



A successful innovative model for promoting value addition with emphasis on coconut

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The Regional Agricultural Research Station, Pilicode in Kasaragod district of Kerala, popularly known by its acronym RARS, is one of the oldest research stations in India. Established in the year 1916 by the erstwhile Madras state government as coconut research station, it has contributed immensely to the wealth of scientific knowledge on every aspect of coconut during the last one hundred and odd years. It was here that the world's first coconut hybrid was evolved four score and four years ago. Subsequently, numerous high yielding varieties have been evolved for which farmers from across the state and beyond throng the station in large swarms every year, during the month of June for buying the exceptionally coveted seedlings. The station has always been in the forefront of coconut research in the country for evolving science based solutions to the prioritised problems of the coconut farmers. One of the challenges faced by the coconut farmers is the declining or stagnating output prices compared to escalating input prices. The increase in the price of coconut over the last decade has only been marginal. Even the productivity of coconut is not significant in spite of the elaborate efforts made by the institutions concerned. Ravaged by climate change, scarcity of skilled labour, violently fluctuating prices and rampant pest and disease attacks, Kerala's coconut farmers are parables on agrarian distress in the country. The RARS, Pilicode of

Kerala Agricultural University, though until recently has been focussing more on developing production technologies, has come forward to address the current felt need of coconut farming sector with a set of value addition based initiatives as a research priority.

Background

Value addition and product diversification has since long been recognised as the key to ensuring better income for the farming community and for the sustainability of farming in our country. However, value addition and product diversification activities in India is minimal, as low as 7% (Saikumar et al., 2010) as the process is constrained by various technological, infrastructural, institutional and policy factors. The picture in Kerala, the land of coconut, too is not rosier as elsewhere in the country. Kerala has not made tangible progress in value addition of coconut except for the traditional activities such as copra and oil milling and coir processing. Coconut based economy can expect a revival only when the profitability of coconut farming is delinked from the price behaviour of coconut oil through value addition and product diversification. By far, the most important reason for the tardy progress in coconut value addition sector is the lack of scalable cost effective technologies suitable for small and marginal enterprises.



Elements of the Value Addition Innovation Diffusion Model Developed by the RARS, Pilicode

Apart from generating and demonstrating technologies, the packaging and labelling of the value added product in its final marketable form and its business/sales potential to increase income need to be demonstrated. Then, the adoption of technologies generated will ensue naturally as a logical sequel resulting in establishment of value addition units in rural areas. This would create more local demand for raw materials which will fetch price to several hitherto underutilized/unutilized crops/produce and farmers will derive additional income. Finally the nation gets nutritive food products ensuring nutritional security apart from contributing to the GDP growth.

In this back drop, the scientists of the RARS Pilicode lead by its Horticulture Division made a brain storming to work out strategies and to arrive at a model for promoting value addition with special emphasis on coconut. It eventually led to the establishment of Centre of Excellence in Post Harvest Technology at the station. The project was sanctioned under a "Network Project on Value Addition and Post-harvest Management" in 2014-15. The centre is designed incorporating all the elements of the model conceptualised so that any willing farmer or entrepreneur among the visitors to the centre shall pick up the message, "It is possible, I can".

Research: Ideation and Innovation Development

It involves generating ideas for innovative technologies and developing innovations for value addition and also packaging, labelling and branding. The innovations thus developed shall have following attributes i) High consumer acceptance ii) Scalable (Must be able to produce on a range from home scale to commercial level) iii) Raw materials shall be locally available, underutilized or non-utilized. The

project is implemented in the following sequence.

1. Infrastructure Creation

The requisite infrastructure includes a pilot plant, lab facilities, machineries, sales counter and Food Pro Mall.

2. Research on Product development

Protocols has been developed for value added products based on crop priority, availability and seasonality. The research, production, marketing etc shall be supervised and managed by a professionally qualified team of scientists and technicians. They shall receive feedback from consumers and entrepreneurs and make necessary changes and fine tuning in the innovations developed.

3. Mass Production and marketing

3.1 Production

The bulk production of value added products shall be carried out by a Self Help Group, trained and groomed for the purpose.

3.2 Sales and Marketing

The sales and marketing shall be through the sales counters and "Food Pro Mall" of the RARS and other KAU outlets.

4. Extension

Impart training to the willing entrepreneurs both individuals and groups, display of the professionally labelled, packaged branded products in the Food Pro Mall as a permanent exhibition and sensitization based on the principle of "Seeing is Believing" and to infuse in the minds of every willing entrepreneur the confidence that 'I can'. It would give accurate experience based data on all aspects of enterprise and technological products including the production cost, revenue and cost benefit ratio. Besides this



Coconut Dehusking Machine



Coconut Desheller



Disintegrator



Screw press milk extractor



VCO Cooker



High Speed Centrifuge



Testa removing machine



Manual hydraulic press

all other extension channels are also used for accentuating the communication and spread of innovations.

