 227,000 MT of raw material. The loss in raw material and metric tons of oil at the following percentages of destruction and deterioration is:

% Lost	Raw Material (MT)	Oil (MT)
5%	11,350	2,395
10%	23,700	4,790
10%	34,050	7,185

At current prices for oil this represents a potential loss ranging from Rs. 3 crores (US $3,3 Million) to Rs. 9 crores (US $9.9 Million) per annum. Given current utilization of capacity, losses are not of these magnitudes; yet, in the future as other problems are resolved, adequate storage will become increasingly critical.

The project has recommended both a major solution to this problem as well as temporary paliatives. The former is development of bulk storage capacity of a size adequate to the needs of the unit. Methods of easing (but not correcting) present problems include modification of stacking patterns to reduce heat and moisture problems; systematic monitoring of temperatures to permit action to prevent deterioration; screening and other devices to limit deprivation by birds, rats and other pests. If such measures, in combination, reduce storage losses by even 1 percent, the total impact would be valued at Rs. 6 lakhs (US $66,000) or more.

Pre-Processing

Pre-processing procedures vary substantially depending on the raw material concerned, ranging from cottonseed where they are complex (and potentially directly remunerative) to rice bran where they are relatively simple. For this reason each type of plant will be discussed separately.

Cottonseed: Pre-processing of cottonseed includes cleaning, delinting, decortication, hull and seed separation, and cooking. The major project achievements concern the latter four processes.

Delinting: Ginned cottonseed has residual lint amounting to 11.5% of the seed. Removal of this lint to a residual 2.5% not only provides a source of income from sale of linters, but also is essential to efficient decortication and hull-seed separation. In cooperative cottonseed oil processing plants, lint recovery ranges from 3.5% to 5.5% on the average, well below the desirable 9%. This inefficient lint removal reduces decortication capacity and contributes to increased retention of meat and fines in the hulls which, in turn, reduces oil recovery.

In project work with Anand Taluka and Gidderbaha, substantial increases have been achieved in lint recovery through minor operating modifications, introducing regular sharpening of first and second cut delinting saws, and by reducing the loss of fly lint (approximately .5%) which escapes into the air causing both a monetary loss to the plant and a health hazard to those who work there.

The capture of fly lint through modification of operations and equipment, extrapolated to all ten cooperative cottonseed processing plants in India, would result in an additional 1,100 metric tons of fly lint at a current value of close to Rs. 24 lakhs (US $265,000). In the instance of the average 100 ton plant, the potential gain amounts to 125 tons of lint worth close to Rs. 3 lakhs (US $33,000).

At the Gidderbaha and Anand Taluka plants, total lint recovery has been raised from an average of 3.5% to approximately 6.5%, an increase of 3%. Assuming both plants maintain that level of recovery, it would produce 1,500 metric tons of additional lint recovery over a 250 day period of operating at rated capacity. At current prices, this would increase revenues by Rs. 21 lakhs (US$231,000). Further improvements are both desirable and possible, raising lint recovery to between 9% and 9.5%. If realized in the two model plants, the additional revenues would be on the order of Rs. 42 lakhs (U.S.$462,000).

Extrapolated from the Anand and Gidderbaha results, an increase in lint recovery of 3% would result in a total increase in revenues in the 10 NCDC financed cottonseed oil processing units of more than Rs. 90 lakhs (U.S.$990,000) far in excess of the project investment. The income could be further increased both in terms of a higher percentage of recovery and operating plants at a greater daily capacity for additional days each year--both of which are possible.

Decortication

At the time that Carl Petersen began working with Anand and Gidderbaha, analysis showed the oil present in the hulls to exceed natural oil content by 1% or more. That represented a loss of Rs. 1,600 (US$176) per day or Rs. 4 lakhs (U.S.$44,000) per annum for a plant operating 250 days at 100 metric tons of delinted cottonseed per day. Assuming similar percentages in all 10 plants, the potential annual oil loss can be extrapolated to 438 metric tons with an annual loss of revenues of Rs. 30.7 lakhs (U.S.$340,000). In this instance too, methods have been developed to significantly reduce this loss which, if adopted, would produce both substantial increases in oil produced and gain in revenues.

Hull and Seed Separation

The equipment normally utilized to separate cottonseed hulls from the seed is rated at 75 tons per day. If lint on the hull is 2.5% or higher, this equipment operates below capacity at an output of about 60 tones per day or less. With 1.5% residual lint, it can operate at as much as 90 tons per day, increasing total plant capacity.

At the time the project began work with Anand and Gidderbaha, analysis showed the presence of meat and fines in the hulls at a level of 2.1% to 2.4%. For a plant rated at 100 tons per day, this represents a daily loss of Rs. 3,000 to 3,800 and an annual loss, assuming 250 days operation, of between Rs. 7.5 and Rs. 9.5 lakhs

(U.S.$82,500 and U.S.$105,000). Extrapolated, the national loss in 10 plants is on the order to Rs. 65 to Rs. 85 lakhs (U.S.$715,000 to $935,000). The project developed methods to significantly reduce this loss, again creating potential for dramatic savings, increased oil production and revenues.

Cooking

The cooking of oilseed prior to processing contributes both to the quantity of oil produced and efficiency of oil expellers. Present practice is to cook the oilseed for five to 10 minutes; to ensure maximum oil recovery and ease of expeller operations, the cooking time should be 30 minutes. The present configuration and capacity of existing equipment limits this option. However, the Bhavnagar Plant (groundnut) is planning to modify its equipment in order to thoroughly cook oilseed prior to expelling. If the results of this experience are as expected, it represents another innovation that should be introduced more widely within NCDC financed cooperative oilseed processing units.

Expeller Operation

Expellers are used to crush oilseed, expelling oil in the process. In India, expellers are fabricated and operated so as to maximize the oil extracted during the expeller process. In the case of groundnut, given the premium price paid for crude oil, there is at least a superficial argument in favor of this approach. In the instance of cottonseed, that argument loses its validity.

The project undertook a number of efforts to improve the efficiency of the expeller process. The major approach has been removal of the reverse worm gears and adapting the configuration of the worms to the specific requirements of cottonseed. By doing so, it proved possible to increase the capacity of the expellers by 160% from 25 to 40 tons per day. In Anand, this increase in capacity permitted reduction in the number of expellers employed from 7 to 4; which, combined with operational efficiencies reduced power consumption more than 50% (an annual savings of Rs. 2.5 lakhs (U.S.$27,500).

