

Linking Farmers to Market: Some Success Stories from Asia-Pacific Region



Asia-Pacific Association of Agricultural Research Institutions
C/o FAO Regional Office for Asia and the Pacific
Bangkok, Thailand

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Foreword

The Asia-Pacific Association of Agricultural Research Institutions (APAARI), as one of its ongoing activity, highlights some highly successful ARD initiatives undertaken by the National Agricultural Research Systems, particularly the APAARI member countries. These case studies cover different topics of emerging concerns and interest at the national, regional and global level. So far, over 30 such success stories have been published and widely disseminated by APAARI to its stakeholders.

Over the past few years, much concern is being expressed on 'Linking Farmers to Market' – especially the LFM initiatives undertaken by NARS. Such studies have been promoted by FAO and the Global Forum on Agricultural Research (GFAR). APAARI, realizing the importance of LFM issues, organized an expert consultation in November 2006 at New Delhi, India, wherein need was expressed to identify some successful cases and publish them for wider use of NARS partners. The current publication is a follow up on these recommendations. It deals with three such success stories based on LFM initiatives undertaken in the Philippines, China and India.

The LFM related case studies carried out in the Philippines deal with four crops - two of these on cashew, one each on citrus and arrowroot. These case studies amply demonstrate as to how an integrated approach involving smallholder farmers as cooperators with R&D support of government institutions, NGOs and even the private sector helped to establish small, well profitably managed cooperative enterprises, taking care of the production and processing aspects, promote value-addition, diversify products and cater to demand-driven markets, based on market analysis and growth. It also emphasised the need for appropriate technology generation and transfer at smallholders' enterprise level to support desired LFM initiatives.

The second one is on LFM case studies that cover the experiences of small farmer households growing potato in Wuchuan County in Inner Mongolia - an Autonomous Region (IMAR) of China. It relates to the development of Wuchuan potato industry commensurate with the expansion of supermarkets in China and the opportunities and challenges it posed to farmers to organize themselves; leading to the development of farmers' associations. It focuses on the successes achieved by these associations in meeting LFM needs and the collaboration of the Chinese and Canadian governments under the Small Farmers Adapting to Global Markets (SFAGM) project initiated in 2003 for five and a half years duration. The project is funded by the

Canadian International Development Agency (CIDA) and executed by Agriculture and Agri-food Canada and the Chinese Ministry of Agriculture. The Wuchuan County is one of the six pilot projects operated under SFAGM. Besides technical assistance, it imparted trainings to small farmers/their associations etc. and exposing them as per needs to several LFM approaches. The case studies presented describe the progress/success achieved towards development of modern potato industry in Wuchuan County, and how small farmers could be included in the new system and adopted to the changed market scenario despite several constraints.

The third success story is different from the first two as it does not deal with crops/commodities but focuses on case studies/models *vis-à-vis* national/Indian perspective for LFM development. It presents four selected case studies of infrastructure strengthening and market networking at state level and one with wider applicability, providing market information using e-information system (e-choupal). Besides these, it also deals with other successful LFM related cases such as those of the National Dairy Development Board (NDDB), Central Food Technological Research Institute (CFTRI) and some other agricultural institutes in development and delivery of appropriate, adaptable, accessible technologies, innovations developed for application in the rural sectors for increased income generation to farmers/producers. It focuses on the strong market network and knowledge-empowerment of the farmer/rural sector to capitalize on new technologies for their overall benefits.

APAARI is thankful to the authors of the respective success stories for providing well synthesized reports that led to this useful consolidated information, with needed inputs from APAARI. The cooperation and support of GFAR/GPP, through CIAT as a facilitator, is also acknowledged. It is felt that wider dissemination of this publication will be helpful to initiate similar studies in other countries of the Asia-Pacific region as per their needs and priorities, and also in generating interest to expand such rural based initiatives on LFM for the benefit of farmers, providing more income *vis-à-vis* promoting rural welfare, thereby contributing positively towards the millennium development goals (MDGs).



R.S. Paroda
Executive Secretary

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Linking Farmers to Market: Some Success Stories in the Philippines

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Acronyms and Abbreviations

APAARI	Asia-Pacific Association of Agricultural Research Institutions
ARMM	Autonomous Region of Muslim Mindanao
ARD	Agricultural Research for Development
ASAP	Agribusiness Systems Assistance Project
BAS	Bureau of Agricultural Statistics
BFAD	Bureau of Food and Drugs
BPRE	Bureau of Postharvest Research and Extension
BU-CAF	Bicol University - College of Agriculture and Fishery
CALABARZON	Cavite, Laguna, Batangas, Rizal and Quezon
CAR	Cordillera Administrative Region
CIAT	Centro Internacional de Agricultura Tropical
CNSL	Cashew Nut Shell Liquid
DA	Department of Agriculture
DOST	Department of Science and Technology
DTI	Department of Trade and Industry
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFAR	Global Forum on Agricultural Research
GMP	Good Manufacturing Practices
GPP	Global Partnership Program
HRD	Human Resource Development
LFM	Linking Farmers to Market
LGU	Local Government Unit
MDGs	Millennium Development Goals
MIMAROPA	Mindanao, Masbate, Romblon and Palawan
MMSU	Mariano Marcos State University
MT	Metric Tons
MVMFC	Malabing Valley Multipurpose Farmers' Cooperative

NARS	National Agricultural Research System
NGO	Non-Government Organization
PAO	Provincial Agriculture Office
PHTRC	Postharvest Horticulture Training and Research Center
R&D	Research and Development
RFU	Regional Field Unit
RMTU	Ramon Magsaysay Technological University
SCU	State Colleges and Universities
SETUP	Small Enterprise Technology Upgrading Program
SPCP	State Polytechnic College of Palawan
STARRDEC	Southern Tagalog Agricultural Resources Research and Development Consortium
WPU	Western Philippines University

I. Introduction

Background Information

Agriculture remains one of the major contributors to economic growth of many countries in the Asia-Pacific region. In the Philippines, it accounted for about 15% of the gross domestic product (GDP) in 2004, valued at P664.7 billion at current market prices, registering an annual growth rate of 3.77%. Agriculture provides employment to about 37% of the total labour force and to one-fifth of the estimated 50 million people living in the rural areas.

The smallholder farmers in the Philippines, like their counterparts in other developing economies in the Asia-Pacific region, face the challenges and opportunities of a rapidly changing market environment brought about by trade liberalization and globalization. Rising incomes, population growth, urbanization, change in tastes and preferences are driving growth in demand for high quality and safe food. Globalization offers opportunities for increased agricultural exports. The capacity of smallholder producers in developing countries to respond to these trends and to take advantage of the opportunities offered by globalization is of utmost concern.

There is growing recognition within the agricultural research and development community of the need for smallholder producers to shift traditional farming strategies to those of more innovative farming leading to better farm incomes. One such innovative approach relates to the establishment of linkages between farmers, producers and markets. This approach, to be effective, calls for priority attention to issues on access to technology and information, institutional arrangements and support services, policies, capacity building of producers, and identification and development of markets, among others.

This publication has been prepared to document and elucidate selected case studies on LFM/linking farmers to markets in the Philippines that have achieved considerable success. It highlights various approaches that may serve as useful guidelines to the national agricultural research system - the member-countries of APAARI which are equally concerned in improving such linkages particularly of the smallholder farmers to markets to provide them better livelihood.

Some Successful Case Studies

Four successful case studies are presented here to illustrate how various stakeholders, namely, a farmer-entrepreneur, academic institution, farmers'

cooperative, and a food processor developed linkages with a view to improving access of smallholder producers to existing and emerging growth markets. The sites of the case studies are shown in Figure 1.

Two of these case studies deal with cashew, one on citrus and the other on a potential underutilized crop – the arrowroot. The case studies reflect different approaches utilizing local experiences and expertise involving farmers' communities, cooperatives, public institutions and even the private sector.

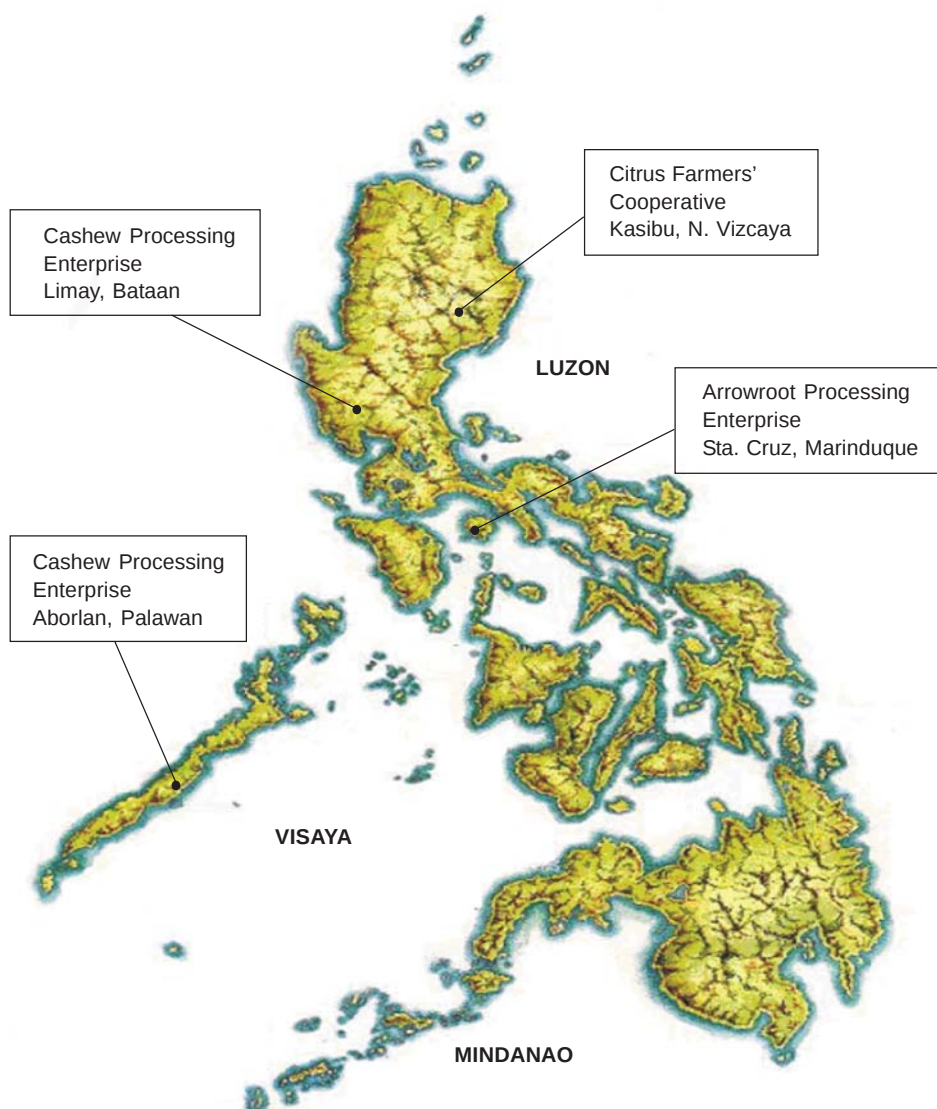


Figure 1. Map of the Philippines showing the sites of the case studies.

II. Processing and Marketing of Cashew: R&D *vis-à-vis* LFM Initiatives

Cashew Production/Industry in the Philippines

In the Philippines, cashew is the leading nut crop and also considered as a high value crop. It is one of the banner crops of the Department of Agriculture (DA) that has been prioritized for development. In 2004, national cashew nut production totalled 116,910 metric tons (MT) on an area of 27,802 ha. Major cashew growing areas can be found in the MIMAROPA region where the island province of Palawan alone contributes about 90% of total national production. Central Luzon contributed about 7.0 percent of total production, which came mainly from the provinces of Nueva Ecija and Bataan. Location of these two major production areas is given in Figure 1, while Annexure I lists the production areas.

There are six cashew varieties recommended for cultivation by the Philippine Seed Board which include Mitra, Gonzales, Recto, Fernandez, Caliwag and Eleazar. The nut and apple characteristics as well as the average nut production per tree of these varieties are given in Table 1. Figure 2 exhibits the fruits of the cultivated varieties. On an average, the cashew nut weighs 11.7 g while the apple part weighs 104 g. The cashew kernel weighs 3.12 g which, when translated to kernel recovery, is about 27 percent of the total nut weight.

Table 1. Nut and apple characteristics of cashew varieties

Characteristics/vars	Mitra	Gonzales	Recto	Fernandez	Caliwag	Eleazar	Mean
Nut weight (g)	13.43	12.78	10.13	11.93	11.71	10.05	11.67
Kernel weight (g)	3.72	3.55	2.96	2.94	3.10	2.55	3.12
Kernel recovery (%)	27.84	27.77	29.22	24.64	26.47	25.37	26.89
Nut production (ave. kg/tree)	9.67	7.38	7.93	6.90	7.02	6.98	7.65
Apple weight (kg)	146.39	129.00	70.22	117.48	79.48	81.77	104.06
Total soluble solids (%)	13.08	15.84	12.36	13.28	13.88	14.06	13.75
Colour of Apple	Orange	Orange	Red orange	Orange	Yellow orange	Orange	

Source: STARRDEC (1997).

Marketing Practices and Constraints

Traditionally, the marketing system for locally grown cashew fruits has been focused on cashew nuts. The cashew farmers earn low income from their cashew trees. This is due to two major factors: (a) the low buying price of unprocessed nuts,



Figure 2. Cashew varieties grown in the Philippines.

and b) the non-utilization of cashew apples for processing into commercially viable consumer products (Equina, 1996).

Other marketing problems are lack of market information, fluctuating prices and high transport cost.

Utilization of Cashew Fruit and Value – Addition Prospects

The cashew tree is cultivated for its true fruit, the cashew nut, and its pseudo fruit, the cashew apple. Both the nut and apple have economic value as food and for industrial use.

The cashew nut consists of the kernel and the shell. The kernel, a valuable product, is widely utilized in the country. It is processed as roasted whole or split kernels and consumed not only as health food but also as luxury dessert food. Local food manufacturers use the dried or roasted cashew kernels as ingredients in the manufacture of ice cream, confectionaries, and hardener for chocolates and pastries. On the other hand, the shell contains the natural resin known as cashew nut shell liquid (CNSL), which is used as a raw material for industrial manufacture, such as in brake linings, industrial rubber, varnishes, paints, adhesives, anti-corrosives, and electrical insulations.

The ripe cashew apple is eaten raw when freshly picked. The apple juice is very nutritious as it is very rich in Vitamin C. The apple can be processed into high valued products such as wines, vinegar, beverages or syrup, jams and candies, juice and juice blends.

Cashew Industry Development: R&D/LFM Initiatives

There are constraints to the development of the Philippine cashew industry, and these constraints fall in four key areas: (1) cultural practices and management; (2) social behavior of cashew farmers; (3) research and development on production and processing; and (4) marketing (ASAP, 1996). In order to mitigate and address these constraints, the government through the Department of Agriculture/DA's research, development and extension agencies and some state colleges and universities (SCUs), have conducted the following programs/activities:

- The DA established programs on cashew production which include the massive distribution of high yielding planting materials to farmers in expansion areas and conduct research, development and extension activities focussed on the improvement of the cultural management practices.
- Some SCUs located in major production areas, such as the State Polytechnic College of Palawan (SPCP), Ramon Magsaysay Technological University (RMTU) in Zambales, and Mariano Marcos State University (MMSU) in Ilocos Norte have undertaken R&D activities on small scale processing of cashew nut and apple.
- The Bureau of Postharvest Research and Extension (BPRE), an attached agency of the DA, conducted benchmark studies on technical and socio-economic aspects of the cashew post-production industry. Information generated served as basis for developing appropriate interventions toward the improvement of the post-production sector. It has developed an improved cashew sheller that can produce CNSL-free whole cashew kernels.

In an effort to enhance the transfer of available cashew nut and apple processing technologies to cashew stakeholders, the BPRE had embarked on a pilot project with a cashew grower as cooperator in 1997, with a view to establishing a viable model of a cashew integrated processing enterprise as a means to strengthening linkages between the farmers and the market.

● Case Study of Farmers in Limay, Bataan

The pilot project was set up in Limay, Bataan, being one of the major producing areas in Central Luzon. In Limay, cashew growing area is about 71 ha producing a total of 84 MT of cashew nuts annually. Cashew farmers in the area individually sell the raw nuts to local traders who visit their villages. They are generally price-takers as traders usually dictate the price of the cashew nuts. During peak harvest season, there is oversupply of cashew nuts in other major supply areas such as the province of Palawan that the traders need not go to Bataan anymore to buy the farmers' produce. As a consequence, cashew farmers experience difficulty in marketing their produce. For lack of market, some farmers out of desperation even started cutting down their cashew trees.

The economic value of the cashew apple is not well appreciated by the farmers. During harvesting, majority of the farmers leave the apples in the field to rot, while some collect and use them as feed for cattle and hogs.

The Cashew Integrated Processing Enterprise

Community-led Interventions: Project cooperator and arrangements: A woman cashew grower and community leader in the village of Duale, Limay with a strong entrepreneurial spirit, saw the vast income potential of processing the cashew nut and apple. Mrs. Rosario Villaviray, who owns a 3.5 ha orchard of cashew trees intercropped with other fruit trees such as mango, guava, santol and jackfruit, approached the BPRE for technical assistance, which was timely because BPRE was about to embark on a participatory pilot project on a small-scale cashew fruit processing enterprise.

As project cooperator, her counterpart or equity to the project included processing space and shed, labour, working capital and management of the enterprise. BPRE, as development facilitator, provided the processing equipment and facilities.

Other support services provided by BPRE included hands-on training for hired workers on the use of the processing technologies, assistance in designing packaging material and linking to packaging suppliers, market research to identify market outlets for the cashew products, and training for the manager and staff on business aspects, record keeping, etc.

Processing and Production: The small scale enterprise was designed to process both cashew nuts and apples. The processing systems adapted are capable of producing the following end products: a) roasted whole cashew kernel, b) roasted split cashew kernel, c) cashew prunes, and d) cashew wine. The process flow chart for the production of the four cashew products is given in Annex II and photographs for the three marketable cashew products, namely, nut, prunes and wine are presented in Figure 3 (de la Cruz *et al.*, 2000).

The sequential steps for the production of whole cashew kernels are as follows:

- a) Sun-dry the raw nuts for two to three days.
- b) Sortout the dried nuts into large and small sizes.
- c) Shell large nuts using a BPRE whole cashew nut sheller.
- d) Pick the cashew kernel from the shell using a pointed object specially made for the purpose.
- e) Remove the testa with or without the aid of a sharpened object.
- f) Sort and clean the raw kernels.
- g) Roasting the kernels in an oven with a temperature of 140-150°C for 1.5 to 2.0 h at single kernel layer depth.
- h) Cooling the roasted kernels before packing.

The split cashew kernel processing follows the same steps except that a splitter type of sheller locally known as *kalukati* is used in shelling.

On the other hand, the SPCP-generated cashew apple processing technologies were adapted for the production of wine and prunes. The steps involved in juice extraction process are the following:

- a) Wash thoroughly the fully ripened apples.
- b) Remove both ends of the apple, and then slice the apple crosswise at one cm thickness.
- c) Extract the juice by osmotic procedure by adding 1 part (by weight) of sugar to every 5 parts of sliced apple.
- d) Stand the sliced apples with sugar overnight, after which, the sweetened juice is separated from the apple pulp.
- e) Process the sweetened juice into wine, and the apple pulp into prunes.

Facility and Capital Requirements: Based on the potential supply of raw material in the project area, the integrated cashew processing plant was designed to process a daily input of 120 kg cashew nuts and 50 kg cashew apples. The total investment



a) Packaging of cashew kernel products



b) Packed cashew kernel products



c) Trimming and slicing of cashew apples to desired thickness



d) Drying cashew prunes for one to two days



e) Packing dried cashew prunes



f) Bottled cashew wine

Figure 3 (a-f). Exhibits the cashew products – cashew nut, cashew apples/prunes and the cashew wine as marketable products.

cost amounted to P299,274.00 (1 US\$=P44), which includes a working capital of P50,000.00 sufficient for a month long operation of the enterprise.

Manpower Requirements: The manpower involved in the processing enterprise consisted of a manager and 18 staff comprising three labourers for shelling the nuts, three labourers for picking the kernel out of the cracked nut, nine labourers for removing the testa, one utility worker, one cook and one assistant cook.

Raw Material Inputs: Raw cashew nuts for processing came from the harvest of the farmer-cooperator and from cashew farmers in the village. The cashew nuts purchased by the enterprise varied in size. The larger nuts (62%) were processed into whole cashew kernels while the smaller nuts (38%) were shelled using the splitter to produce split cashew kernels. The cashew nuts were procured from the farmers at a price of P24/kg. For the cashew apple, which contains 30-40 percent juice by weight, the price offered was P2.50/kg.

Processed Products: Three major products produced in the processing plant include: (a) roasted whole and split cashew kernels, (b) cashew prunes, (c) cashew wine. The roasted kernels are produced in 200 g pack for retail and 20 kg pack for wholesale using plastic bags. The retail packs are properly labelled. For cashew prunes, two types of packaging are used, namely, 200 g pack in labelled plastic/styrofoam material and 50 g pack using cellophane as wrapper. The cashew wine is packed in recycled 375 ml glass bottles with label.

Market Outlets: The market outlets for the cashew products identified by the market study conducted by the project were restaurants, grocery stores, bus terminals and other customers from the province of Bataan and as far as Manila. Being CNSL-free, the cashew kernel products especially the whole cashew kernels are considered to be of high quality.