Centre of Excellence in Post Harvest Technology

The RARS could actualise the above model in a short span of time and accomplish the following components and activities as part of the Centre of Excellence in Post Harvest Technology, which is manned and managed by a professionally qualified team.

1. Creation of Infrastructure

To begin with, a pilot plant and lab facilities with FSSAI registration was established in a built up area of 2000 sq ft after renovating an existing building. A semi mechanised processing facility for Virgin coconut oil (VCO) production with a capacity of 500 nuts/day was installed during 2014-15. These include machineries such as coconut dehusker, deshelling machine, testa removing machine, disintegrator, screw press milk extractor and tubular centrifuge worth Rs.15 lakh. More machineries worth Rs.20 lakh were procured in subsequent years from 2015 to 2017 which included micro filter, VCO cooker/uruli roaster, multipurpose milk juice expeller, coconut chips electrical slicer, vacuum dehydrator, vacuum packing machine, commercial wet grinder, mini grinding mill, multi-purpose fruit/vegetable cutter, electrical drier, automatic bottle filling machine and

a set of cashew nut processing machinery etc.

Machineries in virgin coconut oil (VCO) production unit

2. Research on product development

Initially the research activities were focussed on developing coconut kernel based products mainly on Virgin Coconut Oil (VCO). During 2014-15, besides VCO, other kernel based products such as coconut curry paste, chutney powder, coconut pickle etc. were standardised using minimum processing equipments. The raw materials used were entirely from the farms attached to the RARS. The research on product standardisation and diversification for new innovative downstream products was continued further during 2015-17.

Products Developed: Till date, the station has developed technologies for more than 50 value added products from various horticultural crops of which those from coconut is prominent. The technologies developed are virgin coconut oil (Hot & Cold process), and products from VCO such as Danthapala Oil (skin & hair care), mouthwash, face cream, hair cream, herbal hair oil, body lotion, coconut water based products such as syrup, vinegar, cider, honey, fizzy soft drinks, nata de coco, kernel based products such as defatted desiccated coconut, sweet ball, coconut chips (sweet, spicy & chocolate), chutney powder, coconut pickle, coconut curry paste

(sambar, chicken, channa and fish), coconut milk based products such as milk honey, milk chocolate, halwa, yoghurt, tender nut based products such as juice, pudding, ice cream, banana based chips, halwa, banana powder, cashew apple pickle, squash, jam, RTS, cashew nuts with different grades, papaya candy, jam, pickle, mango pickle, squash, bar, jackfruit halwa, amla candy, passion fruit squash etc.

3. Formation of SHG and operating production unit through revolving fund

A group of 10 members from among those successfully completed the training were selected exclusively based on their performance during the training to form and register a Self-help group "NANMA SWAYAM SAHAYA SANGHAM". They were enrolled as interns and inducted into the production unit on completion of a probationary period of 3 months. A MOU was signed between the SHG group and the Kerala Agricultural University for scaling up the production of value added products for which technology was generated from the station. The main raw materials such as coconut, jack fruit, cashew, papaya, mango etc are made available from the research station to the unit along with other inputs and the SHG members are involved in value adding them into specific research based products as directed by the centre. The products are sold through the sales counter at RARS Pilicode and other KAU outlets. The challenge before the RARS Pilicode in the beginning was to ensure an assured income to this SHG to sustain them in the production unit. This was made possible by offering one third of the income generated through sale proceeds based on the MoU between the centre and the SHG, which they share among the members on a monthly basis. This provides gainful employment and decent income regularly to the SHG members. The expenditure for running the unit is met from the revolving fund operated by RARS earmarked for the purpose, and the income generated is ploughed back into the revolving fund which helps to increase the revenue of the station.

3.1 Mass production of Value Added Products

The value added products, developed by the Centre of Excellence in Value Addition at the RARS Pilicode and scaled up for commercial level production are briefly explained hereunder:

Virgin Coconut Oil (VCO): VCO is obtained from

fresh, mature endosperm (kernel) of the coconut by cold and hot processing methods. Virgin coconut oil is a major source of Lauric Acid and Vitamin E. Health benefits include protection from atherosclerosis and heart disease by increasing HDL, preventing obesity, as a hair and skin conditioner and for aroma therapy and as massage oil. A demonstration unit for production and training on Virgin coconut oil involving machineries has been established at the centre. The product is sold as Kera rathna Virgin coconut oil hot processed and cold processed in 500, 250 and 100 ml bottle packing.

