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ASSISTANCE IN THE ESTABLISHMENT OF A PILOT COMMUNITY FOOD PROCESSING CENTRE*

SI/NEP/77/801

NEPAL

Terminal report

Prepared for the Government of Nepal
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of D.W. Nicholson, expert in food processing industry

United Nations Industrial Development Organization
Vienna

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Summary

At the time of the visit there was little processing of fruit and vegetables on a commercial scale in Nepal, and no evidence that the situation would change in the near future.

A new initiative is therefore required, to create such an industry and the opportunity is seen to be in the need to process vegetables and surplus apples which will be produced in the West and Far West Hill Zones in the next 2 - 5 years. The main problems are the cost of transportation by porter, mail or air, in a remote area devoid of proper means of communication. The processes therefore would be based primarily upon the production of concentrated and dried products, to give savings in weight of $\frac{1}{8}$ x 10X that of the original vegetables and fruit. Secondary considerations would be given to processing jams, jellies, juices and dried fruit drinks and soup mixes for (a) the trekking market, growing at 15 per cent per annum, and (b) inhabitants in the immediate locality.

It is recommended that the first Centre should be established in the Mustang District, with plans for others across the West and Far West Hill Zones, to form an integrated fruit and vegetable processing industry, ultimately supplying the regional development centres of Pokhara and Surket with products for secondary processing, and possibly export.

A feasibility study on the establishment of a plastics container manufacturing industry is suggested.

Investigation on an integrated project for the exploitation of solar energy is recommended.

1.0 Introduction

The author left U.K. 6 December 1977, and after a day's briefing at UNIDO, Vienna, arrived in Kathmandu on 8 December 1977 to commence the 2 month consultancy for project NEP/77/801/11-01, following the request by H.M.G. for Special Industrial Services for such a project.

1.1 Terms of Reference

The terms of reference were based on the Lima Declaration and Plan of Action, which calls for the establishment of pilot community food processing centres in the least developed countries in order to foster self-reliance, to involve community members in project formulation and operation, and to establish agro-based industries.

The purpose of the project was to study the possibilities of establishing a community food processing and preservation centre in one of the regional development centres, and define ways and means for its establishment.

The duties included the undertaking of a field mission to analyse the country's actual and potential conditions for the development of food processing and conservation. The main parameters defining the centre such as location, facilities to be established, institutional framework, and an estimate of the financial resources were also required. The final report was to be prepared, which was to include recommendations to the Government on further action which might be taken.

1.2 Situation on arrival and later developments

Initially the author worked at UNDP, with useful guidance from Mr. K. Mulik. After several days an office was located in the Department of Industries, where work continued, with Mr. P. Guptaka as the Nepali counterpart. When four weeks had elapsed, the Director General, Department of Industries agreed that the plan to take food processing to the West and Far West Hills was in accordance with current Government policy, to help this hitherto underpriveleged area.

1.3 Acknowledgements

The writer greatly appreciated to assistance of Mr. K. Malek J.P.O., UNDP, particularly during the first weeks when the project was being organized. His presence was also invaluable at the important meetings held in the Mustang District with members of the Panchyats and Fruit Growers Association.

Mr. P. Guptaka was also of great assistance in organizing the visits from the Department of Industries to private companies and Government Departments.

The full co-operation of Mr. P. Meyess and the staff of H.A.D.P., was particularly useful, especially the access to current reports, without which meaningful figures would have been impossible to obtain.

The help of Mr. L. Sharma and other members of the Food Research Centre was gratefully received.

Mr. Rai, Assistant Manager Thak Marpla Farm, was instrumental in the smooth organization of meetings and acoommodation during the visit to Murtary District, besides explaining the situation to the inhabitants so well.

1.4 People with whom discussions were held concerning the project

Mr. K. Malik, J.P.O., UNDP

Department of Industries

Mr. J.B. Salyal - Director General
Mr. D.P. Gurhtali, Executive Engineer
Mr. P. Guptha, Chemical Engineer and Counterpart
Mr. G.P. Dhakhal, Economist
Mr. M.K. Joshi, Administrator
Mr. K. Dhungara, Administrator (Birut ragan)

Food Research Centre

Dr. Khan, Head of Food Research Centre
Mr. L. Shama, Food Research Officer
Mr. J. Singh, Assistant Research Officer (Food Engineering)
Mr. P. Manandlan, Assistant Research Officer, (Food Technologist)
Mr. B. Busret, Assistant Research Officer, (Chemist)

Institute of Applied Science & Technology

Dr. Shoesta, Dean

Mr. Pradhan, Food Technologist

Department of Agriculture

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Mr. D.R. Pundey, Chief, Vegetable Development Division

Dr. Mathina, Head of Agricultural Marketing, Stats. Division

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Mr. J. DeWaard, Associate Expert (Agricultural Economist)

S.A.T.A.

Dr. Schilds, Director

Mr. R. Bachmann, Engineer

Mr. O. Warst, Post Graduate Engineer

UNICEF

Mr. S. McWal, Nutritionalist

Private Companies

Mr. G.I. Shresta, Food Technologist, Nebice, Kathmandu

Mr. R. Shresta, Marketing Technologist, Nebice, Kathmandu

Mr. Manandhar, Dairy Technologist, Milk Development Corp.

