

**RESEARCH ARTICLE :**

# Interdisciplinary approaches for translating rural innovations into agripreneurship

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**SUMMARY :** Agripreneurship converts agricultural activity into an entrepreneurial activity. In agriculture and allied sectors the agripreneur adopting innovative ideas. The purpose of this study is to promote agripreneurship in plantation sector through interdisciplinary approach. Plantation crops are high value crops and any breakthrough in translation of relevant rural innovation into agripreneurship can have a greater economic impact. The experts from different domains interacted with the rural innovators about Farmer Led Innovations (FLIs). They were found more than hundred FLIs in plantation sector out of which few FLIs have been identified based on Innovation Index for translating FLIs into agripreneurship. The selected FLIs are viz., tree climber (Device to climb coconut and arecanut tree), multi tree climber, arecanut tree climber, tree walker and automated arecanut climbing and harvesting machine. The outcome of the study has given leverage technological strength to showcase successful FLIs and successful agri-business models across the country.

**KEY WORDS:**

Interdisciplinary approaches, Farmer led innovations, Agripreneurship, Plantation crops

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## **BACKGROUND AND OBJECTIVES**

India is predominantly an agrarian country and hence, agricultural sector has a huge potential for promoting innovations as it has rich resources in rural areas. However, the agriculture sector is facing several challenges from continued declining in fertile land to increased demand in feeding the world's population which could be estimated to reach 9.8 billion in 2050 and 11.2 billion in 2100, respectively (AESAs, 2016). Basically, the Indian economy is an agrarian economy which serves as a platform for agricultural

entrepreneurship, food processing and other allied activities. In developing country like India, the rural entrepreneurs play a key role in economic progress, which leads to an elimination of rural poverty to convert into developed nation (Vinoth and Paramasivam, 2016; Tripathi and Agarwal, 2015 and Kumari and Kumar, 2020). Presently the scope and potential of agripreneurial opportunities is increasing as a result of globalization and more interconnected world market. There are many potential opportunities for entrepreneurs. Agriculture process needs so many kinds of

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inputs like seeds, fertilizers, pesticides and innovative and localized farm technology (Chand, 2019). In agricultural term, innovation takes place as new agricultural technology which has sustainable benefits to farm includes institutional economic incentive for farmers to adopt new agricultural technology.

An indispensable pathway to revitalize the Indian agriculture and also to create more attractive and lucrative venture, was possible through a shift from agriculture to agribusiness. The person or an individual or the farmers who are involved in entrepreneurial accomplishments allied with their farm or who utilizes unique resources which were accessible in their farm to develop a new farm-based business are known as “Agripreneurs” (FAO, 2011). The farming experience and knowledge with their business skills are required to create entrepreneurship in the agriculture sector. It has become common to see farmers as input suppliers, agro-processors and customers. Many farmers developed their skills and competencies to fit in market-oriented farming and value chain demand, so they become agripreneurs. They are well informed of market changes and they produce mainly for market or profit. They are often risk takers, innovators, ambitious about their career in farming and well aware of business needs and commitments. They go after opportunities, take well calculated possibilities and they have capacity to navigate their business through market fluctuations locally or internationally.

Agripreneurship is also known as farm entrepreneurship which is a profitable jointing between entrepreneurship. In other words, turning a farm or farm related activity to make more profit (Lal Bairwa *et al.*, 2014 and GFRAS, 2016). The agripreneurship environment is a dynamic and a complex of inherent risks as well as opportunities for greater profit should the ideas success. Agribusiness is a synonym for entrepreneur in agriculture (GFRAS, 2016). Uplaonkar and Biradar (2015) found out that due to effective management of agro-elements by the persons with risk bearing capacity and a pursuit for most recent knowledge in the agriculture sector which leads to great scope for entrepreneurship in agriculture. Agripreneurship is not only an opportunity but also a requisite for improving the production and cost-effectiveness in the agriculture and allied sector, it has a vital scope for small and marginal farmers, by taking risk nature and also to earn consecutive benefits of farming. Agriculture require entrepreneurship in numerous areas *viz.*, dairy farming, goat rearing, cuniculture, floriculture,

fisheries, shrimp farming, sheep farming, olericulture, plantation sector etc.

Coconut, arecanut, oil palm, cashewnut, tea, coffee, rubber and cocoa are the major plantation crops grown in India. It is the leading producer and consumer of plantation crops like cashewnut and arecanut (MOS and PI, 2018).