Assessment of Costs and Value Added: The three years operation of the cashew processing enterprise (1998-2000) was analyzed to determine the production and marketing costs and value added in processing cashew nut and apple into roasted cashew kernels, prunes and wine. On the average, for 1 kg of roasted cashew kernels the costs of raw material (cashew nuts), processing and marketing are 32.5, 25.2 and 1.7 percent of the selling price, respectively (Table 2). The corresponding value added per kg of the finished product is 40.7 percent. For cashew prunes and wine, the average processing cost represents about 58 percent of the selling price per pack, while the average raw material (apple) cost is only about 9.7 percent. The value added is 31.5 percent of the unit selling price of the finished products.

Table 2. Production cost and value added in cashew nut and apple processing

Product	Raw material cost (P)	Processing cost (P)	Marketing cost (P)	Selling price (P)	Profit margin (P)
Roasted whole cashew kernels (per kg)	100.08 (28.60)	102.96 (29.40)	4.96 (1.40)	350.00	142.00 (40.60)
Roasted split cashew kernels (per kg)	90.87 (36.40)	52.17 (20.90)	4.96 (1.90)	250.00	102.00 (40.80)
Cashew prunes (per 200 g pack)	3.33 (9.50)	20.42 (58.30)	0.25 (0.70)	35.00	11.00 (31.50)
Cashew wine (per 375ml bottle)	3.48 (9.90)	20.27 (57.90)	0.25 (0.70)	35.00	11.00 (31.50)

Note: Figures in parenthesis are percent of the selling price.

Successes Achieved

Profitability of the Enterprise: Based on three years operation, analysis of financial records of the enterprise show that the farmer-processor realized an average yearly net income of P199,805.00. Considering the net cash flows, the investment made on the processing plant can be recovered in 2.4 years with an actual operation of 3 months per year. The rate of return on investment is 40.2 percent.

Benefits to Farmers: For the cashew farmers in the project site, the enterprise provided them with ready market for their cashew nuts and apples. The price offered by the enterprise for raw nuts ranged from P20 to P24 per kg, which is relatively high compared to the price of nuts in other supply areas like Palawan that ranged from P6 to P12 per kg for the same period. Additional income was derived from the sale of cashew apples bought at P2.50 per kg, which had minimal economic value before the processing enterprise was established.

For the cashew farmer turned processor, a higher and more stable income was realized by processing and adding value to the cashew fruit than selling the raw cashew nuts as initially practiced. She was able to expand her enterprise and even acquired more assets to diversify her business. The enterprise empowered her and she even became famous. She has received awards from the government, has been featured on nationally televised agriculture-related programs and visited by other cashew stakeholders from other places to learn from the processing enterprise.

Socio-economic Benefits to the Community: The introduction of cashew nut and apple processing technologies through the pilot enterprise also contributed to some positive effects in the community as follows:

- The processing enterprise generated employment to some residents of the community consisting of 18 permanent workers and additional 22 contractual workers involved in the tedious process of manually removing testa. The contractual workers are paid based on output. With their productive employment, the family households have been better able to buy basic needs, improve their living conditions and pay for their children's school needs.
- By showcasing the processing technologies, the enterprise has drawn interest of other cashew growers in the community to engage in value adding activities. In 2000, four cashew growers have adopted the nut processing technology. They supply the enterprise with raw cashew kernels.
- With the high quality of cashew products produced by the enterprise, the image of the community as a source of these quality products has been enhanced.

Strengthening Institutional Linkages and Support

The enterprise was linked to other institutions for the support needed by the project (Figure 4). The Department of Trade and Industry (DTI) was responsible for the issuance of a license to operate the processing plant. The Bureau of Food and Drugs (BFAD) certified that the cashew products are safe for consumers.

In the early years of the project, the farmer cooperator experienced difficulty in taking credit from government financing institutions due to problems of meeting collateral requirements. She resorted to tapping informal lending sources that charge excessive interest rates (5-8% per month). In 2004, she won the "One Product, One Province, One Million Peso Award" from DTI, sharing equally the cash prize

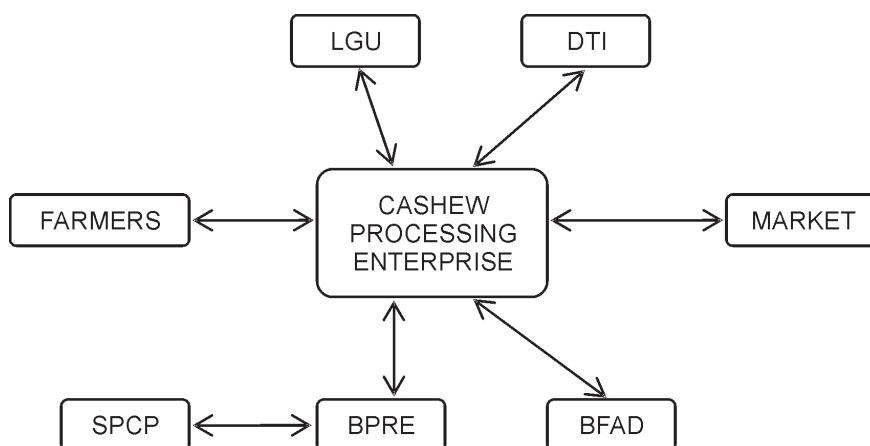


Figure 4. LFM: Linkages associated with implementation of the cooperative project.

with another entrepreneur in Bataan. The prize was in the form of a soft loan without interest and she used this to augment her procurement capital for additional storage of raw materials. Encouraged by the good performance of the enterprise, the local government unit (LGU) of Limay, Bataan also provided financial assistance through an interest free loan.

● Case Study of Farmers in Aborlan, Palawan

The island province of Palawan is the leading producer of cashew nut in the country, where total area planted to cashew is 24,345 ha with production volume of 106,256 MT of cashew nuts. Majority of the raw nuts are bought by agents/traders and shipped to Manila, and transported to the nearby city of Antipolo, Rizal for processing. A large number of processors in Antipolo City turn out products called locally as “blue seal”, which is split cashew kernels that are opaque-white in colour and with low moisture content. The product is sold in big volumes to manufacturers of ice cream, cakes and pastries in Manila.

There is relatively insignificant value adding activities to the cashew nuts in the production areas in Palawan, and the economic potential of the cashew apple is taken for granted by the cashew farmers. Although, simple small-scale cashew processing technologies are available in the area, very few are engaged in processing due to poor market access of cashew products to major demand areas. Cashew farmers get a farm gate price ranging from P12 to P20 per kg of raw nuts, representing a merely 7% of the value of the split cashew kernels and 4% for whole cashew kernels sold to consumers. Thus, farmers do not get a fair share of the value of their cashew produce.

Promoting LFM Concerns: WPU Initiatives

Generating Farmers' Interest in Product Development

Aborlan town, to the south of Puerto Princesa City, the provincial capital of Palawan, is home to the Western Philippines University (WPU, formerly SPCP) considered the pioneer in research and development on cashew processing. Its Food Processing Center has developed laboratory-scale technologies for processing cashew apples into prunes and wine products as described earlier.

In 2000, the WPU linked to some 20 cashew farmers from Magsaysay, Aborlan with the aim to demonstrate the economic benefits of selling the cashew fruits (apples with nuts still intact) instead of only the raw nuts. In order to produce good quality fruit, WPU extension specialists trained the farmers on proper postharvest handling and quality management.

Successes Achieved

Benefits to Farmers and the Community: Farmers increased their income from cashew production more than six-fold by selling the cashew fruit rather than the cashew nut alone. To illustrate, on an average, 14 kg of cashew fruit harvested give only one kg of nuts. The price of cashew fruit is P7.00/kg, while that of the nuts is P15.00/kg. Clearly, the farmer gained P98.00 by selling the cashew fruit compared to P15.00 from cashew nuts. Considering that the average yield of cashew fruit ranges from 68.8 kg (for mature fruit-bearing tree) to 109.2 kg (for young fruit-bearing tree) per tree, the farmer could easily earn from P482.00 to P764.00 per tree per year. On a per hectare basis, where the average number of trees is 138, the farmer's annual income could range from P66,516.00 to P105,432.00.

The processing enterprise generated 14 jobs and contributed in no small way to the income generation program of the University. An average return on direct investment (excluding cost of fixed assets) of 42% was achieved by the enterprise over the past five years. Furthermore, research results on cashew apple processing have been utilized on a pilot scale which would serve as the basis for more aggressive dissemination of the technology over wider areas in the province and elsewhere.

Strengthening Institutional Linkages and Support

Agricultural technicians from the LGU at the municipal level were tapped to provide training on good agronomic practices for cashew. The linkages established by the project are shown in Figure 5.

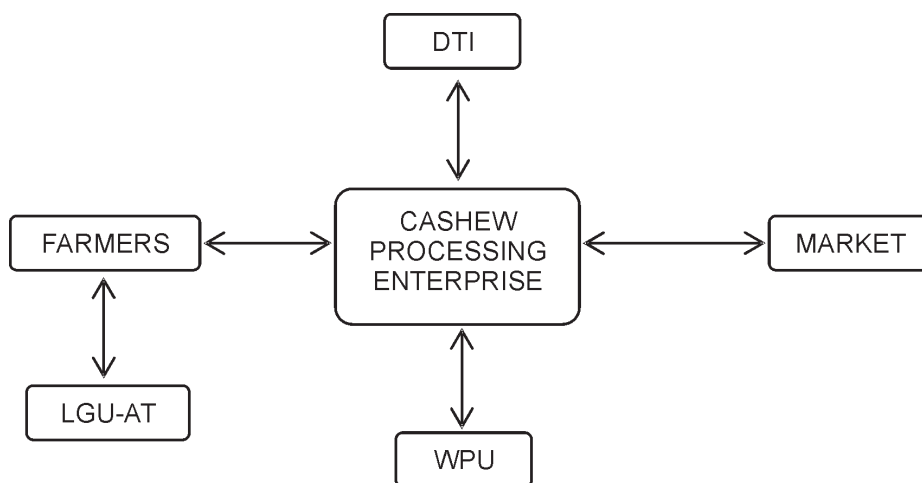


Figure 5. LFM Linkages established by the extension project.

Products of the enterprise include roasted cashew kernels, cashew prunes and cashew wine. To help in product promotion, the enterprise sought the assistance of the local branch of the DTI.

The cashew products are sold directly to the local market, such as malls, food stores, and some hotels, among others. Some of the products are bought by walk-in customers from the university and its environs.

III. Case Study of Citrus Farmers: Improving Postharvest Handling and Market Linkage

Citrus Production/Industry in the Philippines

Citrus, which includes oranges, lemons locally known as *calamansi*, and mandarins (*Citrus reticulata*), ranks fourth among the national priority fruit crops in the Philippines, next to banana, pineapple and mango, in terms of production, volume and value. In 2004, total production of mandarins was reported at 19,898 MT on a total area of 8,917 ha. In terms of production, the top three regions are CALABARZON, Davao and Cagayan Valley producing about 75 percent of total output (Annexure I).

An emerging area for mandarin production in Cagayan Valley region is the Malabing Valley in Kasibu, Nueva Vizcaya, producing high value mandarins such as satsuma and ponkan that are preferred by consumers. Area planted in 2004 was 200 ha with a total production of 6,000 MT, representing 30% of total mandarin production. The potential area suitable for citrus production is 2,000 ha, and it is expected that at least half this area will be planted to citrus over the next five years.

Development of Local Citrus Industry Through Farmers' Cooperative

In 1998, the Malabing Valley Multipurpose Farmers' Cooperative (MVMFC) was organized to develop the local citrus industry in the Malabing Valley. The cooperative started initially with 48 members and gradually increased to 334 farmer-members in 2002. Services offered by the cooperative related to citrus production including the provision of production loans for farm inputs, supply of seedlings, technical assistance, and marketing assistance.

The area planted to mandarin citrus of the Satsuma and Ponkan varieties in the Malabing Valley ranges from 0.3 ha to 8 ha or an average area of 1.85 ha. There are about 450 trees in a hectare of citrus farm. Yield per tree depends on the age of the tree and farm management practices. Given the current farm management practices in the area, actual yields obtained so far range from 50 kg to 150 kg per tree. In terms of distribution by varieties, Satsuma and Ponkan constitute 67 percent and 14 percent of the total tree population, respectively. The balance (19%) is of other fruit trees such as oranges and pummelo.

Postharvest Handling and Market Linkages

In 2002, the BPRE was tapped to provide technical assistance through R & D support for the improvement of the existing harvesting and postharvest handling system from farm to market and the development of additional market outlets for

the cooperative (Gutierrez *et al.*, 2004). An interdisciplinary technical team comprising an agricultural engineer, agricultural economist and extension specialist was created to: (1) assess the performance of the existing postharvest handling and marketing system, (2) search and verify existing postharvest technologies for citrus, and (3) undertake immediate interventions to improve the existing postharvest and marketing operations. In addition, market research was conducted to explore and develop market links with institutional buyers such as hotels and supermarkets for the expansion of the cooperative's market.

Major LFM Constraints

Harvesting and Postharvest Handling: The major constraints in harvesting and postharvest handling system (Pantastico, 1975; Gutierrez *et al.*, 2004) relate to the following concerns:

- During harvest time the citrus farmers are confronted with labour shortage in the area. As family labour could not cope up with the harvesting work, some of the citrus fruits get over-ripened before these could be harvested. Harvest loss due to the over-mature fruits that usually fall to the ground was estimated to be 4 percent valued at P36,000.00 per ha.
- Hauling from the farm to the farmer's house/packing, shade and the subsequent manual handling operations (washing, waxing, sorting and packing, Figures 6&7) entail an addition loss of 1 to 6% due to the effect of rough handling and the manifestation of mold infection and insect damage.
- At the cooperative level, the postharvest operations include temporary storage (2-4 days), resorting and repacking before delivering the fruits to the



Figure 6. Hauling of crated fruits with a sledge.



Figure 7. Sorting and grading of citrus.

wholesaler/retail outlets. Unnecessary delays are incurred at this level, which also contribute to losses both in quantity and quality. An estimated additional 10 to 18 percent losses are incurred due to poor conditions of farm to market road, double handling, poor packaging and some pre-harvest factors such as fruit fly and mold infections that still manifest at the cooperative and wholesale/retail levels.

Marketing: A major problem being faced by the citrus farmers is marketing of the citrus fruits. Due to limited trading capital and inadequate marketing facilities, the cooperative can only absorb 20 % of the total citrus production of cooperative members of 2250 MT/year (3.75 MT average per day). Market outlets of the cooperative are limited to fruit stands in Solano, Nueva Vizcaya (Figure 8) and in other provinces, such as Tarlac, Pampanga, La Union and Benguet. The bulk of the farmers' produce (80%) flows through the traditional marketing channel, which is characteristically complex and inefficient because of the presence of several kinds of middlemen. Furthermore, due to lack of grading standards, the farmers are always at the losing end in terms of pricing of the commodity.

Technology Developments Adaptation

Addressing Needs of Farmers' Cooperative

Immediate interventions undertaken to address some of the needs of the cooperative include the adaptation of an existing onion sorting machine for the grading of citrus fruits. An existing warehouse, with an area of approximately 120 sq. m., that is located near the cooperative's trading post in Solano, Nueva Vizcaya was leased and used as a packing house.

The sorter/grader (Figure 9), which was imported from Japan, works on the principle of sorting by specific weight of the product. It has an actual capacity of 0.84 tons per hour when adapted for grading of citrus fruits of the Satsuma variety. It requires four people to operate the machine, i.e. 1 loader, 1 quality inspector and 2 packers. The cost of the machine is P350,000.00.



Figure 8. One of the fruit stands selling Malabing citrus.

Through intensive fruit-size grading tests of the sorting machine, the cooperative with the assistance of the BPRE technical team has come up with five standard classifications of citrus fruits that include extra large (XL), large (L), medium (M), small (S) and extra small (XS) (Table 3).

Another intervention is the use of stackable plastic crates that can hold 25 kg of citrus fruits, which is lighter to handle than the wooden crates (40 kg capacity) commonly used by the citrus farmers in order to lessen drudgery. The cooperative has acquired these plastic crates on lease to farmers at a reasonable cost. The use of stackable plastic crates can minimize the damage brought about by the poor conditions of the roads from the production area to the cooperative's packing house.



Figure 9. Onion sorter adapted for citrus sorting/grading.

Table 3. Standard classification of citrus fruits using the sorting machine adapted by the cooperative

Class/Citrus vars.	Satsuma	Ponkan
Extra Large (XL)		
Size (cm)	8.28 ± 0.20	8.38 ± 0.19
Weight (g)	229.90 ± 18.12	245.00 ± 25.25
Large (L)		
Size (cm)	7.93 ± 0.14	7.97 ± 0.08
Weight (g)	198.95 ± 9.37	224.60 ± 10.99
Medium (m)		
Size (cm)	7.05 ± 0.16	7.52 ± 0.15
Weight (g)	144.74 ± 11.46	204.00 ± 9.91
Small (s)		
Size (cm)	6.41 ± 0.17	6.74 ± 0.09
Weight (g)	110.59 ± 6.68	151.00 ± 8.22
Extra Small (xs)		
Size (cm)	5.42 ± 0.27	6.12 ± 0.13
Weight (g)	70.25 ± 8.49	109.00 ± 4.18

Note: Size is based on largest diameter of fruit.

Successes Achieved

Market Linkage for Institutional Buyers: Institutional markets such as supermarket chains (5) and hotels (4) in Metro-Manila have expressed willingness to buy the citrus produce from Malabing Valley provided the quality and price are competitive with the imported fruits. For supermarkets, the average daily requirement is 22 boxes (72 pieces per box) of oranges that are large in size. For hotels, on the average the daily requirement is 200-300 pieces of large oranges.

Benefits to the Farmers' Cooperative: The innovative partnership project strengthened the farmers' cooperative and improved its capacity to provide support services, in an integrated approach, on production, postharvest handling and marketing of citrus produced in the valley. In the area of marketing, the increase in trading capital and the establishment of a packing house equipped with a mechanical sorter, together with the use of plastic crates in citrus handling has increased the volume handled by the cooperative from 20 to 75% of total production of members (14 MT/day). Gradually the cooperative has pulled the citrus growers away from depending too much on the traders, who usually dictate the price and terms of payment of the citrus fruits.

With the use of the mechanical sorting machine, the cooperative has established its standard classifications in terms of the fruit size: extra small (XS), small (S), medium (M), large (L) and extra large (XL), making it possible to systematically set the selling prices for the benefit of the citrus growers availing of the services of the cooperative. In addition, mechanical sorting/grading that consistently classified the citrus fruits in more objective manner enabled the cooperative to break into the institutional buyers such as supermarkets.

Because the farmers and family labour have freed themselves from the manual sorting of fruits, they could already cope with the farm level operations of harvesting, washing and waxing. Double handling of the fruit during sorting at the farm and cooperative levels was also eliminated that resulted in better quality fruits.

Strengthening Institutional Linkages and Support

To further develop the citrus production, postproduction handling and marketing in a holistic manner, the cooperative's young and dynamic leadership also sought external support from other government agencies such as the DA, DTI, LGU and R & D institutions such as Postharvest Horticulture Training and Research Center (PHTRC) (Figure 10).

DA extended support in terms of R & D on production technology, capacity building and loan assistance for irrigation system, transport facilities such as delivery trucks, and postharvest handling equipment such as mechanical sorter and

plastic crates. It also co-organized annual citrus festival held during the harvest season, as a promotion strategy to attract the interest of policymakers for industry support and to create awareness of market-men and consumers that would rebound to growth in market.

DTI as the government arm mandated to develop the country's trade and industry assisted in promoting the Malabing Valley citrus during trade fairs and exhibits as well as in the preparation of feasibility study for loan applications.

LGU provided financial assistance in the establishment of a farmer training center, improved farm to market roads, assisted in the conduct of the annual citrus festival and put up counterpart funds in the conduct of trainings/capacity building activities.

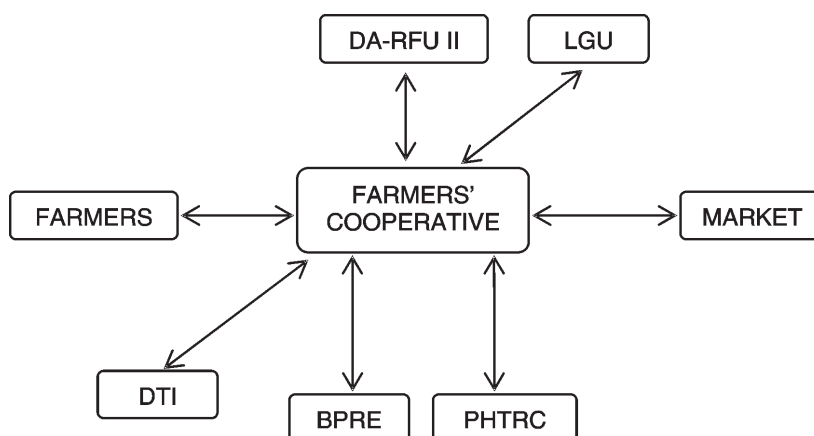


Figure 10. LFM: Institutional linkages of the project.

IV. Case Study of Linking Arrowroot Farmers to Market Through Processing

Arrowroot – A Potential Under-utilized Crop

Arrowroot (*Maranta arundinacea*) is an underutilized species indigenous to Central America and is sporadically grown in Asia-Pacific, in South Asia, Southeast Asia and Australia.

The arrowroot plant matures in 9 to 11 months after planting and reaches up to 80 cm in height. The roots or rhizomes of this plant (Figure 11) contain edible starch. Arrowroot starch is white, odourless and tasteless; produced either in the form of powder or in more or less aggregate masses which are globular and rarely exceed size of pea. The bitter resinous substance present in the skin of the rhizome can be removed in the preparation of starch during peeling.



Figure 11. Uprooted arrowroot showing the rhizomes.

Arrowroot starch has many uses, such as a thickening agent for soups, sauces, and puddings, and as a part of wheat flour substitute in the manufacture of biscuits.

