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Technology Adoption by Small Planters in Mauritius

Ashish Gadekar[1]*, Rimalini Gadekar[2] and Devkumar Panchu[3]

[1]*Dean and Professor in Faculty of Management, Amity Institute of Higher Education, Mauritius*

[2]*Lecturer Department of Mechanical Engineering, Government Polytechnic Nagpur, India*

[3]*Agriculture Officer, Medine, Mauritius*

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***Corresponding author:** Ashish Gadekar, Dean and Professor in Faculty of Management, Amity Institute of Higher Education, Mauritius.

Abstract

Traditionally, economic analysis of agricultural technology adoption (or lack thereof) has focused on imperfect information, risk, uncertainty, institutional constraints, human capital, input availability, and infrastructure as potential explanations for adoption decisions [1-3]. In studying agricultural technology adoption, analysis of the adoption of high yielding varieties (HYV) in India has been particularly influential. Kohli and Singh [3] found that inputs played a large role in the rapid adoption of HYVs in the Punjab on of the prosperous state in India. They claimed that the effort made by the Punjab government to make the technological innovations and their complementary inputs more easily and cheaply available allowed the technology to diffuse faster than in the rest of India. On similar lines study is conducted in Mauritius to learn feasible and acceptable model of technology adoption. Mauritian economy is based on service industry. And farming is done only to satisfy local demand. At points heavy imbalance is observed in demand and supply, hence the study becomes more important.

Keywords: Constraints; Mauritian; Skepticism; Bourgeoisie

Agricultural Technology Adoption

Kohli and Singh [3] used a choice of technique framework to characterise the decision to adopt HYVs in India. They found that since HYVs require higher levels of fertilizer and irrigation to realize their yield potential, their introduction corresponded with a large jump in the demand for fertiliser and irrigated land. Bandiera and Rasul [4] looked at social networks and technology adoption in Northern Mozambique and found that the probability of adoption is higher amongst farmers who reported discussing agriculture with others. Besley and Case [5] use a model of learning where the profitability of adoption is uncertain and exogenous. Looking at a village in India, they found that once farmers discover the true profitability of adopting the new technology, they are more likely to adopt.

Foster and Rosenzweig [2] found that initially farmers may not adopt a new technology because of imperfect knowledge about management of the new technology; however, adoption eventually occurs due to own experience and neighbours' experience. Similarly, looking at pineapple cultivation in Ghana, analyse whether an individual farmer's fertilizer use responds to changes in information about the fertiliser productivity of his neighbour. They found that a farmer increases (decreases) his fertiliser use when a neighbour experienced higher than expected profits using more (less) fertiliser than he did, indicating the importance of social learning.

Adoption of innovations refers to the decision to apply an innovation and to continue to use it Recent adoption studies in Europe [6] in Asia [7,8] and in Africa [9] have identified farm and technology specific factors, institutional, policy variables, and environmental factors to explain the patterns and intensity of adoption. Rao and Rao [10] found a positive and significant association between ages, farming experience, training received, socio-economic status, cropping intensity, aspiration, economic motivation, innovativeness, information source utilisation, information source, agent credibility and adoption. Diffusion of innovations refers to the spread of abstract ideas and concepts, technical information, and actual practices within a social system, where the spread denotes flow or movement from a source to an adopter, typically via communication and influence [11]. The adoption/diffusion model developed in the United States by rural sociologists attempted to predict the adoption behaviour of individuals by looking at their personal characteristics, the time factor, and the characteristics of the innovation itself. But this model was developed at the height of productivity paradigm for agriculture and "green revolution," and now faces serious criticism for its inability to study environmental challenges in agriculture.

Technology Acceptance Model in the Agro-Industry

The Green Revolution in Asia as demonstrated in the empirical literature (see for instance [12-18] among others) is

an indication that improved technology adoption for agricultural transformation and poverty reduction is critical in modern day agriculture. Sunding and Zilberman [19] affirmed that there is a significant gap between the launch of a technology to the market to its wide use by farmers, therefore its adoption is not immediate. Also Agbamu [20] found only knowledge of a practice to be significantly related to its adoption [21] shows that where farmers have to adopt a new crop technology that shifts time from their farming to the home production activity sector, the probability and rate of adoption of such technology are higher; also, as family time is shifted away from the farming sector to home production sector, the economic impact index increases. Arene [22] reported a positive and significant relationship between family size and adoption. On the other hand Voh [23] established that household size is not significantly related to adoption. [24] Reported a significant relationship between landholdings (farm size) and adoption.

