# AGRI-ENTREPRENEURIAL INNOVATIONS FOR LIVELIHOOD SECURITY IN INDO-GANGETIC PLAINS - AN ANALYTICAL STUDY

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# Agri-entrepreneurial Innovations for Livelihood Security in Indo-Gangetic Plains- An Analytical study

**by**


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## Submitted

**In fulfillment of the requirements of degree of Doctor of Philosophy**

**to the**


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*Dedicated to my*

*Lovable PARENTS*

## CERTIFICATE

This is to certify that the thesis entitled **"Agri-entrepreneurial Innovations for Livelihood Security in Indo-Gangetic Plains-An Analytical study"**, being submitted by **Mrs. Sumati Sharma** to the **Indian Institute of Technology Delhi** for the award of **"Doctor of Philosophy"** is a record of bonafide research work carried out by her. She has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis. To the best of my knowledge, the results contained in this thesis have not been submitted in part or full to any other university or institute for the award of any degree or diploma.

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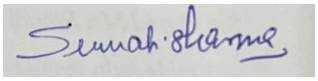
***"The hardest arithmetic to master is that which enables us to count our blessings."-Eric Hoffer***



***(Sumati Sharma)***

## ABSTRACT

Agricultural innovations and entrepreneurship development are critical for improving rural Indians' living standards. There is a need to assess the impact of available agri-entrepreneurial innovations as well as the status of the country's support system for agri-entrepreneurship development. Taking into account this backdrop, the current study was carried out to analyze agri-entrepreneurial innovations and their impact on farmers' livelihood security in selected states of trans, upper and middle regions of India's Indo-Gangetic Plains.

A proportionate random sample of 65 agri-entrepreneurs (around 10% of total agri-entrepreneurs from each of the selected states) was drawn from the sample frame of 647 agri-entrepreneurs comprising four major states i.e., Punjab, Haryana, Uttar Pradesh, and Bihar. Similarly, a proportional random sample of 65 farmers of the same area was drawn. Also, from each of the four states, 15 officials were selected randomly from various government and non-government organizations. In addition to this, eight Padma Shri awardees and five national-level awardee agri-entrepreneurs were purposively chosen for documenting their case studies in detail. This makes the total sample size 203.

Research analyzed and compared the conventional cropping system (Rice-Wheat) prevailing in the study area with the agri- entrepreneurial interventions of the selected sample of agri-entrepreneurs. The overall benefit-cost ratio for the traditional rice-wheat cropping system was 1.37, in comparison to the benefit-cost ratio of the selected agri-entrepreneurial innovations (ranged between 2.08 to 3.0), indicating substantially higher profitability of the agri-entrepreneurial innovations over the traditional rice-wheat cropping system. The Innovation Profitability Index (IPI) was used to assess the profitability of agri-entrepreneurial innovations and was found that 90.76% of the agri-enterprises were with medium profitability (IPI=0.62-0.97). The correlation of IPI with the determinants revealed that social participation ($r = 0.296$, $p = 0.017$) and mass media exposure ($r = 0.997$, $p = 0.000$) were positively correlated with the extent of profitability, whereas the gestation period ($r = -0.777$, p.000) and capital investment ($r = -.318$, $p = 0.010$) were negatively correlated.

Agri-entrepreneurs and farmers had average Livelihood Index (LI) scores of 0.651 (S.D.=0.022) and 0.419 (S.D.=0.021), respectively. According to LI values, 58.46% of agri-entrepreneurs fall into the medium category (0.293-0.698), while 41.53% fall into the high category (>0.698). A comparison of changes in agri-entrepreneurs' livelihood indicators before and after the adoption of agricultural innovations using paired ‘t’ test revealed a significant difference in income ($t = 10.84$), employment days created for family ($t = 11.06$) and

employment days created for others (t = 3.63), expenditure on education (t = 3.67), food (t = 6.33) vehicle (t = 3.31) and gadgets (t = 6.35). Similarly, the two-sample t-test revealed a significant difference in income, employment days created for family, health expenditure, education expenditure, expenditure on food, vehicle, and machinery between agri-entrepreneurs and farmers.

The study further dwelled upon the major sources of support for development of agri-entrepreneurial activities. The most common support systems recognized by the agri-entrepreneurs included Central /SAUs/KVKs (90.77 per cent respondents). Although a variety of support systems were available to agri-entrepreneurs, 89.23% of respondents indicated that financial and capacity-building support were the most often used support systems by them. The analysis of functional linkage revealed that KVKs had a strong (Mean score > 4.7) functional connection with the research institutions, and agri-entrepreneurs.