Arrowroot Production/Industry in the Philippines

Arrowroot, locally known as *uraro*, is a minor crop that grows in hilly areas in some parts of the Philippines. The crop can produce a yield ranging from 27 to 29 MT per hectare, if given the necessary care and cultural management. When planted under coconut or intercropped with fruit trees, arrowroot can produce at least 65 percent of what it normally yields (Gonzaga, 1988). Arrowroot strains grown in the Bicol region, Quezon province in the CALABARZON, and Palawan in MIMAROPA have almost the same yield characteristics producing 17 MT of rhizomes under partial shading (Tabinga and Gagni, 1982).

According to BAS production statistics, in 2004, a total land area of 331 ha was planted with arrowroot, yielding a total of 2,386 MT (Annexure I). The major production region is MIMAROPA, contributing about 63 percent of total production in 2004.

Growing Arrowroot: Farmer's Initiatives

Two unregistered varieties of arrowroot grown in the province of Laguna (CALABARZON) and Marinduque (MIMAROPA) have been characterized by a research team from the Bicol University-College of Agriculture and Forestry (BU-CAF). The characteristics of the two varieties are shown in Tables 4 and 5. The mean starch recovery of arrowroot samples taken in Marinduque (15.4%) is higher than that of the arrowroot samples in Laguna (9.7%).

In the island province of Marinduque, some 20 farmers in the municipality of Sta. Cruz started growing the arrowroot plant over a total area of 18 ha to produce arrowroot flour. The flour is sold to the local bakeries for the production of arrowroot cookies that have become popular as a specialty product of the province. The arrowroot rhizomes are processed manually by the farmers themselves that is a very tedious and time consuming process.

Manual Processing for Starch Production

The manual processing method starts with the washing of the rhizomes in a basin of water. After washing, the clean rhizomes are fed in between two rolling coconut logs with a wooden base. This process is called arrowroot crushing with rasping. It takes an hour to rasp 15 kg of rhizomes. The rasped arrowroot is then sieved and the starch milk is allowed to settle in the settling tank. The starch sediments are washed with water four to five times and the final starch sediments collected are subjected to sun-drying for three to five days. The clumps of dried starch are manually crushed and sieved to produce fine powder or flour. The starch yield with this process is 9-11 percent. For lack of quality control, sometimes the flour produced is of sub-standard quality. Details of traditional processing method in use are given by Metinis *et al.* (2005).

Table 4. Characteristics of arrowroot samples in Laguna

Parameters	Size of rhizomes		
	Large	Medium	Small
Quantity (%)	75	15	10
Rhizomes dimension			
Length (mm)	278	221	135
Diameter (mm)	49	35	21
Weight (g/pc)	183	71	28
Initial mc (%)	80.1	82.9	81.5
Starch yield (%)	11.0	7.5	10.7
Starch mc (%)	10.2	10.5	10.3
Meal yield (%)	9.5	10.0	8.0

Source: Malinis *et al.* (2005).

Table 5. Characteristics of arrowroot samples in Marinduque

Parameters	Size of rhizomes		
	Large	Medium	Small
Quantity (%)	80	10	10
Rhizomes dimension			
Length (mm)	350	271	177
Diameter (mm)	57	41	28
Weight (g/pc)	225	83	31
Initial mc (%)	80.1	79.0	80.0
Starch yield (%)	16.0	15.4	14.9
Starch mc (%)	10.2	10.2	10.3
Meal yield (%)	9.5	8.0	8.5

Source: Malinis *et al.* (2005).

Technology Development

Improvement of Arrowroot Processing: The proprietor of Rejano's Bakery in Sta. Cruz, Marinduque pioneered in the manufacture of arrowroot cookies in the province (Figure 12). The popularity of the specialty product created great demand for high quality arrowroot flour. This prompted the proprietor to promote the cultivation of the crop among farmers in several municipalities of the province to expand production and to warrant the setting up of an arrowroot processing plant (Figure 13) utilizing machines for the extraction and drying of flour.

In 2003, Rejano's Bakery requested the assistance of BPRE in mechanizing the processing of arrowroot. As there were no commercially available machines developed specifically for arrowroot, BPRE linked with the Bicol University-College of Agriculture and Forestry and a private machinery manufacturer to undertake R and D work for the adaptation of existing root crop processing technologies to arrowroot processing. Based on the developed machines,



Figure 12. Arrowroot cookies made from arrowroot flour.



Figure 13. The newly established arrowroot processing plant.

a processing plant for arrowroot was established by the Rejano's Bakery in 2005 (Figure 13). Testing of the processing system showed an actual capacity of 640 kg of rhizomes per day with a flour recovery of about 16 percent.

Successes Achieved

Benefits of Adopting New Technology / Mechanized Processing: The total investment cost of the mechanized system is P195,000.00. Financial analysis of the integrated system showed that the return on investment is 56.5 percent and the payback period is 2.16 years. The processing system was assumed to operate at the actual input capacity of 640 kg/day (8 hours/day).

Benefits to Farmers and the Community: The establishment of the arrowroot processing plant, coupled with the aggressive promotion on the cultivation of arrowroot in the province has provided farmers the opportunities for added source of income. The number of farmers engaged in growing arrowroot has increased to 274, cultivating a total land area of 70 ha in six municipalities.

The introduction and adoption of improved production technology has resulted in average yield increase of 1 MT arrowroot rhizomes per hectare. It was estimated that, on per hectare basis, the return on investment in arrowroot production ranges from 15 to 20%.

With the processing plant, a ready market for arrowroot rhizomes for the farmers was developed so that the individual farmers did not have to do the tedious and inefficient process of manually extracting the flour and just focussed on arrowroot production.

For its part, the food-processor who utilized 90% of total flour output of the processing plant was able to expand the bakery business on arrowroot cookies. On the other hand, the processing enterprise generated a total of 15 regular jobs for the community.

Strengthening Institutional Linkages and Support

The support of other institutions was sought in the implementation of the project (Figure 14). DA through the provincial agriculture office (PAO) extended support in training of existing as well as potential arrowroot farmers on production protocols and production planning to produce high quality rhizomes and to extend processing period respectively, thereby maximizing the utilization of the processing plant.

DOST, through its regional office, extended the arrowroot shredding technology and provided financial assistance through a soft-loan amounting to P2 million for

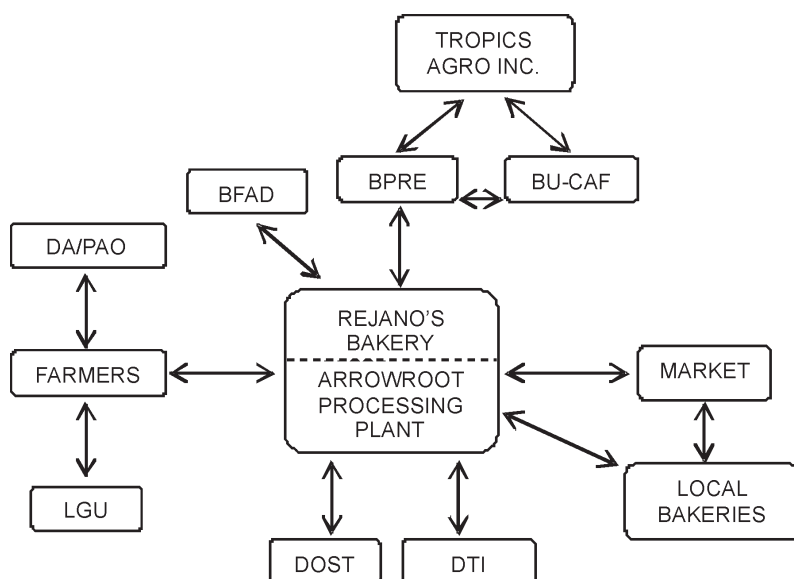


Figure 14. LFM: Linkages associated with the arrowroot processing enterprise.

processing equipment and working capital under its Small Enterprise Technology Upgrading Program (SETUP). It also assisted in the design of packaging materials.

DTI extended training on GMP while BFAD analyzed the arrowroot products in terms of nutritive value and food safety as the basis for granting a licence to sell flour as well as the finished product.

LGU at the municipal level contributed their share by assigning municipal coordinators that linked the arrowroot farmers in marketing their produce to the processing plant.

V. Factors Underlying Success

The collaborative efforts of the stakeholders involved paid off well in achieving the desired goals of linking farmers to markets – widening LFM initiatives, particularly improving market access to smallholders’ – farmer entrepreneurs, cooperatives. The rural based enterprise in each case study on cashew, citrus and arrowroot, proved that it is technically sound, financially workable/feasible, socio-economically beneficial and socially acceptable. Besides, more importantly, it proved gender friendly with larger participation of rural women. Interestingly, it also emphasized that woman could take up the challenge effectively and efficiently, and were successful as entrepreneurs. The micro-enterprise/cooperative in each case study had an element of capacity building/HRD for rural sector to train farmers and other participants. This led to more trained manpower to take-off technology adoption at all operational levels of processing – marketing aspects. This exposure also led them to adopt organized way of working in a participatory mode; which in turn led them to be a part of organized management, leading to standard product development.

The essential feature of each case study was the concern and interest of different institutions working on R&D, extension aspects, etc., in supporting the program/project. As per needs, several public/government and non-government organizations (NGOs) and in case of arrowroot, a private sector entrepreneur joined hands to provide collective inputs.

Concerns on market trends and demand, focuss on R&D *vis-à-vis* technology transfer, led to better product and new product development. Such interventions on value additions paved way for development of small industry in each case, to cater to specific market demand. Further, better access to markets strengthened such LFM initiatives.

A good outcome of the above chain of events largely in the rural sector was that more avenues developed locally for farmers/farming communities and others growers to produce more raw material and supply this to the cooperatives, and cooperatives to expand processing industry to produce the desired standard marketable products.

Also, with growth of small scale industry, more jobs could be created, providing more income to the farmers’ communities. Thus, the whole venture contributed to mitigate poverty, promote rural uplift and thereby meet the Millennium Development Goals (MGDs). The overall successes based on the case studies are given in the Box below:

Successes Achieved in LFM Case Studies

- Profitability and sustainability of the cooperative enterprise.
- Stronger R&D institutional links and support; expertise of different departments utilized.
- Technology development and dissemination-focus on rural sector, smallholder farmers.
- Capacity building of small farmers, rural people locally involved in processing – production.
- Emphasis on quality products, value addition – generating more income as in cashew prunes/cashew wine, arrowroot cookies.
- Increased access to markets; more outlets for quality produce promoting market linkages with institutional buyers; stronger market orientation with focus on small farmers.
- Establishment and expansion of small enterprise brings more jobs; empowerment of women.
- Overall benefits to farmers; socio-economic benefits to the rural/farming community.

VI. Lessons Learned and Impact

The experiences narrated in the LFM studies as given in the above account point out to the following lessons learnt in the while process from processing, production to marketing.

The choice of developmental area-location, site of crop production is important so that raw material is available to operationalize LFM initiatives.

A feasibility study is important for establishing smallholders led micro-enterprises. It is necessary to assess the enthusiasm and commitment of rural sector farming community that they have the aptitude to be driven in this direction. Farmers' history and background effectively weighs such trends to contribute/adopt to new interventions/options, suited to raise their income. Undoubtedly, enterprising individuals in the rural community have a significant role to play in linking smallholder producers to growth in markets *vis-à-vis* demands for products produced.

Most important is that technology for such interventions is available so that technology transfer is feasible for faster adoption for product development and handling of marketable produce. Institutes working in this direction on particular crops/commodities must act as good facilitators and supporters of such enterprises – the above case studies amply support that such R&D initiatives are possible as diverse expertise exists among different institutes in government/public sector and also among private entrepreneurs.

Thus, creating linkages with relevant development – oriented entities is basic to the growth and sustainability of such enterprises taken up by farmers' led cooperatives. Also, government support is critical for product-quality products, product certification etc. to improve market access to smallholder producers.

Another impact of such successful ventures is the development of new emerging markets and expanding linkage with existing markets.

It was evident that market driven production and processing enterprise can have high chances of success. Emphasis need to be laid on value-addition and product development as per consumer demands as this has greater market impact with higher returns to the cooperatives/micro-enterprises as has been the case in the present study.

Also such successful case studies have impact on rural uplift and provide good example of expanding/undertaking similar interventions in other production areas *vis-à-vis* setting up of similar enterprises as also bringing more area under cultivation to cater to increased demand for raw material, thus benefiting smallhold farmers.

VII. Epilogue

This report deals with selected case studies which amply demonstrate the successes of smallholders' cooperative/micro-enterprises on linking farmers to markets. Two of these case studies are on cashew, one on citrus and the other on an underutilized minor crop, namely, arrowroot. The basis of successes has been the choice of sites of production of these crops, and the feasibility of taking up in a cooperative mode, efficient processing of harvested produce involving local farmers/community and other rural people, training them in the processing production process. More important in this context has been the support provided by the public institutions; Governmental, NGOs, and even as in arrowroot, of the private entrepreneur. Such collaborative mechanism in place, helped in the establishment of a sound rural-based small enterprise in each case, empowering women in this venture. Emphasis on standard product development, meeting market demand and finding out market access for the suitable produce led to expansion and providing more jobs to farmers' communities. More demand for the raw produce also helped on a well-conceived project and as per needs, pool in collective expertise of different stakeholders. It is felt that such case studies on linking farmers to markets will inspire others in a proactive manner to contribute to sustainable development and pave way for expansion of such micro-level smallholder farmers enterprises/cooperatives in other production areas of these crops, and also to undertake such LFM studies on other crops for local farmers' benefits. This publication by APAARI and its wider dissemination will help achieve such objectives, being promoted globally by GFAR under Global Partnership Program (GPP), with the involvement/support of CIAT as a facilitator.

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Annexure I**Cashew nut production in the Philippines
by region (2004)**

Region	Area (ha)	Production (MT)
MIMAROPA ^a	25,288	106,341
Central Luzon	1,971	8,289
Western Visayas	161	678
Ilocos Region	139	585
Northern Mindanao	70	292
CALABARZON ^b	58	246
Davao Region	36	152
Others	79	327
Total	27,802	116,910

Source: BAS (2004).

^a Comprising of Mindoro, Masbate, Romblon and Palawan Provinces.

^b Comprising of Cavite, Laguna, Batangas, Rizal and Quezon Provinces.

**Citrus (mandarin) production in the Philippines
by region (2004)**

Region	Area (ha)	Production (MT)
CALABARZON	2,230	7,144
Davao Region	779	4,052
Cagayan Valley	630	2,881
ARMM ^a	1,947	2,000
Central Luzon	509	1,288
CAR ^b	124	873
Bicol Region	1,763	822
MIMAROPA	695	405
Central Visayas	40	148
Others	200	715
Total	8,917	18,898

Source: BAS (2004).

^a Autonomous Region of Muslim Mindanao.

^b Cordillera Administrative Region.

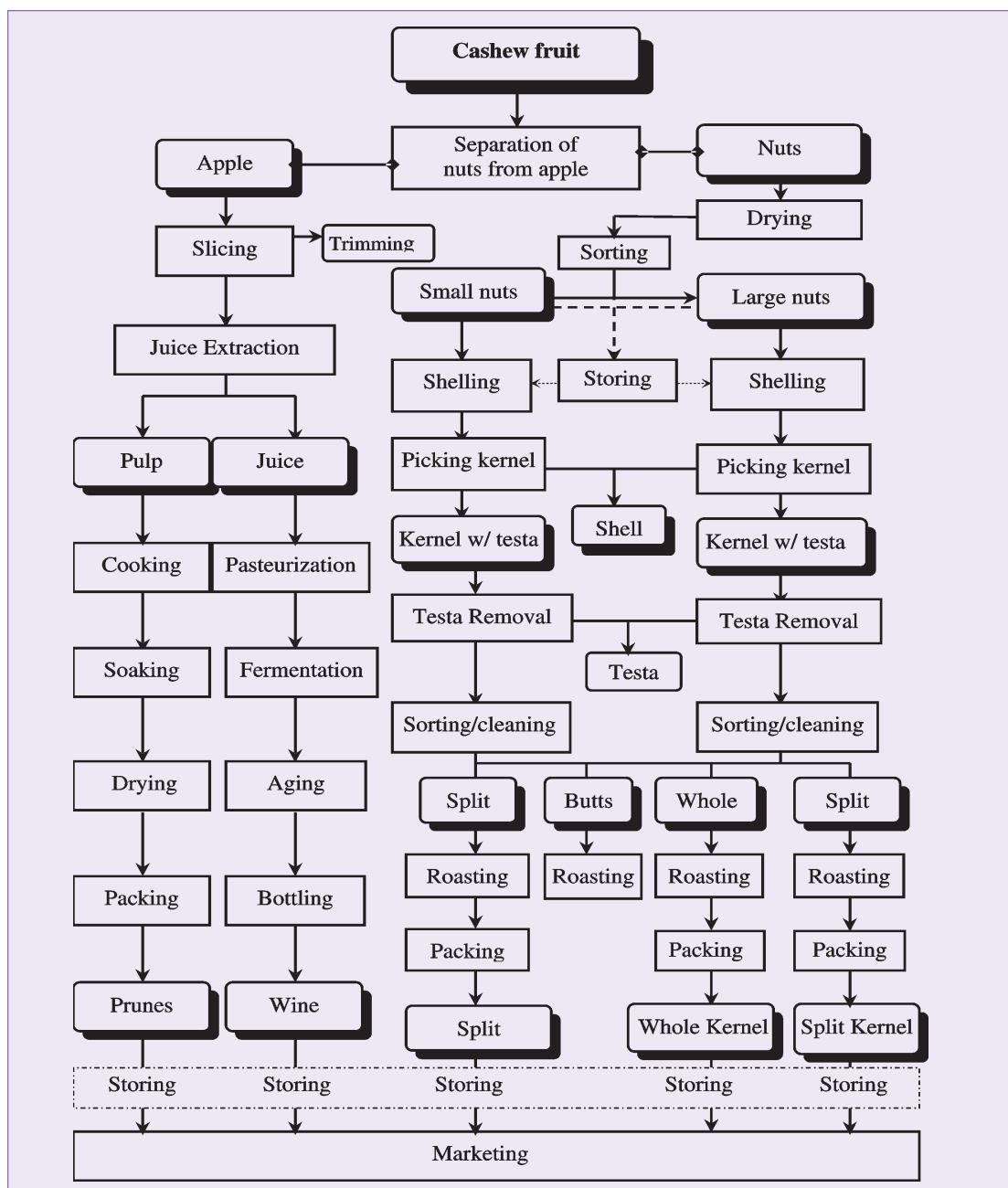
Annexure I Contd...**Arrowroot production in the Philippines
by region (2004)**

Region	Area (ha)	Production (MT)
MIMAROPA	179	1,500
Central Visayas	50	270
CALABARZON	33	260
Bicol Region	17	157
Central Luzon	16	85
Davao Region	12	63
Others	20	51
Total	331	2,386

Source: BAS (2004) (Also refer FAO, 2001; 2005).

Annexure II

Flow chart of the production process for whole and split cashew kernels, and for prunes and wine



Success Story of Linking Small Potato Farmers to Supermarkets: Some Case Studies of Wuchuan County in Inner Mongolia Autonomous Region of China

Dinghuan Hu, Kevin Chen and Hu Song

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Acronyms and Abbreviations

AMS	Aggregate Measurement of Support
APAARI	Asia-Pacific Association of Agricultural Research Institutions
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine
CIAT	Centro Internacional de Agricultura Tropical
CIDA	Canadian International Development Agency
DRC	Development Research Center
FA	Farmers' Association
FAO	Food and Agriculture Organization
FDI	Foreign Director Investment
GFAR	Global Forum on Agricultural Research
IPM	Integrated Pest Management
LFM	Linking Farmers to Market
MOA	Ministry of Agriculture
MOFCOM	Ministry of Commerce
MOH	Ministry of Health
NDRC	National Development and Reform Commission
RH	Relative Humidity
SFAGM	Small Farmers Adapting to Global Markets
SFDA	State Food and Drug Administration
SPS	Sanitary and Phytosanitary Measures
TOT	Training of Trainers
WHO	World Health Organization
WTO	World Trade Organization

I. Introduction

Background Information

The world has witnessed rapid economic growth in China for well over two decades and its achievements in more than 20 years since 1978. This rapid economic growth has promoted great changes in retail business in China as the consumers' incomes have increased. In order to meet the increasing demand of quality agricultural produce/commodity by the urban sector, effective measures were taken to strengthen the required infrastructure to promote farmers' links to market. With national support, this led gradually to better markets and the rapid development of supermarkets which started getting established by the end of 1990s. At present, supermarkets have become one of the main places where the urban consumers purchase their daily necessities. Of the mean total expenses of urban consumers in China, 20% was spent in supermarkets. The main proportion of agri-foods, including fruits, meat and other raw and fresh foods, has been marketed via supermarkets. In order to meet the consumer demands for safe and high quality agri-food products, many supermarkets have introduced value-added certified agri-foods such as the green and organic products.

On the upper stream of agri-food supply chain in China, there are over 200 million smallhold farmers' households with an average land-area less than 0.4 hectare. China's implementation of the policy of reforms during the late 1970s were initiated in rural areas, and resulted in the model of household-based contract system substituted by small household production model with family as the basic unit. The system of people's commune and production team was abrogated. Such bold reforms, pursued in rural areas have greatly mobilised the production enthusiasm of the farmers and the output of agri-foods has more than doubled. Thus, supply of agri-foods has become abundant from long-term shortages. However, while the problem of food supply in terms of quantity in China has been very much solved, that of food quality, especially food safety, has become more and more an issue. At present, there is a gap between traditional production system with family as the basic unit and modern agri-food supply chain with supermarket as the leader. While supermarkets need a great deal of high quality, safe and high value added agri-foods, most of the smallhold farmer households lack experience in cooperating with modern supermarkets and cannot meet standards set for food quality and safety. These emerging concerns/requirements have to be met, so as to facilitate supply and marketing of agri-foods by small holders to supermarkets, thereby resulting in higher income to farmers.

