A STUDY ON DETERMINANTS OF INNOVATION IN AGRICULTURE

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Abstract
Agriculture is the backbone of any economy. At the time of independence more than half of the national income is contributed by agriculture (FICCI). The first five year plan was emphasized on agricultural development. With the advent of new economic policies adopted since 1991, the picture had changed drastically. The contribution of agriculture in national income had declined to 26 per cent and that of service sector had increased to more than half of the total national income. The study tents find the determinants of innovation in agriculture and the problems faced by the innovators in agriculture. In respect of Socio-Political drivers of innovation, study shows that most prominent driver of innovation is 'improved social status'. With regard to Family Linked drivers of innovation, the most important driver of innovation is families' contribution to innovative ideas. It is found that adaptive innovators earn more income when compared to modified and pure innovators. In case of educational qualification and drivers of innovation it was found that there is a difference among the educational qualification regarding the Socio-Political, Family Linked and Personal Oriented drivers of innovation. Socio political drivers are more opted by post graduates, family linked drivers are opted equally by both people with SSLC and post-Graduation and Personnel oriented drivers are opted more by agriculturalist with higher secondary education.

Key Words: Determinants Of Innovation, Agriculture, Socio-Political, Family Linked And Personal Oriented Drivers Of Innovation.

Introduction
Agriculture is the backbone of any economy. At the time of independence more than half of the national income is contributed by agriculture (FICCI). The first five year plan was emphasized on agricultural development. With the advent of new economic policies adopted since 1991, the picture had changed drastically. The contribution of agriculture in national income had declined to 26 percent and that of service sector had increased to more than half of the total national income (Ministry of Agriculture).

When introducing innovations to agriculture, it is important to gain insight into determinants that may facilitate or impede the introduction, in order to design an appropriate strategy for introducing the innovation.Hence, it is essential to focus on innovations in agricultural technology for the development of this sector. Innovation is a driver of economic growth and well-be in the countries. Innovation in agriculture can contribute to Developing new ideas, Economic development, Increasing the productivity in agriculture, Rise in income etc.This research is done to find the determinants of innovation in agriculture and the problems faced by the innovators in agriculture.

Review of Previous study
(Jules Pretty Z. P.)describes the lessons learnt from cases of sustainable intensification of agriculture in the African Union. These cases show that under supportive conditions, agriculture in Africa can produce higher yields, generate adequate income for farmers, regenerate the natural capital and environmental services, and contribute to human development. The challenges they face include widespread land degradation, the various impacts of climate change, endemic poverty and problematic access to water and other inputs for farming. This report contributes to the knowledge required to address agriculture and rural development across the African Union.

(Zilberman, 2000) The chapter reviews the generation and adoption of new technologies in the agricultural sector. The first section describes models of induced innovation and experimentation, considers the political economy of public investments in agricultural research, and addresses institutions and public policies for managing innovation activity. The second section reviews the economics of technology adoption in agriculture. Threshold models, diffusion models, and the influence of risk, uncertainty, and dynamic factors on adoption are considered. The section also describes the influence of institutions and government interventions on adoption. The third section outlines future research and policy challenges.

(hall, 2007), His focus is the challenge of strengthening agricultural innovation systems. The paper prefaces this discussion by reflecting on an apparent paradox. While agricultural innovation has never been better studied and understood, many of our ideas about innovation have failed to fundamentally change the institutional and policy setting of public and private investment intended to promote innovation for development. The paper asks "students of innovation" why a virtual spiral of innovation practice and policy learning has not emerged. The paper then locates the current interest in innovation systems in

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the evolving and contested approaches to agricultural development, noting that this is characterised by a long history of false dichotomies.

(Derek Byerlee) In the seminal work on the subject, agriculture was seen as a source of contributions that helped induce industrial growth and a structural transformation of the economy. He argue that a new paradigm is needed that recognizes agriculture's multiple functions for development in that emerging context: triggering economic growth, reducing poverty, narrowing income disparities, providing food security, and delivering environmental services. . The current attention given to agriculture and the new paradigm in using agriculture for development offer unique opportunities to address the extensive development issues.