By converting the expellers to a pre-press operations leaving a higher residual oil (10% to 16%) for solvent extraction, the capacity could be further increased to 300% above manufacturer ratings. However, in the instance of Anand, limited delinting equipment capacities represent a constraint which would render that order of increase non-productive.

It should also be noted Anand's production manager reports that removal of the reverse worms and modification of the worm configuration have resulted in a much lower incidence of expeller breakdown and repair costs.

Similar modifications were made to the expeller operations in Gidderbaha, again resulting in: increasing capacity to 160% above manufacturers rated capacity; reducing the number of expellers operated from 3 to 2; lowering power consumption by more than 50% at an annual savings of Rs. 1.5 lakhs, and indirectly contributing to a savings of

Rs. 68 lakhs that had been planned as expenditure in expansion of plant capacity.

By extrapolation from the work with Anand and Gidderbaha, there would appear to be a real possibility to substantially increase capacity (a 160% increase in presumed expeller capacity of cooperative cotton-seed oil processing plants would raise the present 875 tons per day/ 218,750 tons per annum to 1400/350,000) while at the same time reducing power consumption by Rs. 15 lakhs (Rs. 1.5 lakhs x 10 plants) with no additional capital investment.

Solvent Extraction

As in the case of expellers, the project explored ways in which existing equipment could be utilized at tonnages substantially higher than manufacturers ratings suggest.

A number of approaches were tested and found to raise the capacity two to three times manufacturers ratings. The central innovations developed were 1) increase of solvent and miscella (the mixture of the solvent, hexane, and oil) temperatures; and 2) increase of miscella concentration from 10-12% oil to 24-26% oil. In addition to doubling to tripling capacity, this produces the following additional benefits:

--steam consumption can be reduced by as much as 60%, substantially lowering fuel costs;

--hexane consumption per ton can be reduced from in excess of 20 litres per ton to between litres 5 and 8 ton; at present prices this means a saving of more than Rs. 150 ($16.50) per ton or, extrapolated, would be a saving of Rs. 325 lakhs (U.S.$3.7 million) for all 10 NCDC financed units.

Even ignoring the savings, the implications of doubling to tripling solvent extraction capacity are staggering. NDCD financed cooperative cottonseed oil processing plants have a rated capacity of 218,750 metric tons annually (On a 250 day operating year basis); this could be raised to between 437,500 and 656,250 metric tons or, by operating 335 days per year to between 586,250 and 880,000 metric tons annually. At these operating levels, the 10 existing units could produce as much as 12.4 to 18.5 lakh metric tons of oil annually, worth between Rs. 17.3 and 25.9 crores per annum, (U.S.$18 to 27 million). Similarly,the production of cottonseed oil meal at these levels of capacity would amount to between 235,000 and 355,000 metric tons worth Rs. 385 to 565 crores (U.S.$40.5 to 59.3 million).

Least this appear to oversimplify an extremely complex situation it should be clearly acknowledged that achievement of these production limits and revenues is not simply a matter of adjustments to expellers and solvent extraction plants. Should production on that order be desired, it would require major investment to create balances in storage capacity, delinting, decortication, hull/seed separation, and refinery capacities; it would require extraordinary increases in working capital for purchase of raw materials, and, most important, it would require a carefully conceived and systematically executed program of training and technical support to plant personnel.

Crude Oil Quality

At present, given imbalances of equipment, it is often necessary to store cottonseed expeller cake until there are sufficient stocks to operate the solvent extraction plant at capacity. Unfortunately, this results in an increase in the percentage of Free Fatty Acids (FFA) which, in turn, increase refining losses. The project conducted experiments at Anand which demonstrated that there is a linear increase in FFA% for each day the expeller cake is held, increasing during the normal storage period from 2% to more than 5%. Longer retention results in further increases, the implications of which can be seen in the following chart:

FFA%	Refining Loss
2.5%	5%
5%	12%
10%	35.40%

The material lost in refining is used for soap manufacture (soap stock) and has a value of only 60% of refined oil. In the average plant, the usual increase in FFA of 3% to 3.5% in storage results in a 13.7 kg loss of oil per ton of cottonseed cake processed, or Rs. 61.50 per ton; for a plant processing 25,000 tons of cottonseed annually, this represents a loss of Rs. Rs. 15.4 lakhs (U.S.$170,000). Extrapolated, it suggests a loss of vegetable oil in 10 NCDC financed plants amounting to almost 3,000 metric tons valued at Rs. 1.3 crores (U.S.$1.4 million).

While the project identified this problem and its magnitude, other than creating a balance of equipment capacities, the most that can be done is to minimize the problem by reducing storage times and creating the best possible storage conditions.

Groundnut Processing

Groundnut represents the greatest single source of vegetable oil in India and, in many parts of the country is the preferred cooking oil, specifically in its unrefined expeller form. The NCDC has financed 13 expeller-solvent extraction complexes in the cooperative sector with rated capacities of 72,640 tons of expeller oil and 7,720 tons of solvent extracted oil assuming annual operations of 250 days.

The project worked with the Fatehnagar Plant in Rajasthan and, on a more extensive basis with the NDDB plant in Bhavnagar, Gujurat.

Noting that the project identified procurement of adequate stocks and proper storage as being as important with groundnut as cottonseed, this report will focus primarily on recommendations specific to this oilseed.

Decortication

In work with Fathenagar and Bhavnagar it was found that the rated capacity of decorticating equipment (generally 40 tons per day) can be doubled with no detrimental effect. This is particularly important as it limits or eliminates the need to add additional decorticating machinery as adjustments are made to increase expeller and solvent extraction capacities.

Expeller Operation

As noted, cooking to an adequate temperature for sufficient time is important both to quantity and quality of oil as well as to the efficiency of subsequent expeller operations. During the project period it was not possible to test and demonstrate this principle; once Bhavnagar modifies its equipment, this will be done.

Presently groundnut plants attempt to extract the maximum oil during the expeller process. This is done both by using a double press operation (cake fed through one expeller produces cake of approximately 10% residual oil and that cake is fed to a second expeller reducing residual oil another 2 to 2.5%) and/or by employing reverse worms which theoretically provide a backpressure increasing the volume of expelled oil.

In Fatehnagar and Bhavnagar, experiments were conducted and combined with financial analyses to demonstrate that elimination of the double press and removal of the reverse worm gear resulted in an increase in capacity combined with reduction in operating costs more than sufficient to offset the premium price for expeller crude oil. Specifically this results in an increase of expeller capacity per unit from 25 to 37.5 metric tons per day with an increase in residual oil in expeller cake from approximately 7.5% to 8.2% on the average); up to a 50% reduction in power requirements; and as much as twice as much total oil produced.