The rapid development of supermarkets, posed a challenge as to how to assist some of 200 million small farmer households to enter into the modern agri-food supply chain led by supermarkets. Small farmers need to be helped to change their traditional production practices, ideology and organizational forms which they have acquired and have been operating over a long period of time but which are not equipped to meet the requirement of supply of produce to the supermarket. The reality is that it is more difficult to change the small households' habits/perceptions than teaching them to adopt new technology. Not only a great deal of time and funds are required, effective methods are needed as well. The Chinese government has recently become aware of the necessity of remoulding small farmer households so as to suit the needs of market change. Owing to the shortage of funds, human resources, and practical experiences, the progress has been rather slow.

SFAGM Project

The Small Farmers Adapting to Global Markets (SFAGM) project was initiated between the Chinese and Canadian governments in April 2003. The project is of five and half years and funded by the Canadian International Development Agency (CIDA) and executed by Agriculture and Agri-food, Canada and the Chinese Ministry of Agriculture. The objectives of this project are to provide technical assistance to help small farmers in the Western Provinces of China to adapt to the changing market conditions after China's accession to the WTO in November, 2001. Many approaches have been experimented including good agricultural techniques, improved extension methods and system, on farm quality and food safety assurance, development of farmers' corporatives and other organizational reforms to increase production and marketing of value added agri-foods. These approaches will help small farmers to share benefits from the development of agri-food supply chains. The Wuchuan County of Inner Mongolia is one of the six pilot projects operated under SFAGM. The project has made tremendous progress towards the development of modern potato supply chain in Wuchuan County, and has explored various ways to include small farmers in the new system. This report presents case studies on potato implemented in Wuchuan County and highlights the successes achieved in spite of several constraints faced by small farmers. The synthesized information provided is meant to share the experiences and lessons learnt on helping small farmers to enter into modern supermarket supply chains –a successful method of linking farmers to markets.

II. Wuchuan Potato Industry

Potato in China and IMAR

Potato was introduced in China around Wanli Period of Ming Dynasty (1573-1619) (Zhai Qianxiang, 1987, 2001, 2004). It was at first cultivated in hilly regions of Sichuan, Guizhou, Yunnan, Hubei, Hunan, Shaanxi and other provinces where the climate is good for its growth. Since the 20th century, along with the progress of cultivation techniques, the cultivated regions of potato progressively expanded to Shanghai, Xinjiang, Shanxi, Fujian, Gansu, Taiwan, Jilin, Heilongjiang, Inner Mongolia, Liaoning and other provinces as well as autonomous regions (He Bingli, 1985).

The main benefit of cultivating potato is that more food energy can be produced from per unit land. In early stages, potato was used as a staple/food crop in main potato-producing areas. Therefore, during 1950-1970 when the Chinese people went short of food supply, the cultivated area of potato increased. Since 1980s, it increased still further. Along with the continuous development of potato for industrial use and the improvement of processing techniques, such as the extraction of potato starch, potato chips and potato bars and also the processing techniques of binder, gourmet powder, malt sugar, glucose, lactic acid, acetic acid, and so on with potato as raw material, these new requirements further promoted the sustainable development of potato industry in China.

The cultivated area of potato in 1961 in China was 1.30 million ha and it increased to 4.88 million ha in 2005. The output of potato in China increased from 12.91 million tons in 1961 to 70.87 million tons in 2005. There is great difference in cultivated area of potato in different regions. The top provinces with the largest cultivated areas of potato are Guizhou, Inner Mongolia, Gansu, Yunnan, Sichuan, Shaanxi, Heilongjiang, Shanxi and Hebei provinces. Also most of the provinces or autonomous regions with the largest cultivated areas of potato are situated in the central and west China which is economically less developed compared to other provinces in China.

Potato in IMAR

Inner Mongolia Autonomous Region (hereafter referred as Inner Mongolia) is situated in north China. It stretches from northeast China to southwest China and is physiographically varied. The total area of Inner Mongolia is 1.183 million sq.km, which occupies 12.3% of that of the whole country and ranks in the third place. The total population of Inner Mongolia is 23.8 million, which includes the rural population of 13.5 million, and consists of 49 nationalities including Mongolian, Han, Man, Hui, Dawo'er, E'wenk, E'lunchun, Korean, and others.

The Nenjiang Xian Plain, Xiliaohe River Plain, Tumote Plain, Hetao Plain and Huanghe Nanan Plain are situated in the east of Inner Mongolia. The terrain is smooth, with enough water and soil is fertile. So this region is the main food crop and cash crop producing area of Inner Mongolia.

The Inner Mongolia possesses a temperate-continental monsoon climate. The annual precipitation is little and its distribution is not uniform. The wind velocity is high and temperature variation in summer and winter is severe. The precipitation decreases progressively from northeast to southwest. The annual total precipitation is 50-450 mm. The soil is mostly sandy with strong permeability. The annual mean temperature is 0°-8°C. The mean annual difference in climatic temperature is 34°-36°C and the mean daily difference, 12°-16°C. These natural climatic conditions are good for potato cultivation.

The cultivated area of potato in Inner Mongolia is 0.553 million ha and the gross output of potato is 7.52 million tons, occupying the second and third places in China, respectively.

Potato Production/Industry in Wuchuan

Wuchuan County is an important potato producing area of the Department of Agriculture of IMAR. It is located 50 km north of Huhhehot City and Yinshan mountains. This county is situated on highland and has a cold climate. Potato is a major crop in Wuchuan County (Figure 1). The gross cultivated area of potato is 0.7 million mu (46,667 ha) which is 1.45% of that of the whole country. The annual mean gross output is 0.87 million tons which is 2.18% of that of the whole country. The annual output of fresh potato is 0.55 million tons and the money earned is about 29.3 million US\$. Potatoes produced in Wuchuan County are mainly dispatched to the markets of north China, such as Beijing, Tianjin and other regions. A relatively large amount is also sent to the markets of south China, such as Nanjing, Shanghai, Hangzhou, Guangzhou and other cities.

Varieties grown: All seed potatoes used in production are of high quality varieties and they have been treated for virus eradication, so they are basically virus-free potatoes. Wuchuan has more than 10 potato varieties belonging to table potato, edible potato and processing type potatoes. The production of table potato accounts for 60% of the total, that of direct edible potato 20% and the remaining potatoes are of processing type. The varieties Zihuanbai and Kexin No.1 are table potatoes; Jinguan, Feiwu Reita, Daxiyang, and Xiabodi are used for food processing, and Youdixirui, Longshu No.3, Bashu No.10 and others are used for processing starch. Generally, the individual weight of fresh Wuchuan potato is about 0.25-0.5 kg and the storage life is more than one year. Wuchuan County has a high altitude and the



Figure 1. Potato cultivation in Wuchuan County.

air and water are not polluted. Farmers in this county mainly use farm manure and very little of chemical fertilizers, so potatoes produced are non-polluted ones.

Potato Processing and Product Development

Western fast food chain stores like MacDonald and KFC are among the biggest potato consumers. SIMPLOT Company is the only potato supplier to MacDonald chain stores in the northern market of China, and is responsible for supplying processed potato chips. Initially, SIMPLOT mainly purchased potatoes directly from the market. The varieties were Zihuabai, Kexin No.1 and Shepody, but from 2002 SIMPLOT began to purchase Shepody only. Because MacDonald required its products to be consistent in quality and potatoes supplied by small farmers varied in quality due to disparity in irrigation and fertilizers, SIMPLOT stopped purchasing from small farmers and began to sign contract with larger farmers having mechanized farming. Although SIMPLOT is strict with suppliers, the purchase price is relatively high. Another benefit is that the company buys total produce of potatoes at contracted price, and so the supplier can get a stable income. SIMPLOT requires its

suppliers to use mechanized operation in growing, irrigation and harvest so as to keep potato quality consistent. High level mechanization and fixed investment have been the major constraints of farmers with small capital. SIMPLOT requires its supplier to have large piece of land, each piece with an area of at least 60 ha, but the average land of small potato farmers in Wuchuan is only 3-6 ha. Though Wuchuan region has physical conditions to supply potatoes to SIMPLOT, high level mechanization and requirement of large areas of land are difficult to achieve.

Apart from French fry and potato chip processing industry, China has a starch processing industry based on potato as its raw material. In recent years, the demand for potato starch in the domestic market has rapidly increased. This is mainly due to the increase in demand for using fairly good quality potato starch to substitute sweet potato starch by the restaurants. Wuchuan County has 7 potato starch processing enterprises, which use sub-standard potato under the diameter of 3 cm. Due to the fact that this kind of potato is limited in quantity, in order to obtain adequate raw material, the competition among the enterprises is very severe. The Wuchuan Sanlian Starch Plant is one of them. This plant was a potato starch processing plant established in 1999. It needs 70,000 tons of potatoes each year. Because of fierce competition, it had only purchased 8500 tons of potato in 2005. In order to guarantee raw material supply, the Sanlian Starch Plant has signed contract with the farmers and given them subsidy in the form of 350 RMB yuan each farmer to purchase potato-sowing machines, the plant had let the farmers who had signed contract with it to have loans from the agricultural credit. Due to the fact that the potato starch processing enterprises had used the sub-standard and low price potatoes, it accounted for a very small demand and could not solve the issue of increase in farmers' income.

Potato Distribution/Marketing

Before the implementation of SFAGM project in Wuchaun, there were three channels for small potato farmers to sell their produce in Wuchuan: (i) they sell their produce through brokers to wholesalers, about 80% of total potato production being sold, this way. (ii) to sell their produce to local wholesale markets; there are several wholesale markets in Wuchuan. By this way farmers can save agent fee charged by brokers, but farmers need vehicles for transportation at the time of selling as well as experience for marketing their produce. Because of these constraints most of small potato farmers were reluctant to sell their products directly to wholesale markets by themselves. (iii) they sell potatoes to starch processing manufacturing units.

The main channel of potato distribution in Wuchuan County is the wholesalers from other provinces or cities who purchase potatoes through the local brokers. Most brokers are potato farmers themselves with relatively higher level of education. The main job of the broker is to help the wholesalers to purchase potatoes. The broker is very familiar with the conditions of the village. When the wholesalers find the brokers, they help them to contact the households who want to sell potatoes. The brokers also help the wholesalers to load a truck with potatoes from households and they charge 25 US\$ of service fees for each truck. The brokers also arrange accommodation for the wholesalers freely. The qualified brokers have a group of long-term collaborating wholesalers on their list. Some brokers also store potatoes in potato storage cellars and sell them at higher price later as per demand.

The potatoes purchased by the wholesalers are transported in trucks to Beijing and Tianjin and other Northern cities' wholesale markets. Also a great deal of potato is transported by train to the Southern markets such as Nanjing, Shanghai, Hangzhou, Guangzhou and other cities. The average transport cost of potatoes from Wuchuan County to Beijing market by truck is 20-25 US\$ /t while that from Wuchuan County to Shanghai market is 40-45 US\$ /t by train.

The wholesalers in Beijing, Shanghai and Guangzhou markets are classified into the first grade and the second grade wholesalers. The first grade wholesalers are those who transport potatoes directly by truck or train from the producing area to the wholesale markets. The second category of wholesalers are those who purchase potatoes from the first grade wholesalers and then sell them to retail traders, restaurants, and local tradesmen of supermarkets. Potatoes produced in Wuchuan County are well-known in Beijing wholesale markets and they are recognized as high quality potatoes. The wholesale price of Wuchuan potato is 2.5 cents/kg higher than that of the similar quality potatoes produced from other places.

III. Development of Supermarkets in China: New Markets for Potato

Expansion of Supermarkets Chain Stores

The advent of supermarkets chain stores in China is relatively a recent development that followed the rapid economic growth and urbanization. In 1990, the establishment of Jiamei Supermarket in Dongguan City, Guangdong Province was a starting point of rapid development of supermarkets in China. Since the mid 1990s, supermarkets have increased rapidly; as also the volume of sale and the number of supermarket chain stores. These developments can be highlighted as follows: In 1994, the sales of supermarkets in China was only 3.154 billion Yuan (RMB) and the number of supermarket stores was only 2,500. In 2001, according to the 100 top chain enterprises of China supplied by China Chain Supermarket Operating Association, the number of supermarket chain stores reached 6,863 and the volume of sales was 122.4 billion Yuan in 2001. Among these supermarkets, the number of domestically owned supermarkets was 6,503 and the sale figures were 112.2 billion Yuan, while the number of foreign owned supermarket stores was 360 and their sales were 10.1 billion Yuan.

By 2006, the number of supermarket chain stores was 675,729 and the volume of sales was 629.3 billion Yuan. Of them, 74 were domestic owned supermarket chains and the number of chain stores was 673,071, and the volume of sales was 729.1 billion Yuan. Nine of these were foreign owned supermarket chains, the number of stores was 2,658, and the volume of sales was 126 billion Yuan (Figure 2).

From 2001 to 2006, the average rate of increase in sales of supermarkets was as high as 69%. The average rate of increase in sale of chain stores was 114%. At the same time, the proportion of sales volume of chain supermarkets to the total retail sales increased from 0.18% in 1994 to 37% in Shanghai, 29% in Beijing, 29% in Qingdao, 26% in Shenyang, and 23% in Tianjin, respectively.

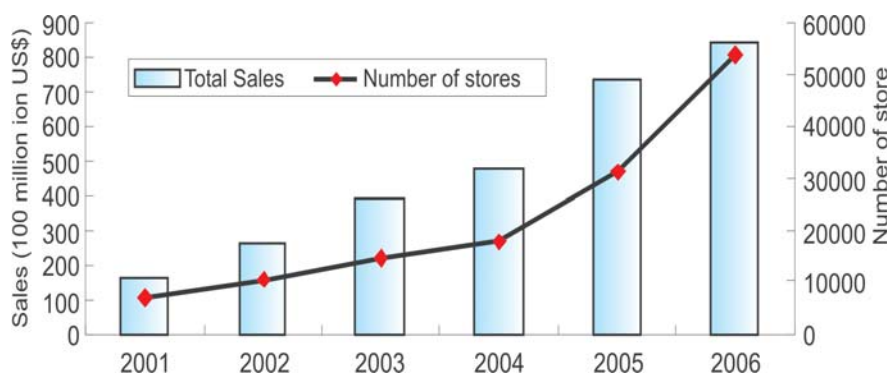


Figure 2. The sales and stores of supermarkets Chain in 100 top retail companies (2001-06).

Processing/Procurement Pattern

Along with the expansion of supermarkets and severe competition among them, the procurement system adopted by supermarkets at the initial stage has changed gradually. The changes in purchasing pattern of supermarkets can be classified into three stages. The first stage at the beginning of the 1990s was the embryonic stage of the development of supermarkets in China. There were only a few supermarkets selling agri-foods and they sourced agri-foods from wholesalers. The second stage was the mid-1990s, when, owing to their rapid development, supermarkets started to source agri-foods from specialized suppliers. The third stage initiated in 2000, when supermarkets began to source products directly from the foreign areas to ensure the quality and safety of agri-food products (Table 1).

Supermarkets' Demand for Quality Potatoes

Along with the increase in consumers' awareness about food safety, some supermarkets have introduced green and organic vegetables. Prof. Dinghuan Hu

Table 1. Changes in purchasing pattern of supermarkets (Unit : %).

Supermarket	Year	Supplied by suppliers	Purchasing from wholesale market	Purchasing from producing areas	Total
CR Vanguard	The 1 st year of establishment 2005	70	30	0	100
		100	0	0	100
Huanlian	The 1 st year of establishment 2005	70	30	0	100
		100	0	0	100
Jian-Mart	The 1 st year of establishment 2005	50	50	0	100
		100	0	0	100
Jingkelong	The 1 st year of establishment 2005	50	50	0	100
		40	0	60	100
Shijilianhua	The 1 st year of establishment 2005	50	50	0	100
		80	10	10	100
WuMart Stores	The 1 st year of establishment 2005	30	50	0	100
		70	20	10	100
Chaoshifa	The 1 st year of establishment 2005	0	50	50	100
		34	33	33	100

Source: Author's survey, 2006.

and his students carried out investigations on 101 supermarkets in Beijing in 2007. Results of investigations show that among the 27 FDI supermarkets investigated, the percentage of green and organic vegetables account for 59.3% of the total, while for the 74 domestic capital supermarkets, it is 41.5%.

In addition to green and organic agri-food, the supermarkets also deal in many common agri-foods too. According to the food safety regulations of the government, the agri-food marketed by supermarkets must be pollution-free. Pollution-free agri-food refers to agri-food that is not polluted by hazard materials during the production process; product that does not contain toxic material or the residual of insecticide is controlled within the residual limits of the national regulations or the residual limits of FAO and WHO. In other words, insecticides nitrate and other hazardous materials do not exceed the set standards. The standard of pollution-free potato stipulated that the seed potato must be selected from a virus resistant variety. The technical specifications of non-pollution potato production are given in Annexure I.

The major constraints that need attention are that the small farmers lack experience of getting in touch with the modern retail industry. They also lack awareness about product quality. For example, they are not aware of standardization and grading of products and how to comply with the contract. The traditional system prevalent since the beginning of potato growing by small farmers is facing the impact of the rules and standardization of modern retail commerce, particularly those of quality and safety standards for small farmers to enter the supermarkets. If they receive support, this process might be very short, and the benefits to the small farmers will be much greater.

Supermarkets have started to show an inclination to purchase potatoes from producers due to the food safety problem in the wholesale markets.

Supermarkets at Beijing and Hohhot

Supermarkets in Beijing have developed very rapidly. From 1994 when the earliest standardized modern supermarket was established, to 2004, when Beijing had a total number of 83 chains of supermarkets, supermarket stores had spread all over in Beijing. In 2005, the total commodity market volume of the supermarkets in Beijing had reached 8.21 billion US\$, accounting for 29.2% of the total commodity retail marketing volume (28.1 billion US\$). The rapid development of supermarkets is not only closely related to urbanization, rural income levels and foreign direct investment, it is also related to the relevant policies of the government, for example, the implementation of “shift from agriculture to supermarket” policy. However, the “Development Plan of the Agri-food Distribution System of Beijing Municipality

during 2002-2008” jointly initiated by the Beijing Commerce Commission and Beijing Development and Planning Commission in 2002 pointed out that in 2008, the chain of supermarkets, community vegetable markets will reach a proportion of over 90% of the total agri-food marketing volume, while the marketing proportion of wet market will decline to less than 10%.

Supermarkets in Hohhot started to develop in 1997, and their number now is more than 30. The supermarket stores have become an important component of the retail industry in Hohhot. Its main characteristics are that the investment and management is from outside of Hohhot, such as Hualian supermarket in Beijing, Hualian supermarket in Shanghai, Weiduoli, Wangfujing, Meite Supermarket in Shanxi and other enterprises. The biggest supermarket belongs to the Beijing Hualian Group, which has Jintai store, Weiduoli store, Jinxing store, etc. that are the biggest large-scale retail stores. The daily marketing volume has exceeded 73,000 US\$ with an annual average of 27 million US\$ per store.

The reason of supermarket development in Hohhot is that it is promoting urbanization and agricultural-livestock industrialization, and goes all out for an integrated distribution pattern of establishing large markets, expanded distribution and trade, which has enabled a rapid development. The second reason is the increase of resident income, the per capita disposable income of urban residents in Hohhot is 1874 US\$, an increase of 15.7%. Moreover, the consumption consciousness has also increased, with improved consumption levels and a trend of shopping in the supermarkets.

IV. Linking Small Potato Farmers to Supermarkets: Successes Achieved

Initial Efforts

Under the promotion of policies and services provided by the local government and with the efforts made by local farmers, potato growing has become a leading industry of Wuchuan County over more than 10 years. However, the distribution and marketing of potato still continues to be a bottleneck inhibiting the development of this industry. The Wuchuan County government and farmer households have been worrying over the distribution of potatoes for a long time. When CIDA project supported by Canada was initiated in Wuchuan County, the local government had focussed on the resolution of the problem of marketing of potato as the first priority that needed to be supported by the project. Accordingly, the specialists in agri-food supply chain and marketing from Beijing were invited to study this problem. The specialists proposed after research that a new channel for distribution of potato should be evolved to transport potatoes to supermarkets in Beijing, Tianjin and Shanghai. The CIDA office and Wuchuan County government agreed with the specialists. However, the problems faced are that what kinds of awareness methods to adopt to educate scattered small farmers to market potatoes produced by them to supermarkets and let them get higher economic profits.

Training and Market Survey

In order to foster local potato farmers/suppliers with organizing ability, the small scale household project entrusted China Agricultural University to organize training classes for farmers and small and medium sized enterprises in Huhhot, the capital of Inner Mongolia Autonomous Region. There were more than 30 people including officers of the government departments, technicians from the town and village stations for popularizing agricultural technology. The potato growers and others who are interested in potato marketing participated in the training. Good results were obtained by imparting such knowledge *vis-à-vis* awareness.

As a follow up of this training, the participants, mainly farmers growing potatoes, in May 2005 carried out potato marketing survey led by Liu Wenxiang, the coordinator for Wuchuan potato pilot project of CIDA. The survey team visited supermarkets, farm-produce fairs, wholesale markets of agricultural products, the distributing centers of raw and fresh agri-foods of supermarkets in Beijing. They also visited some special purchasers of potato, such as SIMPLOT Company. SIMPLOT Company supply raw materials of fried potato bars for KFC and McDonal's. The investigation revealed that although the quantity of potatoes marketed in

supermarkets was still small at that time, but the prospects for potato marketing were very good.

