# COMPETENCIES ACQUIRED BY BENEFICIARIES THROUGH AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA) IN SIKKIM

A Thesis Submitted

To

**Sikkim University**

In Partial Fulfilment of the Requirement for the

**Degree of Doctor of Philosophy**

By

**SUSMITA LAMA**

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School of Professional Studies

Under the Supervision of

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**2025**

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This is to certify that the thesis titled "**Competencies Acquired by Beneficiaries through the Agricultural Technology Management Agency (ATMA) in Sikkim**" submitted to Sikkim University for partial fulfillment of the degree of Philosophy, in the Department of Commerce, embodies the result of Bonafide research work carried out by **Ms. Susmita Lama**, *an ICSSR Doctoral Research Fellow*, *(Roll No. 20PDC008/Reg.No. 20/Ph.D./COM/08)* under my supervision and guidance. No part of the thesis has been submitted earlier to this or any other university for any degree.

All the assistance and help received during the course of the investigation have been duly acknowledged by her.

I recommend this thesis to be placed before the examiners for evaluation.

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I, **Susmita Lama** (Roll No.: ***20PDC008*** & Reg. No. ***20/Ph.D./COM/08***), hereby declare that the research work embodied in the thesis titled **"Competencies Acquired by Beneficiaries through the Agricultural Technology Management Agency (ATMA) in Sikkim"** submitted for the award of the Degree of Doctor of Philosophy in Commerce is done by me under the guidance and supervision of **Dr. Ravi Shekhar Vishal,** *Assistant Professor in Commerce*, Sikkim University and submitted to Sikkim University for the Degree of Doctor of Philosophy, is my original work. The thesis has not been submitted for any other degree at this university or any other University / Institution.

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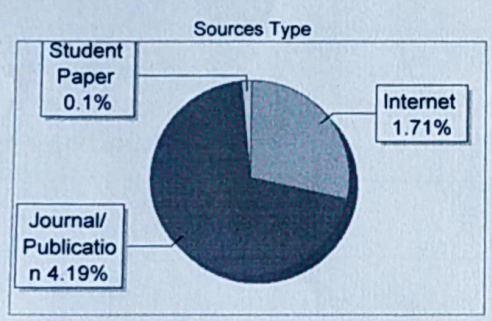


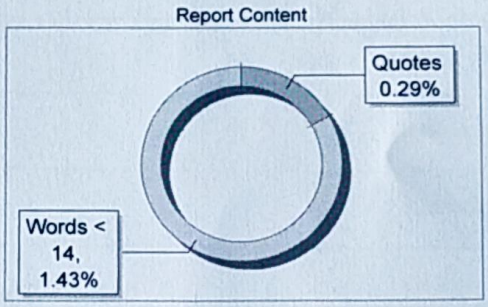


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**~ Susmita Lama ~**

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## List of Abbreviations

| | |
|---|---|
| **AAP** | *Annual Action Plan* |
| **AGRESCO** | *Agricultural Research Council* |
| **AISB** | *Authenticated Information Seeking Behaviour* |
| **APR** | *Annual Progress Report* |
| **ATIC** | *Agricultural Technology Information Centre* |
| **ATMA** | *Agricultural Technology Management Agencies* |
| **ATS** | *Agricultural Technology System* |
| **AVs** | *Autonomous Vehicles* |
| **BA** | *Beneficiaries Awareness* |
| **BAPs** | *Block Action Plans* |
| **BAS** | *Beneficiary Awareness Score* |
| **BMP** | *Better Management Practices* |
| **CDAP** | *Comprehensive District Agriculture Plans* |
| **CDB** | *Community Development Block* |
| **CDO** | *Chief Development Officer* |
| **CDP** | *Community Development Programme* |
| **CEO** | *Chief Executive Officer* |
| **CIGs** | *Community Interest Groups* |
| **CJPI** | *Composite Job Performance Index* |
| **CMAPs** | *Cost and Management Accounting Procedures* |
| **CS** | *Competency Score* |
| **CSAT** | *Climate Smart Agricultural Technologies* |
| **DAAP** | *District Agriculture Action Plans* |
| **DAC & FW** | *Department of Agriculture, Cooperation and Farmers Welfare* |
| **EA** | *Elder Age* |
| **EEIs** | *Extension Education Institutes* |
| **F** | *Female* |
| **F.Gs.** | *Farmers Groups* |
| **FAC** | *Farmers Advisory Committee* |
| **FCMS** | *Farm Crop Management System* |
| **FF** | *Farmer Friend* |
| **FFS** | *Farmers Field School* |
| **FIGs** | *Farmers Interest Groups* |
| **FOs** | *Farmers' Organizations* |
| **FOU** | *Frequency of Usage* |
| **FSP** | *Focused Social Participators* |
| **GAP** | *Good Agricultural Practices* |
| **GB** | *Governing Board* |
| **GMFC** | *Grow More Food Campaign* |
| **HL** | *Health Literacy* |
| **HYVP** | *High Yeilding Variety Programme* |
| **IAAP** | *Intensive Agricultural Area Programme* |
| **IADP** | *Intensive Agricultural District Programme* |
| **IBB** | *Impulsive Buying Behavior* |
| **ICAR** | *Indian Council of Agricultural Research* |
| **ICDP** | *Intensive Cattle Development Project* |
| **IDWG** | *Inter-Departmental Working Group* |
| **INM** | *Integrated Nutrient Management* |