If these modifications of equipment were adopted in the 13 plants financed by NCDC, it would increase expeller capacity from 908 to 1,362 metric tons per day or from 227,000 to 340,500 metric tons per annum (assuming a 250 day operating year). Annual oil production would increase from 72,400 metric tons to 1,08,950 metric tons. Increasing operations to 350 days per annum on this basis would further increase capacity to 476,700 metric tons of groundnut pods, 1,52,500 metric tons of oil, representing approximately 11.5% of the groundnut oil market at 1979/80 volumes.

Solvent Extraction

The same innovations introduced with solvent extraction of cottonseed oilcake can be applied to groundnut expeller cake extraction: 1) increase in temperature of solvent and miscella from 50-55^{o}C. to 61^{o}C.; increase in the percentage of oil in the miscella to between 25% and 33%. This has the effect, as with cottonseed oilcake, of reducing steam and hexane consumption per ton while doubling to tripling the capacity of the solvent extraction plant.

For a 100 metric ton solvent extraction plant, this raises annual (250 day) capacity from 25,000 tons to between 50,000 and 75,000 tons per annum, at substantial reductions in the cost per ton for fuel and hexane. Extrapolated for the 13 NCDC financed groundnut solvent extraction plants, this would mean increasing present capacity of 640 tons per day of oilcake to between 1,280 and 1,920 tons per day; annual capacity could be increased as follows:

	Days of Plant Operation			
Production (000 MT's)	200 256-384	250 320-480	300 384-576	350 448-672

Assuming 7% recovery of oil, production could be increased as follows:

	Days of Plant Operation			
Oil Production 000 MT's	200 17.9-26.8	250 22.4-33.6	300 26.8-40.3	350 31.3-47.0
DOC Production 000 MT's	236-354	295-442	354-531	413-620

At present prices for solvent extracted groundnut oil and de-oiled cake, the potential revenues from operating solvent extraction unit at increased capacities range from Rs. 51 crores to Rs. 144 crores (U.S.$56 million to $158 million). As in the instance of cottonseed oil processing, it should be noted that to approach these production levels is a complex task and would entail massive increases in working capital, far beyond present investment; additional equipment to create a balance of capacities; vastly enlarged storage capacities; and extensive training and technical support to the personnel of operating units.

Rice Bran Processing

Solvent extraction of rice bran oil is a simpler process than either cottonseed or groundnut oil processing. At present, the NCDC has financed seven rice bran solvent extraction units with a combined capacity of 38,000 metric tons of rice bran and 5, 130 metric tons of

oil per annum. The project worked with the plant in Vijayawada, Andhra Pradesh, and introduced a number of adjustments in pre-processing and solvent extraction that, in combination, contributed to increasing the capacity of the plant from 35 to 55 tons per day. These changes included: 1) increasing the pre-processing heating of rice bran from 1 to 5 minutes by lengthening the conveyor system and introducing live steam; 2) reducing the moisture of the rice bran to approximately 8%; 3) decreasing the pellet size, permitting more thorough heating; 4) eliminating the cooling of pellets prior to solvent extraction; 5) operating the solvent extraction unit at an increased volume through methods similar to those used with cottonseed and groundnut expeller cake(as described above). Extrapolated, the 57% increase in production achieved at Vijayawada would increase the capacity of the 7 NCDC plants from 38,000 metric tons to almost 60,000 metric tons (250 day operating year), with an increase in oil production from 5,130 to 8,050 metric tons per annum. The total additional capital investment to achieve these increases is marginal and far simpler to achieve than in either cottonseed or groundnut oil processing complexes.

Unexpected Developments and Benefits

The project produced some significant benefits that were not explicitly included in the design and which bear mention.

Soybean Processing:

During the period between project conception and its implementation, an unexpected increase in soybean production took place,

leading to the commitment of EEC funds to NCDC to finance four soybean processing plants in Madhya Pradesh and one in Uttar Pradesh; a fifth plant in Madhya Pradesh is also being erected with financing by the National Dairy Development Corporation.

By coincidence both project consultants had substantial prior experience with soybean processing and refining and served as extremely useful resources to NCDC in the project planning, plant design and related aspects on pre-project preparation. Mr. Petersen also was able to assist Anand Taluka to undertake custom processing of soybeans produced in Madhya Pradesh, permitting initiation of production enhancement programs in that state based on assurance that soybeans produced there would be purchased and processed.

The project also enabled the managers of the Madhya Pradesh and Uttar Pradesh projects, Mr. U.R. Sahasranaman and Mr. V.K. Sharma to undergo in-service training in the United States in preparation for their future responsibilities. Both Mr. Sahasranaman and Mr. Sharma have emphasized that this experience substantially strengthened their knowledge of soybean processing from procurement through marketing of soybean meal, as well as proving extremely valuable in terms of reaching decisions on appropriate equipment, plant design and start-up operations.

The National Dairy Development Corporation benefitted from the project through assistance in pre-investment planning for their Madhya Pradesh soybean processing operation and through the work done by the project consultant with the Bhavnagar plant. As part of its current project with CLUSA, USAID, the Cooperative Union of Canada, and the Canadian International Development Agency, the NDDB will support establishment of at least six oilseed processing plants. The lessons learned from the project should find implementation and replication in those plants, as well as in those financed by the NCDC. Fortunately, the transfer of these lessons has been facilitated by the continued presence of Mr. Petersen as a technical advisor to the NDDB.

As noted in the inputs section, the efforts of Dr. Walter Gibble may have contributed to the anticipated decision to permit the blending of oils under stipulated conditions. This practice is widely employed in other parts of the world and, if adopted in India, would permit the sale of oils consistent with consumer preference while making maximum use of oils with a high production capacity--such as cottonseed oil but without consumer appeal.

SIGNIFICANT UNFINISHED TASKS

As substantial and potentially important as the accomplishments of the project have been, there remain an equally important set of tasks that were not completed, and which, in some cases, were not anticipated. In the Team's judgment, it is the effective prosecution of these unfinished tasks that will ultimately determine the degree of success

achieved by the project. As indicated, the project has returned several multiples of its cost in direct benefits to the model plants. The potential long term benefits are well beyond calculation; conservatively they could result in thousands of tons of additional vegetable oil production and millions of dollars in both savings and increased revenues which, in turn, should benefit both producers and consumers.