(John knight, 2010)) et al focuses the impact of education on farmers' attitudes toward endogenous risk (measured using an attitude survey instrument) is estimated with household data from rural Ethiopia. Education of the household head is found to decrease risk-aversion. Next, the effects of education and risk attitudes on technology adoption are estimated. Schooling encourages farmers to adopt innovations, whereas risk-aversion reduces the probability of adoption. Thus, we find that schooling encourages innovation, a potentially risky undertaking, not only directly but also indirectly, through its effect upon attitudes toward risk. To the extent that educated farmers are early innovators and are copied by those with less schooling (as other research on the same data has shown), the reduction of risk aversion not only has private benefits for those with education but also may have externality benefits.

Objectives
1. To identify the various drivers of agricultural innovation.
2. To examine the relationship between farmers personnel characteristics and innovations.

Hypothesis
H_{01}**:** There is no significant difference among different educational qualification of respondents with regard to income from innovation.
H_{02}**:** There is no significant difference among no: of innovations adopted by the respondents   with regard to income from innovation.
H_{03}**:** There is no significant difference among the type of innovation of respondents and the income from innovation.
H_{04}**:** There is no significant difference among different educational qualification of respondents with regard to drivers of innovation.

Research Methodology
The study entitled "Determinants of Innovation in Agriculture" is a study on based on both primary and secondary data. The primary data was collected conveniently from 44 randomly selected respondents by using a pre structured interview schedule. Responses on the various measures used in the study were obtained on a five point scale as strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2) and strongly disagree (1). The collected data was analysed using simple mathematical and statistical tools and techniques like tables, graphs, mean, standard deviation, t-test etc. The secondary data used for the study was collected from different sources like websites, journals, magazines and newspapers.

Results and Discussion
Table 1 shows general profile of the respondents. In case of educational qualification 40.9 per cent of the respondent's possess SSLC, 40.9 per cent possess Graduation, 13.6 per cent belong to P.G and 4.5 per cent belong to plus two.

With regard to Type of innovation 36.4 per cent are Pure innovations, 31.8 per cent are Adaptive innovators and 31.8 are Modified innovators.68.2 per cent of the respondents report one innovation, 22.7 per cent reports two innovations and finally 9.1 per cent reports three innovations

Table 1. Profile

Sl.No	Variable	No. of Respondents	Percentage
1.	**Educational Qualification**		
	SSLC	18	40.9
	PLUS TWO	2	4.5

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	U.G	18	40.9
	P.G	6	13.6
	Total	44	100.00
2.	**Type of innovation**		
	Modified innovation	14	31.8
	Adaptive innovation	14	31.8
	Pure innovation	16	36.4
	Total	44	100.00
3.	**No: of innovation**		
	1	30	68.2
	2	10	22.7
	3	4	9.1
	Total	44	100.00

Source: Survey Data; N=44

Drivers of Innovation
Under this study drivers of innovation are classified into three namely, socio-political, personnel oriented and family linked drivers.

Socio-Political Drivers
Socio-political drivers include support from local Govt., Support from NGOs, Encouragement from society, improved social status, Contribute to social development, financial aid from bank and importance of location. Table 2 shows the Socio-Political Drivers considered in our study.

Table 2. Socio-Political Drivers

Sl.no	Variable	Mean	SD
1.	Support from Local Govt.	3.50	.591
2.	Support From NGOs	3.50	.731
3.	Encouragement From Society Favourable	3.82	.896
4.	Agricultural Policy	3.50	.849
5.	Improved Social Status	4.45	.791
6.	Contribute to Social Development	4.27	.758
7.	Financial Aid From Bank	3.27	.924
8.	Is location important	3.50	.902

Source: Survey Data; N=44

Table 2 shows the socio-political drivers. It shows that most prominent driver of innovation is 'improved social status' (4.45), followed by 'Contribute to social development'(4.27), 'Encouragement from society'(3.82), 'Support from local Govt.'(3.50), 'Support from NGOs'(3.50), 'Importance of location'(3.50),'Favourable Agricultural policy' (3.50), and 'Financial aid from banks'(3.27).