## List of Abbreviations

| | |
|---|---|
| **IPM** | *Integrated Pest Management* |
| **IRVs** | *Improved Rice Varieties* |
| **ISB** | *Information Seeking Behavior* |
| **IT** | *Information Technology* |
| **ITD** | *Innovations in Technology Dissemination* |
| **JAU** | *Junagadh Agricultural University* |
| **JDI** | *Job Description Index* |
| **KA** | *Knowledge Acquisition* |
| **KAS** | *Knowledge Acquisition Score* |
| **KVK** | *Krishi Vigyan Kendra* |
| **L** | *Low* |
| **LLP** | *Lab to Land Programme* |
| **LR** | *Large* |
| **M** | *Male* |
| **M** | *Medium* |
| **MA** | *Middle Age* |
| **MANAGE** | *National Institute of Agricultural Extension Management* |
| **MIS** | *Media Information Seekers* |
| **MMT** | *Mobile Money Transfer* |
| **MMTS** | *Mobile Money Transfer Services* |
| **NAEP** | *National Agricultural Extension Project* |
| **NAIP** | *National Agricultural Innovation Project* |
| **NARS** | *National Agricultural Research System* |
| **NATP** | *National Agricultural Technology Project* |
| **ND** | *National Demonstration* |
| **NES** | *National Extension Service* |
| **NGOs** | *Non-Governmental Organisations* |
| **NMAET** | *National Mission on Agricultural Extension and Technology* |
| **NRC** | *National Research Centre* |
| **NRCG** | *National Research Centre for Grapes* |
| **OISB** | *Overall Information Seeking Behaviour* |
| **ORP** | *Operational Research Project* |
| **OSPB** | *Overall Social Participation Behaviour* |
| **PAN** | *Permanent Account Number* |
| **PCA** | *Principal Component Analysis* |
| **PIS** | *Public Information Seekers* |
| **PMFBY** | *Pradhan Mantri Fasal Bima Yojana* |
| **PMKSY** | *Pradhan Mantri Krishi Sinchayee Yojana* |
| **PRAs** | *Participatory Rural Appraisals* |
| **PU** | *Perceived Usefulness* |
| **PUC** | *Provisional Utilization Certificate* |
| **R&D** | *Research and Development* |
| **RBK** | *Rythu Bharosa Kendralu* |
| **R-E** | *Research Extension* |
| **R-E-F** | *Research, Extension, and Farmer* |
| **RKVY** | *Rashtriya Krishi Vikas Yojana* |
| **RKVY-RAFTAAR** | *Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation* |

## List of Abbreviations

| | |
|---|---|
| **S** | *Small* |
| **SAMETI** | *State Agricultural Management and Extension Training Institute* |
| **SAP** | *State Agriculture Plan* |
| **SAUs** | *State Agricultural Universities* |
| **PS** | *Primary School* |
| **SD** | *Standard Deviation* |
| **SDAO** | *Sub Divisional Agriculture Officer* |
| **SEM** | *Structural Equation Modelling* |
| **SES** | *Socio-Economic-Status* |
| **SEWP** | *State Extension Work Plan* |
| **SHGs** | *Self Help Groups* |
| **SI** | *Social Influence* |
| **SLSC** | *State Level Sanctioning Committee* |
| **SMAE** | *Sub-Mission on Agricultural Extension* |
| **SMAM** | *Sub-Mission on Agricultural Mechanization* |
| **SMPP** | *Sub-Mission on Plant Protection* |
| **SMSP** | *Sub Mission on Seed and Planting Material* |
| **SMSs** | *Subject Matter Specialists* |
| **SoE** | *Statement of Expenditure* |
| **SPB** | *Social Participation Behavior* |
| **SPSS** | *Statistical Package for Social Sciences* |
| **SREP** | *Strategic Research and Extension Plan* |
| **SSK** | *Sardar Smruti Kendra* |
| **STRY** | *Skill Training of Rural Youth* |
| **T & V** | *Training & Visit System* |
| **TA** | *Technology Adoption* |
| **TAR-IVLP** | *Technology Assessment and Management - Institute Village Linkage Programme* |
| **TAS** | *Technology Adoption Score* |
| **TDMC** | *Technology Dissemination Management Committee* |
| **TDU** | *Technology Dissemination Unit* |
| **TMO** | *Technology Mission on Oilseeds* |
| **TNI** | *Training Requirement Index* |
| **VSP** | *Voluntarily Social Participators* |
| **WFIGs** | *Women Farmers Interest Groups* |
| **YA** | *Young Age* |
| **YMCA** | *Young Men's Christian Association* |
| **ZRS** | *Zonal Research Stations* |

# Chapter – 1
# Introduction

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# INTRODUCTION

## 1.1 INTRODUCTION TO RURAL EXTENSION SERVICES

Agriculture underlies India's civilization, livelihood, legacy and culture, ***India Brand Equity Foundation, (2022)***. A significant part of the country's GDP, about 18% is contributed by agricultural and allied sectors (2022–23), ***IBEF, (2024)***. India's agriculture sector boasts the distinction of having the second-largest agricultural acreage globally, employing approximately half of the population ***IBEF, December (2023)***.

Around 47 percent of the people are directly or indirectly employed in agriculture, while 65% of the population resides in rural areas as per the ***Department of Economic Affairs, (2024)***. Due to the significant reliance of rural households on agriculture, it is essential to prioritize agricultural development to eradicate poverty in the nation ***Gulathi et. al., (2018)***. In developing countries, agricultural extension services have extensive societal implications. By facilitating the transmission of knowledge, they are instrumental in the reduction of poverty by empowering farmers, ***Aker, (2011)***. To better educate farmers, the Indian Ministry of Agriculture has implemented several reforms in recent years, one of which is the increased use of communication strategies and modern technologies, ***Gulathi, (2018)***.

The approach to overall rural growth and agricultural development has changed significantly in both pre- and post-independence philosophies. Before independence, individuals, members of society, and government leaders made intermittent efforts in diverse regions of the nation.

The endeavor to create model villages in Sunder Ban, Bengal, catalyzed the first initiative project in India. Sir. Daniel Hamilton started this project in 1903 as his initiative. This aided the farmers to become self-reliant. The project operated for 15 years before coming to an end. In 1905, the Imperial Research Institute was inaugurated in Pusa, Bihar which served as the starting point of the Extension Initiative in India. It placed significant emphasis on socioeconomic and educational initiatives. In 1920, a project named the "Gurgaon experiment" was initiated by F.L. Brayne, which allocated a village guide to each hamlet to serve as an extension agent. These agents disseminated professional knowledge on a variety of topics that covered female education in agriculture.