The survey group also interviewed some consumers in Beijing by using a questionnaire. The results of the investigation showed that many consumers are willing to pay higher price for potatoes with good appearance meeting quality and safety standards. They also found that the ordinary consumers were not much concerned/aware about this.

In the investigation carried out in the wholesale market of agricultural products in Beijing, they found that potato-wholesalers in Beijing know much about potatoes produced in Wuchuan County and that Wuchuan potatoes are of the best quality in Beijing wholesale market. On the contrary, the vegetable retailers and individual traders and peddlers in wet markets in Beijing do not know much about Wuchuan potato and they only take interest in the appearance and price of potato.

The survey group visited Carrefour Supermarket with samples of potatoes. The purchasing manager carefully observed the samples and felt that the quality of potatoes was very good. As at that time some other suppliers were supplying potatoes to Carrefour, so the supermarket did not want to put new suppliers on its list. Carrefour took an interest in the coloured potatoes and told the survey team to deliver some of these potatoes to Carrefour for test-marketing. Carrefour asked Wuchuan party to resolve the problem of transportation and distribution of potatoes and also that potatoes should be distributed to 7 large stores of Carrefour, scattered in different districts of Beijing before 6:00 in the morning. The distance from Wuchuan to Beijing is 600 km. Distribution of a small quantity of potatoes with low added value for each store of Carrefour is not worthwhile in transport cost. So the business between the two parties did not materialize.

Some Successful LFM Case Studies

• Case Study of a Household Farmer: Woman Entrepreneur

This relates to the experiences of a woman entrepreneur – Ms. Wu Qiong who was in the survey group that visited Wu-Mart Supermarket, which was planning to change its agri-foods purchasing pattern at that time. Wu Qiong was a participant of Huhehot training class and potato market investigator and also a department manager of a security company. After getting the training, Wu Qiong got interested in marketing potatoes. She wanted to popularize Wuchuan potato through building brand and transporting potatoes to supermarkets. She and the purchasing manager of Wu-Mart supermarket reached an agreement on supplying the supermarket with Wuchuan potatoes.

After the market survey, Wu Qiong wanted to conduct the test of marketing Wuchuan potato to Wu-Mart stores and other supermarkets in Beijing. The CIDA gave Wu Qiong support. The project helped her design the brand mark, and application for the brand mark and registration of company. The project gave Wu Qiong help in human resources, technology and designing, but all the expenses were borne by Wu Qiong herself.

In August 2005, Wu Qiong went to Beijing again accompanied by the project coordinator, Liu Wenxiang and negotiated with the purchasing manager of Wu-Mart stores about potato supply. The two parties discussed details in packing of products, propagation, delivery, quantity and methods, and so on. In September 2005, Wu Qiong and others went to Beijing again and discussed with Wu-Mart stores about the business in detail. However, this time Wu-Mart stores asked Wu Qiong to pay the cost of acquisition and promotion expenses. Considering the cost of acquisition of each store (300 US\$); and that Wu-Mart have over 30 stores, the estimated expenses were 12,000 US\$. This was unexpected and Wu Qiong could not bear the costs. The cost of acquisition was reduced to 2000 US\$ through several negotiations between the two parties. After signing the agreement, Wu-Mart stores showed interest in carrying out the agreement and the purchasing manager eagerly awaited the supply of potatoes.

In the middle of September 2005, Wu Qiong purchased 2 tons of potatoes from farmer households in Wuchuan County and she hired some manual workers to select and pack potatoes. Another problem she faced was the transporting of potatoes - what means of transport to use to deliver the potatoes from Wuchuan County to the distribution centre of Wu-Mart stores in Beijing. The cost of transportation of 2 tons of potatoes from Wuchuan to Beijing by truck was too high as the quantity of potato was too small. At last, she decided to transport these potatoes by using vehicles transporting other goods. While the company was ready to supply the transport, the cost was very high.

The next day, a truck carried 2 tons of potatoes and other cargo from Wuchuan County to Beijing, but the truck was very slow and a distance of only 600 km was covered in 18 hours. The truck reached Beijing suburbs at 10:00 on the next evening, as traffic control was in practice in Beijing city and the city area was closed to trucks before 12:00 in the evening. As the distribution centre of Wu-Mart is located in the city area, so the truck had to transport potatoes to the distribution centre the next morning. As there were no porters in the early morning, Wu Qiong and the driver had to unload potatoes from the truck and move them to goods-receiving place. As a white collar staff member, Wu Qiong had never done a work like this. The transport cost being very high and recovering the total cost of potatoes (0.29 US\$ /

kg) was not possible being higher than the purchasing price of Wu-Mart stores. Wu Qiong had been losing more than 130 US\$ in sending 2 tons of potatoes for sale and so she was not willing to continue selling potatoes. However, Wuchuan potatoes were selling very well in Wu-Mart stores and 2 tons of potatoes were sold out in less than two days. But marketing of Wuchuan potatoes through the supermarket ended up in a loss.

• Case Study of Fukang Potato Farmer Association

Linkages of Small Farmers with Supermarkets

Kang Rui, Chairman of the Fukang Potato Farmer Association has 5.33 ha of land where potatoes are grown. Before establishment of the association, besides growing potatoes, Kang Rui was also a commission broker. His work was to help wholesalers from other places to purchase potatoes. The wholesalers had been purchasing potatoes from Tianli Mutu village since 1995. Before 2000, wholesalers from other places kept on changing. However, after 2000, these wholesalers sent regular suppliers and now about 20 wholesalers come here to purchase potatoes regularly.

Fukang Potato Farmer Association has a direct link with CIDA. A training class for the organization was run by CIDA in 2005. The experts from Canada explained the significance of farmer associations to farmers in the training class giving many examples from other countries. The farmers/students from Tianli Mutu village thus realized the need for a farmer association and this was established by the villagers themselves and the students who had graduated from the training class formed the backbone of this association. There were 60 potato growing households who entered their names for participating in the association during its meeting. Tianli Mutu village Fukang Potato Farmers Association was formally established on December 28, 2005. After one year, the number of members increased to more than 120. The aim of the association is to self-manage collectively the marketing of potatoes to markets in other places.

The association members share the work. Someone manages the purchase of potatoes from the local area, the other is in-charge of transportation, and someone else is in-charge of marketing. The association has organized 4 potato marketing groups and these groups were sent to wholesale markets in Wuhan, Tianjin, Beijing and Yuncheng of Shanxi Province.

The association purchases potatoes from association members and also from non-members, but the association members enjoy a more favourable price. The price of potatoes purchased from a full member is 0.25 cent higher than that from others.

As the salesmen of the association stay at wholesale markets in other places all the year round, so they know trends of the market price of potatoes very well. In purchasing potatoes, the association can decide the price and quantity of purchased potatoes according to market demand and price variation. Potatoes from the association possess higher price competitiveness in market as there are no intermediate links.

The association members enjoy the minimum protective price, which is 9.3 cent/kg. If the market price is lower than this potatoes are purchased by the association, and if the market price is higher than the minimum protective price, the association will pay 0.026 cent/kg more based on market price.

In 2006, professors from China Agricultural University were invited by CIDA to teach farmer households as to how to apply fertilizers to the soil. The professors took soil samples from the field, which were tested in laboratory, and the test results were told to farmer households and the professors taught them to apply fertilizers accordingly. Through studies, the association members have changed their traditional application method. The adoption of application of fertilizers according to soil quality not only reduced the use of fertilizers, but also increased the yield of potatoes by 30%.

It is not easy for the association to establish marketing windows of their own in wholesale markets of other places. There are factions in each wholesale market in different places and these factions collect protective fees from traders. These factions are called "Cai Ba Zi" (local vegetable tyrant) and they control the market. Usually there are 6 or 7 Cai Ba Zi in a large wholesale market and they have titles like the first tyrant, the second tyrant, and so on. Cai Ba Zi collect protective fees from all traders who market agri-foods in wholesale market. If the traders refuse to pay protective fees to Cai Ba Zi, no one in the market can dare to buy their agri-foods even if the price is very low. The association gradually understood the latent rules of wholesale market and had to build good relations with Cai Ba Zi, so the association has held its ground in these wholesale markets at last.

The association helps its members in potato production. It purchases seed potatoes from Inner Mongolia Seed Company. As the purchased quantity of seed potatoes is large, so the company provides free transportation and thus the cost of seed potatoes is reduced. The association also purchases fertilizers for its members from a large fertilizer company. As the purchased quantity is large, so the price can be low. In 2006, the association purchased more than 100 tons of fertilizers and these fertilizers were transported freely, so the cost of each bag of fertilizer get reduced by 0.2 US\$. The association plans to purchase 200 tons of fertilizers in 2007.

The objective of the association in 2007 is to develop pollution-free, green, and organic potatoes, and part of land has been kept for this. With the support of CIDA, the association plans to carry out authentication work of green potato through green food authentication centre of the Ministry of Agriculture. Once the green potatoes have been authenticated, the association plans to distribute potatoes to supermarkets, and thus potatoes will be sold at a higher price.

• Case Study of Chuanbao Green Agri-foods Association

Story of Selling Potato to Hohhot Supermarket

Wang Xilian, Chairman of Chuanbao Green Agri-foods Association, is a very capable woman farmer. She did not find stable work in cities after graduating from senior middle school and she came back to the countryside and engaged in agriculture. She got married in 1986 and she lives with her husband in He'er village of Wuchuan County. Her family contracted 0.87 ha land from the village government in 1988. This is a piece of alkaline land and not fit for growing any crops, so no-one in the village wanted it. Wang Xilian dug a well in the middle of the land and pumped water from the well to wash the alkaline land so as to improve soil and make it suitable for growing vegetables and in 1994 she was successful in her efforts. Wang Xilian made an investment of 2500 US\$ in 1997 to build 0.1 ha plastic film greenhouse. She grew tomatoes, cucumber and other vegetables in the greenhouse. At that time, in Wuchuan County vegetables were in short supply, so the farmer households nearby and residents from adjacent towns and even individual retailers from the town came to buy vegetables from Wang. Wang Xilian began producing vegetable seedlings in 1999, taught the farmer households nearby to grow vegetables, and she marketed the vegetable seedlings to farmer households who had learnt the growing techniques. Wang Xilian's annual income from raising vegetable seedlings was 1300 US\$. At the same time, she had also earned 700-750 US\$ from growing vegetables. Her annual income was fairly high in rural areas of Wuchuan County. As Wang Xilian had achieved great success in growing vegetables and in helping others to develop vegetable production, she was elected a deputy to Wuchuan County People's Congress and a deputy to Inner Mongolia Autonomous Region People's Congress soon afterwards.

The farmer households of He'er village introduced potato under the guidance of technicians of the town government and main varieties grown were Zihuanbai, Feiwuruita, etc. Wang Xilian has found that although the potatoes grow well and the yield is high, but the market for potato is not stable, thus bringing a great pressure on farmer households. Wang tried hard helping farmers in marketing potatoes and increasing their incomes, and thus also finding a new commercial opportunity for herself.

At the time when Wang Xilian was thinking of developing potato market, CIDA also planned to market potatoes to supermarkets. As in other places of China, the potato growers in Wuchuan County are scattered too. What kind of method can be used to organize the scattered farmer households together and how to lead them entering into modern agri-food market with supermarket as the representative? Through discussion, CIDA considered that a number of households with relatively high ability should be trained first in Wuchuan County and then these households will give impetus to others. Wang Xilian exchanged her views with Liu Wenxiang, field coordinator for Wuchuan potato pilot of CIDA and Liu Wenxiang agreed with her. The CIDA decided to train Wang Xilian. At that time, a symposium on potato was held in Hebei Province and Wang Xilian attended the symposium supported by the project. Wang Xilian learnt a lot and gained experience and information. Then CIDA started to support Wang in attending several types of training activities organized by the project, and relating to agri-food supply chain.

After training, Wang Xilian's thinking has become wider. She felt that the best way to resolve the problems of potato marketing is the establishment of farmers associations. The production and marketing of potato can be organized well by the association. Wang Xilian discussed with potato growers in the village contacting each household and asked them if they wanted to participate in the association. Some households were willing and some others were not. With her unrelenting efforts, Chuanbao Green Agri-foods Association was established in August 2005. There were only 50 households at the first association plenary session, but the number of members increased to more than 180 households in May 2007. Wang Xilian was elected the chairman of the association. They have purchasing and marketing department and a technical department in the association. The association guides/instructs the members in technology application and helps them in improving the quality of potato. The purchasing and marketing department purchases and sells potatoes for the members. The price of potatoes purchased from the members is slightly higher than the market price.

In order to open up the potato market, the association has registered a trademark "Chuanbao" which means 'Wuchuan's treasure'. The trademark shows the value of potatoes produced in Wuchuan County. With the registration of trademark, CIDA helped the association with designing the outer packing of potato. The CIDA supported the association in taking pictures, trademark-designing, and packing materials of products, and so on.

On October 1, 2005, brand potatoes of Chuanbao association were sold formally in the market. Chuanbao potatoes are fine ones. The selected high quality potatoes are packaged and marketed. There are two specifications in packed potatoes, one is

5 kg per paper box and the other is 15 kg per paper box. The main consumers of these kinds of potatoes are government departments, private enterprises, and schools. The sales volume of potato of the association was 20 tons in 2005 and all these potatoes were produced by association members. The association opened up wholesale trade of potato in other cities in 2006. The association purchased 600 tons of potato in that year and 150 tons of them were sold as fine potatoes to government departments, private enterprises, and schools. The remaining potatoes were marketed directly by purchasing and marketing department to private supermarkets in Beijing and Wuchuan County.

The association distributed potatoes to the supermarket in Hohhot city successfully in 2006. This supermarket showed interest in the fine potatoes packed in paper boxes and hoped that this kind of potatoes can be experimentally sold in the supermarkets. It was found that the fine potatoes were well-received by consumers and they sold well. Each month, 500 kg of fine potatoes were sold. By April 2007, the sales volume of fine potatoes had reached more than 3000 kg.

Researchers at CIDA project who helped Wuchuan County in strategic development of potato submitted a report on 'Strategic development of potato in Wuchuan'. The report pointed out that the strategic objective of potato industry will be the development of green and organic potato. There is no large scale industrial and mining establishment in Wuchuan County and the environment is good. The farmers in this county still adopt traditional farming methods and they do not use chemical fertilizers and pesticides in large quantity. Random sampling was done by CIDA in Wuchuan County and the samples were sent to Nuohan Laboratory for tests. Results of tests show that the safety of these potatoes matches European Community Standards. These potatoes also meet the standards for export to Japan, the most strict vegetable import country in the world. The report greatly inspired Wang Xilan and other association members. They realized that not only the packing of potato needs to be improved but more important, the quality and safety of potatoes should be improved. The association decided to grow green and organic potatoes.

In the spring of 2006, the association began work on development of selected areas for growing organic potatoes. They planned to develop 350 ha of an experimental base area. The association signed a contract with 180 farmer households who own these lands and asked them to grow potatoes according to the association's standards. The farmer households are required not to apply chemical fertilizers. The association also stipulated that each seed potato should be more than 150 g in weight and without insect holes and scars on its surface. In order to guarantee the quality, the association supplied technical service to growers, and also virus-free potato seeds for them at a price 40% lower than the market price. The association

also stipulated the lowest protective price for purchased potatoes. At harvesting period, the association purchased potatoes produced from the experimental lands at price of 0.2 US\$ /kg. As the marketing channel has not been found yet, so a part of potatoes purchased by the association are used as fine potatoes and the remainder are sold to hotels, restaurants, and agri-food wholesale markets.

The 2008 Olympic Games will be held in Beijing. The Beijing Municipal government is to supply food for Olympic Games. The CIDA recommends the potatoes produced by Chuanbao Green Agri-foods Association to Beijing vegetable associations and then they recommend the potatoes to Beijing Commercial Bureau, the sponsor of Olympic Games foods. The Commercial Bureau sent concerned department staff to the association to carry out investigation and test the land, water source and air. As these three indexes met the requirements, the Commercial Bureau asked the association to carry out growing experiment and required that the potato should be harvested in the middle of July. The potato harvesting period in Wuchuan is September. In order to harvest potatoes earlier than September, the association used one ha of land for experiment. Plastic film greenhouses have been built on experimental lands and potato is sown early. Potato seedlings emerged in late May and it is estimated that it is quite possible to get success in this experiment.

Wang Xilian and her association members are trying hard to distribute potatoes grown by them to modern supermarkets and are optimistic about this deal and that the prospects are very bright.

• Case Study of Shengfeng Green Agri-food Growing Association

Working with Supermarket Supplier

Ms. Xing Linmei is the Chairman of Wuchuan County Kezhen Town Shengfeng Green Agri-food Growing Association. She was a material storekeeper of a construction brigade in Huhehot city. She came back to her village when she graduated from a senior middle school. The conditions in the village were very hard and her family was very poor. In order to earn a living she approached the manager of the construction brigade. When he came to know that she comes from a rural area, he asked her to buy 10 tons of potatoes for the canteen. There were only a few farmers in her village growing potatoes at that time, so she could not fulfil her mission although she made great effort. However, she had found that potato had a great market potential and she grew 1.2 ha of potatoes next year. After harvesting, Xing sold these potatoes to the construction brigade and could earn good income.

The other farmer households in the village also noticed that potatoes produced by Xing were selling well and so, they also started growing potatoes. A bumper

harvest of potato was obtained that year, but the potato growers were extremely worried about their sale. Under these circumstances, Xing Linmei went to the wholesale markets in Huhehot city to look for potato purchasers, and persuaded the wholesalers to come to the village to purchase potato and the potatoes produced by the village were all sold out.

Thus Xing Linmei has established long term cooperative relations and friendship with the wholesalers from other places. In each potato harvesting period, the wholesalers from other places come to meet Xing Linmei and Xing provides accommodation to them. Xing Linmei helps them to purchase potatoes from the villagers, and collects brokerage charges from them according to tonnages of each truck, the brokerage charges for each truck of potatoes are 20 US\$. Besides, Xing Linmei herself also purchases potatoes from the villagers and then transports these to markets in Beijing and other cities. Through her contacts, Xing Linmei distributes more than 40 trucks of potatoes to the wholesale markets. The loading capacity of each truck is about 35-36 tons of potato.

Xing Linmei participated in the “farmer organization training class” run by CIDA in 2006. Through this study, Xing Linmei understood the need for farmers’ associations. After this training, she and other village participants organized the training class for other villagers who did not attend the farmer organization training, so that they could understand the need for such an association, and Shengfeng Green Agri-food Growing Association was established on April 14, 2006. The association provides high quality potato seeds to its members and purchases fertilizers and pesticides and other materials through cooperatives. In the potato harvesting period, the association purchases potatoes from its members at a price of 0.25 cent/kg higher than that from other growers and then markets these potatoes to wholesalers from other places.

In the beginning of 2006, CIDA invited Dr. Hu Dinghuan from the Institute of Agricultural Economics and Development, Chinese Academy of Agricultural Sciences to carry out a strategic study on Wuchuan potato. In the research report, Dr. Hu proposed that the way out for Wuchuan potato is marketing the potato to supermarkets. In consideration of the shortage of distribution capacity, Dr. Hu proposed a two step strategy. The first step is to market potato to supermarkets relying on the present suppliers of supermarkets in Beijing. The second step is to train a number of farmer associations or agri-food distributors with distributing capacity in Wuchuan County, and then the Wuchuan potatoes can be marketed directly to supermarkets. Dr. Hu recommended several vegetable suppliers of supermarkets in Beijing and Shanghai to Wuchuan County, including the

Xiaotangshan Vegetable Company in Shunyi District of Beijing. In view of Dr. Hu's report, the manager of CIDA in Beijing asked Liu Wenxiang the project coordinator to contact Xiaotangshan Vegetable Company. Liu Wenxiang went to Xiaotangshan himself very soon and made an investigation on Xiaotangshan vegetable distribution centre and vegetable growing base areas. Liu Wenxiang also invited the manager of Xiaotangshan to visit Wuchuan to examine potato crop. In May 2006, Manager Wang from Xiaotangshan purchasing department came to Wuchuan to make inquiries and Liu Wenxiang accompanied him to visit two farmer associations growing potato in Wuchuan County; Shengfeng Green Agri-food Growing Association and Wang Xilian's Potato Growing Association and showed him two potato growing base areas of each association.

The aim of Manager Wang's investigation was to find out whether the potato growing environment is polluted and whether the potato meets their standards. Manager Wang also investigated the entire growing process of potato-farmer households. In a training class of Sichuan agri-food supply chain run by CIDA (Sichuan Agricultural University), the participants - Manager Wang and Xing Linmei of the class, had heard about the supply. In September, before harvesting, Manager Wang came to see the base areas again. He asked the association to transport 10 tons of potatoes at 10-day intervals. Xiaotangshan has strict norms at quality, but the price is higher.

On 2006, 15 September, a truck of 6.5 tons of potatoes from the association was transported to Xiaotangshan vegetable distribution centre. When the packages were opened, Xiaotangshan found that the quantity of unqualified potatoes from Wuchuan exceeded 50%. Xiaotangshan's potato standards are that the appearance of potato should be good, size uniform, and without any injury on the skin. There were many rotten injured potatoes in the paper boxes. Manager Wang of Xiaotangshan was disappointed to see these potatoes, and refused to purchase these sub-standard quality potatoes. Xing Linmei, who escorted the potato consignment, had to hire temporary labourers to select potatoes of good quality to sell them to Xiaotangshan. They could select only 1.5 tons (from 6.5 tons of potato) of potatoes which met Xiaotangshan's standards. The association suffered a lot from this business, and Xiaotangshan decided to terminate the contract with the association.

