International Journal of Applied Agricultural Research
ISSN 0973-2683 Volume 15, Number 1 (2020) pp. 1-10

http://www.ripublication.com

Innovative Solutions and Technological Interventions for Employment Generation and Sustainable Livelihood in Kerala, through Pappaya Farming, Latex Extraction and value addition of Products

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Abstract

Livelihood of farmers getting affected due to price fluctuations of agricultural products. Farming communities are to be empowered with income augmenting activities. Innovative technologies developed in Research Institutions and Universities of India are yet to be commercially exploited. Most of the innovative technologies are lying idle in different organizations. Transfer of new technologies for employment generation and sustainable development are the only remedial measure for poverty alleviation sustainable development. Extending Papaya cultivation in six districts of Kerala for ensuring sustainable income to farmers by selling Papaya latex, like Rubber in Kerala, and creating new entrepreneurs in the field of value addition of Papaya byproducts are envisaged in the project. By introducing a new farming culture in co-operative sector and establishing small scale industries by the farmers itself in Kerala will boost the per capita income of the farming community, and an attempt is made by implementing this project.

Keywords: Papaya farming, Technology transfer, Value addition, Sustainable income.

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INTRODUCTION

It is true that the farmers are the backbone of India, but the per capita income of these farming community are very meager, and as a result farmer are leaving their traditional job of agriculture to a large extent. They are always at the mercy of middleman, and there is no role for the farmer to fix the prize of their products. Again, they bare always at the mercy of climatic conditions and various agricultural problems like pest and disease outbreak. Even though there are number Government policies/ subsidies *etc*. to protect the farming community, in effect these are insufficient to safeguard the interest of the agriculturist. Since we are poor in value addition aspects of Agric products, especially in fruit products, the wastage is more than 40% annually.

Papaya (*Carica papaya* L.) is a fast-growing, short-lived, tropical tree, cultivated for its fruit, papain, pectin, and antibacterial substances. It is a tropical fruit having commercial importance because of its high nutritive and medicinal value. Female flowers are produced at the axils of the leaf petiole, and later the fruits will occupy that position along the stem. Male individuals produce inflorescences. Three sex types of papaya are known: female, male, and hermaphrodite trees. Female plants produce flowers and fruits all year round in tropical regions. Papaya cultivation had its origin in South Mexico and Costa Rica. Total annual world production is estimated at 6 million tonnes of fruits. India leads the world in papaya production with an annual output of about 3 million tonnes. The fruit being perishable in nature poses problem in marketing. Development of infrastructure facilities for transport to primary markets, standardization of packaging techniques are aspects which need special attention. Papaya being a tropical fruit grows well in the mild sub-tropical regions of the country up to 1,000 m. above sea level. It is very much sensitive to frost, strong winds and water stagnation. Deep, well drained sandy loam soil is ideal for cultivation of papaya.

In Kerala Papaya is an under exploited fruit and there is no extensive plantation. At the same time, we are growing this plant in almost all home garden as a last resort for vegetable and fruit. By introducing latex extraction from Papaya, we can convert the utility of this crop in to a different magnitude, like Rubber in Kerala and Assam, thus a sustainable income can be generated regularly from latex extraction (which can be converted into "Papain" a value added product of protein digesting enzyme). It is an established fact that a good quality papain has immense domestic and export potential. It has an immense potential in Cancer prevention and treatment. Papain (enzyme obtained from the latex of mature green fruit) has pharmaceutical, nutraceutical, veterinary and industrial applications. Also, pectin can be obtained from the rind. Value added products like tooty-fruity, pickles, jam, jelly, squash etc. can be manufactured from raw papaya after extracting the latex. Thus, there is further scope for new entrepreneurs to establish value added products from Papaya. Papaya cultivation is having immense potential to enhance the monthly income of farmers. A number of research studies done on these lines regarding the different verities suitable for Asian countries (Sukhen Chandra Das, 2013) and quality and quantitative production (Mireille N. Honoré, *et. al.* 2019). The present project was undertaken under the umbrella of Swadeshi Science Movement, as 5- year project with the financial support