### 1.1.1 Pre-Independence Extension and Rural Development Programmes

*Figure No. 1.1*: **Pre-Independence Extension and Rural Development Programmes**

| | |
|---|---|
| Pre-Independence Extension and Rural Development Programmes | Scheme of Rural Construction at the Sundarban in West Bengal [Year 1903] (Sir Daniel Hamilton) |
| | Servants of Indian Society [Year 1905] (Gopala Krishna Gokhale) |
| | Gurgaon Project [Year 1920] (Mr. F.L. Brayne) |
| | Sewa-Gram Experiment in Wardha in Gujarat [Year 1920] (Shree Mahatma Gandhi) |
| | Shriniketan Experiment in Bengal [Year 1921] (Shri Rabindra Nath Tagore) |
| | Mathardam Project in Kerela [Year 1928] Dr. SpencerHatch Young Men Christian Association (YMCA) |
| | Baroda Village Reconstruction Project [Year 1932] Shree B. T. Krishnamachari |
| | Grow More Food Campaign [Year1942] Agriculture Department of State Government |
| | Indian Village Service [Year 1945] Dr. W. H. Wisher |
| | Firka Vikas Yojana in Madras [Year 1946] Government of Madras |

*Source: Compiled by the researcher*

Thereafter, Rabindranath Tagore launched the Sriniketan Experiment in 1920 to educate rural residents and assist them in creating cottage industries. The primary goal was to generate enthusiasm among individuals for rural labor, analyse rural issues, and convert findings into the practical measure (***Pre-Independence Extension and Rural Development Programmes, n.d.)***.

In the year 1928, under the direction of Dr. Spencer Hatch, the Young Men's Christian Association (Y.M.C.A) and the Christian Church Association started the Marthandam project of rural development in the village of Marthandom and Trwanacore. It was based on the fundamental approach of "Self-help with expert counsel". Sevagram, another extension service initiative was established by Mahatma Gandhi in 1933. Its origins were traced back to the All-India Spinners Association, which was founded in 1920. The program focused on promoting rural development by improving the living conditions of villagers. Thereafter, V. T. Krishnachari initiated the campaign in 1932 while serving as the Dewan of the Baroda. Initially, its primary aim was to facilitate a swift improvement in living conditions, industrialization, and the rapid expansion of the educational system.

The Japanese conquest of Burma in March 1942 marked the beginning of the true catastrophe. India had been annually importing several million tonnes of paddy from its eastern neighbour Burma ever since the two countries separated in 1937. Upon the Japanese conquest of Burma, this valuable resource was promptly depleted. A cyclone and disease both destroyed rice plantations in Bengal during the same year. The nation was confronted with both natural and man-made challenges. While the British government attempted to regulate prices and facilitate the British government's tyranny resulted in the Bengal Famine of 1943, one of the most significant artificial catastrophes of the 20$^{th}$ century. Countless individuals succumbed to the catastrophe. The Grow

More Food Program was implemented in the same year. It endeavored to encourage the expansion and intensification of agricultural practices. This program was initiated to aid in mitigating the repercussions of the Bengal Famine.

In 1945, under the direction of Dr. W.H. Wisher, the Indian Village Service commenced in the village of Agasoli, District Aligarh, Uttar Pradesh. Following the partition of the country, local volunteer M.V. Siddiqi Khan relocated to Pakistan, resulting in the closure of this center. The administration of Madras (now Tamil Nadu) resolved to initiate development activities at the local sub division. The inaugural program commenced in 1946. Among pre-Independence initiatives, this was the most significant undertaking.

It aimed to realize the Gandhian principle of "Village Swaraj" by enhancing educational, economic, sanitary, and other developmental initiatives in villages while rejuvenating the community spirit and fostering self-confidence and self-reliance among the populace.

### 1.1.2 Post-Independence Extension and Rural Development Programmes

*Figure No. 1.2*: **Post-Independence Extension and Rural Development Programmes, Community Development Programmes**

| | |
|---|---|
| Post-Independence Extension and Rural Development Programmes | Nilokheri experiment [Year 1948]<br>Dey S.K. |
| | Pilot project (Etawah) [Year 1948]<br>Albert Mayer |
| I. Community Development Programmes | Community Development Programme (CDP) [Year 1952] |
| | National Extension Service (NES) [Year 1953] |
| | Community Development Block (CDB) [Year 1954] |
| | Panchayat Raj System [Year 1957]<br>Panchayat Raj Democratic Decentralisation |

*Source: Compiled by the Researcher*

The Nilokheri experiment, which S. K. Dey initiated in 1948, was an additional well-known extension attempt that garnered national attention. It was initiated among Pakistani refugees with self-sufficiency as its goal. Thereafter, the Etawah Pilot project, conceptualized by Albert Mayer in 1948, was initiated by the Government of Uttar Pradesh. The objectives highlighted were to foster self-sufficiency at the local, district, and state levels, enhance agricultural output, adult literacy, public health, upgrade the technology utilized by individuals, and to cultivate village leadership. At first, the initiative encompassed 64 villages and end of year 1956, it extended to approximately 400 villages. The outcomes attained by this project were remarkable. However, the goal of cultivating local leadership was not fulfilled.

Launched on October 2, 1952, the Program for Community Development (CDP) was one of the first and main systematic government projects in Extension and Rural Development guided by the Grow More Food Campaign (GMFC) idea. The CDP initiative promotes general rural community development through community involvement. In order to broaden the scope of the CDP, the National Extension Service (NES) emerged on October 2, 1953. Due to the shared fundamental concept, the CDP and NES programmes were consolidated under a single entity at national and state levels. Both programmes were mutually supportive and interconnected, operating simultaneously. The Committee noted that the endeavor of CDB and NES to encourage people's initiative are among their least successful aspects of their operations and recommended democratic decentralization. The notion of 'democratic decentralisation' was not readily comprehended by the populace. Consequently, as determined by the then Prime Minister, a three-tier administration was instituted under the designation "Panchayat Raj". ***(Development of e-course for B.sc (Agriculture), n.d.)***

Initiated in August 1952, the Key Village Scheme was the first deliberate attempt at boosting buffaloes' and cattle's output in the country. Grading the native cow population, the program sought to quickly multiply crossbred animals to satisfy the severe demand for premium animals. Initiated in July 1960 in seven chosen districts across different states, the Intensive Agricultural District Program (IADP) aimed at increasing output and production. This initiative used enhanced methods to handle agricultural production challenges in an integrated and intense manner.