The CIDA manager Liu Wenxiang thought that a rare chance should not be abandoned rashly. Liu Wenxiang went to Beijing and negotiated with Xiaotangshan again. At Liu's persuasion, Xiaotangshan agreed to give another chance to the association. One month later, in January 2007, the association transported a truck of 14 tons of potatoes to Xiaotangshan. As the association had learnt a lesson from its first experience, this time the rate of quantity potatoes reached more than 85%. The

Xiaotangshan association was very much satisfied and paid at 0.23 US\$ /kg. The reason of success this time was that the association had trained a number of inspectors and they selected the potatoes one by one, and that all the selected potatoes met Xiaotangshan's standards.

The association subsequently transported three trucks of potatoes to Xiaotangshan and the rate of quality potatoes of these three trucks reached more than 90%. Through cooperation with Xiaotangshan, the association has gained experience to attach more importance to the quality of agri-foods.

The association has also found that although the rate of quality potatoes selected for Xiaotangshan is 100%, but a part of potatoes can also be spoilt during the transportation. Therefore, the association plans to improve the packing boxes for potatoes next year in order to reduce this risk during the transportation. The CIDA also sent technical specialists to give guidance to the association. The specialists suggested that a new potato growing method should be adopted, namely, the high ridge sowing method. The injury of potatoes can be avoided by mechanical tools during the harvesting time.

Xiaotangshan expects high standard of food safety. For instance (1) the application of highly toxic pesticides should be strictly prohibited. Xiaotangshan provides a manual of safe pesticides to the association and only the pesticides listed in the manual can be used, (2) only the virus-free seed potatoes can be used in growing potatoes, (3) the quantity of fertilizer should be reduced. The association accordingly guides farmer households on potato production according to the Xiaotangshan's requirements and purchases qualified potatoes from the growers. The purchasing price of potato paid by the association is higher than the market price. The small potato farmers are willing to work under the supervision of the association. The association plans to cooperate with Xiaotangshan the next year. The association also plans to sell potatoes directly to Carrefour supermarket because the purchasing price paid by Carrefour is much higher than that paid by Xiaotangshan. Xiaotangshan plans to accompany the person in charge of Carrefour quality line to visit potato growing base areas of the association in June 2007. If the potato growing base areas can pass the tests made by Carrefour, the potatoes produced by the association may become one of the agri-foods on Carrefour quality line.

• Case Study of Beijing Xiaotangshan Vegetables Company

A Successful Supermarket Supplier

Xiaotangshan Vegetables Company (Xiaotangshan) was set up in 1984 and it was a state-owned farm under Beijing Agricultural Bureau at that time. For

construction of its building more than 20 ha of land was taken from Xiaotangshan Town, Shunyi County, Beijing on 70 years lease. Beijing Agricultural Bureau made an investment of 125,000 US\$. The fixed assets of this farm have increased to 8,125,000 US\$ now. The construction of the vegetables base area was proposed by Deng Xiaoping. Deng pointed out that the implementation of reform policy and opening to outside world will attract many foreigners to work in Beijing and they would need local vegetables to eat. After the establishment of Xiaotangshan, many varieties of foreign vegetables have been introduced. The vegetables produced are supplied to Friendship Department Stores and large hotels for foreign customers. Xiaotangshan was notified as the special vegetables supply base area for Beijing Municipal Party Committee and Municipal government in 1995 and it has become the special vegetables supply base area for the state council. The so called special supply base area is the designated farm used for supplying vegetables for government leaders at higher levels. In order to ensure the health of the leaders, only the reliable farms can be designated as special supply base area.

After the mid-1990s, supermarkets in Beijing developed rapidly. Xiaotangshan has grasped this opportunity and developed the market by fully using its advantages. In 1999, Xiaotangshan began supplying vegetables for Xidan Wanfang supermarket, the first supermarket in Beijing. It began supplying vegetables for Xidan Department Store in the same year. In 2000, Xiaotangshan began supplying vegetables for Itoyakado, a Japanese supermarket. Xiaotangshan had special vegetable-selling counters in more than 70 supermarkets by 2006. Xiaotangshan's first vegetable base area was constructed in Shunyi County where the headquarters is situated. The first out-reach base area was constructed in 1998 in Dasungezhuang of Shunyi County and then expanded gradually to Miyun and other areas in Beijing suburbs. The first base area outside Beijing was constructed in Zhangjiakou, Hebei Province in 1994. The number of base areas outside Beijing increased to three in 2000 and they are situated in Hainan, Guangxi, and Zhangjiakou. In 2005, there were base areas outside of Beijing which are Hebei Province (where there were 2), Inner Mongolia, Shandong, Guangxi, and Yunnan. Altogether, Beijing has 8 base areas (1 is in Shunyi, 2 in Pinggu, 4 in Miyun and 1 in Yanqing). At present, the varieties of vegetables grown exceed 450.

The return from the produce sold in Xiaotangshan was 463,000 US\$ in 2000, more than 625,000 US\$ in 2001, 1,125,000 US\$ in 2002, 1,500,000 US\$ in 2003, 2,25,0000 US\$ in 2004, and 3,250,000 US\$ in 2005. The income reached 3,750,000 US\$ in 2006.

There is 21 ha of land in the base area of Xiaotangshan headquarters and the vegetables produced here are specially supplied for the State Council, Beijing

Municipal Government and some hotels in Beijing. Beijing out-reach base areas are distributed over Shunyi, Pinggu, Miyun and Yanqing and the total area is 160 ha. The 6 base areas out of Beijing belong to about 1000 small scale farmers, and Xiaotangshan manages these base areas through its own staff. Xiaotangshan is responsible for the management, giving instructions in process of production, providing technical assistance, and supervising the use of pesticides and fertilizers. The company also invites experts to give regular technical instructions. The leading staff of the company inspect the arrangement and progress of work every week. The company carries out professional and technical training of personnel in base areas and more than 1000 personnel received training in 2005.

The negotiations between Xiaotangshan and Carrefour on cooperation with Carrefour's quality line, the green food with Carrefour brand, were started in April 2005. Staff in charge of Carrefour's quality line went to supervise base area generally once a month but occasionally three times a month also. The main investigation dealt with factors such as the growing environment, water source, soil and air and these were tested to see if they met their set requirements. They also investigated the technical needs, management and production aspects and the use of pesticides by farmers. They asked Xiaotangshan to provide a written report on these items in detail. Carrefour gave Xiaotangshan the technical manual of vegetable production and also the packing manual prepared by Carrefour. These manuals contain all the details and requirements from production, processing to transportation of vegetables of Carrefour's quality line. In the process of negotiations, Carrefour proposed that Xiaotangshan's production and management must meet with the requirements of the manual. If Xiaotangshan had difficulties in meeting the requirements, the two parties could have discussions further and after revision of the standards, the final version that is accepted by both the parties could be followed. On September 10, 2005, the quality line vegetables produced by Xiaotangshan were formally sold in the market of Beijing Carrefour's Shuangjing chain stores. At first seven vegetables were produced under the quality line: cucumber, cherry tomato, large tomato, cabbage, sweet pepper, carrot, and potato. In January 2006, Chinese radish was also added to the quality line. With the success of trial operations, from 25 September 2005, the quality line vegetables produced by Xiaotangshan started to be sold in six Carrefour chain stores. Figure 3 depicts this and also activities of other Farmer Association.

Traceability is a key point of quality line of vegetables. The operating method of traceability is that each greenhouse has a code number and detailed records. Field production records include details of field operations: fertilizer application, spraying pesticides, irrigation, volume of harvest, and raising seedlings, etc. The code number on the top right corner is corresponding to greenhouse code number. Therefore, the

accuracy of traceability in Xiaotangshan is very high and the products can be traced to the greenhouse. The traceable code number of vegetables produced in Xiaotangshan is a 9-figure number, digits 1-2 represent base area, digits 3-5 represent greenhouse number, and digits 6-9 represent the production date.

The traceability system of Xiaotangshan has the following characteristics: (1) All the plots have code numbers; (2) All the plots have field records; (3) All the farmer households have records; (4) Each box of harvested crop has a code number; (5) Each package has a traceability code number. Two pieces of important information can be detected from the code number: (a) Producing area of the products; and (b) The correct packing date. Through the packing code number, the supermarket can find the production area of the products, product-producing greenhouse, and the detailed information of production place and corresponding greenhouse, the volume of harvest, etc., and other information which can be used when problems occur. The benefits of traceability system are: firstly, the area of production can be known; secondly, once problems occur in the product, the source of problem can be found out quickly, and the problem can be linked/solved.



Farmers sell their potato to
Fukang Potato Farmer Association



Wang Xilian Chairman, Chuanbao Green
Agri-Food Association in the potato field



Potato selection and grading at cellarage
of Shengfeng Green Agri-food Growing
Association



Potato at Carrefour supermarket
store in Shanghai

Figure 3. Potato production and handling by potato farmers' associations; potato at Carrefour supermarket.

All the products produced in Xiaotangshan vegetable base area should be tested before harvest and the vegetables can be harvested only when indicators of pesticides and fertilizers have been tested. Samples of the harvested vegetables should be tested again. Records of tests for the latest three years are kept in the computer database of the company. The harvested products are packaged in boxes according to different varieties. Each box has a code number and the names of farmers are printed on the same boxes.

Now the company is carrying out an experiment on non-pollution treatment. The waste leaves and stems are collected and treated as compost. This experiment is still at the initial stage.

As is evident from the above LFM case studies, CIDA has been very supportive of the activities of the farmers' associations. Figure 4 depicts some of these activities *vis-à-vis* guidance provided by CIDA experts (for training courses see Annexure II).



CIDA potato training course class room



Field training course of CIDA



CIDA experts help examine insect pests in the potato field



Potato farmer family interviewed

Figure 4. CIDA training activities: field inspection, guidance to farmers, interaction of author with potato farmer.

V. Factors Underlying Success

The major factors that contributed to the success of the Wuchuan potato industry *vis-à-vis* linking potato farmers to supermarkets, based primarily on the implementation of the CIDA supported SFAGM project (2003-07) executed by Agriculture and Agri-Foods Canada and the Chinese Ministry of Agriculture (MoA), are as follows:

Potato Farmers as Beneficiaries: The potato farmers could be provided technical assistance to adopt to the changing market conditions. They could learn and get exposed to growing needs in production, handling, processing and marketing aspects as per requirements of supermarket chains, with better operating channels from farm to markets. The knowledge imparted focussed on new agricultural techniques, improved extension methods/systems, on farm quality and food safety assurance, development of farmers' cooperatives for easy areas to market/delivery system, and other organizational reforms to increase production and marketing of value added agri-foods. The Wuchuan county is one of the six pilot projects operated under SFAGM/CIDA and the project has made significant achievements towards the development of potato supply chains in Wuchuan county, exploring various ways to include small farmers in the new system.

Capacity Building: The CIDA training component under the SFAGM project covered all aspects of training provided in six modules – training courses for 29 diverse topics. These training modules were on: (i) WTO and agricultural administration, (ii) Food safety, (iii) Agricultural extension, (iv) Agricultural management, (v) Farming technologies, and (vi) Cross cutting themes.

The details of short training under each module training course are given in Annexure II. Several facilitators/farmers got an opportunity to undergo some of these short trainings as per needs (see case studies, chapter IV).

Establishment of Farmers' Associations: Another notable factor was the establishment of several farmer associations in Wuchuan county that promoted LFM activities. The farmers' associations (FAs) could be apprised with policy and legal framework, governance, agri-business management, the facilitators got training, farmer-members also got training on awareness, and learnt specific technologies in terms of quality and production, efficiency, promoting women participation in decision making and on facilitating market initiatives, as facilitators, as chairman of FAs, etc. Other successes achieved relate to enforcement of FA law-legal aspects/policy, establishment of five potato farmers' associations in Wuchuan from none existing earlier, and these FAs are benefiting over 1000 farmer households; providing

initiatives for branded potato sold to retailers/supermarkets in big cities like Beijing and the recognition of potato suppliers (see case studies chapter IV, also box given).

Linking Farmers to Supermarkets: The above activities not only strengthened the farmers' associations, but more importantly, changed their mindset focussing on production - marketing and management aspects *vis-à-vis* approach to supermarkets as the new markets for potato and find out more avenues/outlets to store-chains for potato supply. These achievements are well reflected in case of Fukong Potato Farmer Association, Shengfeng Green Agri-food Growing Association, Chuanbao Green Agri-food Association and Beijing Xiatangshan Vegetables Company. The feasibility study undertaken in the initial stages of CIDA project on the distribution and marketing of potato, and the survey conducted subsequently, helped in better planning of activities. Interestingly, the rapid growth of supermarkets was accompanied by changes in procurements and purchasing pattern (see chapter III, Figure 2 and Table 1).

Potato farmers' association development – role of SFAGM project

Farmers' association	Role of SFAGM project
Establishment	• Policy research on FA legal framework • Training of facilitators for farmers association • Awareness training for potential farmer members • Feasibility study • Registration
Development	• Training on FA governance • Training on agribusiness management • Training on commodity specific technologies in terms of quality and production efficiency • Promote women's participation in FA decision making • Facilitate marketing initiatives
Achievements	• Contribution to the enforcement of FA Law — July 1, 2007 • Contribution to the establishment of potato FAs in Wuchuan starting from zero to 5 benefiting over 1000 farmer households • Contribution to the initiatives of branded potato sold to modern retailers (supermarkets) in big cities like Beijing • Contribution to the recognition of potato supplier (Wuchuan) to Olympic Games, Beijing 2008

Information provided by CIDA.

Technology Adoption/Transfer: The CIDA training courses provided on job trainings, visits within and even to Canada in some cases, proved extremely effective to farmers/farmers' associations/cooperatives, etc., such as in adopting ridge-sowing of potato, better cultivation and cultural practices, meeting quality and safety standards *vis-à-vis* choice of sites for organic farming/growing pollution-free potatoes, harvesting, grading and packaging for delivery of product/produce, quality supply; meeting standards of supermarkets. All these measures in turn fetched more income to farmers and farmers' associations which have grown stronger and sustainable for the benefit of farmers, small holders producers.

VI. Lessons Learned: Emerging Concerns

Despite the rapid economic development in China, the rural residents' income, especially the small farm households' income in agriculture is still very low compared with urban residents. China has only a small amount of arable land. Restricted by cultivated land area, the farm households in rural areas of China could hardly increase their income through expansion of cultivated area. The small farm households can get more incomes only by adapting other innovative measures such as the following: Firstly, increase the added value of agricultural products that allow the farm households get higher profits from higher price through the improvement of quality and safety of the same quantity of agricultural products. Secondly, reduce the intermediate links of supply chain so that the farm households could share a part of benefits made by broker agents, wholesalers and others in intermediate links of supply chain. Thirdly, reduce the risk of market price fluctuation by using the way of contract production so that the loss of income of small farm households can be avoided when the market price is low. However, on the traditional agricultural products supply chain, it is difficult for the small farm households to accomplish the above three requirements owing to the shortage of technology and information.

The development of supermarkets in China and formation of modern agricultural products supply chain have provided a platform for agricultural products of high quality and safety. The problem ahead is as to how to build a channel linking the production of the small farm households and the supermarkets that the products of the small households enter into supermarkets directly. Also, as to how to improve the quality and safety of agri-foods produced by small farm households and enable them to get more added values.

From the case studies presented on 'Linking Small Potato Farmers to Supermarkets' in Wuchuan County, it is obvious that there are many challenges and opportunities in delivering agri-foods produced by the small farm households to supermarkets. While some of the challenges come from external environment, more challenges come from the small farm households per se. The experiences learnt from the case of Wuchuan potato are as follows:

1. The small farm households should focus more on organizational management and build-up if they want to establish long-term relations with supermarkets. There is no comparison between the small farm households and supermarkets in size. In order to obtain more favorable negotiating position, it is necessary for the small farm households to establish cooperative organizations, so that they can strengthen market negotiating needs. Also as local organization, the

small farm households should work together and improve their production and technology adoption aspects through sharing of information. In addition, in the organization, an efficient management and supervision system can be established which guarantees the quality and safety of agricultural products.

2. There is a pressing need to create an awareness and concern among the small farm households on quality and safety of agricultural products. The improvement of the quality and safety of agricultural products not only increases their income, but also is beneficial to the health of consumers and for environmental protection and sustainable development of agriculture.
3. The small farm households need improvement in technology application. The supermarkets have a set of internal and external standards for agri-foods and the desired agri-foods cannot be produced by the small farm households if they have no grasp of the production technology. There is a continuing need to provide technology know-how to these farmers.
4. Linking small farm households with supermarkets is an arduous and a long-term task. In China, the individual farm households have undergone adjustments to market economy for more than 30 years and have formed their own concepts and it is difficult for them to change these traditional concepts and habits and produce agri-foods according to set standards and contracts. So, more effective motivational mechanisms should be in place to change their mindset to adapt to new market trends.
5. The supermarkets should also strengthen/improve their cooperation with small farmers. From a long-term perspective, supermarkets will get benefits from the cooperation with the small farm households and the supply of safe and high quality agri-foods will be guaranteed. Therefore, the supermarkets should foster the farm households and establish a long-term cooperative partnership. In order to attain this goal, the supermarkets must fully consider better income generation prospects of small farm households.
6. In providing overall motivation, in the above context the SFAGM project has done a commendable service in helping the small farm households in Wuchuan County in agri-foods entering into supermarkets and has achieved great success. The key to this is to find out as to how to consolidate these achievements and promote them further. The spread of information on successful experiences as given in this report, to other areas for production of quality and safety agri-foods will help establish more associations like that of Wuchuan, promoting LFM concerns of the small farmers in particular.

VII. Epilogue

This status report on 'Linking Small Potato Farmers to Supermarkets' is based on selective LFM case studies undertaken in the potato growing Wuchuan County in Inner Mongolia Autonomous Region (IMAR) of China, where potato is a major food crop and livelihood provider to the small farmers' households. This study traces the gap between traditional production system *vis-à-vis* market opportunities, and focuses on the new market requirements of high quality safe potato production and its marketing for the supermarkets. It brings out the concerns of small farmers of Wuchuan County for developing better linkages to markets, at all operational levels for the benefit of the farming community, based on the work carried out under the 'Small Farmers Adapting to Global Markets (SFAGM)' Project. The project was operated jointly by the Chinese and Canadian Governments in 2003 for five and a half years, funded by the Canadian International Development Agency (CIDA) and executed by Agriculture and Agri-food Canada and the Chinese Ministry of Agriculture. Diverse approaches were followed to change the mindset of the traditional farmers, educating them with the new agricultural techniques, improved extension methods, focus on farm quality and safety measures as per market demands/standards, developing farmers' cooperatives and introducing other organizational reforms to increase production and also adopt changing market trends. Experience gained and lessons learnt have been summarized based on the case studies undertaken focusing on linkages of small farmers to supermarkets. This report will inspire small potato farmers of other regions to jointly use the experiences of Wuchuan county farmers to their advantage, particular through the development of farmers' cooperatives/associations in managing/addressing the LFM concerns successfully.

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Annexure I**Technical specifications of non-pollution potato production in Wuchuan County****1. Scope**

These technical specifications define the environment, requirements, and management measures of the area of non-pollution potato production. These technical specifications apply to non-pollution potato production.

2. Requirements for environments of potato production areas

- 2.1 Selection of environments of production base area is implemented according to NY5010 standards.
- 2.2 The land for production of potato should be smooth, with good conditions of irrigation and fertility, the soil layer should be deep and loose. Water-saving irrigation should be used. The content of organic matter is high and pH is 7.0-7.5.
- 2.3 The residual plastic film should be recovered and residue of plants should be moved away after harvest.

3. Techniques of production**3.1 Selection of varieties**

Select varieties of high quality, high adverse resistance, high adaptive capacity, and good commercial performance.

3.2 Treatment of seed potato

Diseased and abnormal seed potato tubers should be eliminated before sowing.

Seed potatoes should be taken out from cellar 15-20 days earlier before sowing and put them in a room for accelerating germination. Cut seed potatoes into small cubes 2-3 days before sowing or use small potato directly.

3.3 Land preparation

Carefully harrow up the land for moisture conservation and remove crop residue. It is recommended that plastic film mulching in cultivation should be used.

3.4 Sowing at proper time

3.4.1 Date of seeding. Sowing at proper time according to local conditions.

3.4.2 Rational close planting. According to different varieties and culture conditions, 45 000-525 000 seedlings(hills)/ha are commended.

3.5 Water and fertilizer management

3.5.1 Irrigations water should be given at proper time according to the water requirement in the whole growing period of potato and to the water saving principles.

3.5.2 Fertilizer application. Fertilizer should be applied according to the conditions of soil nutrients and fertilizer requirement of potato. Organic and inorganic fertilizers, basic fertilizer and top dressing should be combined in application in order to reach balanced application of fertilizers.

4. Field management

According to the growth and requirements of cultivation at different growth phases of potato, hoeing, harrowing, checking and reseeding, cultivating, hilling up, weeding, irrigating and top dressing should be done timely.

5. Pest management

5.1 The main diseases and insect pests

5.1.1 The main diseases are potato virus disease, potato late blight, potato early blight, potato ring rot, potato black leg, etc.

5.1.2 The main insect pests are cut worm (*Agrotis ipsilon*), wire worm, white grub, aphid, Meloidae, meadow moth, etc.

5.2 The principles of control

Implement the policy of putting prevention first and adopting the guiding principles of integrated pest management (IPM), using resistant (tolerant) varieties first and cultural control as the focal point and the integrated control techniques including biological control, bionomic control, physical control, chemical control should be adopted and thus the economic loss damaged by insect pests should be controlled under economic threshold in plant protection. The pesticide residue should be in line with the national standards.

5.3 Control methods

5.3.1 Agricultural control. Select resistant (tolerant) varieties and virus-free seed potatoes adapting to local conditions, optimize cultural and management measures, adjusting seeding period, thus reducing the basic number of original insects and infective opportunities. Pull out the diseased plants timely and treat them in a distant place.