Family Linked Drivers
Family linked drivers include family support in decision making, family co-operation in risk taking, family's contribution to innovative ideas and support from family for arranging funds. Table 3 shows the Family Linked Drivers considered for the study.

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Table 3.Family Linked Drivers

Sl.no	Variables	Mean	SD
1	Family Support In Decision Making	3.82	.786
2	Family Co-operation in Risk Taking	3.50	.792
3	Families Contribution to Innovative Ideas	3.91	.802
4	Support From Family for Arranging Funds	3.59	.787

Source: Survey Data; N=44

Table 3 shows that the important driver of innovation is 'families contribution to innovative ideas'(3.91) followed by 'family support in decision making' (3.82), 'support from family for arranging funds' (3.59) and 'Family co-operation in risk taking'(3.50).

Personnel Oriented Drivers
Personnel drivers includes vision about agriculture, all innovative ideas are successful, ready to learn new things, faced challenges while adopting innovation, ready to make new connections from odd combinations, strong passion for agriculture, technology and innovation and hard work. Table 4 shows the Personnel oriented drivers taken for the study.

Table 4. Personal Oriented Drivers

Sl.no	Variables	Mean	SD
1	Vision about Agriculture	4.68	.471
2	All innovative ideas are successful	3.82	1.126
3	Ready to adopt changes	4.41	..497
4	Ready to learn new thing	4.68	.708
5	Faced challenges while adopting innovation	4.36	.838
6	Ready to make new connections from odd ones	3.95	.888
7	Strong passion for agriculture	4.41	.787
8	Technology and innovation	3.86	.554
9	Hard work	4.73	.544

Source: Survey Data; N=44

Table 4 show that most prominent personnel drivers of innovation is 'Hard work'(4.73), followed by 'vision about agriculture'(4.68) and 'ready to learn new things' (4.68) , followed by 'ready to adopt changes' (4.41) and 'strong passion for agriculture' (4.41), 'Faced challenges while adopting innovation'(4.36), 'Ready to make new connections from odd combinations'(3.95), 'Technology and innovation'(3.86). 'All innovative ideas are successful'(3.82).

Testing of Hypothesis
1. Education and Income from Innovation
As the qualification of a person increases, he is considered to gain more expertise in such innovation. So as the educational qualification increases the income from innovation also increases. In order to examine whether the educational qualification has any role in innovation and consequent income the following hypothesis were formulated and tested.
H_0: There is no significant difference among different educational qualification of respondents with regard to income from innovation.
H_1: There is a significant difference among the different educational qualification of respondents with regard to income from innovation.

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Table 5. Education and Income from Innovation

Description			ONE WAY ANOVA				
Education	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
SSLC	4.06	2.209	Between Groups	13.778	3	1.231	0.311
Plus Two	2.50	2.121	Within Groups	149.222	40		
Graduate	2.94	1.662					
Post Graduate	3.83	1.722					
Total	3.50	1.947		163.000	43		

Since the P value is greater than 0.05, the null hypothesis is accepted. Hence, Educational Qualification has no significant role in Agricultural innovation. It is contrary to the popular belief that higher educational qualification will bring more innovation. Thus it can be concluded that, there is no significant difference among different educational qualification of respondents with regard to income from innovation.

2. Number Of Innovation And Income
Generally, when the number of innovations adopted increases, the income will also increase. In order to find out whether the number of innovations adopted has any role in income from innovation, the following hypothesis is formulated and tested.
 H$_0$: There is no significant difference among no: of innovations adopted by the respondents   with regard to income from innovation.
H$_1$: There is significant difference among no: of innovations adopted by respondents with regard to income from innovation.

Table 6. Number of Innovation And Income

Description			ONE WAY ANOVA				
No: of Innovation	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
1	2.57	1.223	Between Groups	82.133	2	20.821	.000
2	5.50	1.080	Within Groups	80.867	41		
3	5.50	3.000					
Total	3.50	1.947		163.00	43		

Since the P value is less than .05, the null hypothesis is rejected. Therefore it is concluded that there is significant difference among no: of innovations adopted with regard to income from innovation.