*Figure No. 1.3*: **Post-Independence Extension and Rural Development Programmes, Technology Development Programmes**

| | |
|---|---|
| Post-Independence Extension and Rural Development Programmes | Key Village Scheme [Year1952] Government of India |
| | Intensive Agricultural District Programme (IADP) [Year 1960] |
| | (IAAP) Intensive Agricultural Area Programme [Year 1964] |
| | (ICDP) Intensive Cattle Development Project [Year 1963-1964] |
| II. Technological Developments | High Yeilding Variety Programme (HYVP) [Year 1966] |
| | Training & Visit System (T & V) [Year 1974] |
| | Lab to Land Programme (LLP) [Year 1979] |
| | (NAEP) National Agricultural Extension Project [Year 1983] |
| | (TMO) Technology Mission on Oilseeds [Year 1986] |
| | National Agricultural Technology Project (NATP) [Year 1998] |
| | (TAR-IVLP) Technology Assessment and Management, Institute Village Linkage Programme [Year 1999] |
| | Agricultural Technology Information Centre (ATIC) [Year 2000] |
| | National Agricultural Innovation Project (NAIP) [Year 2006] |

*Source: Compiled by the Researcher*

The Intensive Agriculture Area Programme (IAAP) was initiated in 114 districts in 1964 and subsequently expanded to accommodate an additional 150 districts. The IAAP also implemented the Package method; however, the employment pattern in these districts was less intensive than that of the IADP. The advancement of intensive agriculture was the primary objective of both the IADP and IAAP. The existing crop varieties, which exhibited limited fertilizer responsiveness, imposed the constraints within which they operated.

During the years 1963–1964, the Intensive Cattle Development Project (ICDP) got underway. The goals of the initiative and the Key Village Scheme were aligned, although encompassed a somewhat broader scope that included a package like dairy extension, cattle breeding, Incentives & subsidies for milk production, veterinary aid and disease control, castration of scrub bulls, feed and fodder development etc. During 1964–65, many Mexican dwarf wheat cultivars, Taichung Native 1, and an exotic paddy variety were evaluated and deemed promising. The preliminary concept of the Fourth Plan emphasized the necessity for an innovative strategy to rapidly enhance agricultural output, leading the Indian government to initiate a program in 1965 to expand the cultivation of high-yielding crops. The High Yielding Variety Program was the term given to this arrangement.

The Indian Council of Agricultural Research (ICAR) recognized in 1971 how important and extensive the links were between education, extension tasks, and research. The Operational Research Project (ORP), Lab to Land Project (LLP), Krishi Vigyan Kendra (KVK), and National Demonstration (ND) were the four leading Transfer of Technology Projects that the ICAR commenced.

A standardised national effort was constituted by the National Demonstration Programme. To achieve optimal results, highly dedicated and collaborative farmers were chosen, superior methods and technologies were implemented, including a consortium of scientists and local extension agents. Field days, field visits, and farmers and field extension worker training were vital for technology spread. The national demonstration was meant to outperform extension agencies. In 1974-75, the Operational Research Projects were implemented. It addressed a wide range of subjects, including agricultural farming, integrated pest management, mixed farming, plantation crops, the enhancement of Diara and char lands, post-harvest technology, arid land management, land reclamation, and fisheries. The Agricultural University of Tamil Nadu founded the first Krishi Vigyan Kendra (KVK) in Pondicherry in 1974. Nationwide, there are 602 Krishi Vigyan Kendras (KVKs) at present.

To sustain elevated agricultural output and income, farmers want access to competent extension services and pertinent research. The Training and Visit (T & V) program was established in 1974 by Benor Daniel, a World Bank expert, to provide extension services in a diverse array of agricultural and administrative contexts in developing countries. The objective of the T & V extension system was to develop a professional extension agency that aids farmers in enhancing productivity and increasing their earnings, as well as providing appropriate support for agricultural development. However, this process was laborious and several states had trouble supplying adequate labor. This approach was primarily restricted to farmers. The youth and farm women were neglected. ***(Agricultural Extension System, n.d.)***

ICAR then launched Lab to Land Programme (LLP) to promote economic drivers. In 1979, the Indian Council of Agricultural Research launched this initiative for its Golden Jubilee. The initiative transferred proven, low-cost technologies to small and marginal

farmers to improve their socioeconomic status. ***Patel & Patel, (1991-1992).*** Thereafter, the National Agricultural Extension Project (NAEP) began in 1983 to accelerate technological transfer between research and extension, leading to increased productivity. Later, in 1986, the federal government started the technological project on oilseeds to increase the output of oil seeds lowering imports and reaching edible oil self-reliance. The National Agricultural Technology Project (NATP) was initiated by the Indian Council of Agricultural Research (ICAR) on June 30, 1998, with funding from the World Bank. The project was designed to enhance and supplement the current resources and boost its output.

The most significant agricultural effort financed by the World Bank was NATP, valued at Rs. 992 crores, apprehended and implemented by NARS ***(Agricultural Extension Programmes, n.d.)***

Functioned as a federal system, The Agricultural Technology Information Centre (ATIC) established in the year 2000 facilitates the dissemination and support of various innovative and technical advice, farm-worthy techniques, diagnostic services, and input supply. It is designed to establish a robust connection between research and extension to achieve excellence in agriculture ***(Vasantrao Naik Marathwada Krishi Vidyapeeth, n.d.)***. In 2007, the National Agricultural Innovation Project (NAIP) was initiated by the Indian Council of Agricultural Research (ICAR). The principal objective of NAIP was to accelerate and maintain the conversion of Indian agriculture to mitigate poverty and generate income. This was accomplished through the cooperative expansion and maneuver of agricultural novelties by public entities with the farmers' groups, private sector, and other stakeholders.