Systems and Procedures Not Tested

As has been discussed, the project reached the conclusion that the major problems facing the cooperative oilseed processing sector lay in three areas; production planning and control, raw material grading and storage, and in processing efficiency and reliability. Of these, the greatest emphasis was given to the last. As noted, this was a valid decision, one that has produced significant results in the model plant operations and which offers far greater potential if widely implemented. Nonetheless, this concentration of effort does not imply that the other systems and procedures do not require additional analysis, development, testing and extension. In combination with the work done, they represent the sum of functions that must be carried out efficiently and effectively by a profitable and productive oilseed processing operation.

Unanticipated Systems

Although related to the systems and procedures targetted by the project, there are three categories of systems that should be highlighted because of their integral relation to the exploitation of the work

accomplished by the project. These are briefly discussed below:

1. Procurement planning and financing: At present, NCDC financed plants operate at far from full capacity. A sample of reports prepared by the management of these units strongly supports the contention that the major single reason for low capacity utilization is lack of raw material. This is often the result of inadequate working capital. More than one plant has ceased operations for this reason.

   The planning of procurement and its financing are complex and inter-related. They are also integral to the relationship between the producer or the producer cooperative and the processing cooperative. Insofar as all the technical changes identified in this project--and more--depend on adequate and continuous supply of raw material, this system deserves the same serious attention and application of talent as was applied to the questions of processing efficiency and reliability.

2. Capacity Integration: One of the evaluation team's observations was the imbalance between various equipment in the processing complex. If, for example, the solvent extraction unit has a capacity of 100 tons of oil cake, there must be a balancing of equipment that results in production of 100 tons of expeller cake per day. This, in turn, implies expeller capacities, hull/seed separation capacities; decortication capacities; delinting capacities; cleaning capacities; and storage capacities. In many

cases these operations have sub-systems that must also be in proper balance, with the total being consistent with electric motors and supply, boiler capacity, etc. Imbalances at any stage in the system preclude operation at optimal capacities.

While the project has been successful in introducing changes that both increase capacities and effect parallel reductions in operating costs, some of these changes have served to exacerbate rather than resolve equipment imbalances. Although this has been addressed as a problem and the outline of solutions identified, the further development, testing and extension of this area both to present and future plants, as well as to vendors, would appear to be a matter of importance.

3. Synthesis of Production Planning, Technology and Financial Management

An oilseed processing plant can be compared with a living organism in a changing environment. Rote application of rules, whether technical, financial or management, will more often miss than hit the target. As potentially valuable as the project's results are, a significant change in the assumptions on which they are based could well necessitate a different approach. As an example, decisions on the use of expellers to express a given percentage of crude groundnut oil are directly related to the price differentials between crude and solvent extracted oil and must include consideration of a wide variety of production variables such as power consumption and costs, oil cake values, repair and maintenance costs, etc.

The manager of an oilseed processing complex must be in the position to synthesize information on changes in technology; raw material availability, present and future costs; marketing costs and prices; to reach optimal decisions at any given point in time. The process used to reach the recommendations tested and confirmed in the project model plants, provides a basis for such management decision making. But it must be stressed that it is the decision process--not the results--that must be replicated by the plant manager. It is this synthesis, and its realization in NCDC-financed units, that will represent the ultimate project achievement.

Extension of Systems/Recommendations

Were nothing more to happen than the implementation of improvements in processing efficiency in the model plants, this project could be judged successful. The value returned far exceeds the investment made. However, to be satisfied with that accomplishment, in the face of the potential, would be irresponsible. The potential return is far too great. For this reason, the major category of unfinished tasks lies in the effective extension of the system changes that have been identified along with those that can and should be identified in the future. The ultimate goal is that plant management and operational personnel will be able to respond to a changing environment in a way that maximizes technology, finance and raw material resources. To realize this goal, an investment of magnitude and a vehicle to undertake the effort on a

continuing basis will be required. However large such an investment might seem, it is minute compared to the returns from full exploitation of the production potential of present and proposed cooperative oilseed processing complexes.

EVALUATION OF PROJECT STRATEGY

The project strategy, in outline, called for the application of the skills, experience and commitment of the project consultants and coordinator, their counterparts, and members of the CLUSA Oilseeds Advisory Committee to individually and collectively move through a logical progression from:

1. Identification and definition of the major problems facing the cooperative oilseed processing sector; to
2. Development, testing and confirmation of solutions to those problems; to
3. Preparation of documentation (the Manual) of those solutions their rationale and technology of implementation; to
4. Development and implementation of training for managers and operators.

It was assumed that if successful, that sequence of activities would result in:

1. Improved plant efficiency, leading to;
2. Improved plant production, financial viability and surplus, benefitting membership; leading to,
3. The financial incentives and means to encourage increased production of oilseeds and income for the producer; and
4. Stabilization of prices through closing the gap between supply and demand as well as lowering costs of production.

In the team's judgment, the logic of the strategy is sound; there were minor problems related to the inputs applied; and there was a significant miscalculation on the complexity of the steps following confirmation of solutions to operating and management problems. It also remains to be demonstrated that improved plant performance will have a significant effect on the production and income of the farmer member of a cooperative or on the price paid by consumers. This is not to suggest that it will not happen, but only to indicate that its realization will depend on accomplishment, in full, of the preceding steps.

With hindsight, it is possible to identify three elements of the strategy that might have been better conceived:

1. The project proposed to address 10 major categories of systems and procedures; in the doing it became apparent that this posed a range and complexity far beyond the time and talents of those involved; it might have been preferable to have narrowed the scope from the beginning, based on the type of analysis done by the project consultants and their counterparts after the former had arrived.

2. If the target systems had been more sharply defined, it would have been possible, in turn, to develop a far more precise definition of advisor tasks and to more accurately determine the skills and experience most likely to produce the desired results. Had this been done, it might have resulted in the recruitment and selection of an individual with skills complementary to Mr. Petersen's and more directly appropriate to some of the important, but as yet unfinished, tasks

identified above.

3. The strategy assumed the creation and operation of the National Association of Cooperative Oilseed Processors. Had this organization come into existence, it is likely that far greater progress might have been made on steps three and four of the strategy as outlined. It might have been appropriate to have considered the possibility that NACOP might not be formed and to have defined an alternative approach in that event.

RECOMMENDATIONS

The CLUSA Representative has pointed out that an "Expert" is anyone more than fifty miles from home. The problem with being more than 10,000 miles from home is that you begin to believe that you are in fact an expert. While a great many observations and judgments have been offered in the body of this evaluation--and others will be presented in the recommendations--the reader should know that the evaluation team recognizes its limitations of time, knowledge and experience. Thus, the recommendations are presented with sincerity but also in full recognition that they may well reflect naivete not to say ignorance. They are presented in the hope that they stimulate further thought, appropriate conclusions, and where indicated, action. They are not presented as prescriptions to be followed in full.