Mr. K. Schrang, Manager, Plumbing Division, Balajse Jantra Shala Kathmandu

Mr. P. Raymond, Works Engineer, Plumbing Division, Balajse Jantra Shala, Kathmandu

Mr. Dinanatl, Manager, Koshi Metal Craft, Birat ragan

Mr. K. Rijal, Owner, Rijal Canning, Ithani

Mr. J. Dhakal, Owner Morang Canning, Shnishehre, Jhapa

Mr. J. Dhakal, Owner, Sudha Fal Rash, Shnishehre, Jhapa

Cottage Industrialists

Mr. S. Raj Karnaker, Owner, Nepal Canning Ind., Kathmandu

Mr. S. Tuladhase, Owner, Nissan Fruit Products, Kathmandu

Mr. J. Brandt, General Manager, Tuladhar Processing Ind., Kathmandu

Mr. N. Vaidya, Owner, Nepal Kissan Fruit Preservation, Birganj

2.0 Literature Surveyed for Background Information

Agricultural Sectoral Analyses, R. Foot, UN Library Ref. 0500-008

Profiles of Manufacturing Industries in Nepal - Department Industries File

Perspective Study - Working Paper of Agricultural Products Processing, Agricultural Services Division, FAO Feb. 1974

Industrial Growth - Problems and Possible Solutions - Country paper, Org. 130/3/UNIDO.

Perspective Study - Working Paper on Crop Development in Nepal - FAO April 1974

Development of Reporting Systems on Current Agricultural Statistics M.I. BADR. FAO 1975

Agricultural Marketing Tables, June 1977 Vol. VII, No. 1 Special Issue

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People & Economy in Terai Region of Nepal - Dept. Industries

Nepal in Perspective. Centre for Economic Development and Administration 1973 by Rana and Mall

Self-sufficient Pilot Community Integrated with Agricultural Economy, Joklik 1976, UNIDO

Helamba Solar Dehydration, Joint Project HADP 1977 73/004

Report on Field Triop to Jumta - A.J. Rijk, December 1977 HADP 73/004

Descriptive Report - Food Manufacture in the National Economy - Department of Industry

Provisional Programme of Work at Horticultural Farms, Cassidy July 1977, HADP 73/004

Industrial Growth Problems and Possible Solutions, Country Paper, Nepal ORG 130 3 UNIDO

HADP 73/004 Series of eight reports on Apple Production and marketing, in Nepal

Marketing of Oranges in Eastern Hills, Agricultural Marketing Statistics Dept. 1975 (in Nepali)

2.1 Results of the Literature Review

Some projected figures for the production of fruit and vegetables were found in a few reports, but were not considered suitable for the purposes of this consultancy. No meaningful figures for the current production were found also, and the Department of Food and Agricultural Marketing Services confirmed that the only figures they had were a recent apple marketing survey produced in conjunction with Hill Agricultural Development Programme No. 73/004, for the Western Hill regions and the Helamba District.

Estimates of apple trees distributed in various districts, and estimates of yields, obtained from HADP 73/004.

(i) Mustang

13,750 trees with the following distribution according to the period in which they will start producing: 1,000 - 1 year; 5,500 - 2 years; 1,000 - 3 years; 2,000 - 4 years; 3,000 - 5 years, 750 - 6 years; and 500 - 7 years; plus 14,000 distributed this year. The estimated yield in 5 years time was 200 million tons.

(ii) Jumla

Estimated 60,500 trees, of which 18,000 are 4 - 8 years old. Yield in three years expected to be 100 million tons.

(iii) Helamba

Estimated trees 28,000, of which 35-40 percent have reached bearing age, with estimated yield in normal conditions of 50 million tons. (The trees in this district are said to have an average production of only 5 kg. each).

From estimates in the HADP report on the Jumla District, for the number of apples from five years old (currently the first age for bearing fruit) to 8 year old trees, and average weights of apples, the estimated yields would be 2 kg. from 5 year old trees, 6 kg. from 6 years old, and 45 kg. from 8 years old.

Using these figures the estimated for Mustang in 5 years time would be increased to 445 tons, and for Jumla in 3 years time 270 tons. A careful re-appraisal of the situation is therefore required.

There are no figures available for vegetable production, either by variety or as a whole. However, last year Mustang District produced 1 m. tons of carrot seed, and 500 kg. radish seed to order, indicating the potential of the District for vegetable production for processing.

3.0 Present situation of the Food Processing Industry in Nepal

In order to register a business with the Department of Industries, for a licence number, there is a minimum requirement of fixed capital assets of 200,000 Rps. Out of 154 such registrations, in the whole of Nepal, 114 are for agricultural and food processing operations, comprising 100 rice, oil, flour or date mills; one ginger processor; 8 bakeries, biscuit manufacturers and/or confectionery manufacturers; 3 dairies; and only 3 fruit and fruit squash, jams and jelly, canning/bottling manufacturers.