Foremost and oldest industries in the country are tea and coffee industries, which provide sufficient employment opportunities to the people and hold enormous potential for export (Joseph, 2014). In recent times, plantation sector in India has been characterized by discriminating intervention and also removal of tariff barriers (Harilal and Eswaran, 2017). The plantation sector faces a number of issues *viz.*, low productivity, increase in cost of production and unstable prices of goods (Ikram *et al.*, 2013). With the increasing domestic and regional demand for farmer led innovations in plantation sector, efforts are to be made to support FLIs for scalingup of innovations through agripreneurship. This transformation will enable the farmer/innovators to provide livelihood and assumes greater importance in Indian rural economy.

### Objective:

To nurture agripreneurship in plantation sector through interdisciplinary approach.

## RESOURCES AND METHODS

By broad grouping of parametric statements using reliability analysis, the categorized parameters were reviewed and classified into three broad groups’ *viz.*, novelty (6 parameters), usability (7 parameters) and viability (8 parameters) by using factor analysis. The interdisciplinary approach team representing various specializations like breeding, Agronomy, Engineering, Statistics, Economics and Extension assessed the rationality of documented 134 FLIs. Based on parametric statements in five point continuum the whizzes have further tapered to 28 innovations by assigning the weightages for the three identified indices *viz.*, novelty, usability and viability as 30, 40 and 30, respectively by using the following formulas:

$$\text{Weightage} = \frac{\text{Novelty / Usability / Viability parameters}}{\text{Total number of parameters}} \times 100$$

$$\text{Novelty index} = \frac{\text{Obtained score}}{\text{Maximum score}} \times \text{Weightage} \times 100$$

$$\text{Usability index} = \frac{\text{Obtained score}}{\text{Maximum score}} \times \text{weightage} \times 100$$

$$\text{Viability index} = \frac{\text{Obtained score}}{\text{Maximum score}} \times \text{weightage} \times 100$$

$$\text{Innovation index} = \text{Novelty index} + \text{Usability index} + \text{Viability index}$$

Using the three indices, innovation index has been prepared for prioritising and shortlisting the FLI. Accordingly 28 FLIs were shortlisted. Out of shortlisted FLIs, three innovations were identified for acceleration into agripreneurship by providing hand holding and strategies for upscaling. The innovations viz., tree climber (Device to climb coconut and arecanut tree), multi tree climber (Arecanut

tree climber and tree walker) and automated arecanut climbing and harvesting machine are identified as potential FLIs towards agripreneurship (Fig. A).

## OBSERVATIONS AND ANALYSIS

The farmer-innovators were interviewed in depth based on the innovations chosen, field level trials and experimentation. The verification of performance of various identified FLIs was conducted in the innovators field and other adopter (farmer's fields). Based on the reliability and accuracy in operation/results the FLIs were up scale to commercial model to promote agripreneurship. The performance of the FLIs and field level observations by the interdisciplinary team is given below.

### Tree climber (Device to climb coconut and arecanut tree):

Late M. J. Joseph alias Appachan from Kannur, Kerala developed a device under the guidance of his father that helps in climbing coconut or arecanut trees (Fig. 1). The tree climber consists of two metal loops which are meant for holding the legs and it is made up of 10 mm MS rod having sub-loops, rubber belt, wire ropes, connecting clamp, MS plates etc. It has a handle on the top for hand grip and a pedal base at the bottom for

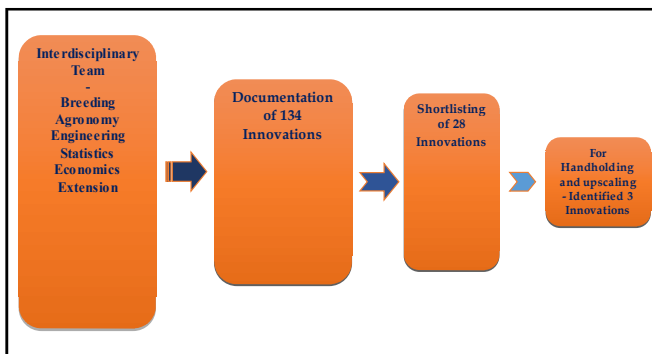


Fig. A: Conceptual framework



Fig. 1: Tree climber (Device to climb coconut and arecanut)

