Concept Paper

Synopsis of coconut and rice value addition endeavor

A ROHINI, GG KAVITHASHREE and M PANDIYAN

Agricultural College and Research Institute
Eachangkottai, Thanjavur 614902 Tamil Nadu, India
Email for correspondence: rohini_agri@yahoo.co.in

 Received: 6.6.2018/Accepted: 12.7.2018

ABSTRACT

The market-oriented agriculture is the need of hour in the present state as consumers demand value-added and healthy products than what would be available elsewhere. Due to this scenario the farmers should reorient their production and other activities to match the demand. It will be profitable if the farmers select the produce of their region and go for processing and value addition as the resource base is within their reach. In such condition it is worthwhile for the Thanjavur region farmers cultivating paddy and coconut to a large extent specialize in both commodities as the raw material is abundant and always available with them. This paper throws light on the aspects of minimal processing and value addition in coconut and rice for increasing farmers' income and providing satisfaction to the consumers.

Keywords: Processing; value addition; rice; coconut; market; income

INTRODUCTION

Indian agriculture has undergone tremendous changes in the last two decades after the formation of World Trade Organization. Cropping pattern around the world has changed in a big way due to the varied climatic conditions, market opportunities and input cost (Datta 2001). Monsoon and market risks are the two major impediments for the agricultural system having a strong bond with other sectors of the economy (Boselie and Van de Kop 2004). To cope up with these changes our farmers turned heavily towards market-oriented agriculture to meet the heavy input cost and balancing with the market economy. When landholdings are small and the overall economic development has matured beyond the basic food needs, farmers face market risks and they opt for diversifying away from grains towards higher value commodities and products. The demand for high-value food commodities is more responsive to income changes (Birthal et al 2007). Favourable agro-ecology pushes stakeholders to diversify away from food grain and toward higher value commodities such as horticultural products and healthy cereals demanded by more sophisticated consumers both domestic and international (Gulati et al 1994).

In India only six per cent of total agro-output is currently processed as against 80 per cent in some developed countries leaving a large potential to be tapped in this sector. Food processing industry in India is a sunrise sector and has gained prominence over the recent years and is presently growing at 14 per cent. Farming community could involve in minimal processing and be able to produce value-added products and market them at remunerative prices. Only when raw materials available in their region are being processed and value-added they will be able to get high level profit for a successful business. Paddy and coconut have a vast scope for value addition and a review is done on these aspects in this paper to earn knowledge. Also there is an urgent need for value addition so as to provide an additional source of income and to improve the economic status of the farmers and the country. Cauvery delta regions constitute 'Rice bowl of Tamil Nadu' and the farmers are involved in rice cultivation in majority and also coconut cultivation is largely followed by them.

Coconut: an imperative crop

The coconut palm (*Cocos nucifera* Linn) is supposed to be one of the five legendary Devavrikshas

and is eulogised as Kalpavriksha: the all giving tree in Indian classics.

Coconut

All parts of the palm are used in some way or the other in the daily life of the people. India occupies the premier position in the world overtaking Indonesia and the Philippines the other two prominent coconut growing countries. In India the four southern states together account for 90 per cent of the total production of coconut in the country.

Coconut value-added products: The important products of coconut in our country are whole coconut (tender and mature), copra, toddy, Neera, Gur, coconut palm candy, sugar, vinegar etc. Coconut as a tasty food adjunct is well recognized. It is used in different value-added formats such coconut shell-based products, coconut flower syrup, coconut palm jaggery, coconut palm sugar, coconut oil, raw kernel, tender coconut water etc (http://coconutboard.nic.in/Coconut Products.aspx). It has been used as staple part of the diets of almost all Polynesian and many Asian people for centuries. It is used as food, as flavouring agent and made into beverages (Anon 2008).

Tender coconut water: Coconut water refers to the liquid endosperm of a tender coconut at an age of approximately nine months from time of pollination. It contains sugars, amino acids, electrolytes, minerals, vitamins, complex carbohydrates and other nutrients. Perishability of tender coconut is relatively high. The minimal processed tender coconut can be stored up to 24 days in refrigerated condition at 5-7^{o}C. Packing tender coconut water in pouches/aluminium cans has shelf-life of more than six months under normal ambience condition and 12 months under refrigerated condition.

Coconut chips: Coconut chips are the thinly-sliced crispy coconut meat which may be sweetened or salted and may come in handy as a ready to eat snack food. It is prepared by slicing the coconut meat of eleven to twelve month-old nuts thinly into strands, soaked in syrup, drained and dried in a dryer or oven (Siddarameswara Swamy 2015).

Snow ball tender nut: Snow ball tender nut is a tender coconut without husk, shell and testa which is ball-shaped and white in colour. Eight month old coconut is more suitable for making snow ball tender nut in which there is no decrease in quantity of tender water and the kernel is sufficiently soft. The process is dehusking of the nut, making groove in the shell and scooping of the tender kernel in ball shape without breakage by using a scooping tool (Sangamithra et al 2013).