1. Extension of project results:

The evaluation team is convinced that many of the systems and procedural

changes identified during the project can produce major improvements in the operation of cooperative oilseed processing units with resulting increases in production, savings in costs, and revenues that will lead to financial viability and surplus. At the same time, many of these innovations are complex and will in many cases be perceived by plant management and operators as both untested and risky. Given this, considerable care should be taken in planning and executing a program to introduce and promote these changes.

Generally, the adoption of change involves a progression of stages: creation of awareness; promotion of interest; assistance in evaluation; encouragement and support of trial; and support for ultimate adoption. This sequence may provide an outline for planning the extension of the project results to the present and proposed NCDC-financed units.

Awareness: A degree of awareness of the project results has already been created through NCDC-sponsored workshops, publications and word of mouth. It might be well to supplement and complement these efforts by a series of bulletins that individually address each major system change, describing its major elements and rationale with a case study of results in the model plants. The objective is not to teach, but to create awareness.

Interest: While written communication, broadly distributed, is an effective method of creating awareness, interest is best promoted through an individual approach. This can best be achieved by individual

correspondence and personal contact. For example, a letter responding to proforma reporting on hexane use or lint recovery and mentioning model plant success in improving performance, might stimulate interest. Similarly, a visit to a plant by an NCDC consultant including discussion of their problems and model plant results would also promote interest.

Evaluation: Evaluation is a critical stage in that it either leads or doesn't lead to trial of the innovation. As a general rule, evaluation takes place in the context of observing the innovation employed by another individual with whom one can identify. For example, a plant manager should have contact with another plant manager of similar background, experience and skills, who has successfully employed the innovation; a shift-in-charge should have the opportunity to observe the innovation(s) adopted by another shift-in-charge. This almost always requires a visit to a plant where the innovations are successfully in place.

Trial: The last stage but one, trial is the actual attempt to employ the innovation; if successful it leads to adoption in most cases. If unsuccessful, it leads to rejection, and often, to bad publicity. For this reason, it is important to both create the confidence necessary for someone to be willing to undertake the trial and the skill transfer and support necessary to success. There are three major tools related to this: 1) the Manual; 2) training; 3) technical support.

The Manual, in its present form, is of value to the rare individual who is able to read, relate what he needs to his own experience, adapt and employ an innovation; generally less than 5 percent of any group fall in this category. We would recommend that the manual be used as a basis for training and as an operational guide. If it is to be used in these ways, it will be necessary to categorize the users and both organize and, in cases, adapt the material for each category. For example, a manager needs material that details the rationale of a change, its major components, and how to measure its performance. The operator needs a step-by-step description of each task as well as procedures for trouble-shooting when performance indicators require. As has been noted, the manual would best be issued in a looseleaf form so that future changes and additions can be incorporated. Its success as a manual will best be measured by the number of smudged pages.

The Manual, to the extent that it defines function, task and step, is the basis for training design. Again, training needs to be based on analysis of the jobs of those trained, with specific objectives developed for each category of personnel. Good training has a measurable objective, a method for assessing the skills and attitudes of participants at the beginning and end of training, and employs a few basic principles such as: 1) frequent opportunity to practice what the objective calls for; 2) early and accurate feedback on the accuracy of practice; 3) recognition of the importance of creating an understanding of why the mastery of a skill is potentially useful; 4) the breaking down of learning into a graduated sequence of increasingly difficult steps; and 5) the recognition that each individual in a training group is different and

the attempt to work with the assets and liabilities of each in a constructive way.

It is recommended that the initial investment in the manual be exploited by the further investment in its systematic revision in a manner appropriate to job categories and its use as the basis for carefully designed training programs that effectively develop new skills and positive attitudes related to the innovations introduced by the project. This is a difficult and onerous task. It will cost time, effort and money. By the same token, it is an easy task to ignore; however, if attacked with talent and commitment, it will prove a major contribution to broad adoption and implementation of the project results.

Good training increases the probability of successful trial; it does not guarantee success. If 5 percent of a group can pick up a manual and use it directly, perhaps an additional 25 percent can receive training and then implement what they've learned. Technical assistance is a necessity for the remaining 70 percent. The Manual, its revisions and subsequent additions, implies a set of performance standards that can be used by a consultant as the basis for an operational analysis. Where performance is less than adequate, that standard becomes an objective for the consultant's work. In most instances, deficient performance of a system or procedure can be attributed to the lack of skill, an attitude, and/or lack of a resource like equipment, money or personnel. An effective consultant works with management and staff--

on a sustained basis--to systematically develop skills and positive attitudes as well as to mobilize required resources. In the trial stage of an innovation, skill enhancement and support for positive attitudes are critical ingredients.

It is recommended, in summary, that: 1) the manual be appropriately revised; 2) that it be used as the basis for skills-based training; and 3) that trial of innovations be supported by well-planned and executed technical assistance.

2. Role of Implementing Agencies

The initial project design was premised on the creation of NACOP. A national organization, in addition to its role as a trade association, has the potential to provide the type of communication, training, and technical assistance necessary to support development of the industry. Had NACOP come into existence at an early stage of the project, it is probable that far greater progress would have occurred in dissemination of the project results. NACOP remains the logical vehicle for this effort. We would recommend that all parties concerned make every effort to overcome the remaining obstacles to the registration and establishment of NACOP and, once this is accomplished, to ensure it has the technical and financial resources necessary to effectively extend and build on the results of the project.

NCDC, given the broad range and magnitude of its responsibilities, has done an admirable job in supporting the efforts entailed in the project. We would recommend that, if the prospects for early establishment of NACOP are not promising, that NCDC undertake the additional task and responsibility of creating an adequately staffed technical cell that would concentrate exclusively on the tasks necessary to exploit the potential created by the project. Such a cell could, as NACOP comes into existence, be transferred to NACOP to ensure continuity of the effort. It is important to note that this would imply employment of additional professional staff as it appears unrealistic to assume that current staffing levels would permit the level of investment of time necessary.

It is also recommended that NCDC explore the question of financing working capital at levels that will permit processing operations approaching full real capacity of the plants. This would entail both increasing allocation of margin money, resolving problems with commercial banks and state cooperative banks who provide financing, identifying alternatives such as pooling, and developing procedures by which plant general managers can leverage available funds to the maximum.