3. Type of Innovation and Income From Innovation
   There are 3 types of innovations namely pure innovation, Adaptive innovation and   Modified   innovation.
   H$_0$: There is no significant difference among the type of innovation of respondents and the income from innovation.
   H$_1$: There is a significant difference among the type of innovation of the respondents and the income from innovation.

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Table 7.Type of Innovation And Income From Innovation

Description			ONE WAY ANOVA				
Type of Innovation	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
Modified Innovation	2.64	1.216	Between Groups	22.420	2	3.269	.048
Adaptive Innovation	4.43	2.377	Within Groups	140.580	41		
Pure Innovation	3.44	1.788					
Total	3.50	1.947		163	43		

Since the p value is less than 0.05, the null hypothesis is rejected. Thus, it can be concluded that there is a significant difference among the type of innovation with regard to income from innovation.

Educational Qualification and Drivers of Innovation
In order to examine whether the educational qualification has any role in drivers of innovation, following hypothesis were formulated and tested.
H_0: There is no significant difference among different educational qualification of respondents with regard to drivers of innovation.
H_1: There is a significant difference among the different educational qualification of respondents with regard to driver of innovation..

In Table 15, since the P value is less than 0.05 in all cases, the null hypothesis is rejected. Hence, we can conclude that there is a significant difference among the educational qualification regarding the Socio-Political, Family Linked and Personal Oriented drivers of innovation.

Table 8. Education and Drivers of Innovation

Socio-Political Drivers							
Description			**ONE WAY ANOVA**				
Education	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
SSLC	3.59	.224	Between Groups	3.306	3	8.725	.000
Plus Two	2.857	.000	Within Groups	5.052	40		
Graduate	3.91	.465					
Post Graduate	4.095	.322					
Total	3.759	.441		8.358	43		
Family Linked Drivers							
Description			**ONE WAY ANOVA**				
Educational qualification	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
SSLC	3.833	.529	Between Groups	2.298	3	2.821	.051
Plus Two	2.750	.000	Within Groups	10.861	40		
Graduate	3.638	.583					

Post Graduate	3.833	.258					
Total	3.705	.553		13.159	43		

Personal Oriented Drivers							
Description			**ONE WAY ANOVA**				
Education	**Mean**	**SD**		**Sum of Squares**	**df**	**f**	**P value**
SSLC	4.148	.399	Between Groups	1.603	3	4.184	.011
Plus Two	4.778	.000	Within Groups	5.108	40		
Graduate	4.494	.202					
Post Graduate	4.185	.582					
Total	4.323	.395		6.712	43		

This gives a meaningful insight about the profile of respondents and also about the drivers of innovation in agriculture. From the study it is found that 95 per cent of the respondents are males. 40.9 percent of the respondents posses SSLC and the same proportion also holds a degree. 40.9 per cent of the respondents are among the age group of 41-55. It is also evident that most prominent drivers of innovation are Improved Social Status, Family Contribution to Innovative Ideas and hard work.

Conclusion
The Study on Determinants of Innovation in Agriculture was conducted to find the prominent factors influencing innovation in agriculture. In respect of Socio-Political drivers of innovation, study shows that most prominent driver of innovation is 'improved social statuses. With regard to Family Linked drivers of innovation, the most important driver of innovation is 'family's contribution to innovative ideas. The study shows that, in case of Personal Oriented Drivers of innovation, the prominent driver is 'Hard work'.

From the study it is found that Educational Qualification has no significant role in Agricultural innovation. In case of number of innovation and income from innovation, it is found that as the number of innovation adopted increases the income from innovation also increases. It is found that adaptive innovators earn more income when compared to modified and pure innovators. In case of educational qualification and drivers of innovation it was found that there is a difference among the educational qualification regarding the Socio-Political, Family Linked and Personal Oriented drivers of innovation. Socio political drivers are more opted by post graduates; family linked drivers are opted equally by both people with SSLC and post Graduation and Personnel oriented drivers are opted more by agriculturalist with higher secondary education.

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