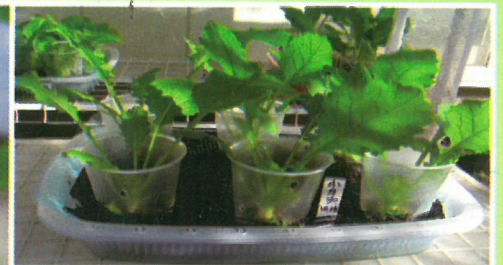
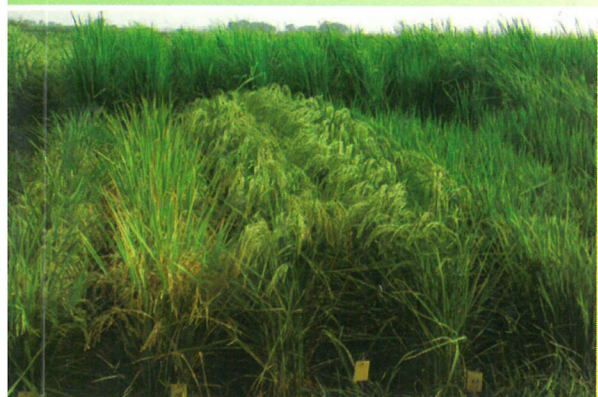


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Entrepreneurship Development through Value Added Jackfruit Products

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ABSTRACT

India stands second in production of Jackfruit in the world, producing 14.36 lakh tonnes from 1, 02,000 ha. In India, Karnataka ranks first in jackfruit production producing 2.6 lakh tonnes from 11,333 ha. It is an underutilized and over produced crop which lacks processing. Raw fruit fetches low income, thereby processing of Jackfruit is promoted for enhancing the income. Entrepreneurship development in rural population is increasingly being recognized as a means to overall development of the rural community as well as that of the country. The objectives of women Self Help Group (SHG) is to earn, save, utilize and develop themselves to be self-sufficient. Entrepreneurship among SHGs needs to be encouraged. The SHG members had undergone the hands on training on preparation of Jackfruit products through vocational training, namely- Chips, Papad, Halwa, Jam, RTS beverage and Mixture. They were exposed to marketing avenues of Jack products through an Exposure Visit to Mango and Jack Mela - held at Lalbaguh, Bangalore. Production units were established by SHGs and supported by KVK through Critical inputs such as weighing balance, sealing machine, foil sealer, labeling and packing materials. The experience of this FLD model was shared among other farmers in the locality through Field day. KVK guided the SHGs in getting Market linkages such as local bakeries, exhibitions, Krishimela etc. The groups had a turnover of ₹ 85,000 in six months by selling the products using brand names registered under FSSAI. Thus, the SHGs realized a considerable income through processing of jack fruit.

Key words: Jack fruit, Processing, Value addition, Self help group, Entrepreneurship

Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to the family Moraceae, is a fairly large sized tree and bears the largest fruit among the edible fruits. Jackfruit tree is native to India and popular in several tropical and subtropical countries and the fruit is known as the 'poor man's fruit' in eastern and southern parts of India. The total area under jack fruit cultivation is increasing in recent years and largely grown in southern states viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh besides, in other states like Assam, Bihar, Orissa, Maharashtra and West Bengal. India stands second in production of Jackfruit in the world producing 14.36 lakh tonnes from 1, 02,000 ha. In India, Karnataka ranks first in jackfruit production producing 2.6 lakh tonnes from 11,333 ha. The nationwide post harvest losses is estimated to be 50% and if it were sold for ₹ 3 per kg of whole fruit, then the losses would be ₹ 215.4 crores worth food stuff in the form of jack fruit every year (Shreepadre 2010). It is an underutilized and over produced crop which lacks processing. Raw fruit marketing fetches low income, thereby processing of Jackfruit is promoted for enhancing the income. Cutting a jackfruit may seem quite a challenging task but once cut opened, the rest is easy and enjoyable. The interior of ripe fruit consists of large,

pleasant flavored yellow sweet bulbs (fully developed perianths), massed among narrow ribbons of thin, though undeveloped perianths and a central pithy core constitute 25-30 per cent of the total fruit. Each bulb encloses a smooth, oval, light brown seed (endocarp) covered by a thin white membrane (exocarp). The seed is 2-4 cm long and 1.5 – 2.5 cm thick. There may be 100-120 or upto 500 seeds in a single fruit comprising 5-6 per cent of the total fruit (Morton 1987).