The 3 canning/bottling companies were small, as is indicated by the declared figures of total fixed capital assets of 2 million Rps, a daily capacity of 7 hecta litres squash, 450 kg. fruits, plus 1,000 cans, bottles or jars, operating for 180 days per annum. Total staff requirements were 5 technical, 20 administration and 86 others. All bottles, cans, caps and colouring ingredients were imported.

Accompanied by Mr. P. Gupta, a visit was made to the three factories situated in the Kosi and Mechi Zones of East Nepal, but none were working. Two were registered in the same, semi-district building containing only two M.B.I. can seamers and a few sundry items, situated in the centre of neglected land. Operations had obivously ceased several years previously, the owner declaring that lack of cans, bottles, and produce for continuous production, shortage of technical skills and low profit margins when competing with imported products had caused the cessation. He had switched his attention to rice milling.

The third faotory was in better order, with a diesel generator in good working oondition, a wood fired steam boiler, and a good assortment of processing equipment, including a juioe pasteurizer. Canned pineapple rings, ohunks and juice were sampled, from the latest produotion made at least two years previously. It was claimed that the plant could supply the looal market. However the transport oosts to Kathmandu made it impossible to compete with imported products.

Other problems expressed by the owner were the shortage of a regular supply and cost of cans from India, the cost of jars and bottles bought on a small-scale from semi-automatic manufacturers in India, whose products were inferior to that produced by the large-scale automatic manufacturers who required large orders.

He was currently trying to develop an export market in Singapore for tomatoe ketchup, since, although the quality was better than the imported Indian products, the local market on its own was too small for profitable production.

There was a shortage of skilled technicians in the food processing industry, and since his had left several years previously and the owner was not a technical man and had no sons to train , he would continue to face problems during the forthcoming seasons. Currently the produce such as mangoes, pineapples and guavas from his land, which could be processed in the factory, was sold as fresh profitably in the looal markets.

The conclusion of the visit to East Nepal was that little or no commercial canning or bottling was currently being carried out in Nepal, nor likely to be in the near future.

To obtain a broader picture of the processing industry a biscuit and confectionery manufacturer, and a dairy were also visited.

The biscuit/confectionery manufacturer currently produces over 1 ton each of biscuits and sweets per shifts. There were few immediate problems regarding senior teohnical staff, as it was a family business with one son being trained by the suppliers of the biscuit manufacturing plant. Diffioulty was also being experienced in reoruiting a suitably qualified food quality controller. Problems also arose from the unavailability of supplies of materials. Produotion had oeased early on the day of the visit, as fat deliveries had not been made on time. Until 6 months ago there had been only one supplier of a suitable grade of flour; with the arrival of a second supplier, quality and deliveries had improved. Ingredients such as far for biscuits, and liquid glucose for sweets were imported from India, as were most of the packaging materials, except for locally made corregated fibreboard cases, of very poor quality, which were gradually being introduced to replace expensive 18 kg. square tins, and laminated cellulose film from U.K., reported to cost half that paid for a similar, but much inferior laminate from India.

All biscuits were wrapped manually, and sweets either on an automatic form/fill/seal machine, or simple manually operated heat-sealing machine, depending upon the variety of sweet.

All products were sold profitably in Nepal, as prices were below imported Indian goods.

The three main problems mentioned were lack of reliability of quality and continuity of supplies of materials from India, the need for quality control for which a suitable candidate could not be found, and the lack of export facilities to India.

The dairy visited operates using 50% buffalo milk, containing 7-8% fat, and 50% skimmed milk powder plus water to produce the final pasteurised product. No extra processing is given to the main water, despite the need to boil the same water in hotels and homes occupied by expatriates. This may explain why all milk must be boiled before use.

No problems were expressed by the person on site, other than the shortage of buffalo milk and that of checking the strength of the caustic used in the washer for sterilizing the bottles. The

appearance of some of the bottles on the line suggested that hot water on only very dilute caustic was being used. Other independent statements indicated that the modern plant, recently installed and commissioned by experts from New Zealand, has some operational problems, particularly since the original Nepali counterpart technologist, trained by New Zealand staff in Nepal and New Zealand did not return to the dairy industry after completing his training, but was directed to another post, leaving the dairy without the most experienced Nepali available.

The movement of counterpart staff during or soon after completion of training is a common occurrence. With a shortage of technical staff, there is always the pressure to move them to what is considered a more urgent cause. However, to move a partly or fully trained counterpart into an entirely new situation hinders rather than helps the overall situation when no replacement is available.

There was no time to fully investigate the contribution made by food processing carried on at the cottage industry level. Indeed the lack of detailed information made any overall conclusion difficult. However, a number of cottage scale processes of fruits to make jams, jellies and squashes were contacted, and several in Kathmandu brought samples to the Department of Industries. It was not possible to view any processing in operation as none was producing. A visit to one site emphasized the small-scale on which the processers work, with a probable maximum output for example of some 500 litres of orange juice, to produce 2,000 bottles of squash. None could, or would, give an estimate of their likely annual output, and no detailed records were available. There were obvious difficulties with marketing the products made, partly caused by each processor producing a similar range of products, from the training received at the Food Research Centre, and also by the difficulty in competing with imported Indian produce. Most operators bought their fruits in the open market, as output did not warrant bulk buying direct from growers.