## 1.2 OVERVIEW OF AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA)

### 1.2.1 Introduction to ATMA

The Agricultural Technology Management Agency (ATMA) is a group of key stakeholders who are engaged in agricultural initiatives that are designed to promote the sustainable expansion of agriculture in districts. Its main goal is to decentralize the operational supervision of the public Agricultural Technology System (ATS) and to enable the integration of research and extension endeavors. It receives and uses project finances through agreements, contracts, and revolving accounts that can be used to collect fees and recover operating expenditures. Increasingly, ATMA is accountable for all district-level technology dissemination activities. It establishes connections with all non-governmental organizations, research organizations, division departments, and district organizations engaged in agricultural development.

Within 1998 and 1999, the Government of India (GOI) implemented the centrally sponsored Agricultural Technology Management Agency (ATMA) program. ***Jangde et. al. (2024)***. The Agricultural Technology Management Agency (ATMA) has instituted technical extension services as an alternative to conventional farming methods. It seeks to decentralize the operational governance of governmental agricultural research and extension initiatives. It promotes the empowerment of farmers and agricultural women's groups by enhancing awareness of new technologies and providing demand-driven training to support technology adoption and knowledge acquisition. Thus, agricultural extension is a policy instrument government can utilize to promote agricultural development ***Contado (1998)***.

The ATMA Scheme is currently operational in 28 states across 691 districts and 5 Union Territories in the country. ***Ministry of Agriculture and Farmers Welfare, Agricultural***

***Technology Management Agency (ATMA) Scheme (2021)***. Technology, research, and extension are important aspects that agriculture must rely on to accomplish its anticipated expansion.

### 1.2.2 Evolution of ATMA

On the 30th of June in the year 1998, the National Agricultural Technology Project (NATP) was established by the Indian Council of Agricultural Research (ICAR) to implement significant reforms within the country's Agricultural Research and Extension systems, while also enhancing their capacity to confront forthcoming challenges. NATP was developed and implemented by The Indian National Agricultural System (NARS), the largest agriculture initiative aided by the World Bank, and cost Rs. 992 crores. The seven-year tenure of NATP spanned from 1998 to 2005. ***(Livestock Extension Education)***.

While the Department of Agriculture and Co-operation manages the Extension component of NATP, the Research component is carried out by the Indian Council of Agricultural Research (ICAR). The Project Implementation Institutions takes the responsibility of implementing the Innovations in Technology Dissemination (ITD) element of NATP which comprises of NATP cell at the State headquarters, Extension Training Institute SAMETI (State Agricultural Management and Extension Training Institute), the State Agricultural Management and District Level Agricultural Technology Management Agencies (ATMA).

SAMETI guarantees consistent training and improvement of skills for extension functionaries at the Block/District level of the state, as well as to effectively engage with extension functionaries and grassroots farmers using the cafeteria of their

activities. The Director of SAMETI will operate under the general supervision of the State Nodal Officer designated under the framework of ATMA.

The component of the Extension program known as "Innovations in Technology Dissemination" (ITD) seeks to offer a district-level combined extension delivery system. The objective of this component is to evaluate novel methods for technology transfer, innovative organizational structures, and efficient operational protocols. Its major objective is decision-making for the districts of the state by establishing ATMA.

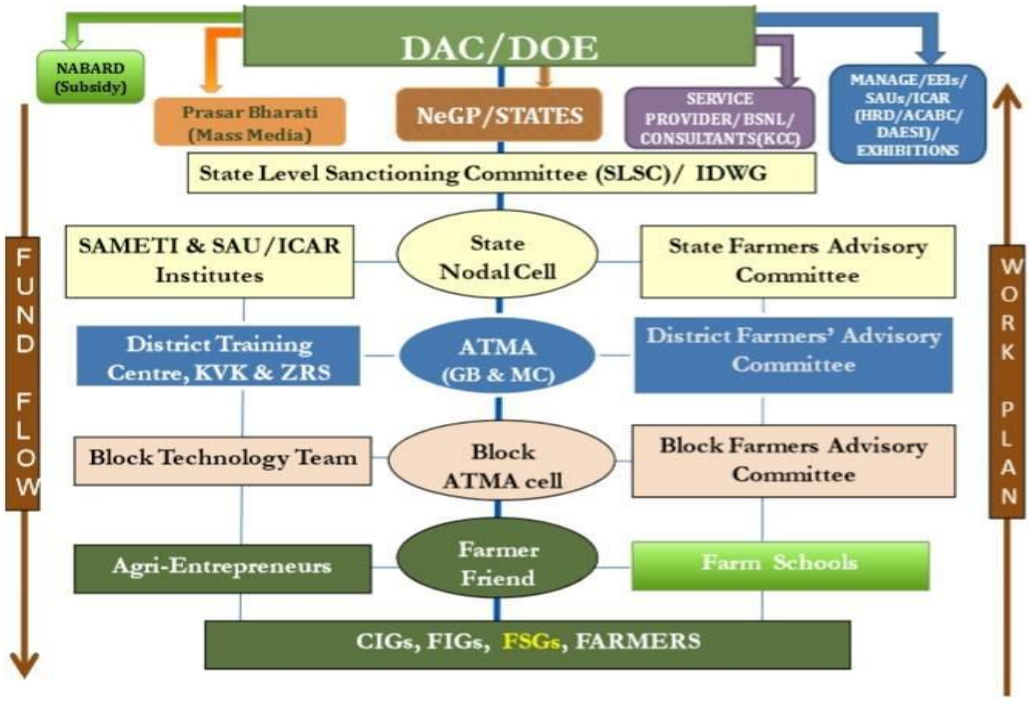
Four districts were selected for pilot testing in each of the seven participating states, as outlined below: The districts in Andhra Pradesh are Adilabad, Chittoor, Prakasam, and Kurnool; Bihar comprises the districts of Madhubani, Muzaffarpur, Patna, Munger, relating to the countryside or rural areas; Jharkhand comprises the districts of Chaibara, Dumka, Palamau, Jamtara; Himachal Pradesh comprises the districts of Shimla, Hamirpur, Kangra, and Bilaspur; Maharashtra comprises the districts of Aurangabad, Amaravati, Ahmednagar, and Ratnagiri. Orissa consists of the districts Koraput, Sambhalpur Khurda, and, Ganjam. Punjab comprises the districts of Gurdaspur, Jalandhar, Sangrur, and Faridkot. Each pilot district integrated research and extension activities through ATMA scheme. This scheme is seen as a primary institutional innovation designed to answer the issues inside the extension system.