5.3.2 Biological control

5.3.2.1 Fully utilize the plant-origin pharmaceutical products, such as azadirachtin, oxymatrine, alkaloid of tobacco, etc.

5.3.2.2 Protect and utilize natural enemies, such as lady beetle, aphid lion, hover fly, and others in aphid control.

5.3.2.3 The recommended biological control formulations are Avermectins, Liuyangmycin, Astromicin, *Bacillus thuringiensis* (Bt), Nongkang 120, Nuclear Polyhedrosis Virus, *Beauveria*, Lucaibao, Weidi, polyoxin, etc.

5.3.3 Physical control.

5.3.3.1 The recommended physical control methods are high pressure mercury lamp, blast lamp, and pest-killing lamp.

5.3.4 Chemical control

Based on the strengthening the occurrence prediction of diseases and insect pests and field investigations, keep abreast of the dynamics of occurrence of diseases and insect pests, and carry out chemical control in good time. Pay attention to mixed use and alternate use of selected chemical pesticides so as to reduce the resistance of insect pests to pesticides. The application of pesticides should be made strictly according to the stipulations of GB4285, AGB8321 and those pesticides and fertilizers not allowed to use by state formal decree should not be used completely.

6. **Harvest, storage and postharvest management**

6.1 Harvest

6.1.1 Potato should be harvested timely when the plants have completely died, tuber is stopping to grow, and a thick suberose layer is formed on the surface of tuber.

6.1.2 In the course of harvesting, abnormal potatoes and foreign substances should be removed, then remove the diseased and rot potatoes after airing and drying and stored in cellar.

6.2 Cellar storage management

6.2.1 Be careful when store potatoes in cellar and avoid mechanical damage.

6.2.2 The amount of stored potatoes should not more than more than 2/3 of the capacity of cellar.

6.2.3 Keep the temperature in cellar at 4-7°C and RH not lower than 80%

6.2.4 It is proposed that the vertical cellar should be changed to horizontal cellar in order to prevent germination, rot and freeze injury of potato.

6.3 Marker and package

The harvested potatoes should be marked with variety, origin of production, producer's name and the simple of non-pollution agricultural product. The mark should conform to the stipulations of GB7718. Potato should be stored according to different varieties and sizes.

Annexure II**CIDA Training conducted at different places during the implementation of SFAGM Project (2003-2007)**

Training Activities	Target Audience	Venue	Duration
Policy Research and Development			
National food safety strategy	DRC ¹ , MOA ² , AQSIQ ³ , SFDA ⁴ , MOH ⁵	China	3 years
Farmers association	DRC, MOA	China	3 years
Ag Domestic Support and AMS notification to WTO	DRC, MOFCOM ⁶ , MOA	China	1 year
International coordination on agricultural trade policies	MOFCOM, MOA	China	1 year
Reform of agricultural extension	MOA	China	4 year
Agri-food cold chain	NDRC ⁷	China	1 years
Farm produce association	MOA	China	1 years
New round of WTO Ag negotiation issues (blue box, amber box, green box, market access WTO/SPS)	MOFCOM	China	1 years
Handling food safety crisis	SFDA	China	1 years
Food recall	AQSIQ	China	1 years
Training Courses for WTO & Agriculture Administration Modules			
Executive Management Training (focusing on food safety and SPS issues)	Government officials both senior DG level and working staff level	Canada	2-4 weeks
WTO and Agriculture Trade Policy	Government officials and researchers	Canada	2 weeks
WTO/SPS (practical attachment)	Government officials	Canada	3-6 months

*Contd...*¹ Development Research Center of The State Council.² Ministry of Agriculture of the People's Republic of China³ General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China⁴ State Food and Drug Administration of China.⁵ Ministry of Health of The People's Republic of China.⁶ Ministry of Commerce of The People's Republic of China.⁷ National Development and Reform Commission of The People's Republic of China

Note: Training of trainers approach is applied to all the categories of training activities below.

Training Activities	Target Audience	Venue	Duration
Training Courses for Food Safety Modules			
Food safety lab capacity building (focusing on lab quality control and hazardous contaminants testing)	Lab technicians from national reference labs and provincial labs	Canada and China	4 weeks
On farm quality assurance program	Researchers, government officials, extension workers, farmers, agri-food processors	Canada	3 weeks
Meat hygiene inspection	Meat inspectors	China	1 week
Food science certificate	Government officials through distance learning	Canada and China	Part-time, 1 year
Risk assessment and management	Government officials	Canada and China	3 weeks
Training Courses for Agricultural Extension Modules			
Participatory agricultural extension TOT for crop sector methodology	Farmers and extension workers	China	3 months
Participatory agricultural extension TOT for crop sector methodology	Farmers and extension workers	China	3 months
Farmers Field School	Farmers and extension workers	China	2 weeks
National seminars and workshops	Government officials, policy researchers, extension workers	China	1 week
Training Courses for Agribusiness Management Modules			
Changing Agri-food markets	Government officials	Canada	3 weeks
Supply chain management	Government officials, extension workers, farmers, agribusiness firms	China	1 week
Small and medium size Agri-food enterprises	Government officials, extension workers, farmers, agribusiness firms	China	1 week
Agricultural livestock marketing finance & risk	Extension workers, farmers	China	1 week
Facilitators for farmers cooperatives	Researchers, government officials, extension workers, farmers	China and Canada	1 week

Contd...

Training Activities	Target Audience	Venue	Duration
Food safety, quality standards management	Government officials, extension workers, farmers, agribusiness firms	China	1 week
Market information service	Government officials, extension workers, farmers, agribusiness firms	China	1 week
Training Courses for Farming Technologies			
Feeds and feeding	Farmers and extension workers	China	1 week
Breeds and breeding	Farmers and extension workers	China	1 week
Herd health	Farmers and extension workers	China	1 week
Crop rotation	Farmers and extension workers	China	1 week
Balanced fertilization	Farmers and extension workers	China	1 week
Conservation tillage	Farmers and extension workers	China	1 week
Integrated pests management (IPM)	Farmers and extension workers	China	1 week
Training Courses for Cross Cutting Theme			
Results-based management (RBM)	Project staffs and Chinese counterparts	China	1 week
Environmental sustainability awareness	Project staffs and Chinese counterparts	China	1 week
Gender equality	Project staffs and Chinese counterparts	China	1 week

Information provided by CIDA.

Linking Farmers to Market: Some Successful Case Studies from India

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Acronyms and Abbreviations

APAARI	Asia-Pacific Association of Agricultural Research Institutions
APMC	Agriculture Produce Market Committees
CFTRI	Central Food Technological Research Institute
EC	Evaporative Cold Storage
ICT	Information Communication Technology
IT	Information Technology
LFM	Linking Farmers to Market
NABARD	National Bank for Agriculture and Rural Development
NCDC	National Cooperative Development Corporation
RIDF	Rural Infrastructure Development Fund
NDDB	National Dairy Development Board
R&D	Research and Development
SHG	Self Help Group
VGKK	Vivekananda Girijana Kalyana Kendra
VSATs	Very Small Aperture Terminals

I. Introduction

Background Information

The agricultural produce sector has been one of the most important components of the Indian economy. Considerable progress has since been achieved in scaling new heights in the production of food grains; commercial crops like cotton, sugarcane, tea, etc. fruits, vegetables and milk. The increasing trend of agricultural production has brought, in its wake, new challenges in terms of finding markets for the marketed surplus. There is also a need to respond to the challenges and opportunities that the global markets offer in the liberalized trade regime. In order to enable the farming community to benefit from the new global market access opportunities, the internal agricultural marketing system in the country needs to be integrated and strengthened. The Government of India is striving to improve the Indian agricultural markets and marketing environment so as to provide maximum benefit to the producers and, in turn, compete with the global markets. Agriculture and agricultural marketing need to be re-oriented to respond to the market needs and consumer preferences. Agricultural marketing reforms and creation of marketing infrastructure has been initiated to achieve the above purpose.

The subject of agriculture and agricultural marketing is dealt with both by the States as well as the Central government in the country. Starting from 1951, the various Five-Year Plans laid stress on development of physical markets, on-farm and off-farm storage structures, facilities for standardization and grading, packaging, transportation, etc. Most agricultural commodity markets generally operate under the normal forces of demand and supply. However, with a view to protect farmers' interest and to encourage them to increase production, the government also fixes minimum support/statutory prices for some crops and makes arrangements for their purchase on state account whenever their price falls below the support level. The role of government is normally limited to protecting the interests of producers and consumers, only in respect of wage goods, mass consumption goods and essential goods; and to promote organized marketing of agricultural commodities in the country through a network of regulated markets.

Regulated Agricultural Produce Markets

To achieve an efficient system of buying and selling of agricultural commodities, most of the State Governments and Union Territories have enacted several legislations to provide for regulation of agricultural produce markets. The basic objective of

setting up of a network of physical markets has been to ensure reasonable gain to the farmers by creating environment in markets for fair play of supply and demand forces, regulate market practices and attain transparency in transactions.

With a view to coping up with the need to handle increasing agricultural production, the number of regulated markets have also been increasing in the country. While, by the end of 1950, there were 286 regulated markets in the country, their number increased to 7177 by 2001 (Table 1), and presently stands above 10,000 (exact estimates not available).

Table 1. Regulated Markets in India

Year (upto)	Number
1950	286
1956	470
1961	715
1966	1012
1974	1777
1978	2481
1985	5695
1990	6217
1995	6836
1996	6960
1997	7001
1998	7062
1999	7075
2000	7127
2001	7177

The advent of regulated markets has helped in mitigating the market handicaps of producers/sellers at the wholesale assembling level. But, the rural periodic markets, in general, and the tribal markets in particular, remained out of its developmental ambit. The area served by each market across the states has large variations but that need not be a bottleneck. In the regulated markets of the country various infrastructural amenities are available. Auction platforms are needed in markets for settlement of the price of the produce in a congenial atmosphere between buyers and sellers. Some commodities when brought for sale contain higher moisture than desired level and for drying these suitable space is required.

Trader modules viz. shop, godown and platform in front of shop exist in 63% of the markets. Cold and cool storage units are needed in the markets where perishable commodities are brought for sale. The basic facilities viz. internal roads, boundary walls, electric lights, loading and unloading facilities and weighing equipment are available in more than 80% of the markets. Farmers' rest houses exist in more than half of the regulated markets. But more is needed.

With the above background information and a long history of agricultural development *vis-a-vis* market development and needs of the farmers, this report at the instance of APAARI, aims at focussing some of these LFM initiatives taken at state and national level through infrastructure development and technological innovations. Some successful case studies/success stories are dealt with presenting overall national concerns.

II. Agricultural Market Needs

Major Constraints

The purpose of regulation of agricultural markets was to protect farmers from the exploitation of intermediaries and traders and also to ensure better prices and timely payment for the produce. Over a period of time these markets have, however, acquired the status of restrictive and monopolistic markets, providing no help in direct and free marketing, organized retailing, smooth raw material supplies to agro-processing, competitive trading, information exchange and adoption of innovative marketing systems and technologies. Farmers cannot sell their produce directly in bulk except on retail basis to the consumers. They have to bring their produce to the market yard. Exporters, processors and retail chain operators cannot get desired quality and quantity of produce for their business due to restrictions on direct marketing. The processor cannot buy the produce at the processing plant or at the warehouse. The produce is required to be transported from the farm to the market yard and then only it can be purchased and taken to the plant. There is thus an enormous increase in the cost of marketing and the farmer ends up getting a low price for his produce.

The licensing of traders in the regulated markets has led to the monopoly of the licensed traders acting as a major entry barrier for a new entrepreneur. The traders, commission agents and other functionaries organise themselves into associations, which generally do not allow easy entry of new persons, stifling the very spirit of competitive functioning and it needs reforms so as to bring in awareness to such traders.

In view of liberalization of trade and emergence of global markets, it was necessary to promote development of a competitive marketing infrastructure in the country and to bring about professionalism in the management of existing market yards and market fee structure. While promoting the alternative marketing structure, however, the government needs to put in place adequate safeguards to avoid any exploitation of farmers by the private trade and industries. For this, there was a need to formulate a model legislation on agricultural marketing.

The Ministry of Agriculture accordingly formulated a model law on agricultural marketing in consultation with the State Governments. The draft model legislation provides for establishment of private markets/yards, direct purchase centers, consumer/farmers markets for direct sale and promotion of public-private partnership in the management and development of agricultural markets in the country. It also provides for separate constitution for special markets for commodities like onions,

fruits, vegetables, flowers, etc. This has been included in the legislation to regulate and promote contract-farming arrangements in the country on a wider canvas.

Marketing Reforms

The Government has taken various steps to persuade the state governments to bring changes in marketing Acts on the lines of the Model Act such as Central Sector Scheme to provide investment subsidy on market infrastructure developmental projects. Contract farming has been prevalent in various parts of the country for commercial crops like sugarcane, cotton, tea, coffee, etc. The concept has, however, gained importance in recent times in the wake of economic liberalization. The main feature of contract farming is that farmers grow selected crops under a buy back agreement with an agency engaged in trading or processing.

There are many success stories on contract farming, such as of potato, tomato, groundnut and chilli in Punjab; safflower in Madhya Pradesh; oil palm in Andhra Pradesh; seed production contracts for hybrids seed companies in Karnataka; cotton in Tamil Nadu and Maharashtra, etc. which has helped the growers in realization of better returns for their produce. In India, contract farming has considerable potential where small and marginal farmers can no longer be competitive without access to modern technologies and support. The contractual agreement with the farmer provides access to production services and credit as well as knowledge of new technology. Pricing arrangements can significantly reduce the risk and uncertainty of market place.

Small-scale farmers are frequently reluctant to adopt new technologies because of the possible risks and costs involved. In contract farming, private agribusiness will usually offer improved methods and technologies because it has a direct economic interest in improving farmers' production to meet its needs. In many instances, the larger companies provide their own extension support to contracting farmers to ensure that production is according to the specification. Skills the farmer learns through contract farming may include record keeping, improved methods of applying chemicals and fertilizers and knowledge of the importance of quality and demands of export markets.

In view of the above, contract farming arrangements need to be encouraged widely. While doing so, the policy makers need to protect the interest of both the farmers as well as the industry equitably. This would require arrangement for registration of sponsoring companies and recording of contract farming agreements, in order to check unreliable and spurious companies. A dispute resolution mechanism needs to be set up at a approachable location for farmers which can quickly settle

issues, if any, arising between the farmers and the company under a quasi-judicial procedure. The farmers, while raising the contracted crops, run the risk of incurring debt and consequent displacement from land in the event of crop failure. Farmers need to be indemnified from such a situation.

III. Developing Marketing System/Infrastructure Strengthening: Some Successful Case Studies

Infrastructure Strengthening

Projections of production and marketed surplus of various farm products show that the quantities, which the marketing system will be required to handle in future, are quite large. A marketing system backed by strong, adequate infrastructure is at the core of agricultural marketing. Market infrastructure is important not only for the performance of various marketing functions and expansion of the size of the market but also for transfer of appropriate price signals leading to improved marketing efficiency. High investment and entrepreneurial skills required for creation and management of modern markets has to come from private sector. This will facilitate greater participation of the private sector, particularly for massive investments required for the development of marketing infrastructure and supporting services.

With a view to induce large investment in the development of marketing infrastructure, the Ministry has formulated a scheme for “Development/Strengthening of Agricultural Marketing Infrastructure, Grading and Standardization”. Under this scheme, investment subsidy is provided on the capital cost of general or commodity specific infrastructure for marketing of agricultural commodities, and for strengthening and modernization of existing agricultural markets, wholesale, rural and periodic or in tribal areas. Storage infrastructure is necessary for carrying over the agricultural produce from production periods to rest of the year. Lack of adequate scientific storage facilities cause heavy losses to farmers in terms of wastage in quantity and quality of produce in general and of fruits and vegetables in particular. It is well known that small farmers do not have the economic strength to retain produce with themselves till the market prices are favourable. There is strong need in the country to provide the farming community with facilities for scientific storage so that wastage and produce deterioration are avoided and also to enable it to meet its credit requirement without being compelled to sell the produce at a time when the prices are low. Accordingly, many capital investment subsidy schemes have been launched in India and the main objectives of such scheme include creation of scientific storage capacity with allied facilities in rural areas to meet various requirements of farmers for storing farm produce, processed farm produce, agricultural inputs, etc., and prevention of distress by creating the facility of pledge loan and marketing credit.

The different case studies/models that have been fairly successful are detailed below.

Rythu Bazar (farmers' market in Andhra Pradesh)

Rythu Bazars were introduced with a view to eliminate the middlemen and arrange facilities for the farmers to sell their produce directly to the consumers at reasonable rates fixed every day. The scheme benefits both the farmers and the consumers. Regulated market yards for fruits and vegetables are functioning only at a few centres. The marketing system for fruits and vegetables is now in the hands of middlemen. Middlemen exist at various levels between the farmers and the consumers and exploit through malpractices in weighing, handling and payments. Large number of small farmers are unable to effectively bargain for better price in the wholesale market. Inefficiencies in the wholesale markets result in a long chain of intermediaries, multiple handling, loss of quality and increase the gap between the producer and consumer prices. Large number of small retailers, each handling small quantities, create high overheads leading to high margin on produces. The typical Rythu Bazar scene is shown in Figure 1.



Figure 1. Rythu Bazar in Andhra Pradesh, South India.

(Source: Courtesy Public Domain Websites)

The beneficiary groups: Rythu Bazars are intended to benefit farmers by providing them access to markets. Inadequate marketing support is one of the major handicaps faced by the farming sector. The movement of produce from the farms to the ultimate retail outlets faces a number of constraints and farmers are at the mercy of the middlemen and commission agents. In the absence of adequate facilities for storage and preservation, farmers are forced to make distress sales. At present, market yards are mostly set up by the State Governments. For setting up of agricultural markets, funds are sourced from National Bank for Agriculture and Rural Development (NABARD) through Rural Infrastructure Development Fund (RIDF) and National Cooperative Development Corporation (NCDC). However, infrastructure available to farmers for selling their produce still remains inadequate. Rythu Bazar is an initiative to create infrastructure facilities to enable farmers to sell their products directly to retail consumers thereby ensuring that farmers realize better prices and consumers receive fresh vegetables, fruits, etc., at reasonable prices and thus address constraints in agri-marketing infrastructure.

Business Linkages/Strategy: Typically, a Rythu Bazar covers 10 to 15 villages and at least 250 farmers including 10 groups (self help groups) who are selected by a team consisting of Mandal Revenue Officers, Horticulture Officers and Agriculture Officers in the villages to operate in the bazars. Joint Collectors of the concerned districts ensure that adequate transport facilities are arranged for transport of goods to Rythu Bazars in consultation with State Road Transport Corporation. In addition, online information of prices and commodities movements is provided on the internet.

Outreach and Potential: More than 100 Rythu Bazars are in existence benefitting 4500 farmers and large number of consumers. Rythu Bazars can play a key role in addressing some of above given marketing problems, and there is thus a clear need to facilitate similar marketing infrastructure throughout the country.

Apni Mandi (farmers' market in Punjab)

Traditional marketing system of fruits and vegetables is unfavourable for farmers as major share of consumer spending is pocketed by the traders. The farmers used to get low price for their produce whereas the consumers had to pay higher price for poor quality products available in the markets. The "Apni Mandi" farmers' market in Punjab addressed these constraints as it belongs to both the farmers and the consumers who can mutually help each other.

Basic infrastructure facilities like market yard, lighting etc. are provided at the farm level. Extension services of the relevant departments are also pooled in, securing the benefit of on-going government scheme to "Apni Mandi" farmers. The benefits include input subsidies, better quality seeds and loans at reasonable rates of interest from the bank. Apni Mandi scheme provides self-employment to the producers and also removes the social inhibition among them for retail sale of the produce. Apni Mandis are being organized in about 23 cities and towns of the State. An evaluation study has shown that Apni mandi is a blessing for the farmers, particularly the small farmers, and has the advantage of direct marketing.

Uzhavar Santhai (farmers' markets in Tamil Nadu)

The idea of setting up marketplaces which directly link producers and consumers and exclude traders and middlemen in Tamil Nadu is called as 'Uzhavar Santhai' (Farmers' Markets), started during 1999. The major objectives of Farmers' markets in Tamil Nadu are to: eliminate middlemen and traders from the marketing of vegetables in the Farmers' markets; establish direct contact between farmers and consumers; maintain stability in the prices of fresh vegetables and fruits; increase coordination between the agriculture and the horticulture departments; act as

information centers for the marketing of fresh vegetables and fruits, and promote awareness and to provide training in relation to the preservation and packaging of perishable fresh vegetables and fruits. This has been fairly successful. Many of the farmers depend on rains for vegetable growing and hence there are vagaries of nature that need to be understood.

Shetkari Bazar (farmers' market in Maharashtra)

The farmer has no say while fixing price of his produce in the market in this model. In present agricultural marketing system, a number of middle-men are involved till the produce reaches the final consumer, and as a result the farmer gets only 30 to 35% of the every rupee paid by the consumer. Shetkari Bazar is a concept of direct marketing by producer (farmer) to consumers. By circumventing the intermediaries, the produce reaches in good shape with minimum handling. This results in better price realisation for the farmer-producer and good quality produce to the consumer at reasonably lower price. This type of marketing has been tried in the state of Andhra Pradesh (known as Rythu Bazar). This is expected to help small farmers with small quantity of perishable fruits and vegetables to get a fair price and escape commercial exploitation in the market place.

In 2002, the Govt. of Maharashtra decided to set up Shetkari Bazars in the state and the Maharashtra State Agriculture Marketing Board was appointed as nodal agency for implementing this scheme. The Shetkari Bazars (Figure 2) in all district and key taluka places are managed by the Agriculture Produce Market Committees (APMC) from the area and the produce brought by farmers is not levied cess. Local committees are set up to monitor the prices and take the commitment forward.