A visit was received from one cottage industrialist from the Terai region, who claimed to produce 20-30,000 bottles of assorted squashes p.a., operating December to March with citrus fruits, and June, July with mangoes and lychee. His main problem was lack of continuity of fruit supplies and cost of imported bottles and until his son received a U.N. Fellowship in food technology, a lack of technical know-how.

Only those cottage-scale processors who had received instruction from the Food Research Centre, were aware that such a service was available, and all of the industrial processors said they would appreciate help from that quarter.

The general conclusions were that the processing industry as a whole was suffering from a lack of continuity of supplies of raw materials and the unavailability of experienced technical staff. Other difficulties being encountered were the lack of the opportunity, or aid, for exporting, and difficulty in competing with imported products.

4.0 The Packaging Industry in Nepal

The time available did not permit a detailed examination of the packaging manufacturing industry in Nepal. The only tin box and can making factory, situated in the East, was not operational during the visit to Biratnagos, since stocks particularly of the large 18 kg tins, were sufficient to meet likely forward order. The increase in the cost of the tin plate had led to a significant drop in demand. All tin plate was imported from India, and deliveries were unreliable since India itself had a shortage. His desire for open ended can making facilities did not seem justified, in view of the lack of a viable canning industry.

All retail open ended cans for processing were imported from India as flat body blanks, which were reformed before seaming on the base, a slow and comparatively expensive operation. Since none of the canning factories were operational during the visit, it was not possible to assess accurately the situation with regard to price and reliability of supplies. However, from past experience of price and intermittant supplies of cans from India, it is unlikely that a large scale canning industry is feasible in Nepal.

All bottles, jars and caps were being imported from India at the time of the visit; the cottage scale industries used mainly recycled second hand containers, bought in local market. The Hetauda bottle and jar manufacturing factory had been closed for 12 months in order to reline the furnaces, and was due to reopen at any time. This factory would make a significant contribution to the glass container requirements in Nepal, thus reducing the reliance on imported containers from India. All the new materials for glass manufacture, however, have to be imported.

No plastic bottles or laminate are manufactured in Nepal, and they would be desirable when developing a food processing or packaging industry on account of their low weight. Laminate manufacture is unlikely to be feasible in Nepal, but manufacture of plastic bottles in low, medium or high intensity polythene, and PVC, by blow or injection moulding, from imported granules would be possible. The advantages of the plastic bottles would be the weight savings over glass important for use in the hill areas, and are also unbreakable and have the advantage over tin cans of having re-use potential, possibly not for foodstuffs without careful cleaning facilities, but certainly for other domestic uses.

It is therefore recommended that the Hetauda factory should be made as productive as possible. In the meantime a feasibility study is requested for the setting up of a plastic container manufacturing industry, with one of the products to include re-usable bulk containers suitable for transporting concentrated fruit juice and purees from the hill areas via porter, mule, and air.

5.0 Visit to Mustang District to assess feasibility of establishing a community Food Processing Centre in the Area.

In order to assess the feasibility of setting up a Food Processing Centre in the Mustang District, a visit was organized for a team comprising the author, Mr. K. Malid (UNDP), Mr. L. Sharma (Food Research Centre), P. Gupta and L. Joshi, both from the Department Industries. The accomodation and meetings in the area were efficiently arranged by Mr. Rai, assistant Manager Thak Marpla Horticultural Farm, who also accompanied the party throughout the stay.

One main reason for selecting the Mustang District was the reputation of the Thakalis, who are predominately in the area, and are noted for their business accumen and ability to be well organised.

During the 5 day tour, the villages of Jomesom, Marpha, Tukuche, Kobang, Toglung and Lete were visited to meet members of the village Punchyats and District Fruit Grower Assooiation.

A meeting to explain the plans for a Food Prooessing Centre and its significanoe was held, headed by the chairman of the oulminated District Fruit Grower Association, Chairman of the District Panohyat, and presided over by the Pradhan District Offioer, whioh was attended by 35 members of the Fruit Grower Association from the various villages. Full details of the meeting were reoorded by Mr. K. Malik, UNDP, and the Seoretary F.G.A.

At the meeting the F.G.A. members were most enthusiastic about having a oommunity FPC, and agreed to take full responsibility for running it, inoluding the seleotion of at least two persons from the District for detailed teohnical training, and the contribution of at least 10% of the initial capital cost, provided that the Government would support the FPC during the first years, providing an experienced teohnologist to run the Centre and train counterpart staff, guidance on the products to be produoed, and assistance with marketing these produots in the first instanoe by providing an outlet for them. The Department of Industries members confirmed that such a centre would be eligible for a lioense.

6.0 Justification for Food Processing Centres in the West and Far West Hill Zones

In a 90% subsistance economy such as Nepal's, there is little incentive to produce a surplus of vegetable and fruits for processing.. However, the planting of tens of thousands of apple trees in the W. and Far W. Hill Zones during recent years is expected to produce a surplus to the immediate local requirements in the next 2 - 5 years, of several hundreds of metric tonnes.

In the absence of cable cars and roads now or in the near future, and the associated problems of the cost of transport by porter, mule or intermittant air services and difficulty in landing large volumes from such remote areas, there is an urgent need for food processing techniques which reduce the volume and/or weight to handle the expected large surplus of apples.