Edible copra: Two types of copra namely milling and edible are made in India. Milling copra is used to extract oil while edible grade of copra is consumed as a dry fruit and used for religious purposes. Milling copra is generally manufactured by adopting sun-drying and artificial means. Different grades of edible copra are available in the market according to the size, colour etc. Ball copra is an edible grade of copra consumed as a dry fruit and used in preparation of sweets and also used for religious purposes. Edible copra is also available in cups.

Coconut oil: Coconut oil is used in the country as a cooking fat, hair oil, body oil and industrial oil. Coconut oil is made from fully dried copra having maximum moisture content of six per cent. The branded coconut oil in small packs is mainly marketed as hair and body oil. India has unbeatable quality advantage in this sector. Refined coconut oil is mainly used in the manufacture of biscuits, chocolates, confectionery items, ice cream, pharmaceutical products and costly paints.

Virgin coconut oil: Virgin coconut oil is also made from the milk extracted from raw kernel by adopting wet processing technology. Coconut milk is fermented and then by mechanical process water is separated from oil. No heating or application of sunlight or dryer is done for the process. Virgin coconut oil is abundant in vitamins, minerals and anti-oxidants thus making it the 'mother of all oils'. It is the purest form of coconut oil and water white in colour.

Neera: It is a drink tapped from inflorescence of coconut tree. It is the non-alcoholic and nutritious drink from the immature inflorescence of coconut tree which can be promoted due to its potential for value addition, employment generation and better returns to the coconut farmers. It is good for digestion, facilitates clear urination and prevents jaundice. It is an abundant source of minerals, 17 amino acids, vitamin C, broad-spectrum B vitamins and has a nearly neutral pH. Diversified value-added products like coconut flower syrup, jaggery and coconut palm sugar are produced from Neera (http://coconutboard.nic.in/Coconut Products.aspx).

Nata de coco: Nata de coco is a gelatinous product prepared from matured coconut water by the action of cellulose-forming bacteria. It was found that 100 litres of coconut water would yield about 20 kg of raw nata. There is very good demand for nata de coco in countries like USA, Europe, UAE, Japan, Taiwan and Korea.

Desiccated coconut powder: Desiccated coconut powder is the shredded coconut kernel and finds use in many food products. It is rich in healthy saturated fats with no cholesterol and also a good source of dietary fibre. In consumer packs it is readily acceptable in both coconut growing and non-growing countries also (http://coconutboard.nic.in/CoconutProducts.aspx).

Yoghurt: Coconut milk can serve the purpose of extracting the cow's milk for the preparation of yoghurt which has high commercial value in providing highly nutritious food items at reduced price. The process involves reconstitution of milk containing 50 per cent non-fat dry milk and 50 per cent coconut milk, pasteurization, inoculation with bacteria, packaging, incubation and chilling.

Coconut flour: After expelling the milk the protein rich residue is dried and powdered to obtain a product called coconut flour. The flour so obtained typically contains 7-8 per cent protein, 3-5 per cent moisture and 17 per cent oil. It can be used as an ingredient in weight control foods because of its high fibre content (Markose and Poduval 2009).

Rice: a new perspective for value addition

The concept of minimal processing of rice is the need of the hour which is to be introduced among the farmers/entrepreneurs/self-help groups for the income generation and also for the entrepreneurship. Indian population is turning towards healthiest food choices due to increased non-communicable disorders like diabetes, cardiovascular diseases etc. Cereals-pulses-millets-based products will be highly demanding ones among consumers. In south India especially Tamil Nadu the term 'to eat' literally means to eat rice. All varieties of rice are available throughout the year supplying as much as half of the daily calories. Paddy post-harvesting in a new and nutraceutical-based approach will be beneficial for the society.

Broken rice: The broken rice is widely used in the food preparations and in the industries for making flour and in the manufacture of baby foods. The starch extracted from broken rice finds wider application in the pharmaceutical, textile and other industries. Since broken rice is as good as whole rice in nutritional aspect the utilization of broken rice into value-added products and extruded products like Vadaam was found feasible.

Rice bran oil: Commercially rice bran is the most valuable by-product which contains about 12 per cent protein and 15 per cent fat. It also contains vitamins and minerals and is a potential source of edible oil. Bran oil is obtained by the extraction of rice bran with solvents. It is also obtained in the solvent extraction milling of rice. The oil contains a high percentage of unsaturated fatty acids yet it is quite stable because of the presence of natural antioxidants. Bran after solvent extraction has a higher percentage of protein. Its oil is ideal for margarine and shortening.

Parched rice: It is prepared by throwing rice in sand heated to high temperature in an iron or mud pan. On stirring rice begins to crackle and swell. Then the content of the pan are removed and sieved to separate the parched rice from sand. Parboiled rice is used for making grayish to brilliant white colour parched rice and sold either salted or unsalted. It is eaten as such or mixed with butter milk or milk.