The bulb colour ranges from thin white, cream, and yellow to bright orange. The size of the fruit lets ranges widely from small to big and thickness of pulp ranges from thin wafery to as thick as 0.5 cm while the sweetness ranges from slightly insipid to very sweet, the texture of the pulp ranges from soft to crispy. The pulp flavour ranges from very mildly scented to strongly scented and the size of the whole fruit ranges from 8 inches to 3 ft, as big as one weighing 20-50 kgs similarly the tree height also ranges from 50 to 60 ft. (Rajarajeshwari and Jamuna 1999). Entrepreneurship development in rural population is increasingly being recognized as a means to overall development of the rural community as well as that of the country. It is believed that ninety percent scope of

developing entrepreneurship in agriculture exists, as against the present only ten percent in rural areas (Jhamtani 2003). World wide it is observed that small and medium enterprises create most of the jobs. In Indian context if full employment is to be created we need to exploit the potential of small scale industries including those directly linked with agriculture such as value addition of crops, fruits and vegetables, diversification and value addition in agriculture as a whole. Front Line Demonstration (FLD) is a unique extension activity. It empowers farmers/farmwomen to learn innovative technology released from recognized institutes. It involves participation and interaction. Farmers learn by carrying out activities themselves and through constant observation. A FLD followed by Hands on training programme one can see, learn, do and practice. Hence in 2004 the concept of Self Help Group came into existence in Karnataka for the overall upliftment of rural women in the existing society. The objectives of women Self Help Group (SHG) is to earn, save, utilize and to develop in such a way, so as to solve their day to day problems and to make themselves self sufficient. By encouraging women SHG to engage in micro-enterprise that could be self-managed encourages management skills, risk taking, taking up their own decisions and earn their own income having a direct opportunity to experience various issues leading to improvement in self confidence and self reliance (Geeta et al. 2013). Thus, the study on value addition to Jackfruit was undertaken by Krishi Vigyan Kendra, Bangalore Rural, through a Front Line Demonstration (FLD) on "Preparation of Jackfruit products: Branding and Market linkage" among the members of two Self Help Groups of Melekote cross and Kachalli village, Doddaballapur taluk, Bangalore Rural District.

MATERIALS AND METHODS

SHGs namely – Shri Divya Jyothi Mahila Self Help Group of Melekote cross village and Divya Jyothi Sthri Shakthi Self Help Group of Kachalli Doddaballapur taluk, Bangalore Rural District were selected to study the impact of developing entrepreneurial skills through Front Line Demonstration (FLD) on "Preparation of Jackfruit products: Branding and Market linkage".

Vocational training using of Audio visual teaching aids: A vocational training was organized for the SHG members comprising of Demonstration and hands on training on preparation of various Jackfruit products namely- Chips, Papad from raw unripe bulbs, whereas Halwa, Jam, RTS beverage from ripe bulbs and Mixture from rind. The SHGs were sensitized on nutrient composition of Jackfruit; Cost economics, importance of Hygiene and Sanitation in production unit, Marketing channels, Food Safety and Standards Authority of India (FSSAI) licensing and registration using film shows and power point presentations. A manual containing the details of value added products were distributed to the participants.

Sensory evaluation and cost economics: The products were evaluated for organoleptic characters like appearance/colour,

taste, texture, flavour and overall acceptability by scoring method using 5 point hedonic scale. The evaluation was achieved by selected partially trained judges from staff of KVK and the participants of the training programme. The judges were given a score card instructed individually to evaluate the products. The cost economics of the demonstrated products were also determined based on the ingredients cost, production cost, overhead charges and profit.

Exposure to marketing avenues: They were exposed to marketing avenues of Jack products for better understanding of the market demand through organizing an educational Exposure Visit to Mango and Jack Mela -2016 held at Lalbaguh, Bangalore, as a part of vocational training programme.