A strategy is, therefore, proposed, whereby an initial Model Community Food Processing Centre is commissioned in the Mustang District, Dhaulagire Zone, where it is considered such a centre for the most favourable circumstances for success food operation. Initially apples would be processed, supplemented by other local fruits and vegetables, to extend the processing season. With the successful operation of the first centre, others across the W and Far W Zones are envisaged, the second phase probably commencing with Centres at Jumla and Dolpa. Ultimately these centres would supply secondary processing centres in the regional development centres of Poklara, and Sunkhet. In this way unified fruit and vegetable processing industry, with export potential could be established.

The centre in Helemba District would develop on its own to supply products to Kaltmardi, direct.

6.1 Districts where a surplus of apples is likely to be able to support Food Processing Centres in the near future

Helambu District,	Bagmate Zone	Central Hills
Mustang, Dolpa,	Daulagise Zone	W. Hills
Jumla, Humla, Mugu,	Kaneli Zone	Far W. Hills
Bartade,	Mahakali Zone	Far W. Hills
Manany,	Gundaki Zone	W. Central Hills

7.0 Position of the Food Research Centre, and Institute Applied Science and Technology

7.1 Food Research Centre

1. Present Situation

Apart from the Head of the Centre and the Food Research Officer, there are 7 assistant Food Technologists, including a Process Engineer, and 20 chemists, all 27 having a MS in relevant subjects, together with a Maintenance Engineer, 70 laboratory assistants, and 20 administrative staff.

Duties of the Centre include Standardization and Quality Control of fats and oils, milk and milk products, 16 fruit products and tomatoe ketchup,both imported and manufactured in Nepal.

15 Districts are also covered by the Food inspectors.

Training courses are held each year in 4 - 5 different major fruit and vegetable growing areas, to demonstrate cottage scale jam, juice and fruit processing techniques, mainly to housewives. During this work, trainers from industry can have 2 - 3 months on-the- job training in these processing techniques. Training is also available in the Processing Laboratory which has the largest fruit and vegetable capacity in the country. Equipment includes a cabiney drier, machinery cuts, a laush box, a can seamer, bottle filler and capper, pulpers and finishes, and a Niro spray drier. All training offered by the Centre is free of charge, the participants having to arrang only their meals and accomodation.

2. Recommendations

1. Additional equipment such as a rotary drum drier, and facilities for concentration by evaporation, should be purohased to offer a oomprehensive servioe to future fruit and vegetable procession.

2. Greater use of the facilities should be made by extending the training operations to form cottage scale to meet more emphasis on industrial processing.

3. The facilities offered by the F.R.C. should be more credibly advertised. None of the industrialists interviewed was aware of the facilities, and all expressed varying degrees of interest in them. Only a few locally based cottage scale processors, who had received the training several years ago were aware of them

4. The range of products offered to trainees, on oottage scale should be increased, since part of the marketing problems encountered in Kalhmandu are from selling the same range of jams and

7.2. Institute of Applied Science and Technology

1. Current Situation

The Institute has only been formed recently, and is still awaiting delivery of much of its equipment. One on going project, relevant to the Food Processing Centre, is an assessment of solar drying techniques. Some good products had been produced on rudimentary apparatus, made from indiginous materials, suitable for farmers to use, on a cottage scale bases. There was little instrumentation on the equipment, making scientifio study and conclusions difficult.

2. Recommendations

1. The various pieces of solar drying apparatus should be equipped with wet and dry ball thermometers, hair hygrometers and possibly a vase animoter, to enable meaningful and repeatable experiments to be performed. Ideally such experiments should be carried out in the area where fruit and vegetables will be dried, to overcome differences in climatic conditions and altitude.

2. More emphasis should be placed on heaters driers, with a view to industrial applioations.

3. Solar heating and solar stills should also be included in the work.

4. Work on solar energy for food processing should be co-ordinated with the Food Research Centre and the HADP.

8.0 Exploitation of Solar Energy

The Institute of Applied Science and Technology, the Food Research Centre, and HADP are involved in various experiments with solar drying based mainly on using indiginous materials on a cottage industry or smaller scale.

Whether this serves an immediate useful purpose, the author feels that, in the short term, there should be very close liaison between IAST, FRC and HADP and any others concerned with solar drying, to prevent duplication of effort and achieve a unified aim.

In the long term there is an urgent need for a fully co-ordinated and integrated project on the use of solar energy on a larger scale for water heating, food drying, and alcohol distillation, to help overcome the shortage of energy sources, and reduce the reliance on timber to conserve forests.

The programme would be accompanied by meterological information on the W. and Far W. Hill Zones, and Helaubu District where Food Processing centres could be situated.

9.0 Proposals for the establishment of a Model Community Food Processing Centre

9.1 The Food Processing Centre FPC should be established near Thak Morzha Horticultural Farm, in the Mustang District of the Dauyhagire Zone for the following reasons:

1. The Thakis, who are the predominant tribe in the District and who are well known for their business acumen, developed when the area was on a main sell bartering route to Tibet, and their ability to organize each village into unified action, have expressed their desire, through their District Fruit Growers Association for a FPC.