Table 1 : Strengths and weaknesses of the innovation

Sr. No.	Particulars	Values
1.	Time required for setting the machine	24 seconds
2.	Time required for climbing up	1 Min 31 sec
3.	Time required for harvesting	2 Min 18 sec
4.	Time required for climbing down	1 Min 12 sec
5.	Time required for unlocking the machine	49 sec
6.	Total time required	5 Min 21 sec
7.	Height of the palm	18.88 meter
8.	No. of palms climbed per hour per person	6 to 7

resting the foot. The loops are put around the tree trunk on the opposite sides. Loop on either side is lifted up by the simultaneous movement of the hand and the feet. By such alternate motion, one can easily climb a coconut tree/arecanut palm in minutes (Table 1). It is simple, safe and easy to use, handy for people untrained to climb up tall trees swiftly, helps in reducing drudgery and also in climbing faster using lesser energy. It can also be used for gathering nuts or spraying pesticides. This simple machine designed in 1970's brought about a major revolution in the coconut gardens across the country. He was supported all through by NIF through their MVIF Scheme by extending their support in marketing his climber to countries like USA, Maldives, Thailand, Australia, Brazil, Mexico etc. It is gender friendly, sustainable, eco-friendly and has no socio-economic implications. It can also be used by children and can serve as a good source of additional income for non-climbers. This innovation is very popular among farmers and farmer organizations. This device got patented (Patent No. 147172). This innovation came up due to the unavailability of professional climbers during the harvesting season.

The strengths of the innovation are semi-skilled operators can operate, less time for training, less dependency on labour and it can be used for palms of any girth while the weaknesses of the innovation include

fragility issue with the strength of cable, agronomical issues, safety concerns and less output (less no. of trees per hour and almost 50% less compared to trained climber) (Table 2).

**Multi tree climber, arecanut tree climber and tree walker:**

D. Renganathan alias Venkat Damodaran Naidu (60) from Coimbatore, Tamil Nadu established a simple, cost effective coconut and arecanut tree climber which is manually operated seating type with a locking system and a safety belt (Fig.2).The climber has a seating provision with two frames, the upper frame is operated by hand while the lower one by leg. The user sits comfortably without fear while up and down movement of upper and lower frame, one can climb the tree because locking system has been provided. A four lock pin can be fixed at any height to avoid the possibility of a fall. The safety belt was made up of polyester and it is provided at the top frame. In belt special clamps are provided for clamping and removing the top belt easily. Belts are used to clamp the upper and lower frames. Major advantages of this machine viz., useful for trees with different girth, the operator can easily install and remove the climber from tree.

Due to occupational risk and the strenuous labour involved in climbing the tall trees there was a scarcity of Coconut Tree climbers in coconut growing states. The innovator farmer developed a machine during harvesting due to unavailability of labour. Major attributes of this innovation are easy handling, less weight, easy transportation, zero maintenance, any level of height could be climbed, low cost (Rs.7000/ machine) and women

**Table 2 : Strengths of the innovation**

Sr. No.	Strengths
1.	Semi-skilled operators can operate
2.	Less time for training
3.	Less dependency on labour
4.	It can be used for palms of any girth



**Fig. 2: Multi tree climber, arecanut tree climber and tree walker**

can also use it with ease. The machine was patented in the year 2012 (Patent No. 835/CHE/2012). The only limitation of the machine is that lesser number of trees can be climbed as compared to conventional method (30 per day as compared to 50 per day manual method with trained and skilled labour) (Table 3). The time required for climbing up a 10 m palm on an average for coconut trees is 4.8 minutes for 10 metres and in case of palm trees, it is 10 minutes for 5 metres. The time required for climbing down a 10 m palm in case of coconut trees is 5 minutes for 10 metres and 7 minutes for 5 metres in case of palm tree. The total time required is 9.8 minutes for 10 metres (coconut) and 17 minutes for 5 metres (palm) and this does not consider the tree top operations that may vary based on the tree condition (Table 4). It was observed that about 15 minutes is required for such tree top operation like removal of leaves, harvesting the coconuts etc. The speed of the operation is 0.98 metres/minute, in terms of trees, it is approximately 25 minutes per tree. The machine is reliable and durable and is exported to several countries like Australia, Costa Rica, Dominican Republic, Fiji, Guadeloupe, Hong Kong,

Indonesia, Iran, Malaysia, Maldives, Mauritius, Philippines, Qatar, Saudi Arabia, Spain, Sri Lanka, Thailand, Trinidad and Tobago, United States, Laos, Iraq, Taiwan, Seychelles and Vanuatu.