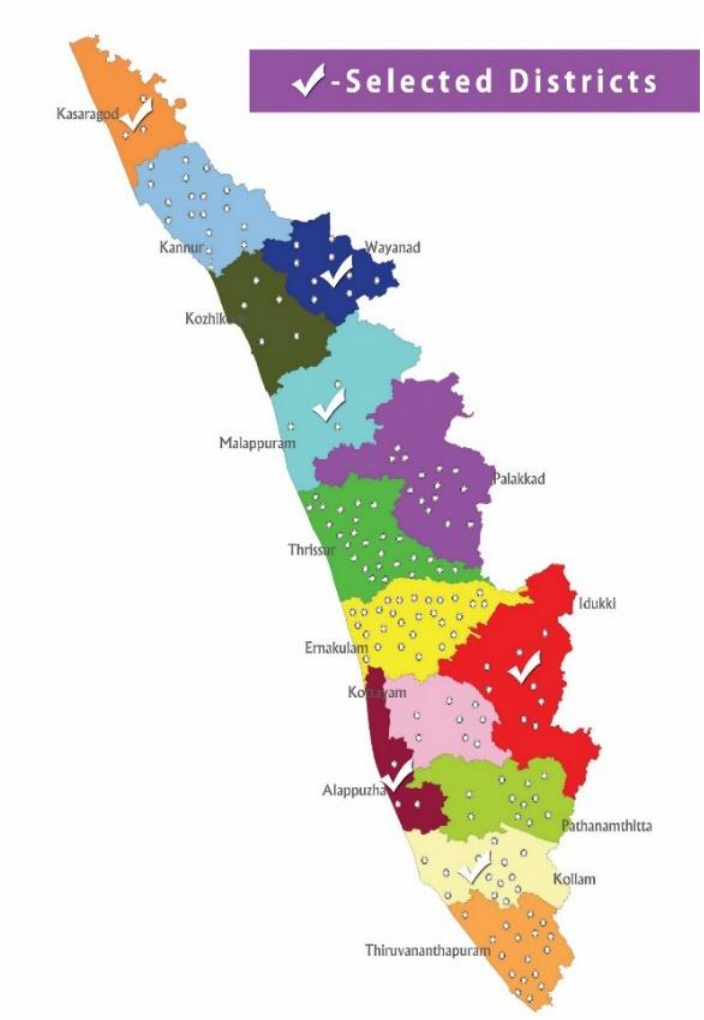
of Department of Science and Technology, Government of India.

OBJECTIVES

The Project envisage the following objectives *viz*.i). Development of entrepreneurial skills for optimum utilization of local resources, ii). Popularization of identified innovative technologies among Entrepreneurs, iii). Scaling up of viable Technologies in Agriculture, and Engineering for Sustainable Development through formation of Clusters and small-scale industrial units and iv). Creating a business Eco-system by establishing effective forward and backward linkages and Marketing strategies.

STUDY AREA

Six Districts *viz.* Kasaragod, Wayanad, Malappuram, Thrissur, Idukki and Kollam, in Kerala State were selected for the present study based on the initial field survey regarding the availability of resources, as the first phase of study.



METHODOLOGY

Protocol development for cultivation of Papaya was done with the technical support of Krishi Vigyan Kendra (KVK) of Kerala Agricultural University. The seedlings can be raised in nursery beds 3m. long, 1m. wide and 10 cm. high as well as in pots or polythene bags. The seed rate is 250-300 g./ha. The seeds after being treated with 0.1% Monosan (phenyl mercuric acetate), ceresan *etc*. are sown 1 cm. deep in rows 10 cm. apart and covered with fine compost or leaf mould. Light irrigation is provided during the morning hours. The nursery beds are covered with polythene sheets or dry paddy straw to protect the seedlings. About 15-20 cm. tall seedlings are chosen for planting in about two months. A spacing of 1.8 x 1.8 m. is normally followed. However higher density cultivation with spacing of 1.5 x 1.5 m./ha enhances the returns to the farmer and is recommended. The seedlings are planted in pits of 60x60x60 cm. size. In the summer months the pits are dug about a fortnight before planting. The pits are filled with topsoil along with 20 kg. of farmyard manure., 1 kg. neem cake and 1 kg. bone meal. Tall and vigorous varieties are planted at greater spacing while medium and dwarf ones at closer spacing. Papaya plant needs heavy doses of manures and fertilizers. Apart from the basal dose of manures (@ 10 kg. /plant) applied in the pits, 200-250 g. each of N, P_2O_5 and K_2O are recommended for getting high yield. Application of 200 g. N is optimum for fruit yield, but papain yield increases with increase in N up to 300 g. Micro-nutrients viz. $ZnSO_4$ (0.5%) and $H_2 BO_3$ (0.1%) are sprayed in order to increase growth and yield characters. The irrigation schedule is fixed on the basis of soil type and weather conditions of the region. Protective irrigation is provided in the first year of planting. The main diseases reported are powdery mildew (*Oidium caricae*), anthracnose (*Colletotrichum gloeosporioides*), damping off and stem rot. Application of wettable sulphur (1g./l.) carbendazim/thiophanate methyl (1g./l.) and Kavach/Mancozeb (2 g./l.) has been found to be effective in controlling the diseases. The economic life of papaya plant is only 3 to 4 years.