2. There will be an estimated apple surplus in the area within 5 years amounting 150 - 400 tons p.a., which would be difficult and expensive to transport to consumer centres.

3. The availability of other fruits(not surplus), estimated by the Fruit and Vegetable Development Division, Department of Agriculture to be 5 million tons pears and peaches, and 50+ million apricots including there growing wild. Grapes (per raison in 1980), almonds, and walnuts are also being grown.

4. The potential of the vegetable crops. such as carrots, for extending the processing season.

5. There is an adequate supply of good water throughout the year.

6. It is potentially a good area for solar drying.

7. The availability of STOL airstrip at Jomosam, for receiving equipment and supplies.

8. It is one of the main trucking routes, and with a 15% increase in tourists each year, is therefore a good potential market for such products as jams, jellies,squashes, fruit juices, and dried soup and soft drink mixes.

9. There are plans to install a mini hydro plant producing 20 kW in the near future, and a larger hydro-electric scheme producing 300 - 500 kW within 5 years.

10. The proximity of the thate Marpla Horticultural Farm and Distillery, for advice and raw materials from the former, and outlet for by products to the latter.

11. Deposits of an unknown quantity of lignite or coal are in the vicinity, which would supplement or replace the requirement for wood, which is in short supply.

12. No. 2,3,4, and 8 would enable the Center to operate from a broader base, than in most other areas, and would increase its value as a model centre, enabling each future centre to select the process(es) relevant to its particular needs using the experience gained in Mustang.

9.2 Size and Facilities

The initial single story buildings should cover approximately 500 sqare meters comprising the following areas:

I. An office, II. a small laboratory, III raw materials storage, IV raw materials inspection, grading, tearing and preparation, V Wet processing and packing VI dry processing and packing, VII storage of finished goods and packaging materials, VIII personal washing and toilet facilities.

A waste and efficient treatment area would also be required.

Estimated cost of lands, buildings, finished to hygenic food processing standards, site preparation, and efficient treatment area. 300,000 Rps.

9.2 Staffing

1. International Staff

Initially the FPC is to be commiesioned and run by a UN Volunteer Food Technologist, with detailed knowledge and experience of the industrial preparation, processing and packaging of concentrated juices, and preserves, and dried sliced, flaked and pureed products, from locally grown fruits and vegetables. An understanding of quality control procedures, production planning and control and routine planned maintenance would also be an advantage, in order that local personnel could be trained in these basic Industrial Management Functions. Service time for the volunteer - 36 months.

2. Local Staff

a. One pereon from Mustang District, for detailed Technological Training in Fruit and Vegetable Processing, through a UN Fellowship.

b. Two persons for relevant technical training at the Food Research Centre and/or the Institute of General Science, Tribhiwan University, Dharan.

c. One maintenance/electrical engineer

d. Two administrative/office staff

e. Ten routine operativee

3. Consultancy Back-up

a. Food and Agricultural Marketing Services Desk to conduct a detailed market ecenary to establish the best products together with prioes and markets for these products to be manufactured at the FPC.

b. UN consultant Food Technological or Nepal Food Proceseing Engineer to give detailed specification and order the equipment which is to be purchased for the FPC, particularly in light of 2a, aoove. Service time 3 months.

c. U.N. Consultant or Nepali Engineer for waste utilisation and effluent treatment arising from fruit and vegetable proceseing, to advise on the best outlets and treatments for the area, eepecially as the local river water is subsequently used for domestic purposes further down the valley.

d. Nepali counterpart Food Processing Engineer, preferably from the Food Research Centre, to accompany 3b and 3c, if consultants

are used, supervise the installation of the equipment when it arrives. Service time - intermittant over 6 - 12 months.

e. UN Consultant to be called, when the need for subsequent FPC'S arises. Service time 1 - 2 months for each.

9.4 Processing Equipment for the FPC to give processing capacity of 25 - 50 Kgs. per hour.

		Estimated cost (rupees)
1.	Wood/coal fired vertical fire tube steam boiler; Capacity 5-10 H.P. at 20 psi	75,000
2.	Diesel generator. Output 5-10 KW 3 phase	40,000
3.	Juice pasteuriser. Capacity 25Kg/hour	100,000
4.	Rotary drum drier, for purees Capacity 25Kg/hour	60,000
5.	Filter press, for clarifying juices. Capacity 25Kg/hour	25,000
6.	Evaperator, with aroma recovery or concentration facilities, for concentrating juices. Capacity 25Kg/hour	120,000
7.	Hand basket press, for apples	1,500
8.	Pulper/finisher, for purees and pre-juice pulp preparation. Capacity 50Kg/hour	12,000
9.	Carboreendeem peeler, for carrots,etc. Capacity 5Kg/batch	5,000
10.	Juice/puree storage tanks, Capacity 200L at 4,000 (two)	8,000
11.	Juice filling tank. Capacity 50L.	2,000
12.	Cabinet drier. 25KW. Capacity 20Kg/12 hours for fresh fruit and vegetables (Capacity would be increased by using solar drying for initial stage)	15,000
13.	Steam/hot water blancher and baskets capable of being used to pasteurise bottles of juice.	5,000
14.	Steam jacketed kettle, with pouring spout, for making syrups, jams and jellies. Capacity 50L.	5,000
15.	Hand operated roll-on capper, for bottles of juices and purees	1,000
16.	Trimming table, locally made 15'x3', sloping front to back, for trimming, peeling and coring, with shelf below for buckets for waste material	500