Establishment of production units: The SHGs established production units in a separate building with essential facilities such as electricity and water supply. These production units are registered under Food Safety and Standards Authority of India (FSSAI) for production and marketing of value added products from Jackfruit. After the thorough hands on training, the SHG members are involved in production and marketing of jackfruit products.

Supply of critical inputs and designing of labels: The minimum critical inputs to establish a small production unit such as weighing balance, sealing machine, foil sealer, labeling and packing materials were made available under FLD funded by ICAR, New Delhi. SHGs were guided to develop brands, get their FSSAI license and design the labels to attract the consumers as per the FSSAI guidelines.

Field day: The experiences of this FLD model was shared among other farmers in the locality through organizing a Field day and it created awareness about enhancement of income through processing of Jack. An exhibition consisting of display of marketable products and also, a sale was organized during this field day.

Market linkages: KVK guided the SHGs in getting Market linkages such as exhibitions, fairs, local bakeries, National conference of KVKs and Krishimela organized by UAS held at GKVK, Bangalore, and Mahila Mahotsava organized by IIHR, Bangalore on the eve of celebration of Women in Agriculture day at Lalbaguh.

Consumer acceptability and Marketability: The products selected for marketing were tested for consumer acceptability and marketability using 3 point and 5 point hedonic scale respectively. A hundred consumers evaluated the products for acceptability and marketability

RESULTS AND DISCUSSION

The results of the study on value addition to Jackfruit undertaken by KVK, Bangalore Rural, through a FLD on "Preparation of Jackfruit products: Branding and Market

linkage” among the members of two Self Help Groups are presented as follows:

Table 1 Nutritive value of jackfruit (100 g edible portion)

Composition	Young fruit	Ripe fruit
A. Proximate analysis		
Water (g)	76.2 to 85.2	72.0 to 94.0
Protein (g)	2.0 to 2.6	1.2 to 1.9
Fat (g)	0.1 to 0.6	0.1 to 0.4
Carbohydrate (g)	9.4 to 11.5	16.0 to 25.4
Fibre (g)	2.6 to 3.6	1.0 to 1.5
Total sugars (g)	–	20.6
B. Minerals and Vitamins		
Total minerals (g)	0.9	0.87 to 0.9
Calcium (mg)	30.0 to 73.2	20.0 to 37.0
Magnesium (mg)		27.0
Phosphorus (mg)	20.0 to 57.2	38.0 to 41.0
Potassium (mg)	287 to 323	191 to 407
Sodium (mg)	3.0 to 35.0	2.0 to 41.0
Iron (mg)	0.4 to 1.9	0.5 to 1.1
Vitamin A (IU)	30	175 to 540
Thiamine (mg)	0.05 to 0.15	0.03 to 0.09
Riboflavin (mg)	0.05 to 0.2	0.05 to 0.4
Vitamin C (mg)	12.0 to 14.0	7.0 to 10.0

Jack fruit is rich in several nutrients Azad (2000) given in (Table 1). It can act as source of complete nutrition to the

consumers. The fruit is equivalent to Avocado and olive in terms of the healthier mix of nutrients for human dietary needs, almost having the exact nutrient equivalents of mother’s milk. It is rich in vitamin B and C, potassium, calcium, iron, proteins and high level of carbohydrates, affordable and readily available supplement to our staple food. The fruit is also the source of chemical “Jacalin” useful in preventing colon cancer, AIDS etc.

Six products demonstrated in the sessions along with hands on training were evaluated for sensory parameters. (Table 2) represents the sensory scores of the demonstrated value added jackfruit products. The participants were trained with regard to the objectives of sensory evaluation. The scores ranged from 3.8 - 5.0 for the sensory attributes such as colour, flavor, taste, texture / consistency and over all acceptability. According to the results the overall acceptability scores for the value added Jackfruit products such as Jam (5), Halwa (4.8), Papad (4.7), Chips (4.2), Mixture (4.6) and RTS beverage (4.3) showed that all the products were highly acceptable. Similarly Priyadevi *et al.* (2014) showed that jack fruit has got great potential for value addition.

The products were subjected to a ranking test and the results are presented in (Table 3). According to this table Jackfruit Jam ranked first followed by Halwa, Papad and Chips where as Mixture and RTS beverage were ranked least.