Technical, financial, infrastructural, extension, and socio-psychological barriers faced by farmers and agri-entrepreneurs were evaluated using a 5-point Likert scale. Lack of published literature and technical guidance (Mean score = 2.20), high fluctuation in prices (Mean score = 3.47), irregular supply of electricity (Mean score = 2.69), requirement of more expertise in adoption of innovations (Mean score =2.69) and risky nature of the job (Mean score=3.65) were the most severe constraints identified by agri-entrepreneurs, under technical, financial, infrastructural, extension, and socio-psychological dimensions respectively.

Further, suggestions from agri-entrepreneurs and officials were also sought in respect of documentation, validation, commercialization and dissemination of agri-entrepreneurial innovations which may be helpful in further strengthening, expanding and upscaling of innovations. Data analysis revealed that the majority of respondents (57.6%) suggested that national campaigns and exhibitions can be utilized to track innovation. In case of validation, majority of respondents (41.6 %) suggested establishing testing facilities and (40.8%) opined that training in assessing the uniqueness of the innovation is necessary. Similarly, when it came to commercialization, the majority of respondents (56.85%) advocated financial support to innovators. The most preferred suggestive strategy for the dissemination of agri-entrepreneurial innovations was through recognizing/awarding innovators (56.0%).

Finally, based on the suggestions of the respondents, researcher framed the policy recommendations and suggested future scope of the study.

## सार

ग्रामीण भारतीयों के जीवन स्तर में सुधार के लिए कृषि नवाचार और उद्यमिता विकास अति महत्वपूर्ण हैं। वर्तमान में, उपलब्ध कृषि-उद्यमिता नवाचारों के प्रभाव के साथ-साथ कृषि-उद्यमिता विकास के लिए देश की सहायता प्रणाली की स्थिति का आकलन करने की आवश्यकता है। इस पृष्ठभूमि को ध्यान में रखते हुए, भारत के सिंधु-गंगा के मैदानों में कृषि-उद्यमी नवाचारों का विश्लेषण एवं उनका किसानों की आजीविका सुरक्षा पर प्रभाव पर अध्ययन किया गया।

65 कृषि-उद्यमियों (चार राज्यों में से प्रत्येक के कुल कृषि-उद्यमियों का लगभग 10%) का एक आनुपातिक यादृच्छिक नमूना लिया गया, जिसमें भारत के ऊपरी और मध्य भारत-गंगा के मैदानी इलाकों के चार प्रमुख राज्य यानी पंजाब, हरियाणा, उत्तर प्रदेश और बिहार से 647 कृषि-उद्यमी शामिल थे। इसी तरह 65 किसानों का एक आनुपातिक यादृच्छिक नमूना भी लिया गया। साथ ही, चारों राज्यों में से प्रत्येक से, विभिन्न सरकारी और गैर-सरकारी संगठनों से 15 अधिकारियों का चयन किया गया। इसके अलावा, आठ पद्म श्री पुरस्कार विजेताओं और पांच राष्ट्रीय स्तर के पुरस्कार प्राप्त कृषि-उद्यमियों को उनकी सफलता की यात्रा का विस्तार से अध्यन एवं दस्तावेजीकरण करने के लिए चुना गया। इस तरह कुल नमूना आकार 203 बनता है।

वर्तमान अध्ययन में चयनित कृषि-उद्यमियों के कृषि-उद्यमशीलता नवाचारों के साथ में भारत-गंगा के मैदानों में प्रचलित पारंपरिक फसल प्रणाली (चावल-गेहूं) का विश्लेषण-एवं उसकी तुलना की गई । पारंपरिक चावल-गेहूं फसल प्रणाली के लिए समग्र लाभ-लागत अनुपात 1.37 था, जो चयनित कृषि-उद्यमिता नवाचारों के लाभ-लागत अनुपात (2.08 से 3.00 के बीच) से काफी कम था। लाभप्रदता सूचकांक (पीआई) का उपयोग कृषि-उद्यमी नवाचारों की लाभप्रदता का आकलन करने के लिए किया गया था और यह पाया गया कि 90.76% कृषि-उद्यमी मध्यम लाभप्रदता (आईपीआई = 0.62-0.97) के अंतर्गत थे। निर्धारकों के साथ पीआई के सहसंबंध से पता चला कि सामाजिक भागीदारी (आर = 0.296, पी = 0.017) और मास मीडिया एक्सपोजर (आर = 0.997, पी = 0.000) का लाभप्रदता के साथ सकारात्मक रूप से सहसंबद्ध थे, जबकि परियोजन पूर्ण होने की अवधि (आर = -0.777, पी 0.000) और पूंजी निवेश (आर = -.318, पी = 0.010) नकारात्मक रूप से सहसंबद्ध थे।