Voh [23] also reported that socio-economic status of farmers is positively and strongly related to adoption. This report implied that the higher the socio-economic status, the higher the tendency to adopt innovation. [25] Reported that farmers who are more exposed to formal extension information have a high propensity towards adoption than those with less exposure. However, [24] did not establish any relationship between education and adoption. Education, size of holdings and cosmopoliteness accounted for significant variation in communication behaviour of farmers. Goswami and Sagar [26] identified some factors associated with knowledge level of an innovation. They found educational level, family educational status, innovation proneness and utilisation of mass media to be positively and significantly correlated with knowledge level. Earlier evidences [27,28] led to the categorisation of adoption behaviour into innovators, early adopters, early majority, late majority and laggards. This is based on validated studies that the adoption behaviour of any agricultural technology would follow a normal distribution curve in a given social system [11].

As outlined by Dillon [29] it is also sometimes useful to recognize that, like other systems, agricultural systems may be categorized as which is a special point to be considered when technology adoption need to be implemented:

- Purposeful or non-purposeful depending on whether or not they can select goals and the means by which to achieve them.
- Static or dynamic depending on whether or not they change over time in response to internal or external influences.
- Open or closed depending on whether or not they interact with their environment.
- Abstract or concrete depending on whether or not they are conceptual or physical in nature.
- Deterministic or stochastic depending on whether or not their behaviour exhibits randomness over time, i.e., their future behaviour is uncertain.

The Technology Adoption Models and Steps

Innovators (2.5%)

Innovators are the first individuals to adopt an innovation. Innovators are willing to take risks, youngest in age, have the highest social class, have great financial lucidity, very social and have closest contact to scientific sources and interaction with other innovators. Risk tolerance has them adopting technologies which may ultimately fail. Financial resources help absorb these failures [27].

Early adopters (13.5%)

"This is the second fastest category of individuals who adopt an innovation. These individuals have the highest degree of opinion leadership among the other adopter categories. Early adopters are typically younger in age, have a higher social status, have more financial lucidity, advanced education, and are more socially forward than late adopters. More discrete in adoption choices than innovators. Realise judicious choice of adoption will help them maintain central communication position" [27].

Early majority (34%)

"Individuals in this category adopt an innovation after a varying degree of time. This time of adoption is significantly longer than the innovators and early adopters. Early Majority tend to be slower in the adoption process, have above average social status, contact with early adopters, and seldom hold positions of opinion leadership in a system" [27].

Late majority (34%)

"Individuals in this category will adopt an innovation after the average member of the society. These individuals approach an innovation with a high degree of skepticism and after the majority of society has adopted the innovation. Late Majority are typically skeptical about an innovation, have below average social status, very little financial lucidity, in contact with others in late majority and early majority, very little opinion leadership"[27].

Laggards (16%)

Individuals in this category are the last to adopt an innovation. Unlike some of the previous categories, individuals in this category show little to no opinion leadership. These individuals typically have an aversion to change-agents and tend to be advanced in age. Laggards typically tend to be focused on "traditions", likely to have lowest social status, lowest financial fluidity, be oldest of all other adopters, in contact with only family and close friends, very little to no opinion leadership. Rogers [11] reported two types of discontinuance which can be replacement discontinuance that is rejecting an idea in order to adopt a better one that supersedes it or disenchantment discontinuance when a decision to reject an idea as a result of dissatisfaction with its performance (Figure 1).