Last, it is recommended that NCDC explore the technical and financial feasibility of bulk storage and, if potential feasibility is established, to work with concerned agencies and cooperatives to finance such storage on a pilot basis.

CLUSA has drawn on its own resources in India and the United States as well as having effectively mobilized the participation of individuals (project consultants and Advisory Committee members) and cooperative organizations (U.S. in-service training) to contribute to the project. In the course of this effort, CLUSA has both made a considerable investment and developed a broad knowledge of cooperative oilseed processing in India.

It is recommended that CLUSA make effective continued use of its investment and expertise by working with NCDC, NACOP and other agencies presently or potentially interested in cooperative oilseed production, processing and marketing, to identify and respond to the evolving needs of this sector.

Manufacturers and vendors of oil processing equipment play a critical role in the sector. Their design of equipment and recommendations on its use substantially influence operating results. To date, the project findings are often at variance with the manufacturers' recommendations. An effort to involve and educate these companies would appear well worth the effort.

USAID/India made this project possible with its initial grant and flexible response to requests for its amendment. It is recommended that as efforts are undertaken to exploit and expand on the potential created by this project, that USAID continue to provide limited financial support to the agencies and cooperative organizations involved.

3. Member Benefit

The purpose and strength of a cooperative lies in its ability to provide services and maximum return to its members. During the life of this project, there was little opportunity to realize the potential of providing such benefits to the membership of cooperatives involved. It was noted, however, that the links back to the member are not particularly strong and that the membership is not necessarily equivalent either to majority ownership of the cooperative oilseed processing plants or to the producers who supply them with raw material. We would recommend that present efforts be accelerated to: 1) increase the equity participation and ownership of members (whether producers or other cooperatives) in the cooperative oilseed processing plants. It is this ownership by members that ultimately creates the accountability for performance essential to long term growth and success; 2) promote ways and means to link producers directly with processing as opposed to current reliance on the open market purchase of raw material. The NDDB and Gujurat Groundnut Growers Federation have begun to demonstrate the effectiveness of this approach both in terms of ensuring that farmer members rather than traders benefit, and building the loyalty necessary to ensure reliable supply of raw materials. Although these recommendations are not central to the objectives or methods of the project, they are central to the basic goals and purpose of the cooperative movement and should not be ignored or undervalued.

4. Final Evaluation

This report outlines the status of the project at its chronological end. At the outset, we suggested that the full results will take an additional period to be realized. If this is going to happen, there should be evidence within the next three to five years that would permit drawing such conclusions. Initial indicators would include the establishment and operation of NACOP with an active program of training and technical assistance underway.

We would recommend that a final evaluation be conducted in 1984/85 in order to more fully measure the impact of the project. Such an evaluation could be undertaken at relatively low cost by drawing on the staff of the same organizations who participated in the end-of-project evaluation exercise.

SUMMARY AND CONCLUSION

The NCDC Cooperative Oilseeds Processing Management Project was ambitious in its objectives; while much of the agenda was not achieved, in many ways the accomplishments returned far more than the time and money invested does in most projects. Most important, the project has created a foundation on which a strong, vital and viable cooperative processing sector can be built. Realization of the capacity of the 32 plants financed by NCDC should have a major impact on vegetable oil production in India, with benefits to the cooperatives, to their members, and to consumers. The successes have been due to the

commitment and support of a variety of agencies and organizations. The full success possible can only be achieved if those same groups redouble their efforts in the confidence that tremendous strides are possible and that the potential not only exists but cries to be realized.

APPENDIX I

Persons Contacted

By Phone:

Mr. V.K. Sharma, Uttar Pradesh Markfed
Mr. U.R. Sahasranaman, Madhya Pradesh Oilseed Growers Federation

India

NCDC

Mr. V.B.L. Mathur, Managing Director
Mr. K.J.S. Bhatia, General Manager
Mr. Y.P. Kumar, Chief Director (Processing)
Dr. N.S. Rajagopal, Consultant (Processing)
Mr. A. Ramanathan, Consultant (Finance)
Mr. B.S. Shekhawat, Technologist (Oilseeds)

Ministry of Agriculture, Government of India

Mr. P.S. Kohli, Additional Secretary
Mr. M.D. Joshi, Cooperation

USAID

Mrs. Priscilla Boughton, Director
Dr. Richard Brown, Deputy Director
Mr. Harry Houck, Chief, Office of Food for Development

CLUSA/India

Mr. M. Rex Wingard, Permanent Representative
Mr. Carl Peterson, Advisor

Anand Taluka Cooperative Cotton Sale Ginning & Pressing Society

Mr. Jasubhai A. Patel, Manager
Mr. Desai, Production Manager

Bhavnagar Vegetable Products Unit

Mr. N.R. Jain, General Manager
Mr. Rao, Production Manager and Project Manager

Binkadakatti and Gadag

Mr. D.R. Patil, Chairman

Maharashtra Markfed

Mr. J.A. Jagtap, Additional Managing Director

APPENDIX II

SUMMARY OF TELEPHONE INTERVIEWS WITH MR. V.K. SHARMA (U.P. MARKFED) AND MR. U.R. SAHASRANAMAN (M.P. OILSEED GROWERS FEDERATION)

The following summarizes the comments and observations of Mr. V.K. Sharma and Mr. U.R. Sahasranaman on the value of the training/observation/orientation program undertaken as part of the NCDC Oilseed Processing Management Project. At the time of the interview (February 15, 1982) Mr. Sharma had completed approximately six weeks of a ten week program; Mr. Sahasranaman had completed four weeks of an eight week program. Their schedules are attached to this appendix.

Question: What were your initial expectations/objectives for your Training in the U.S.?

Response: Both indicated that they hoped to observe and learn about U.S. methods in relation to:

1) Plant layout, equipment configurations and start-up;
2) Dehulling
3) Production of edible flour
4) Production of soymeal for animal feed
5) Solvent extraction methods
6) Seed preparation
7) Storage
8) Drying and tempering
9) Hull cleaning
10) Toasting of Hulls
11) Marketing including operation of Futures Market, and
12) International Marketing

Question: To date, how successful do you feel that the program has been in meeting your expectations?

Response: Both indicated that it had been very successful. Following are their observations of specifics they felt to be of value:

1) Mr. Sharma indicated that at the time of his visit his primary focus was the equipment requirements of his plant in Uttar Pradesh. Through visits and discussions with processing units and equipment manufacturers he learned that, for example, the type of drying equipment they had proposed was unnecessary in Indian conditions. This equipment would have cost Rs. 18 lakhs (US$198,000). He also learned that the cracking rollers they had planned for purchase for $65,000 could be matched by equal or better equipment at $35,000, a saving of US$30,000 (Rs. 2.7 lakhs). Based on these and other lessons, he has communicated with his headquarters in Lucknow recommending the changes based on the orientation.