Sensitization by organizing workshops and meetings, in local panchayats is the initial process. Formation of papaya farmers society for group farming is essential, since most of the farmers are having small farming areas. For economic viability of the programme, with respect to papaya latex extraction and marketing a minimum level of farming area is required. As a part of entrepreneurship development program, technological intervention and assistance to farmers are taken care off. Developing a marketing strategy, for sale of latex and value-added products was envisaged in the programme. Protocol for value-addition of by-products was formulated and communicated to the farmers. Assistance to farmers for getting Government subsidies in agriculture and availing bank loans for establishing industries are also extended. Technical assistance for soil management, pest management etc. with the support of various government machineries was given to the farmers as and when required. Papaya cultivation was promoted on group farming basis. Training and Technical assistance for latex extraction was provided to the farmers. Latex extraction was done on rotational basis of 3-4 days interval from the same plant. Value added products generation from latex extracted raw papaya was yet another phase of the project, for boosting the income of farmers. Formation of marketing society for sales of value-added products was also done for steady flow of income.

RESULTS AND DISCUSSION

Since Papaya farming is not known to Kerala farmers, a number of entrepreneur awareness programme were organized in selected district, to convince the farmers regarding the scope of this new venture. In total 52 meetings were conducted with the participation of potential farmers, panchayat officials, agricultural officers and resource persons from various organization. On the whole 2636 farmers were participated in the meetings conducted in different districts. Again, based on the initial response, 49 entrepreneur development programmes were organized for the selected farmers for giving training in papaya farming. In total 1042 farmers got training from all the selected districts initially.

As the part of the ongoing programme, so far, more than 200-acre land was converted to Papaya farm in 7 District as shown (Table,1). The programme in Palakkad district was started only in the 3rd year.

Table 1: Details of Papaya cultivation in selected districts.

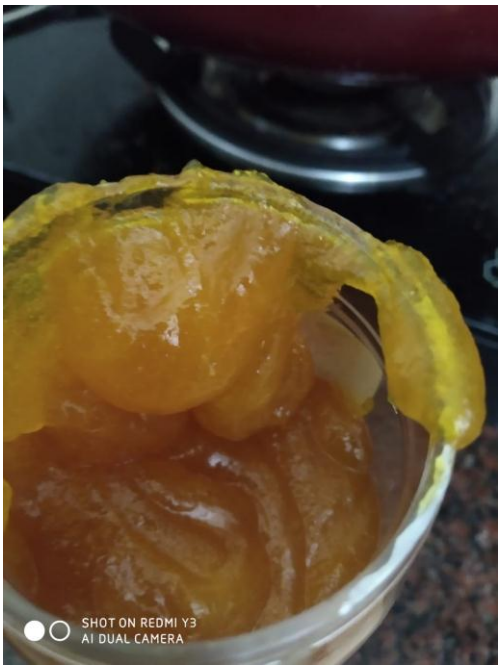
Distric/Place name	**1st yr (1917-18)**	**2nd yr (1918-19)**	**3rd yr (1919-20)**	**Total area (acre)**
Kasaragod	10	13	15	38
Wayanad	4	7	13	24
Malappuram	11.5	12	12	35.5
Palakkad	-	-	15	15
Thrissur	9	13	16	38
Idukki	2.5	6	11	19.5
Kollam	5.5	9	16	30.5
			G. Total	**200.5**

Papaya nursery views

Trees of tapping stage

Papaya plantations od different age

Papaya latex extraction and raw latex



Value addition of Papaya fruits after latex extraction

Economic feasibility:

As per the protocol prepared for papaya farming one-acre land can support 800-900 plants, out of which 750-800 plants can be having 10-15 fruits in the latex extractable condition and can be tapped at an interval of 4-5 days for 8-10 weeks continuously. From our experiment it was observed that from a single tree bearing 8-10 raw fruits one can get 60-75 grams of papain in each tapping. After latex extraction of latex the fruits are converted into value added products by the farmers in their production units. Thus a farmer/entrepreneur is getting on an average Rs 15-20,000 net profit, hence we found this venture as a success storey.

ACKNOWLEDGEMENTS:

The authors gratefully acknowledge the financial support from Department of Science and Technology, Government of India. The technical support from Kerala Agricultural University, Kerala State Agricultural Department including different Agricultural Offices in different Districts, and the financial support to farmers from various Banks are appreciated.

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