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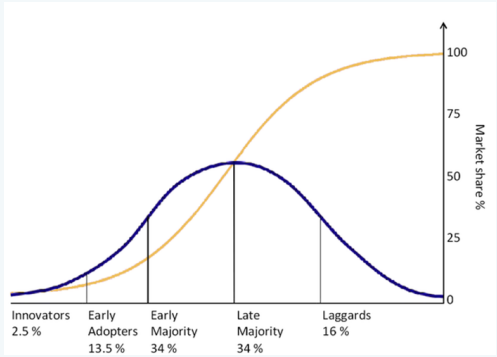

Figure 1: The 5 technology adoption stages (Source ondigitalmarketing.com/.../5-customer-segments-technology-adoption/)

Bishop and Coughenor [30] reported that the percentage of discontinuance among Ohio farmers ranged from 14%for innovators and early adopters, to 27% for early majority, to 34% for late majority, to 40% for laggards; while Leuthold [31] reported 18%, 24%, 26% and 37% respectively for Canadian Farmers. Greeve [32] reported the discontinuance of the easy listening format by radio stations in USA and also Rogers (2003) noted the discontinuance of chemical innovation and the rise of organic farming. Ogunfiditimi [33] used the term "abandoned adoption" to describe discontinued use of previously adopted innovation and identified 14 reasons among maize & cassava and cocoa farmers in Nigeria. Similarly [34] reported the varying degrees of discontinuance among farmers in Ekiti state Nigeria to be immediate, gradual and rapid based on the nature of innovation and farmers situation. Adesina and Baidu-Forson [35] found that farmers perceptions affect the adoption of improved varieties of sorghum and mangrove rice in Burkina Faso and Guinea respectively.

Enrique Silva R., National TTG President made a comment that seems to reflect international reality: "[Technological transfer] is more necessary than ever, because agricultural commodity prices tend to constantly go down while costs tend to go up, so that the profit margins are narrower." Enrique Silva R. explained: "The name of the groups does not correspond exactly to the philosophy of the system. It is not a matter of only transferring knowledge or technology. The human contact is what is fundamental in the group's activity. The most relevant is the friendship that takes place among the participating farmers. That is, the characteristic individualism of the farmer of the past is broken. An absolute sincerity between neighbours is obtained ... which leads to a great friendship. With friendship they communicate both the failures and successes ...."

Brief History of Small Planters and Agriculture in Mauritius

In Mauritius almost half of our sugarcane land belongs to planters and the rest for corporate sectors. The question was being asked how small planters may have been able to own nearly forty five percent of lands, when regarding Mauritius historical background concerning British, French and even Dutch colonisation. Where did they ever get the money to buy those lands?

The following possible reasons were stated:

1. May be those small planters were sirdars, that can be defined as those (e.g. a foreman) holding a responsible position or a person holding high ranks, and they had the opportunity to buy lands.

2. Those small planters could also have been in the class of "Bourgeoisie". This word is derived from the French word meaning a French citizen-class. Bourgeoisie is often identified a social class oriented to economic materialism characterised by their ownership of capital, and their related culture or who is a member of the wealthiest social class of a given society, and their materialistic worldview.

3. Those small planters were not socially considered as labourers.

It was also pointed out that the History of Small Planters in Mauritius should be clearly read in order to understand the small planters' context well.

It was also well explained that some thirty years ago, land price in Mauritius was very expensive. This can be explained by the fact that with sugarcane plantation in those lands and high sugar prices in world market (about 35,000 MUR per tonne of sugar), planters was getting lots of revenues from their sugarcane plantation. So they preferred to keep those lands and were not reluctant to sell those lands. Hence land price was very expensive even those days.

Present Status of Small Planters in Mauritius

It has been clearly expressed the fact that land owners considered their land as a fortune. They didn't want to sell their fortunes. Hence it was well remarked that real farmers in Mauritius don't own any land. They get land for agriculture through renting from land owners. Hence the complexity of the situation is that land owners are considered as planters but they are not those who are cultivating the lands. Land owners are being registered as Cane planters in Mauritius, but they are not the ones cultivating. The better pieces of land are usually rented at better price. Long ago the grand-parents and parents of those people who are the present day land owners were trying to gain maximum profit with their sugar cultivation. Nowadays with the drastic decrease of sugar price in world market (12,000 MUR per tonne), there is tendency of zero profit. The cost of production is very high. Land owners prefer to leave their lands bare or rent it with others.