Danthapala oil: A downstream re-innovated value added product from Virgin Coconut Oil and Danthapala (*Wrightea tinctoria*) leaves along with other herbal ingredients which has strong antifungal and antibacterial properties. It is developed in two formulations, one for hair and other for skin. It is useful in dermatitis, hair fall, psoriasis, dandruff, eczema and is a panacea for skin related disorders. It is sold in 100 ml bottle packing.

Herbal hair oil: This product is prepared from virgin coconut oil, and an extract of 9 herbs having hair care properties such as hibiscus, amla, henna, aloe vera, curry leaf, bhringraj, neelamari (Indigo), tulasi and other natural ingredients. It helps in hair growth, and effective against hair fall and dandruff. This is also sold in 100 ml bottle packing.



burns

Face cream: Another innovated product from Virgin coconut oil and other natural ingredients such as beeswax, turmeric and Aloe vera. It helps in reducing pimples, acne, wrinkles, aging and stretch marks and soothes

Mouth wash: Downstream product from Virgin coconut oil along with components for oral hygiene such as oils of clove, cinnamon, cardamom, pepper mint and natural extract of mango leaves.

Hair cream: A completely natural



● Value Addition

product prepared from virgin coconut oil, bee wax, Aloe vera, amla, hibiscus leaves, tulsi and lavender oil. It helps in reducing excess hair fall, moisturizes hair and cleans scalp, brings shiny appearance, controls itching and grooms strong hair.

Body lotion: Another innovated product from Virgin coconut oil and other ingredients intended mainly for infants and babies. A completely natural cream prepared from virgin coconut oil, bee wax, aloe vera and other natural ingredients. It is a good skin moisturizer and promotes supple skin and protects it.

Coconut water syrup: Refreshing drink made from coconut water obtained from mature nuts while preparing VCO without losing the freshness. It is prepared using coconut water with equal amount of sugar, ginger, natural colour and citric acid as a preservative. This can be consumed after diluting 4-5 times with water.

Coconut water vinegar: A natural product derived from coconut water with sugar, fermentation by inoculation of yeast/ Acetobacter followed by addition of mother vinegar, oxidation and acidification. Natural vinegar is free from the hassles of synthetic vinegar prepared from commercial acetic acid which is harmful to health.

Coconut water cider: A fermented beverage standardized from coconut water through pasteurization and fermented using yeast as inoculums and further subjected to blending and filtration.

Coconut chips: Prepared from thinly sliced fresh coconut meat by slicing the meat into 0.6-0.7mm



thickness, blanching in boiling water, soaking in syrup, draining and drying in a dryer. It is standardized in 3 flavours, spicy, sweetened and chocolate. It is a ready-to-eat snack food rich in fibre.

Coconut milk toffee: Toffee developed from a combination of Coconut milk, virgin coconut oil, glucose, chocolate and jaggery.

Coconut water honey: A brownish viscous product standardized from coconut water rich in sodium and potassium, useful in healing wounds and utilized for further value addition.

Coconut sweet ball: Sweet ball prepared from fresh coconut meat, residue of VCO, virgin coconut oil, raisins, cardamom, jaggery and coconut milk. It is an excellent sweet which is healthy and relishing.

Chutney powder: Kerala's traditional cuisine prepared by using coconut kernel, spices, onion, salt and black gram. Chutney powder can be stored up to 6 months without refrigeration.





Coconut pickle:

Prepared by using fresh coconut meat into thin cubes, sesame oil, spices, salt and vinegar.

Coconut curry paste:

A convenient food developed based on traditional Kerala cuisine for easy, fast cooking without any

preservatives. It is a ready to use stable product with long shelf life (one year or more), uniform quality for instant results. It is prepared from coconut kernel, Virgin Coconut Oil, salt, curry leaf and an ideal blend of spices. 50g of paste is sufficient for a family of 4 for a single preparation. 4 recipes are developed separately for chicken, fish, channa and sambar preparations

Coconut cookies: Tasty coconut cookies prepared from desiccated coconut powder, virgin coconut oil, flour (Maida/wheat/ragi), vanilla essence.

Tender coconut Pudding: A delicious dessert standardised from tender coconut water, meat, milk, china grass, essence and cashews with shelf life for one week.

Tender coconut ice cream: Prepared using combination of tender coconut water, tender coconut meat, coconut milk, condensed milk and sugar.

The mass production of value added products in coconut are based on zero waste concepts. The husk obtained while dehusking are utilised for burial in coconut plantation of RARS Pilicode. Coconut shells removed while deshelling is used as fuel source in cashew nut processing. The testa removed for production of VCO is dried and mixed with cattle feed and given to the dairy animals in the farm. The defatted desiccated coconut is value added to various products and sold. The Coconut water obtained while processing is also value added to

various products as explained. The remaining kernel wash water and coconut water is microbiologically processed, concentrated and enriched with nutrients and used for nursery plants and vegetables. Thus it is maintained as a zero polluting unit.