Constituent members of ATMA include extension and research units within the districts, including departments of agriculture, animal husbandry, horticulture, and fisheries, as well as KVKs and Zonal Research Stations (ZRS). ZRS holds monthly workshops at the Block level under NATP to improve direct contact between scientists, extension workers, and farmers. It hosts a farmer fair at the block level before each major agricultural season to allow small and marginal farmers to discuss technical issues with

scientists. It also prepares local-language technical communications on agriculture and associated sectors for the Farmers Advisory Committee (FAC), District Chiefs, ATMA, and Block Technology Team (BTT).

The Governing Board of ATMA establishes programs and procedures for activities of Research Extension at the district, which the Management Committee holds. The Governing Board makes policies tasked with advising the ATMA and evaluating its operations and progress. Implementation and oversight of ATMA's daily operations fall under the purview of the Management Committee.

*Figure No. 1.4:* **Organisational Structure of ATMA**




*Source: ATMA Scheme, (2018) for the State Extension Programme of Extension Reform*

### 1.2.3 Implementation of ATMA Component

The organization setup involves the activities at National, State, District, Block, and Village levels. ATMA is required to submit the district's approved financial plan to the

Unit of Technology Dissemination. The ATMA office shall compile and consolidate every block plan. The Project Director is required to submit the consolidated reviewed plan to the G.B. of ATMA for approval and consideration, review, monitoring, and amendment (if necessary). ATMA is obligated to prepare the Financial Annual Investment Plan for G.B. ATMA's consideration and approval. The district level (BTT) Block Technology Team will create the extension and research Annual Action Plan (AAP) through the strategic research and extension plan. Thereafter, the Farmer Advisory Committee (F.A.C.) will examine and monitor the prepared action plans which the Project Director and G.B members approve. Village extension officers from line departments will carry out extension-related field activities in collaboration with farmer organizations, under the direction of ATMA officials.

### 1.2.4 Procedure for Action Plans

The Strategic Research and Extension Plan (SREP) is a plan document for the district that outlines the extension and research priorities. It takes into consideration the agroecological conditions and identifies areas of technology generation gap along with agriculture dissemination in animal husbandry, fisheries, horticulture, and dairy. All actions relating to extensions of Sub-Missions in NMAET (namely SMPM, SMAM, and SMPP) are included in SREP. SERPs are formulated in alliance with the relevant non-governmental organizations (NGOs), Government Institutions, Farmers, agricultural science centers (KVKs), private sector entities, local governing bodies (PRIs), and other interested parties at the district.

ATMA implements components of field extensions and training found in projects of State Governments and DAC. The funds allocated for these operations are allocated

through ATMA and resources are appropriately allocated in the support of goals and activities of Missions, Sub-Missions, and Programmes/Schemes.

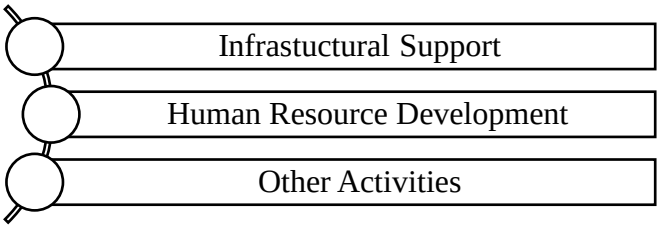
Strategic Research and Evaluation Plans, are documents that outline a five-year vision. These plans will be periodically reviewed and updated to address any newly recognized gaps and developing areas of interest. Each year, SREPs serves as the foundation for the development of Block Action Plans (BAPs). BAP is responsible for the creation of DAAP (District Agriculture Action Plan). The Rashtriya Krishi Vikas Yojana (RKVY) establishes Comprehensive District Agriculture Plans (CDAP), which consolidate the State Extension Work Plan (SEWP) into the State Agriculture Plan (SAP).

### 1.2.5 The Cafeteria Activities Under the Agricultural Technology Management Agency (ATMA)

Under the ATMA scheme, the Cafeteria of Activities is a decentralized, adaptable framework that enables states and districts to select from a diverse array of agricultural extension activities in accordance with their local requirements. Under ATMA, the term "cafeteria" denotes the selection and execution of a variety of extension-related activities.

*(a). The Activities of State Level includes:*

*Figure No. 1.5:* **The State-Level Activities**




*Source: Compiled by the researcher*

*Infrastructural Support:* Infrastructure assistance was previously allocated for the enhancement of training institutes of the state like SAMETIs. The enhancement of training institutes i.e., SAMETIs is not included in the current array of operations.

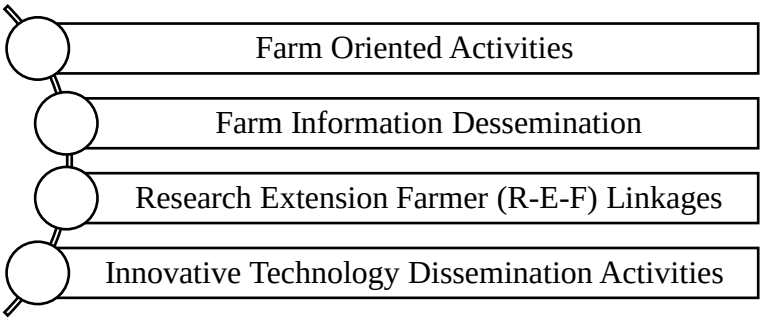
States seeking to enhance their training infrastructure may utilize RKVY-RAFTAAR fund for this purpose.

*Human Resource Development:* The DAC&FW has augmented training facilities nationwide which will educate ATMA representatives and other relevant officials.