17.	Bottle and jar washing station, with hot water and brushes	2,000
18.	Tank and sprays for washing fruits and vegetables	4,000
19.	Two double solar water. Capacity 400L water 80°C/day	20,000
20.	Processing scales	6,000
21.	Solar heater-drier, Capacity 20Kg in design stage	10,000
TOTAL COST OF PROCESSING EQUIPMENT		507,000

II. Laboratory equipment required for simgle, total solicits, and moisture content determination

1.	Drying cover and vacuum pump	5,500
2.	Set of hand refactareters, 0-80% dissolved solicits	6,000
3.	Single pan balabce, accurate to 0.5 Mg	12,000
4.	Set of hydrometers	1,000
5.	Salter kitchen scales	500
6.	Assorted glassware	1,000
TOTAL COST OF LABORATORY EQUIPMENT		26,000
TOTAL COST OF 1 and 2		533,000
Add 25% for transportation and other contingencies		133,000
TOTAL ESTIMATED EXPENDITURE		666,000 Rp

Note: This is a tentative list, aimed at covering all likely requirements for the manufacture of concentrated juices, purees, and diced, sliced, or pureed dried products and jams and jellies. It has been assumed that most fruit and vegetable preparation will be by hand. If, for example, the detailed Market Survey discovers other products which should be manufactured, or recommends certain products should not be manufactured, then the list will need to be modified by the UN Consultant Food Technologist or Nepali Processing Engineer.

No allowance has been made for water treatment.

III. Cost Analysis Comments

It is not possible to have any detailed operational costs for the project as there are so many factors, not the least of which is the cost of producing the fruit and vegetables.

Some tentative figures can, however, be given as a guide.

10.0 Recommendations

10.1 For the Food Processing Centres

1. The first Model Community Food Processing Centre, with an initial processing capacity of 25 - 50 Kg fruit and vegetables per hour should be established near Thah Marpha Horticultural Farm, in the Mustang District, Dhaulagire Zone.

2. The Centre should be established as a model for future centres, to be sited in the W. and Far W. Hill Zones, and Helambu District, primarily for processing apples in the first instance.

3. Nepali staff for the centre should be recruited locally and those selected by the District Fruit Growers Association, should be trained through a UN Fellowship and receive instruction from the Food Research Centre, Mathmanda, the Institute of General Science, Dharan, and the resident UN Food Technologist.

4. The responsibility for the Centre should be placed with the District Fruit Growers Association.

5. The Food Research Centre is to sample the water supply, during minimum and maximum flow, for analysis for mineral and bacteriological content, to establish whether or not pre-treatment will be nexessary. The Food Research Centre will alsc be responsible for other detailed product analysis.

6. The Department of Mines is to carry out a detailed survey of the extent of the coal/lihnite deposit reported in the area, and the suitability for use in vertical tube steam boilers.

7. A more accurate and deailed analysis of the potential apple production in each of the Districts is required, together with a good assessment of the other fruits, including citrus and vegetables in the W. and Far W.

8. An urgent detailed Market Survey is required to identify the most suitable markets and the best range of products to be manufactured.

9. The Government should provide a secondary processing facility for eg. bottling, and a marketing outlet for the products initially. The Food Research Centre facilities are suggested for this.

10. On identifying suitable markets and establishing the initial FPC and associated processes successfully, further FPC should be commissioned in the W and Far W. Hill Zones, and Helambu District. Gumla and Dolpa are the most likely second phase sites.

11. When output warrants it, secondary Processing Centres should be established at regional development centres of Pohhara and Sarkhet, to handle the produce from the Hill Zones pared process local fruits, including citrus or vegetables. In the longer term, asceptic filling

of juices and purees into bulk containers for export and manufacturing should be considered.

In this way a unified Fruit and Vegetable Processing Industry, based initially on apples, would be established across the W. and Far W. of Nepal.

12. If the plans of the Yugoslavs to build in the Dhartuta/Dharan area a citrus processing factory (market throughout oranges in 1975 was 2,000 metric tons, from September to April, with a peak of 900 metric tons in December) and a tomatoe paste plant does not materialize, then a large FPC or other commercial enterprise should be considered.

13. Detailed analysis and bacteriological work would be prefered by the Federal Research Center.

II. General Recommendations

1. An intergrated project should be implemented on the use of solar energy for heating water, drying food products, and alcohol distillation accompanied by meteorological information of the W. and Far W. Hill Zones, in areas where future FPCs might be situated.

In the immediate future, there should be close liaison between the Institute of Applied Science and Technology, the Food Research Centre, Hill Agricultural Development Programme, and any others involved in solar drying projects, to prevent duplication of effort and achieve a unified aim.

2. A Feasibility study is requested for the establishment of the manufacture of P.V.C. and low, medium and high density polythene bottles. The study should include the use of bulk containers for the transportation of juices and purees by porter, mule or air.