Table 2 Sensory Scores of the value added Jackfruit products

Name of the product	Sensory parameters (N = 20)				
	Colour	Flavor	Taste	Texture/ consistency	Over-all acceptability
Jack fruit Chips	4.0	4.1	4.1	3.8	4.2
Jack fruit Papad	4.5	4.7	4.8	4.8	4.7
Jack fruit RTS beverage	4.2	4.2	4.3	4.1	4.3
Jack fruit Jam	4.9	4.9	4.9	4.8	5.0
Jack fruit Halwa	4.8	4.9	4.8	4.9	4.8
Jack fruit Mixture	4.0	4.1	4.0	4.4	4.6

Score Card: 5 – Excellent, 4 – Very Good, 3 – Good, 2 – Fair, 1 – Poor

Table 3 Ranking test for the value added Jackfruit products

Name of the product	Ranking
Jack fruit Jam	I
Jack fruit Halwa	II
Jack fruit Papad	III
Jack fruit Chips	IV
Jack fruit Mixture	V
Jack fruit RTS beverage	VI

The (Table 4) shows the cost economics of the value added jackfruit products. The cost of production of each product included the actual ingredients cost and the production cost (30% of the ingredients cost which includes labour, fuel and machinery maintenance cost) and a profit of 30% of cost of production was added to get the sale cost. This sale cost was then equated to the marketing cost depending upon the prices existing in the market. According to this table the jackfruit products cost ranged from ₹ 100 to 300/kg. Thus representing that the cost is very affordable for

the nutri-dense jackfruit products with as much as 30 – 40% profit that can be relished in off season also. Masood (2011) expressed similarly that women entrepreneurship means an act of business ownership and business creation that empowers women economically increases their economic strength as well as position in society.

The (Table 5) shows the change in income due to value addition to Jackfruit. Cost benefit ratio of the frontline demonstration. The sale cost of demo product is compared to the sale cost of check (fresh fruit bulbs). Around 70% increase in the returns could be observed due to value addition in converting the raw fruit bulbs into value added products such as Jack chips, Papad and Halwa. B:C ratio is highest for Jackfruit chips (1.64) followed by jam (1.55), Papad (1.47) and halwa (1.47). Man days required for production of 40 kg/end product and the amount realized by each man day given in the table shows that production of chips (₹ 1180) although labour intensive could get higher returns followed by halwa (₹ 970) and papad (₹ 960). The

C:B ratio for production of various value added products of jack shows that jack fruit value addition is remunerative enterprise. Velusamy *et al.* (2008) reported that out of 16 SHG's three SHG's were engaged in value addition activities such as jackfruit RTS beverages, vegetable

pickling and preparation of weaning foods and most of them sold their products to nearby families. Trainees prepared 3000 ml of fruit juice everyday and earned ₹ 2500 per month from RTS beverage 24 kg of pickle per month and earned ₹ 2000/- per month.

Table 4 Cost economics of the value added Jackfruit products

Name of the product	Ingredients cost* ₹/kg	Production cost ₹/kg	Total cost ₹/kg	Profit (30%) ₹/kg	Sale cost ₹/kg	Market cost ₹/kg	Total profit ₹/kg
	A	B	C = (A+B)	D	E = (C+D)	F	
Jack fruit Chips	140	42	182	55	237	300	118
Jack fruit Papad	157	47	204	61	265	300	96
Jack RTS beverage	58	17	75	23	98	100	25
Jack fruit Jam	99	30	129	39	168	200	71
Jack fruit Halwa	156	47	203	61	264	300	97
Jack fruit Mixture	112	37	149	45	194	200	51

Includes cost of packing material

Table 5 Change in income due to value addition to Jackfruit

Particulars	Whole Jack	Jack bulbs	Jack packed bulbs	Jack RTS beverage	Jack Jam
Quantity	5 kg fruit	1.4 kg/60 bulbs	1.4 kg/60 bulbs	7 lit. (1.4 kg pulp based)	2.1 kg (1.4 kg pulp based)
Product/fruit	1 fruit	5 Packs	6 packs	35 bottles	15 bottles
Quantity	-	12 nos./ pack	10 nos./ Pack	200ml/ bottle	140g/bottle
Price (₹)	-	24/ pack	30/ Pack	20/bottle	30/bottle
Gross income (₹)	50	120	180	700	450
Net income (₹)	30	48	69	150	200