It was also pointed out that present day land owners consider themselves middleclass. They do not want to do agricultural business. They want more office works or they leave for abroad, but they are still heirs of those lands left behind by their grand-parents and parents. They are not even prepared to sell their lands due to the fact of their consideration of land as fortune. It

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has also been indicated that during those times when planters were getting a lot of profits from selling sugar, even after getting such fortunes in farming the planters did not invest in their business activities. Why weren't they investing? Why were they only buying wants and preferring luxuries? This was mainly due to a problem of social structure in Mauritius.

In Mauritius, if a planter is considered a big planter there is tax being paid whereas for a small amount of land no tax is paid. Hence it is usually a fact that heirs of those big land owners become the new owners with small amount of land where no tax is being paid. Mauritius is consisted of landless farmers who do not own land but only cultivate it after renting.

Technology among Small Planters

It is found that in Mauritius the Government are giving facilities for derocking for those planters being registered as Cane Planters. At the end of the day the ones having the best lands have in mind just of renting those lands at expensive prices. Only those who can afford can do so. Since those landless farmers having the best land are not having any thoughts to new technology since they have no ownership. Why to invest fortunes for new technology when they don't own the lands? It was found that even those who do not want to be a farmer anymore but having lands, they are not selling since price of land has the trend of increasing since the last fifty years. Then what came out as relevant was how and why to bother about new technology investment?

Years of farming experience

Table 1 shows that most of our small farming community have more than 15 years of experience meaning that this community is an ageing population as rightly said by Gopal Pillay: "There is the problem of what is known as succession planning in our small farming community. This is the biggest issue according to him; who will take over?" The high ageing farming population being noticed from the result can also be matched with Raj Ramnauth's that "Traditional farmers are finding it difficult to pass on their heritage to youngsters. The latter are not willing to carry out livestock and farming activities." This can be one of the major constraints that small farmers in Mauritius are actually facing which can also lead to the fact of non-adoption of technology.

Table 1: The farming experience of small farmers.

Span of years	1 to 5 years	6 to 10 years	10 to 15 years	More than 15 Years
No. of Farmers	10	6	16	70

This result of more than 15 years of farming experience can also be interpreted as the traditional attitude of Mauritian farmers. "The psychology in Mauritius in agriculture is still towards the traditional way of doing things" as mentioned by Raj Ramnauth during the interview session which tally with the above mentioned point. That may be one of the reasons of resistance to change towards technology adoption.

Proposed Technology Adoption Model for Mauritius Set up through Setting up of Farming Zone Areas and Entrepreneur Approach

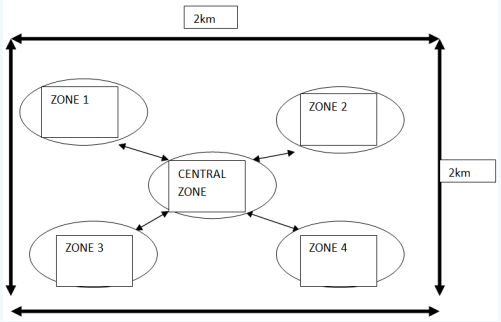

Figure 2: Farming zone Model.

This suggests that a farming zone with an area of four square kilometres could be created as shown in Figure 2 below. All necessary facilities would be provided consisting of even the store and cold rooms where produces could be easily stocked and stored. Postharvest facilities could be developed to add value to the produces. Products would be made readily available as when needed.

- Family support business

It was also suggested that since all favourable conditions prevail for moving from sugarcane to vegetables production, family support businesses should be encouraged.

- Moving to cattle, poultry and forestry business activities

It was also well specified that cattle rearing for milk and meat purposes should be encouraged to boost up morale of planters since the declination of sugarcane industry. Poultry farming could be further developed. Forestry developments could also be earmarked.

- Government boost up plans

It was also well noted that Government should be giving tax rebates to land owners.

Good planters should be encouraged to develop agriculture by providing them with more skills to be more successful.

Government should work upon effective policies in order to encourage towards Fresh Market Products.

Conclusion

The following important issues were related and how to tackle them discussed:

- The human sociology aspects need to be investigated so as answers regarding why the owners are not putting money put forward.

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- How and what to do to help those people to invest should be worked upon.
- Empowerment of farmers to become entrepreneur should be put forward.
- Infrastructures should be put in place in order to permit farmers to develop.

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