   Both participants shared observations as follows:

2) The frequency of black-hulled soybean in India results in

black specks in finished soybean meal, which, along with meal composition, results in a lower international market price. As a result of the program, they feel they have a better idea of the equipment, and its use, necessary for improved dehulling (eliminating majority of black hull particles) and meal quality.

3) Production of edible soy flour is an objective of the soybean processing units in UP and MP. Both participants felt that the orientation was very valuable in enabling them to: a) establish quality standards for edible soy flour; b) control of bacteria and salmonella through controls in processing, sanitation and housekeeping methods as well as use of hot room to decontaminate.

   Both plants are also contemplating production of textured vegetable protein; as a result of orientation both feel they are now well aware of how to produce a high quality TVP flour.

4) Both candidates learned that currently employed methods of toasting soy meal for animal feed in India in flake form should be changed to toasting of properly granulated form; they also feel they now know the proper toasting methods.

5) Both felt that based on the orientation they now know the reasons for purging a solvent extraction plant, and how best to carry out the purging.

6) Both brought with them the question of the best method of desolventizing in production of edible soy flour. They were both concerned with the safety factor and extensive instrumentation required for flash desolventizing. They have learned that splash desolventizing with schnecken tube will work and permit manufacture of the quality of PDI required and that if an extra-high PDI is required, it is possible to utilize the flash method in India.

7) Although it was not on their list of objectives, both participants visited seed preparation plants. They related the methods of preparing and storing soybean seed (for planting) with those in India and believe that the problem of cracked hulls and reduced germination (resulting from high temperature/ low humidity conditions in India) can be alleviated with some of the approaches to processing and storage they have learned.

8) Both participants were concerned with the problems of storage in India and feel that they may have identified a potential solution in the free storage of soybean in closed conditions with use of dispersed temperature probes for hotspots. Mr. Sahasranaman is contemplating testing this in the Ujjain facility.

9) In India there is a debate on the necessity of drying and tempering of soybeans in relation to achieving better results

in dehulling; in India different people have widely varied opinions. Based on their discussions with processing plant personnel in the U.S., they have concluded that tempering is not necessary in Indian conditions.

10) In Indian some vendors have stated that a gravity table is unnecessary for hull cleaning to recover meat. As a result of their tour, the participants have learned that it is necessary for an economical operation.

11) Hull toasting is not done in India. The participants learned that it is essential in India in order to limit the uric acid level in cattle feed. While Indian farmers do not presently use urea directly in cattle feed, when this practice is adopted, a high uric acid level in soybean meal will have an adverse affect on the cattle.

12) Both participants felt that they had learned a great deal about optimal plant layout: the importance of interlocking systems; insulation of conveyance systems to ensure condensation of moisture does not give rise to high bacteria levels; use of hot air only in the flour mill; air convection of material to ensure no collection of material susceptible to bacteria build-up.

13) A proposed visit to the Chicago Board of Trade was anticipated as potentially of great value in learning how the forward trading operations worked. This was felt to be of considerable value as the individual organizations (UP Markfed and the MP Oilseed Growers Federation) are directly involved in the international market.

Question: Do you feel that what you have learned will better enable you to train others in the plants/projects for which you are responsible?

Response: Both participants felt that the majority of what they had learned will be of primary value to themselves in their responsibilities. However, on a secondary level, they feel that they are in a better position to train plant and production managers as they now have a firm understanding both of methods and procedures as well as the rationale for their use.

Question: How much of what you have learned do you feel is directly applicable to your work in India? applicable with adaptation?

Response: Both felt that in terms of plant layout, equipment and the majority of operating methods, most of what they learned is directly and appropriately applicable to their situations. The major exception is in tank/bin storage and bulk handling which they felt is difficult to manage without transport fleets far in excess of what they believe is realistic in their situations.

The marketing and accounting systems that they have observed (totally computerized in most instances) are quite different

Appendix II

both in context and approach than in India. Mr. Sahasranaman did indicate that he was interested in exploring ways in which smaller computers could be utilized in their accounting operations.

Question: What styles/methods of training have been employed (formal/informal) and how effective have they been?

Response: The initial program was planned with the NCDC General Manager who, by virtue of his previous orientation visit, was in a position to offer excellent guidance.

The training approach can best be described as an observation-inquiry method. They have spent an initial period in each plant orienting themselves to its operations and, based on this initial observation, have been able to set up discussions with concerned plant personnel to discuss various operations, procedures, lay-out configurations, etc., in considerable depth. They indicated that the personnel of the cooperatives have been extremely generous with their time and have been willing to provide them with whatever technical drawings, manuals, operational materials, etc., that they have requested.

Question: How appropriate has the content and method of training been to their needs?

Response: Both participants indicated that content and method were both extremely appropriate and that while prior to the visit they had had discussions with Carl Petersen on a number of the technical areas that were content of the training in the U.S., they had regarded Petersen's views as "theoretical"; now that they had had the opportunity to undergo training in cooperative processing complexes in the United States, they understood that the "theory" was practical application that was directly relevant to their responsibilities in India.

Question: What recommendations would you make to improve the training if NCDC were to sponsor similar training visits in the future?

Response: The responses included:

1) Training should be geared to the specific responsibilities of the individuals sent; e.g. plant managers would spend time with different plants concerning the technical aspects management of the processing units while marketing people would be involved directly in that part of the operation.

2) It would be very useful to have those with responsibility for marketing undergo ontraining that would result in their mastery of the various and complex rules and methods of international commodity trading. (Presently international marketing is done on the basis of information/advice from the larger commodity brokers in India).

3) As they saw substantial differences in operation in different

plants and found this valuable, they feel it is important that such visits be organized to see as many different operations as possible both to strengthen the individual participants' understanding and to enable them to select what is best suited to their situation and requirements.

4) While the weather (coldest winter in years) timing was helpful in the respect that it forced them to spend as much time as was available on the central objectives of the visit, they felt that a milder season might have enabled them to see much more than they were able to as far as outside-the-plant operations were concerned. Mr. Sharma stressed, however, that in terms of his interests relative to equipment purchase, the timing was perfect.

5) Both participants felt that the program was well organized and implemented, of considerable value to them, and recommended that the program be continued in the future to orient those who will be responsible for the many soybean complexes being planned in India.