Figure 2. Farmers' Market (Shetkari Bazar) in Maharashtra, Western India.

(Source: Courtesy Public Domain Websites)

e-Choupal

International Business Division of ITC, one of India's large exporters of agricultural commodities, has conceived e-Choupal as a more efficient supply chain aimed at delivering value to its customers around the world on a sustainable basis. The e-Choupal model has been specifically designed to tackle the challenges posed by the unique features of Indian agriculture, characterised by fragmented farms, weak infrastructure and the involvement of numerous intermediaries, among others.

'e-Choupal' also has the potential for the Indian farmer to reach out as to who is in the cycle of low investment, low productivity, weak market orientation, low value addition, low margin, low risk taking ability that made the Indian agribusiness sector globally uncompetitive, despite rich and abundant natural resources. Such a market-led business model can enhance the competitiveness of Indian agriculture and trigger a virtuous cycle of higher productivity, higher incomes, enlarged capacity for farmer risk management, larger investments and higher quality and productivity. Further, a growth in rural incomes will also unleash the latent demand for industrial goods and hence is necessary for the continued growth of the Indian economy. This will perhaps create another virtuous cycle propelling the economy into a higher growth trajectory.

The Model in Action: The 'e-Choupal' largely leverages 'Information Technology' to virtually cluster the value chain participants, delivering the same benefits as vertical integration does in mature agricultural economies. The 'e-Choupal' makes use of the physical transmission capabilities of current intermediaries – aggregation, logistics, counter-party risk and bridge financing, while disintermediating them from the chain of information flow and market signals. With a judicious blend of click and mortar capabilities, village internet kiosks managed by farmers – called *sanchalaks* – themselves, enable the agricultural community to access ready information in their local language on the weather and market prices, disseminate knowledge on scientific farm practices and risk management, facilitate the sale of farm inputs (now with embedded knowledge) and purchase farm produce from the farmers' doorsteps (decision making is now information-based).

Real-time information and customised knowledge provided by 'e-Choupal' enhance the ability of farmers to take decisions and align their farm output with market demand and secure quality and productivity. The aggregation of the demand for farm inputs from individual farmers gives them access to high quality inputs from established and reputed manufacturers at fair prices. As a direct marketing channel, virtually linked to the 'mandi' system for price discovery, the 'e-Choupal' eliminates wasteful intermediation and multiple handling, thereby significantly reducing transaction costs. The 'e-Choupal' ensures world-class quality in delivering

all these goods and services through several product/service specific partnerships with the leaders in the respective fields. While the farmers benefit through enhanced farm productivity and higher farm gate prices it also benefits the chain with lower net cost of procurement (despite offering better prices to the farmer) having eliminated costs in the supply chain that do not add value.

The e-Choupals, information centers linked to the internet, represent an approach to connect seamlessly subsistence-farmers with global markets. It has helped link the largest labour force with the mandis, the international markets as well as the final consumer at much reduced transaction costs. This facilitates disintermediation through the creation of an alternative development paradigm that skips the formation of cooperatives and self-help groups and replaces them with the network chain. It exemplifies and enables in achieving developmental goals. The e-Choupal project thus brings out the concept of profitable rural development all around.

Business Model of e-Choupal: The business model of the 'e-Choupal' centres on the deployment of a network of internet-connected kiosks, known as 'e-Choupals', throughout agricultural areas in India with the help of VSATs (Very Small Aperture Terminals). An e-Choupal is an electronic version of the traditional 'choupal', where farmers are provided with the latest weather reports, local and international produce prices, and best farming practices. Costing US\$ 3,000 - 6,000 each to set up, they also serve as procurement and purchase points, allowing farmers not only to sell their produce to ITC but also to buy agricultural inputs and consumer goods for daily household use. Some of the guiding management principles when transforming the current model into a viable business model are:

Re-engineering instead of reconstructing: *Price setting:* The benchmark price is static for a given day. Information on prices is communicated to the *Sanchalaks* through the 'e-Choupal' portal (Figure 3). The commission agents are responsible for feeding daily mandi prices to the e-Choupal. Also, the price quoted to the farmer is conditional and the farmer has the option to refuse the sale. This depends on the quality tests.

Quality tests: These are performed right in front of the farmer and any deductions are rationalized to the farmer. This has principally arisen from the success of milk sector, which has made a difference for the producer and ensures quality to the end consumers. Also, the entire process is more scientific for instance, weighing is done by means of electronic machines and instruments like moisture meters are used to measure moisture content. One of the greatest benefits of this re-engineered supply chain is that the farmer collects his payment in full at the cash counter before returning to the village.



Figure 3. e-Choupal activities: (a) Given the low levels of literacy in the rural sector, the role of the Choupal Sanchalak, the lead farmer of the village, in facilitating physical interface between the computer terminal and the farmers is central to project e-Choupal; (b) e-Choupal mobile vans take the message of e-Choupal to new villages. Thereafter virtual helpdesks enable the farmer to find solutions to his problems through online interactions; (c) e-Choupal provides the farmer appropriate documentation which records the quantity and quality of the output.

(Source: Courtesy Public Domain Websites)

The value chain is enhanced and upgrades the resource competition to quality value thus bringing in competition. The farm to factory process will be more dependable under this system.

Intangible Benefits from e-Choupal: The e-Choupal brings in large amount of intangible benefits and has a great capacity for expanding especially for farmers to have the freedom of choice and action and enhancing their income with induced capability provide them better life. Ultimately the information technology (IT) to farmer linkage generates the sustainable livelihood for the farmer through this approach and it improves every year, learning from the past experience.

IV. Other Success Stories: Technological Innovations

Technology Development and Transfer

The success of the networked resource for the farmers and growers with many of the cooperative systems has given higher value addition at primary level. In many such instances, the LFM activity differentiates marketing of many of the agricultural products and minimises the role of middle level traders with intervention of institution with their capacity to deliver appropriate, adaptable and accessible technologies. Institutions such as Central Food Technological Research Institute (CFTRI), Milk cooperative movement in Kaira district, the National Dairy Development Board (NDDB) and also, to a large extent, some of the Indian agricultural research institutes, have made a big impact through innovations for application in the rural and small scale level for increased income for the producers. This is also reflected in many of the organized retailers coming into play in today's markets in India for bulk marketing by the farmers and reachout of fresh agri-products by the consumers. Some successful case studies have been briefly dealt with focusing on innovative technologies for the growers and the farmers who, in turn, have been able to mobilize their agri-products to reach the markets.

Gujarat Model of Success: Dairy Cooperatives

Dairy Cooperatives*/NDDB initiatives

Dairy Cooperatives account for the major share of processed liquid milk marketed in India. Milk is processed and marketed by 170 Milk Producers' Cooperative Unions, which federate into 15 State Cooperative Milk Marketing Federations. The Dairy Board's programmes and activities seek to strengthen the functioning of Dairy Cooperatives, as producer-owned and controlled organisations. NDDB supports the development of dairy cooperatives by providing them financial assistance and technical expertise, ensuring a better future for India's farmers.

Amul: A success story: The success story of Amul which inspired 'Operation Flood' and heralded the 'White Revolution' in India began with two village cooperatives and 250 litres of milk per day, nothing but a trickle compared to the flood it has become today. Today Amul collects, processes and distributes over a million litres of milk and milk products per day, during the peak period, on behalf of more than a thousand village cooperatives, owned by half a million farmer members. The revolution that started as an awareness among the farmers, gradually grew and matured into a farmers' movement and their determination to liberate themselves.

*The Indian Dairy Industry (www.indiadairy.com).

A new wing was added for the manufacture of 2500 tons of roller-dried baby food based on the formula developed by the Central Food Technological Research Institute (CFTRI), Mysore. It was the first time anywhere in the world that baby food was made from buffalo milk on a large commercial scale.

The strengths of Indian Dairy Industry are demand profile, margins, flexibility of product mix and availability of raw material in abundance in addition to technical manpower. The opportunities in this area include in terms of value addition of milk and milk products and export potential to neighbouring countries of India and Middle East countries. The Indian dairy industry, following its delicensing, has been attracting a large number of entrepreneurs. Their success in dairying depends on factors such as an efficient yet economical procurement network, hygienic and cost-effective processing facilities and innovativeness in the market place.

CFTRI Initiatives

The CFTRI through short-term training programmes, workshops, seminars, mission mode training programmes, exhibitions and EDPs, as well as through personnel counseling and capacity building programmes, provided know-how to farmers and village industries as well as village cooperatives and women's self help groups on various technological aspects. These include simple postharvest food technologies for rural areas, improvement and maintenance of food quality, plant sanitation and hygiene, and packaging systems appropriate to the products. These have enormously helped the farmer community to transform their farm produces into value-added products and to enhance the performance of their existing food processing and marketing ventures.

A few examples of technologies developed by CFTRI which have reached successfully to the rural and urban poor are: (a) Mini dal mill for processing pulses (Figure 4; more than 1000 such units are functioning, particularly in rural parts of the country), (b) introduction of mechanical roasters in poha units, (c) introduction of leg operated papad press in papad making units, (d) propagation of leaf cup and plate units in rural areas, and (e) improved edge-runner rice flaker by traditional rice flaking units in the state of Maharashtra. Other technological interventions relate to evaporative cool (EC) storage system, dehydrating grapes for raisins, standardizing a method to cure/polish turmeric into a better product.



Figure 4. Mini Dal mill for villages and cottage industries

Yet another effective contribution of CFTRI has been in Karnataka where a joint program was initiated by the institute with M/s. Vivekananda Girijana Kalyana Kendra (VGKK), B. R. Hills for the upliftment of the tribal poor in the forest and hilly regions of B. R. Hills and Yelandur in southern India by implementing tribal development programs, strengthening of their livelihoods. This was achieved through activities such as formation of self help groups (SHG) and an apex body from tribal communities, exploring the potential of the non-timber forest produce by conversion into a range of suitable value added products, such as tamarind blocks and concentrate of gooseberry pickle and dried slices, mango pickle and Decalepis pickle, establishing value addition production center and marketing linkages with market development agencies and by conducting training programs for SHG groups and tribal women on the skills of production of value added products and development of entrepreneurial and managerial capabilities for employment generation.



Figure 5. Training of the rural masses in B.R. Hills (in Southern India) under Indo-Canadian Project with CFTRI .

CFTRI reachout had also its visibility in the tribal areas of Manipur developing fruit processing facilities; to use the perishable fruits produced by the tribal farmers to help them to sell their products; and promote agricultural and horticultural development for poverty alleviation; to adopt novel and efficient technology for fruit processing for producing marketable products, save energy and transportation cost and to catalyse development of northeastern region through agro-processing efforts. The project being carried out is designed with integrated plant and machinery to operate the pilot plant for maximum 300 days in a year. The proposed pilot demonstration plant is of great importance as it will indicate suitable avenues for group development, production and marketable surplus which will provide income generation to tribal farmers of Ukhrul district of Manipur. It lays priorities on fruits, such as pineapple, passion fruit and orange for processing value addition and marketing to benefit the tribal communities/farmers (Figure 6).

The fruit processing technology (membrane process for clarification/concentration of fruit juice) is developed by CFTRI, Mysore and has demonstrated through this pilot project for the first time which may be used as a model by other regions in the nearby area/states. The new process enables almost 20% utilization of different fruits in various seasons produced throughout the year. The scheme envisages

utilization of the fruit resources of north-eastern state of Manipur through novel and innovative processes of reverse osmosis and micro/ultra filtration for producing superior quality of fruit juices and other products there from and ultimately provide sustainable livelihood to the tribal communities. The pilot scale capacity is of the order of 1-2.25 tons of canned slices / juice concentrate per day. The commercial level plants are of the order of 20 tons and above per day. The results of the pilot scale project will enable design and operation of indigenous plant of commercial scale elsewhere in the country using this technology perhaps even reaching other countries also.

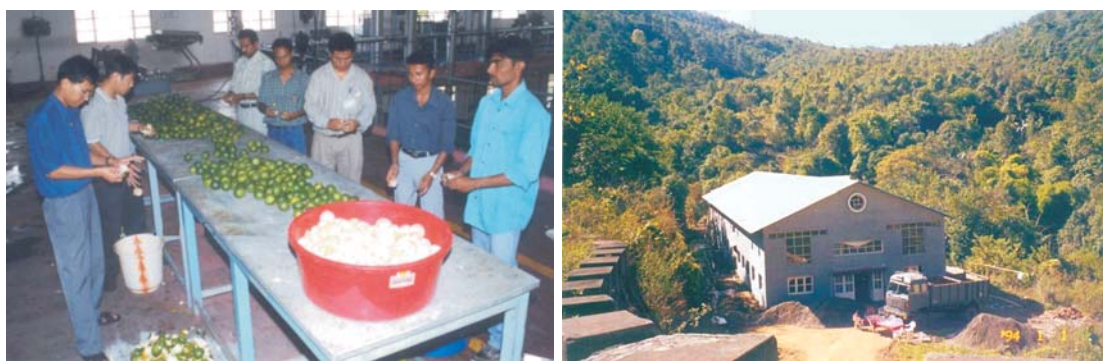


Figure 6. Fruit processing unit in Ukhrul district of Manipur to process pineapple juice and concentrate.

V. Factors Underlying Success *vis-à-vis* Emerging Concerns

- **Promoting Agro-processing Technology:** The case studies presented amply justify that there is a need for promotion of agro-processing centres in rural sector/ production catchments for value addition of agricultural produce including technological back- up support. The participatory resource management will be the key for such an approach with the programmes jointly planned, implemented and evaluated by all service providers.

- **Human Resource Development/ Capacity Buildings:** In knowledge-driven development, there is need for providing required training/education keeping in view the diverse needs not only on production procedures, but also quality certification and reporting procedures, grading, packaging, storage, transportation and other requirements of both domestic and export markets (Figure 7). The farmers need to have knowledge about the whole range of agri-business, production systems, research institutions,



Figure 7. The training is paying dividend continuously for value addition for agricultural commodities.

programs and schemes of the development departments, open markets both at domestic and global scale, and other unlimited partners which is to be provided through training, demonstration, literature, and other human resources development support including interface at different levels.

- **Market information networking:** The development of Information Communication Technology (ICT) and Telecommunication Network have paved the way for creation of information network, knowledge pool and services on new agricultural technology, products and marketing of produce, which must be intensively used. Though an effective system is in place, there is scope to improve this further. It will be appropriate to develop farmer-friendly information network to provide whole range of information leading to delivery of knowledge of new agricultural technology, products, procedures, and related services to enable them to take control of their farming environment in near future and thus bringing about value addition to the chain.

- **Research-Extension-Farmer Interface:** Although a variety of farmers' organizations including cooperatives, farmers' club/self help groups, and farmers' companies have been promoted in the past, there is lack of sustainability of their existence and

the purpose for which they were promoted. These farmers' organizations need to be looked as a kind of business federation for undertaking primary processing and marketing of local products and to facilitate much needed organizational support for effective implementation of quality control and standardization of farm products. This is also done in many R&D institutions and universities especially agricultural setups to take care of the knowledge dissemination and transmission of information and training. The new mechanisms and protocol suggested for technology development and delivery system for various sectors of agriculture would need spatial and functional integration and complementarities and institutional arrangements in the context of creating an environment to encourage and assimilate results of innovativeness. This would require policy support in terms of integration of efforts of institutions dealing with technology development, assessment and refinement, and dissemination including encouraging and accepting the contribution of corporate sector, private sector, cooperatives and farmers' associations in delivery systems.

- **Contract farming and other issues:** Contract farming is a system for the production and supply of agricultural/ horticultural produce under forward contracts between growers and buyers. The terms and nature of the contracts differ according to variations in the nature of crops to be grown, the technologies and the context in which they are practised. Contract farming can help the farmers to access credit, quality inputs, technical guidance and reduces risks of deficient market demand and adverse price fluctuation. The corporate bodies/buyers of the agricultural produce benefit from contract farming through the assured supply of quality raw material. The experience with contract farming shows that it has been beneficial in many ways with larger companies. However, for small land holders there are many practical problems.

- **Marketing strategies and infrastructure requirements:** Access to markets with increased value addition for commercialization of the tradable surplus is crucial for rural prosperity. As prices for agricultural products frequently fluctuate, it is important to manage the commercialization process effectively and in a way that allows the optimum share of value addition to flow to the marginal regions. Appropriate marketing strategies will have to be worked out to address issues relating to marketing/infrastructure required. The most immediate infrastructure for rural areas is the development of local transport network.

- **The impact of Farmers' Markets:** Producers use different market outlets (commission agents, local traders and Farmers' Markets) at different times of the year as a strategy to maximise profits. Farmers' Markets are especially beneficial for

small producers, who have difficulties selling small volumes during the dry season on the conventional market system. Farmers' Markets have influenced producers' practices in two main ways: (1) diversification of production to include a wider variety of vegetables, and (2) intensification to maximise the use of water and land resources throughout the year. Farmers' Markets have also stimulated producers' adoption of marketing strategies through a better understanding of consumers' needs and preferences based on incomes, dietary habits and local needs. Factors which affect producers' capacity to adapt to changes include access to credit and financial assets, and institutional support across the system. These are key factors in ensuring that farmers fully benefit from the Farmers' Market initiative, and deserve to be better addressed.

• **Role of women:** Women's traditional role in farming includes major responsibility for vegetable production. Since this has become a cash crop generating a good income, men have taken over control, especially in larger farms. However, women are still responsible for much of the farm work, particularly non-mechanised activities such as hand weeding. However, few women from producer households attend Farmers' Markets on a regular basis because of their other domestic and farming responsibilities, which have often increased with the introduction of Farmers' Markets. Closer contact with urban middle class consumers and with institutions in Farmers' Markets and need based training (Figure 8) has expanded women's skills and self-confidence, and earned them recognition from family and community. One needs replication of these in areas which can adopt it and needs integration and networking.



Figure 8. Selected training for the trainer in cottage and village industries for women.

VI. Future Outcome

Decentralized market activities in 15 to 20 thousand centres is proposed to linking-up villages to markets. Thrust will be on regulating market activity outside the market yards involving *gram panchayats* to organize and manage markets at local level by undertaking remunerative schemes and improving their revenues. Creation of new, and upgrading of existing market support infrastructure facilities will ease out congestion in regulated markets, facilitating farmers to access market operations locally. Also, further strengthening will require: licensing of nearly one lakh rural youth as qualified graders to service the farming community; organising commodity – specific growers’ associations at village, market and state level integrating their functions in relation to market – centric activity; achieving vibrant market activity throughout the state to take care of deficit areas with market surplus on commodity – specific basis; linking-up villages to local market; local market to regional/state markets and state markets to national and international markets duly networking them on-line (e-marketing), well organized *gram panchayats* can be market centres providing pre-harvest and postharvest services required by the farmers and ultimately, facilitating remunerative price to farmers, timely payment, fair trades practices and elimination of middlemen through organized effort of co-ordinating agencies and farmers co-operatives at all levels. Overall the above proposed developments will reflect the expected outcome. All these need sustainability with a clear demand from the market and the need to emphasize the quality of the commodity in place.

VII. Epilogue

The report brings out the needs and concerns of regulated markets which have grown from 286 in 1950 to over 10,000 now. Comensurate with their spread, there has been focus on agricultural marketing reforms. Overall concerns both at the state and central government level and spread of marketing network has led to build up of market infrastructure strengthening *vis-à-vis* developing marketing system. Effort has been towards a more organized structure so that LFM activities benefit the farmers at large. A synthesized information on some successful case studies of agricultural produce marketing-network such as in Punjab, Andhra Pradesh, Maharashtra and Tamil Nadu, and the highly successful initiative of ITC's e-Choupal with widespread agricultural-market information that provides guidance to the farmers and other stakeholders on market has been given. Also, highly successful efforts based on technological innovations such as of dairy cooperatives, thrust provided by National Dairy Development Board in national context has been dealt with. The CFTRI and several agricultural research institutes have, over the years, also contributed towards processing technologies and product development/ value addition that have reached successfully to the farmers and rural communities in particular. All these endeavours have provided income generations to the farmers.

The technological advances made also reflect the change in trends, making the farmer/grower more enlightened who now can have not only access to the latest market information but also encashes it by proper strategy and becomes a part of the value chain itself as he reaches out to the market place. When once this gets streamlined it becomes an organized setup which would then require a co-operative movement (the success story of dairy cooperatives in India) which will enhance the interfacing as a solution for sustainable agriculture through sustainable value addition and of course with ensured sustainable consumption through a sustainable market. Some of the pathways that India has shown can even serve as good model for other countries of Asia-Pacific to follow perhaps with local modification for their own advantage and value addition to the food chain.

Acknowledgement and Disclaimer Clause

The information described in this write up is derived from a number of public domain websites and other available public domain documents and many a times from some of the leading news papers, reports, magazines and from various talks given in several national and international conferences and also by the author's self experience at many sites and his own report in value addition chain as well as from the commercial public domain websites where from the photographs are downloaded for use in this article. We gratefully acknowledge the public domain websites for allowing us to use these photographs for this article to make a point and at no point we claim it as our own and are grateful to these websites for the access. Since the contents of the paper is a consolidation of large amount of information which may have not been updated to the latest statistics, the points made are very generic in terms of LFM. Therefore, it should be read from that perspective and in no way it defines or guarantees that such models will be applicable to other countries or to other areas since it depends upon the crop, the infrastructure, the government policies, taxation as well as the farmers cooperatives to work with the local system in close tandem to the changing scenario on a day-to-day or weekly basis. Therefore, the context under which one should see this article should be from the angle of generic point rather than trying to look at any single aspect. It is the holistic approach for a sustainable development that is emphasized and the author is grateful to a number of people for their cooperation in the preparation of discussion on the matter as the article and all their inputs are acknowledged.