Table 6 Cost benefit ratio of the frontline demonstration

Particulars	Check	Demo	% increase over check	Gross cost ₹ / 40 kg end product*	Gross return	Net return	B:C ratio	% profit	Man days required	₹ earned / man day
	₹/kg product	₹/kg product								
Jack fresh bulbs	90	-	-	2800	3600	800	1.28	28.5	4	200
Jack RTS beverage	-	100	10	3000	4000	1000	1.33	33.33	2	500
Jack jam	-	200	55	5160	8000	2840	1.55	55.03	4	710
Jack chips	-	300	70	7280	12000	4720	1.64	64.83	4	1180
Jack mixture	-	200	55	5960	8000	2040	1.34	34.22	4	510
Jack papad	-	300	70	8160	12000	3840	1.47	47.05	4	960
Jack halwa	-	300	70	8120	12000	3880	1.47	47.78	4	970

*20 kg / demo / SHG

The (Table 6) shows the cost benefit ratio of the frontline demonstration. The sale cost of demo product is compared to the sale cost of check (fresh fruit bulbs). Around 70% increase in the returns could be observed due to value addition in converting the raw fruit bulbs into value added products such as Jack chips, papad and halwa. B:C ratio is highest for Jackfruit chips (1.64) followed by jam (1.55), Papad (1.47) and halwa (1.47). Man days required for production of 40 kg/end product and the amount realized by each man day given in the table shows that production of chips (₹ 1180) although labour intensive could get higher

returns followed by halwa (₹ 970) and papad (₹ 960). The C:B ratio for production of various value added products of jack shows that jack fruit value addition is remunerative enterprise. Similar results were obtained by Veena (2009) in the study on income earned by entrepreneurs in different entrepreneurial activities.

The (Table 7) shows the consumer acceptability for value added jack products. The table shows that most of the value added products such as Jack chips, papad, mixture and jam are highly acceptable (100%) followed by Jack halwa (85%) and RTS beverage (75%).

Table 7 Consumer Acceptability of value added Jack products

Consumer acceptability (%)	Demo (%) (n=100)					
	Jack RTS beverage	Jack halwa	Jack chips	Jack papad	Jack mixture	Jack jam
3-Highly acceptable	75	85	100	100	100	100
2-Acceptable	25	15	0	0	0	0
1-Not acceptable	0	0	0	0	0	0

Entrepreneurship Development through Value Added Jackfruit Products

The (Table 8) shows the market linkage for value added jack products. The two SHGs have their own production units. The scores regarding the marketability showed that Jack chips, mixture and papad had excellent

followed by jam, halwa and RTS beverage. The units supplies their products to local bakeries/shops, KVK marketing complex, and also sold directly during local fairs, krishimela and exhibitions.

Table 8 Market linkage for value added jack products

Marketability	Demo (%)					
	Jack RTS beverage	Jack halwa	Jack chips	Jack papad	Jack mixture	Jack jam
*Scores	73	95	100	100	100	86
Impact on social status	Own production unit started					
Market linkage	Local bakery/shops, KVK marketing complex, Exhibitions					

*Scores (5-Excellent, 4-Very good, 3-Good, 2- Fair, 1- Poor)

The rural youth have high potential for entrepreneurship but lack the necessary understanding of personal traits that help in making them entrepreneurial. Their family members too need to understand the importance of entrepreneurship and provide necessary moral and financial support to encourage them to take to entrepreneurship. The entrepreneurial orientation of the youth can be enhanced through appropriate training interventions using frontline demonstration (FLD) approach. Hence in this study, three small outlets were identified at Doddaballapur taluk and the production of 06 types of value added Jack fruit products

have been started. Hence, the SHG realized a considerable income through the frontline demonstration (FLD) model developed by KVK in processing of Jackfruit to value added products. The SHGs had a turnover of ₹ 85,000 in six months by selling the products under the brand name "SIRI PRODUCTS" and "NISARGA PRODUCTS" in various exhibitions. Thus, marketing of the nutritious Jack fruit products as an income generating activity by the SHG for the health conscious community is promoted which in turn helped the economic empowerment of members of SHG for sustained growth.

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