कृषि-उद्यमियों और किसानों का औसत एल0आई0 स्कोर क्रमशः 0.651 (एसडी = 0.022) और 0.419 (एसडी = 0.021) था। आजीविका सूचकांक मूल्यों के अनुसार, 58.46% कृषि-उद्यमी मध्यम श्रेणी (0.293-0.698) में आते हैं, जबकि 41.53% उच्च श्रेणी (>0.698) में आते हैं। युग्मित 'टी' परीक्षण का उपयोग करके कृषि नवाचारों को अपनाने से पहले और बाद में कृषि-उद्यमियों के आजीविका संकेतकों में परिवर्तन की तुलना से आय (टी = 10.84), परिवार के लिए सृजित रोजगार के दिनों (टी = 11.06) और अन्य (टी = 3.63), शिक्षा पर व्यय (टी = 3.67), भोजन (टी = 6.33) वाहन (टी = 3.31), एवं गैजेट्स ( टी =

6.35) में सार्थक अंतर पाया गया। इसी प्रकार , दो-नमूना t-परीक्षण आय, परिवार के लिए सृजित रोज़गार दिवसों, स्वास्थ्य व्यय, शिक्षा व्यय, भोजन पर व्यय , वाहन, और मशीनरी में कृषि-उद्यमियों और किसानों के बीच एक सार्थक अंतर को प्रदर्शित करता है।

आगे के अध्ययन में कृषि-उद्यमिता गतिविधियों के विकास के लिए सहायता के प्रमुख स्रोतों का विश्लेषण किया गया है । 90 .77% उद्यमियों का मानना है कि केंद्र/राज्य कृ० वि0 वि0 एवं कृषि विज्ञान केंद्र सहायता के प्रमुख स्रोत है। यद्यपि कृषि-उद्यमियों के लिए विभिन्न प्रकार की सहायता प्रणालियाँ उपलब्ध थीं, 89.23% उत्तरदाताओं ने संकेत दिया कि वित्तीय और क्षमता-निर्माण सहायता उनके द्वारा सबसे अधिक उपयोग की जाने वाली सहायता प्रणालियाँ थीं। कार्यात्मक लिंकेज के विश्लेषण से पता चला कि के0वी0के० का प्रगतिशील किसानों एवं अनुसंधान संस्थानों के साथ मजबूत (औसत स्कोर> 4.7) कार्यात्मक संबंध थे।

किसानों और कृषि कृषि-उद्यमियों द्वारा सामना की जाने वाली तकनीकी, वित्तीय, ढांचागत, विस्तार और सामाजिक-मनोवैज्ञानिक बाधाओं का मूल्यांकन 5-पॉइंट लिकर्ट स्केल का उपयोग करके किया गया। प्रकाशित साहित्य और तकनीकी मार्गदर्शन का अभाव (औसत स्कोर = 2.20), मूल्य में भारी उतार-चढ़ाव (औसत स्कोर = 3.47), बिजली की अनियमित आपूर्ति, (औसत स्कोर = 2.69) नवाचारों को अपनाने के लिए कुशलता की कमी (औसत स्कोर = 2.69) और जोखिम भरा काम (औसत स्कोर = 3.65) कृषि-उद्यमियों द्वारा क्रमशः तकनीकी, वित्तीय, ढांचागत, विस्तार और सामाजिक-मनोवैज्ञानिक आयामों के तहत पहचानी जाने वाली सबसे गंभीर बाधाएं थीं।