3.2 Marketing

3.2.1 RARS, Sales Outlet

The packed and bottled value added products are sold through the sales counter attached to the RARS Pilicode. For this purpose, the existing sales counter was renovated to give a facelift and stylish look to attract customers. Based on demand, the products are also sent to sales outlets of KAU located in different districts all over Kerala.

3.2.2 Food Pro Mall

A Food Pro Mall was constructed incurring Rs.15 lakh with a built up area of 850 sq ft in the RARS Campus at Pilicode, which is situated on the Kozhikkode-Mangalore Highway. It has an octagonal shape and a beautiful architectural look of a modern shop marked by its attractive and stunning display of products. The food pro mall sell the branded value added products from the processing unit in its final marketing form, in attractive packing and labelling. It serves as a perennial, 'seeing is believing' source of motivation for the aspiring entrepreneurs, youth and women groups of the zone and beyond. Food Pro Mall has started to function in full swing with a variety of ready to eat and ready to serve food items prepared through value addition of coconut and other fruit crops of the region such as tender coconut milk shake, tender coconut pudding, ice cream, coco choco milk shake, coconut based fizzy drinks, amla juice with honey, and ginger with beetroot flavour, passion fruit juice etc. The Food Pro Mall attracts not less than 200 customers per day and it has become a favourite food joint for many and the customer base is expanding in fast progressions.

Analysis of the sales output based on product category reveals that VCO is the most sought after value added product in coconut. However more revenue is obtained through ready to drink (RTD) processed tender coconut juice made available from the food pro mall on an instant basis.

4. Training Programmes

The centre conducts regular training programmes, based on the principle of 'learning by doing' to those interested entrepreneurs and self help groups, who are willing to take up the value addition in



coconut as an enterprise based on the RARS model. So far, 260 woman entrepreneurs in 30 batches and Kudumbasree members have been imparted training in batches of 10 members. The trainees were evaluated based on their performance after the completion of training and certificates were issued to them in a public function. The 'Nanma SHG' unit of the station play a crucial role in maximising learning experience to the trainees during the training process. The SHG imparts real experience to aspirant trainees and serve as a constant source of motivation to similar groups in setting up a value addition firm.

5. Transfer of Technology

Production protocol for certain novel technologies available with the centre are transferred to entrepreneurs on need basis, on payment of technology transfer fee fixed for different value added products from Kerala Agricultural University. They also will be provided practical training on the particular product. Technical advice and guidance is also provided to the potential entrepreneurs for setting up of coconut based processing units regarding machineries, quality specifications, marketing prospects etc., based on the data available with the centre.

6. Outcome and Impact

a) Financial Achievements

The year wise income from the sales of value added products from food pro mall and sale counter of RARS, Pilicode is depicted in the graph below.

Year wise income of RTS and value added products

There was a steady growth in revenue in 2019-20. Provided the existing rate of growth is projected, the

income can be expected to rise to around one crore per year with in another two years. Considering a capital investment of a total of 50 lakhs for the project including buildings, the projects become break even with in a period of 5 years which sounds very good.

b) Adoption

Several entrepreneurs are inspired by the VCO plant established under the project and are convinced about the technical feasibility and profitability of such ventures. At least two units have been established in the district of Kasaragod and three units in Kannur district by the trainees.

7. Conclusion

From the experience so far, the RARS model has been proved successful in terms of the technologies generated for their suitability to microenterprise level, their output and outcome in terms of income and employment generation, consumer acceptance etc. The RARS, Pilicode could establish a strong foundation of value addition research for evolving novel products with attributes compatible with the agro climatic situation, market and consumer needs and preference of the region in coconut and other horticultural crops. The model, besides offering novel technologies could also successfully demonstrate the risks involved, possible constraints and the hurdles to be crossed in achieving success in the venture. The centre has succeeded in instilling confidence among intrested entrepreneurs to start value addition enterprises at micro level or even at commercial level. The trainings and demonstrations conducted also facilitated awareness and adoption fulfilling almost all the objectives of the project.

A robust supporting system and linkages encompassing technical, infrastructural, financial, marketing and regulatory environments are also required to enable the aspiring entrepreneurs to gauge the opportunities and launch a new company in coconut value addition sector. Aspiring entrepreneurs can ideally come forward to embark on coconut value addition as a remunerative business considering the enormous potential and opportunities available in the sector. It is our sincere hope that the model evolved and demonstrated by us is worth replicating in Kerala.

Source: *Saikumar, B.C., Manjunatha, A.V., Chengappa, P.G., and Nagaraj. 2010. "Value addition in agriculture and allied sectors," *Journal of Global Economy, Research Cetre or Social Sciences, Mumbai, India, 6(4), 311-327.* ■