*Other Activities:* facilities such as the Krishi Expos, Agri-Exhibitions, Regional Fairs, farmer awards, incentives for outstanding extension efforts, and the Scheme assessment, which includes training of fresher along with induction program for the staff, review workshops, and progress of quality resource materials.

*(b). District Level/ Block Level*

*Figure No. 1.6:* **Activities at the District/Block level**




*Source: Compiled by the researcher*

*Farm-Oriented Activities:* The SREP development, training/exposure visits of farmers, women food security groups, mobilization of farmer groups, and the conduct of demonstrations are all farm-oriented activities that are designed to empower farmers and enhance their involvement in the process of technology dissemination.

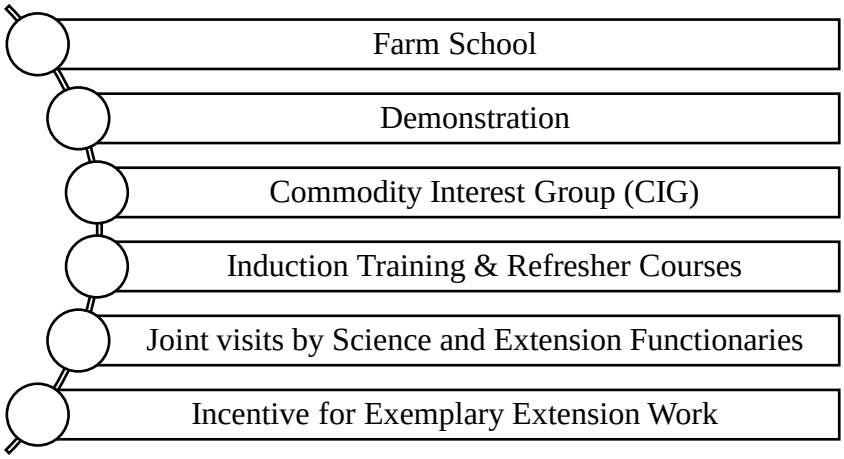
Farm Information Dissemination: It incorporates the development of electronic technology packages, the dissemination of information via printed materials, local agricultural exhibitions, and affordable publications.

*The Linkages of Research-Extension-Farmer:* The activities encompass the facilitation of local-level Farmer-Scientist Interactions, the organization of Kisan Goshties and Field Days, and joint visits by scientists and extension personnel.

*Innovative Technology Dissemination Activities:* The Hand-Held Devices for information dissemination, Display Boards and Pico Projectors, innovative extension methods like Kalajatha, quality resource material development, and certified crop advisory, are all part of Innovative Technology Dissemination (ITD) Interventions.

*(c). The Main Activities included under ATMA are:*

*Figure No. 1.7:* **Main Activities of ATMA**




*Source: Compiled by the researcher*

*Farm School:* Farm Schools are implemented at the Block/Gram Panchayat level. These are established in the domain of exemplary or accomplished farmers. The FAC and BTT collaboratively identify farmers with the potential to develop farm schools in the Block across several sectors, and this list will be forwarded to the governing board through the Panchayat. The governing body approves "Farm Schools" along with its trainer.

*Demonstration:* To have a distinct effect on the productivity of crops and allied areas, in a block a cluster approach is implemented for plot demonstration. The primary function of farm schools is the demonstration of crops in sector-related activities. These demonstrations will concentrate on Integrated Crop Management, encompassing field preparation, seed treatment.

*Commodity Interest Group (CISGs):* It advocates and mobilizes the principal commodities, of farmers ranging from 20 to 25 farmers. The members are required to convene at least once monthly to deliberate on actions and determine the future course of action. BTT and BFAC will regularly oversee the operations of all CIGs. CIGs must uphold precise registers and records.

*Induction Training & Refresher Courses:* Upon the recruitment of BTMs and ATMs, an Induction Course must be conducted with an average duration of six days. Additionally, it is recommended that a three-day refresher course be conducted annually for extension functionaries under the ATMA scheme. This course should focus on crop-specific skills and broad crop knowledge.

*Joint Visits by Science & Extension Functionaries:* To guarantee that scientists and extension workers have the necessary mobility during field visits, funds have been allocated to cover the cost of vehicle rentals.

*Incentive for Exemplary Extension Work:* The provision of financial incentives and awards is necessary to incentivize the high-quality services of extension workers. Three factors should be broadly considered when selecting the individual for the award.

## 1.3 AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA) IN SIKKIM

The majority population of Sikkim relies on Agriculture for livelihood. The sustainable agriculture system of Sikkim is both environmentally friendly and economically viable for individual farmers. The Department is promoting and encouraging farmers to implement new and modern technologies in the organic farming system to ensure the sustainability of production and the certification process in designated areas, as the state is organic, ***Agriculture Department, (2024)***. The successful experiment of ATMA initially tested as a pilot study introduced the scheme "Agricultural Technology

Management Agency" in Sikkim during the year 2005-06, as a pilot project in two (02) districts of Sikkim *(East and South)*. Later in 2008, it was implemented in the North and West districts of Sikkim. ATMA in Sikkim provides training to the farmers in the District and Block levels. In total, there are 6 Districts covering 31 Blocks altogether, East District (10), West District (09), North District (04), and South District (08).

ATMA Sikkim has one SAMETI Director as a head who supervises the entire state and each district is appointed with the Project Director and Deputy Project Director. The main focus areas are Farmers' Training, Frontline Demonstration, Capacity Building, Skill Training of Rural Youth (STRY) Exposure Visit *(Model Farm Visit)*, Farmers' Scientist Interaction, Organising Farm Schools, Kissan Mela, Mobilisation of Farmers Groups, etc.