कृषि उधमिता नवाचारों को सुद्रण करने, फैलाने व आकार बढ़ाये जाने के लिए कृषि उद्यमियों एवं अधिकारीयों से प्रलेखीकरण, सत्यापन, व्यवसायीकरण, व प्रसार सम्बन्धी विषयों पर राय ली गयी। अधिकांश संस्थागत प्रतिनिधियों (57.6%) ने सुझाव दिया कि नवाचार को ट्रैक करने के लिए राष्ट्रीय अभियानों और प्रदर्शनियों का उपयोग किया जा सकता है। सत्यापन के मामले में, (40.8%) उत्तरदाताओं ने कहा कि नवाचार की विशिष्टता का आकलन करने के लिए प्रशिक्षण आवश्यक है। इसी तरह, जब व्यावसायीकरण की बात आई, तो अधिकांश उत्तरदाताओं (56.85%) ने नवप्रवर्तकों को वित्तीय सहायता की वकालत की। कृषि-उद्यमी नवाचारों के प्रसार के लिए सबसे पसंदीदा विचारोत्तेजक रणनीति नवप्रवर्तकों (56.0%) को सम्मानित/पुरस्कृत करने के माध्यम से थी।

अंत में, उत्तरदाताओं के सुझावों के आधार पर, शोधकर्ता ने नीतिगत सिफारिशों को तैयार किया, और भविष्य में अध्ययन के लिए सुझाव दिए ।

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## ABBREVIATION

| | |
|---|---|
| AIM | Atal Innovation Mission |
| ANOVA | Analysis of Variance |
| APEDA | Agricultural and Processed Food Products Export Development Authority |
| APMC | Agricultural Produce Market Committee |
| ASCI | Agriculture Skill Council of India |
| ASPIRE | A Scheme for Promotion of Innovation, Rural Industries and Entrepreneurship |
| ATARIs | Agricultural Technology Application Research Institutes |
| ATIC | Agriculture Technology information Center |
| ATMA | Agriculture Technology Management Agency |
| BC ratio | Benefit Cost ratio |
| CIPHET | Central Institute of Post-Harvest Engineering and Technology |
| CIRB | Central Institute for Research on Buffaloes |
| CSIR | Council for Scientific and Industrial Research |
| DBT | Department of Biotechnology |
| DSR | Direct Seeded Rice |
| DST | Department of Science and Technology |
| EIR | Entrepreneur in Residence |
| FPOs | Farmer Producer Organizations |
| FSSAI | Food Safety and Standards Authority of India |
| GDP | Gross Domestic Product |
| HYV | High Yielding Varieties |
| IARI | Indian Agricultural Research Institute |
| ICAR | Indian Council of Agricultural Research |
| ICCOA | International Competence Centre for Organic Agriculture |
| ICT | Information and Communication Technology |
| IFS | Integrated Farming System |
| IGP | Indo-Gangetic Plains |
| IIE | Indian Institute for Entrepreneurship |
| IIP | Indian Institute of Packaging |
| IPI | Innovation Profitability Index |

| | |
|---|---|
| KVK | Krishi Vigyan Kendra (Farm Science Centre) |
| LI | Livelihood Index |
| MANAGE | National Institute of Agricultural Extension Management |
| MoFPI | Ministry of Food Processing Industries |
| MSC | Micro Save Consulting |
| MSMEs | Micro, Small and Medium Enterprises |
| NABARD | National Bank for Agriculture and Rural Development |
| NAFED | National Agricultural Cooperative Marketing Federation of India Ltd. |
| NCDC | National Cooperative Development Corporation |
| NCVET | National Council for Vocational Education and Training |
| NDRI | National Dairy Research Institute |
| NIESBUD | National Institute for Entrepreneurship and Small Business Development |
| NGO | Non-Governmental Organisation |
| NHB | National Horticulture Board |
| NIDHI | National Initiative for Developing and Harnessing Innovations |
| NIF | National Innovation Foundation |
| NIFTEM | National Institute of Food Technology Entrepreneurship and Management |
| NSDC | National Skill Development Corporation |
| MSDE | Ministry of Skill Development and Entrepreneurship |
| PAU | Punjab Agricultural University |
| PMKVY | Pradhan Mantri Kaushal Vikas Yojna |
| PMKK | Pradhan Mantri Kaushal Kendra |
| PPVFRA | Protection of Plant Varieties and Farmer’s Rights Authority |
| PRAYAS | Promoting and Accelerating Young and Aspiring Innovators and Startups |
| RKVY-RAFTAAR | Rashtriya Krishi Vikas Yojana-Remunerative Approaches for Agriculture and Allied Sector Rejuvenation |
| SAUs | State Agricultural Universities |
| SFAC | Small Farmers' Agri-Business Consortium. |
| SHGs | Self Help Groups |
| SLA | Sustainable Livelihoods Approach |
| SRI | System of Rice Intensification |
| TBI | Technology Business Incubator |
| TMR | Total Mixed Ration |