### Automated arecanut climbing and harvesting machine:

Suresh P V (44) from Malappuram, Kerala devised the automated arecanut palm climbing and harvesting machine (Fig. 3) which does the climbing and harvesting of palms from the ground using a remote or mobile control and which works using the power generated by a 42 cc petrol engine fitted with an automatic clutch that produces the necessary power for the driving unit and so does not have any battery unit. It is highly suited in field situations wherein there is difficulty in maintaining the charge of the battery. It is controlled by wireless remote that has a range more than 100 m and or mobile phone from the ground which works even with voice recognition. The farmer innovator came up with this machine due to shortage of labour in arecanut climbing, risks involved in climbing during rainy season, risks involved in climbing thin palms, casualties involved, ergonomic issues, requirement of skilled labour besides the need to climb the arecanut palm twice/thrice physically every year to carry out the harvesting and spraying of chemicals operation (plant protection measure). Using this machine, harvesting can be done in 360-degree angle thereby removing the fronds properly and reducing the chances of Mahali disease/fungal attack in arecanut that harbors in the harvested fronds. The harvested arecanuts are collected in a tray preventing the shattering of nuts thereby saving on labour. The machine can climb over dents or knocks in the surface of the tree, does not make any wounds on the palm while climbing, facilitates easy transportation and performs extremely well in rainy season. The device can remotely be put

**Table 3: Strengths of the innovation**

Sr. No.	Strengths
1.	Easy Handling, less weight (made using aluminium, 9.4 kg/machine), easy transportation, zero maintenance, any level of height could be climbed and women could also use it with ease.
2.	One can climb upto 40 ft in 5 minutes (this includes time needed in fixing, climbing up- down and removal of device from tree).
3.	Availability of safety measures (locking system and a safety belt)
4.	Useful for trees with different girth.
5.	Low cost (Rs. 7000/machine)
6.	Suitable in areas where there is shortage of labour
7.	Patented (2012)

**Table 4: Time required for climbing up a 10m palm**

Tree	Time	Tree details
1.	5	Coconut (10m)
2.	4	Coconut (10m)
3.	6	Coconut (10m)
4.	5	Coconut (10m)
5.	4	Coconut (10m)
6.	10	Palm tree (5m)

**Average:** 4.8 minutes for 10 metres (coconut) 10 minutes for 5 metres (palm)



Fig. 3: Automated arecanut climbing and harvesting machine

in forward, reverse, neutral and cutting mode. It weighs about 28 kg and can work for about 3 hours with 1 litre of petrol. The harvesting of nuts is done from the ground. The innovator states that the heavy weight of the machine is the only limitation. The farmer pays Rs. 60000/year/hectare (1000 plants) for harvesting through the manual method (3 harvests/year) whereas using the machine, the farmer benefits by Rs. 20,000/- in the first year. Only one machine has been developed. The machine costs about Rs. 30,000- Rs. 40,000 for sale.

### Conclusion

Farm mechanization has become inevitable for augmenting agricultural production and achieving steady growth in agriculture in synchronization with population growth. Increasing shortage of agricultural laborers also necessitates the availability of Agri-machinery at right time and at an affordable cost to farmers. Further utilization of appropriate FLIs reduces the unit cost of production through enhanced input use efficiency and their judicious use hence this study has given the need of assessment of FLIs and its refinement, commercialization and promoting business model for agripreneurs through public-private partnership, networking with R and D institutes, industries, financial institutions, there by contributing for promotion of rural innovations in agriculture.

There is a great scope for agripreneurship, which is essential for improving the production and profitability in agriculture and allied sectors. Agripreneurship Development will help the economy to leverage the identified strengths and to achieve tremendous growth

in primary sector and to contribute for rural development. It also helps in achieving balanced economic growth in India. An individual with risk bearing capacity and a quest for latest knowledge in plantation sector can prove to be a right agripreneurs. The plantation sector has a large potential to contribute to the national income. The promotion of agripreneurship will transform rural innovations in agriculture into an organized agribusiness sector.

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