3. The Food Research Centre should play a more positive role in commercial food processing both practically and by advertising the training facilities and programmes which are available. Equipment for evaporation and volatile recovery, and roller drum drying should be purchased, to offer a comprehensive service to future fruits and vegetable processors.

4. A Nepali Food and Packaging Technologist with industrial experience should be attached to the Industrial Services Centre and/or the Department of Industries, who is capable of advising the food processing industry in a practical way, (not merely issue licenses or produce reports and Feasibility studies). In the event of the lack of such a Technologist, a UN Consultant should be used for 1 - 2 months in order to advose on proolems arising in the industry. A permanent consultant would not be fully utilised. It would be essential to explain to the private companies, that this service is in no way interested in turnover and profits from a taxation point of view, otherwise the service would not be called upon. (During this consultancy the author was asked innumerable technical questions concerning

immediate and future problems).

5. More emphasis should be put into improving industrial tool processing. At the moment both the Institute of Applied Science and Technology and Food Research Centre are concentrating on the cottage scale level. While this is commendable and necessary in the long run efficient commerce is only created by industrial scale processing.

6. The intended programme for work on solar drying should be co-ordinated with HADP, the Food Research Centre, and, in particular, the Institute of Applied Science and Technology.

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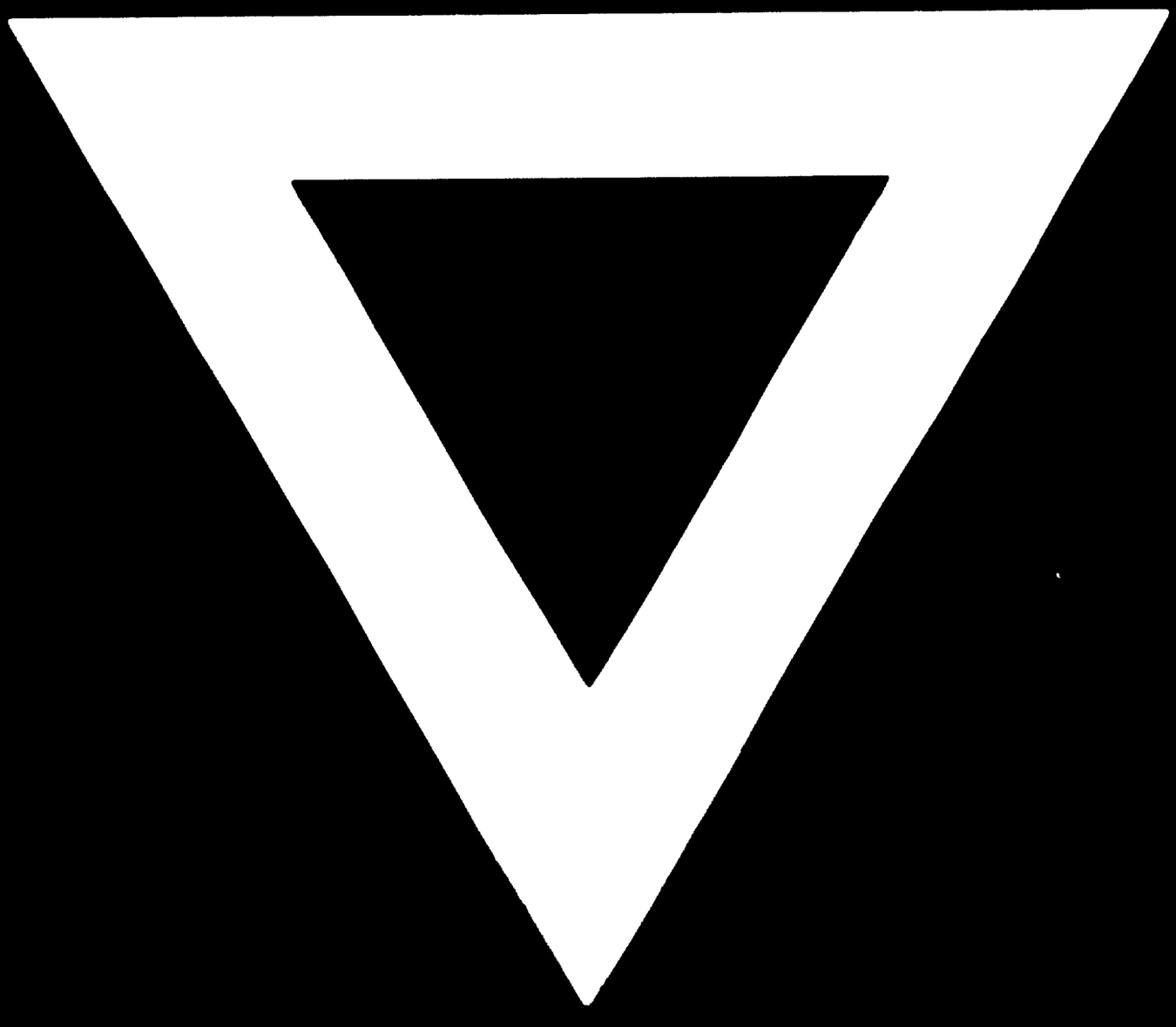

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