Expanded rice (Pori): Expanded rice (Murmura, Pori, Muri) is a traditional convenience food widely consumed in India either as such or with jaggery, roasted Bengal gram and shredded vegetables and spices. In the traditional process paddy is soaked in water preferably overnight until saturation, drained and then either steamed or dry-roasted in sand for parboiling. The parboiled paddy is milled, salted and again roasted in sand for expansion.

Puffed rice (using rice), a popular ready to eat snack product is obtained by puffing milled parboiled rice. In the traditional process rice is gently heated on the furnace without sand to reduce the moisture content slightly. It is then mixed with salt solution and again roasted on furnace in small batches with sand on a strong fire for a few seconds to produce the expanded rice. Rice expands about eight times retaining the grain shape and is highly porous and crisp as reported by Mishra (2015).

Puffed rice from parboiled rice is soaked in salt water to increase the moisture to about 20 per cent. The moist rice is introduced into a hot vessel at

about 250-275°C for 30-40 seconds. The rice puffs suddenly.

Popped rice: This is yet another traditional valu-added product prepared from raw paddy. The paddy at a moisture content of 12-14 per cent is directly roasted in iron pans using sand as a medium at a temperature of 150-200 °C. Popped rice is useful in religious functions and ceremonies.

Flaked rice: Flaked rice is another important value-added product prepared from paddy. Traditionally it is prepared from soaked paddy after heat treatment and immediate flattening using a flaking machine (an edge runner). It is made from parboiled rice. It is thin and papery and of white colour.

Quick cooking rice: It is made by steeping polished rice in water to a moisture content of 35 per cent, cooking under pressure and drying. Alternatively the rice may be subjected to freezing, thawing and dehydration. Producers' seasoned rice products combine convenience, versatility and taste to create delicious rice recipes ready as easily as water can be boiled. Polished rice may be precooked and canned as rice pudding and also used to make dry breakfast cereals.

Fermented products from rice (Idli/Dosa): Idli is a small, white acid leavened and steamed cake made by bacterial fermentation (12-18 hours) of a thick batter made from rice and dehulled blackgram dhal. Idlies are soft, moist and spongy having a desirable sour flavour. Dosa is another common fermented product used in India. This is prepared from a fermented batter of rice and pulse in the proportions ranging from 6:1 to 10:1. Both the ingredients are finely ground unlike in the Idli batter which contains the rice component in a coarse consistency.

Dhokla: Dhokla is a fermented food prepared from rice and Bengal gram. This is popular in western India particularly Gujarat. This is prepared from a batter of coarsely-ground rice and Bengal gram. The fermented batter is steamed in a pie dish, cut into diamond shape and seasoned.

Extruded products: Extrusion is a process that combines several unit operations including mixing, kneading, shearing, heating, cooling shaping and forming. It involves compressing and working raw material eg flours, starches, proteins, salt, sugar and other minor ingredients to form a semi-solid mass under a variety of controlled conditions and then forcing it to pass through a restricted opening such as a shaped hole or slot at a predetermined rate. To it heat is applied directly by steam injection or indirectly through a heated barrel. The rice-based extruded products include Sevai, Idiappam, Murukku (Chakli), rice-based Vadagam etc.

Brown rice: It is the rice recommended by the doctors/ physicians to improve the health. It is important to modify the staple food 'rice' by altering foods like millet-incorporated foods, increased consumption of fruits and vegetables etc. Brown rice-based Puttu mix, Kozhukattai mix, Murukku mix, health mix, Idiappam mix, instant Aapam batter, instant brown rice batter etc are few value-added products in demand especially in the semi-urban and urban regions. Brown rice actually is a product from any type of paddy (either raw or parboiled paddy of any rice variety) and only the outer husk is removed (Patil and Khan 2011).

The earlier called hand-pounded rice is the similar type of rice with enriched nutrients. Hence it contains all its botanical components and the nutrients provided by them. The outer layers (bran) and the germ or embryo of brown rice are rich in protein, fat, dietary fibre, vitamins and minerals whereas the inner portion of the rice grain (endosperm) is rich in starch alone. A whole grain of rice has several layers. Only the outermost layer, the hull is removed to produce brown rice. This process is the least damaging to the nutritional value of the rice and avoids the unnecessary loss of nutrients that occurs with further processing.

CONCLUSION

Farming community can be involved in minimal processing and to produce value-added products and market them at remunerative prices. Paddy and coconut cultivated mostly in Delta regions can be processed to get value-added products which can be a wise way of entrepreneurship activity for increasing income. Only when raw materials available in the region are being processed and value-added farmers can gain high level profit for a successful business. Food processing and value addition in agro-produce could be a wise way of entrepreneurship activity for increasing farmers' income.

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