U.S. TRAINING SCHEDULE FOR MR. V.K. SHARMA AND MR. U.R. SAHASRANAMAM,
NATIONAL COOPERATIVE DEVELOPMENT CORPORATION OF INDIA

Training at Dawson, Minnesota

Appointment	Cooperative	Phone Number
Thursday, January 21, 8:00 a.m. you should be at the cooperative headquarters. Training continues through Wednesday, February 3.	Soybean Processing Division, Land O'Lakes, Inc. Dawson, Minnesota 56232 Headquarters is located at Diagonal and 8th Street.	Mr. Bob Jordheim, Site Manager (612)769-4386

Flight Number	Leave	Arrive
Northwest 307, Wednesday, January 20	Washington National Airport 7:59 a.m.	Minneapolis, Minn. 10:19 a.m.

Bus	Leave	Arrive
When your flight arrives at Minneapolis airport at 10:19, go immediately to the Greyhound Bus Station, 29 North 9th Street in Minneapolis. Buy a round trip ticket from Minneapolis to Dawson, Minnesota. The bus you will take out of the Greyhound Station to Dawson is Zephr Line.	Bus departs Minneapolis at 12:00 Noon.	Dawson, Minnesota approximately 4:30 p.m.

Note: You need to return from Dawson to Minneapolis on the afternoon of Thursday, February 4, to see Crown Iron on Friday and catch Friday night flight to Kansas City.

Hotel	Dates	Phone Number
Parkside Motel, Dawson, Minnesota Double Room with 2 beds is $19.00 plus tax. Location is East Highway 212. When you arrive at the bus station, call Mr. David Burks and he will come to pick you up to take you to the motel. He and his wife Cathy operate the motel.	January 20 - February 4	(612)769-2138

Training at St. Joseph, Missouri

Bus	Leave	Arrive
Take Zephr Line from Dawson, Minnesota to Minneapolis on Thurs,, February 4.	Dawson, Minnesota 1:05 p.m.	Minneapolis, Minn. approx. 5:00 p.m.

Flight	Leave	Arrive
Braniff 245, Friday, February 5	Minneapolis 8:30 p.m.	Kansas City 9:40pm

Mr. John Dotson of Farmland Soy Processing Inc., will have someone meet your plane and take you to your hotel.

Hotel	Dates	Phone Number
Holiday Inn, 4312 Frederick, St. Joseph.	February 5 thru Feb. 19	(816) 279-1671

Appointment	Cooperative or Company	Phone Number
Training will last from February 8, Monday, through February 19, Friday.	Farmland Soy Processing, Inc. 5th and Sylvanie St. Joseph, Missouri 64501	Mr. John A. Dotson General Manager (816) 233-6161

Training at Hutchinson, Kansas

Flight	Leave	Arrive
Air Midwest 603, Saturday, February 20	Kansas City 9:25 a.m.	Wichita, Kansas at 10:58 a.m.
Air Midwest 605 SAME DAY	**Wichita 11:10 a.m.**	**Hutchinson, Kansas at 11:28 a.m.**

Hotel	Dates	Phone Number
Holidome Holiday Inn, 1400 North Loraine, Hutchinson, Kansas. You can take a cab from the airport to the hotel.	Saturday, February 20 thru Friday, February 26.	(316)669-9311

Appointment	Cooperative	Phone Number
Training will last from Monday, February 22 through Friday, February 26.	Farmland Agri Services Texturized Soy Protein Operation, 960 North Halstead. Farmland will arrange for transportation to the plant.	Mr. Floyd Shoup, Executive Director (316) 663-5711

Return to Wasington, D.C. for Mr. Sharma Only

Flight	Leave	Arrive
Air Midwest 622, Saturday, February 27	Hutchinson 6:38 a.m.	Wichita 7:00 a.m.
TWA 258	Wichita 7:52 a.m.	St. Louis, Missouri at 9:00 a.m.
TWA 410	St. Louis 9:40 a.m.	Washington National Airport at 12:25 p.m.

Hotel	Dates	Phone Number
St. Charles Hotel, 1731 New Hampshire Avenue, N.W., Washington, D.C.	Saturday, February 27 thru Monday, March 1	(202) 332-2226

Visit to Crown Iron, Minneapolis

Appointment	Company	Person and Phone No.
Friday, February 5, 9:00 a.m.	Crown Iron, 1229 Tyler Street, Northeast, Minneapolis (largest extractor/manufacturer)	Glenn Bresche (612) 781-3101

Hotel	Date	Phone Number
Holiday Inn, 1313 Nicollet Avenue, Minneapolis, Minnesota. Reservation made in the name of Mr. V.K. Sharma. The Confirmation Number is 872 64D 96.	Thursday, February 4	(612) 332-0371

In order to make this appointment at Crown Iron, Mr. Sharma and Mr. Sahasranamam need to leave Dawson on the bus which leaves at 12:00 Noon on Thursday, February 4. The bus arrives in Minneapolis at 5:00 p.m. They should take a cab immediately to the Holiday Inn which is only about ten blocks from the bus station. They should be sure to arrive at the Holiday Inn before 6:00 p.m. After the appointment with Crown Iron on Friday morning, February 5, they have a night flight to Kansas City.

Addition to Training Program, April 8, 1982

Mr. Sharma and Mr. Saharasnamam also had the following training:

1. March 3 visit to Chicago Board of Trade where discussions were held with the Oilseeds Manager for Merrill Lynch.

2. March 4 visit to Soy-Cot Sales for a meeting with Mr. Lloyd Smith, President.

During these two visits detailed discussions were held regarding futures trading, hedging, and the daily working of the Chicago Board of Trade. International marketing of soymeal and ways to relate the Chicago Board of Tradefutures offers to the international price of meal, were discussed.

3. March 5 visit to USDA Northern Regional Research Center at Peoria, Illinois for detailed discussions on manufacture of lecithin.

APPENDIX III

CLUSA WASHINGTON BACKSTOPPING SUPPORT OF NCDC OPG, INCLUDING APPROXIMATE PERSON MONTHS INVOLVED.

1. Recruitment, orienting, processing and editing of reports of Advisory Committee members and consultants going to India - two person months.

2. Designing and making detailed arrangements for U.S. training/orientation visits of Indian personnel under NCDC project - two person months. A CLUSA Washington staff member accompanied the Indian participants for two weeks during the first phase of the U.S. training program in the fall of 1978.

3. Locating and supplying technical information to the project - one person month.