*Table No. 1.1:* **List of Total No. of ATMA Beneficiaries in Sikkim**

| **Activities** | **No. of Activities *(No. of beneficiaries)*** | | | |
|---|---|---|---|---|
| | **2018 -19** | **2019 -20** | **2020 -22** | **Total** |
| **Training** (*Inter- state, within state, within district*) | 28 (1090) | 24 (729) | 30 (646) | **82 (2465)** |
| **Demonstration** (*Agriculture*) | 52 (52) | 33 (33) | 79 (79) | **164 (164)** |
| **Exposure Visit** *(Inter- state, within state, within district)* | 9 (443) | 8 (452) | 32 (440) | **49 (1335)** |
| **Capacity Building** | 47 (1819) | 10 (159) | 23 (343) | **80 (2321)** |
| **Agriculture Technology Refinement, validation, and adoption** | 10 (193) | 10 (457) | 14 (872) | **34 (1522)** |
| **Farm School** | 19 (450) | 15 (370) | 28 (685) | **62 (1505)** |
| **Farm Information Dissemination** | 2 (359) | Nil | 1 (102) | **3 (461)** |
| **Farmers Friend** | 10 (10) | Nil | Nil | **10 (10)** |
| **Demonstration (*allied sector*)** | Nil | 1 (153) | 1 (172) | **2 (325)** |
| **Grand Total** | **177 (4416)** | **101 (2353)** | **208 (3339)** | **486 (10108)** |

*Source: compiled by the researcher*
*Note: No. of Programs and No. of Participants stated in Parenthesis.*

## 1.4 CHAPTER OUTLINE

**CHAPTER – 1: Introduction**

The chapter deals with the background of Extension Services, the ATMA (Agricultural Technology Management Agency) in general, and the ATMA Sikkim. It will give a clear idea of the ATMA Scheme and the measures of how it is implemented and supported.

**CHAPTER – 2: Review of Literature**

The chapter consists of reviews based on the skills acquired through ATMA which involves different stages like ***Awareness, Technology Adoption, and Knowledge Acquisition,*** along with the relationship and association of the Competency of beneficiaries and the ***Demographic and Socio-economic Status and Information Seeking & Social Participation Behaviour***. It will also include the various reviews' subject to moderation effects of the ***Demographic & Socio-Economic*** variables.

**Chapter – 3: Research Design**

The chapter deals with the overview of the methodology used to accomplish the hypothesis set for the study. It presents the conceptual frameworks, basis of computation of variables and its frequency details.

**CHAPTER – 4: Computation of *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), Information Seeking Behaviour (IBS) and Social Participation Behaviour (SPB) and It Levels.**

This chapter gives a clear view of the computation of ***Beneficiary Awareness Score***, ***Technology Adoption Score,*** and ***Knowledge Acquired Score*** concerning with the ***Demographic Variables and Socio-Economic Status & Information seeking and Social Participation*** by the ATMA beneficiaries in Sikkim.

**CHAPTER – 5: Measurement of Competency Score (CS) and Level of Expertise Mapping Through Manual & Machine (Cluster) Based Classification**

This chapter assists in comprehending the beneficiaries' status regarding the Competency Score they have acquired, which will be identified from various clusters, including ***Novice, Proficient & Expert*** based on the Level of Expertise they possess. Additionally gives an insight into the assessment of association and relationship on the ***Level of Expertise*** with different ***Demographics and Socio-Economic Status and Information-seeking Behaviour*** and ***Social Participation*** by the ATMA beneficiaries.

**CHAPTER – 6: Mediator Moderation Analysis of Overall Information Seeking Behaviour (OISB)→ Competency Score (CS) with Mediating Effect of Overall Social Participation Behaviour (OSPB) and Moderating Effect of Demographic and Socio-Economic Profile**

This chapter explains the mediating-moderating role of ***Demographic Variables*** on ***Information-Seeking Behaviour***, and ***Competency Score*** with ***Overall Social Participation Behaviour*** as mediating factor and ***Demographic Variables*** as moderating factors.

**CHAPTER – 7: Summary of Findings and Conclusions**

The final chapter deals with the overall findings, conclusion, implications recommendations, and limitations of the study.

# Chapter – II

# Review of Literature

# CHAPTER – 2

# REVIEW OF LITERATURE

## 2.1. INTRODUCTION

The research process consists of an important component of literature which guides the researchers with a panoramic comprehension of the subject matter and leads them in an appropriate direction. Prior knowledge of relevant previous studies is required to have a thorough grasp of the present investigation and to establish a suitable research technique. It enables researchers to proceed with their investigations by furnishing essential guidelines. The present chapter encompasses a literature review that incorporates works from various authors and researchers who have undertaken studies that are essentially comparable to the present study. The literature study undertaken so far encompassing the Agricultural Technology Management Agency was critical to comprehensively understand the existing work and research technique.

This chapter presents the literature review on the study of different aspects of ATMA beneficiaries through the *Agricultural Technology Management Agency* (ATMA)

## 2.2. THE LITERATURE REVIEW FOR THE PRESENT STUDY

The literature review is organized into the sub-headings below:

*Figure No. 2.1:* **Segmented Review of Literature**

| | |
|---|---|
| Review of Literature | Measurement of Awareness Level |
| | Measurement of Technology Adoption |
| | Assessment of Knowledge Acquired |
| | Association/ Relationship of Demographic & Socio-Economic Status, Information Seeking & Social Participation Behaviour |
| | Med-Mod Analysis using Demographic & Socio Economic Factors |

*Source: Compiled by the Researcher*

### 2.2.1 Measurement of Awareness Level

***Boopathy et al., (2024)*** ascertained the factors that impact awareness of the government intervention program, Rythu Bharosa Kendralu (RBK) in Andhra Pradesh. A total of 400 respondents were chosen from four regions, with 100 respondents from each region. The primary data used in the present analysis was gathered in Andhra Pradesh during the 2021-22 academic year. To investigate the awareness of determinants, binary logistic regression was implemented with R software. occupation, gender, age, operational holding, extension contact and literacy status, were all included in the regression analysis belonging to awareness (0 or 1) is a determinant factor of farmer awareness. The respondents possessed a high awareness of crop insurance, e-crop registration, Rythu Bharosa, and agricultural extension. Almost complete awareness in case of interest subsidies and quality inputs. Soil testing (15.5%), agriculture advisory board (64.25%), digital library (48.75%), veterinary services (56%), milk collection (18%), WhatsApp advisory (49.75%), seed germination testing (13%) and custom hiring centers (78.5%), are all identified as having lower levels of awareness. A cultivators' odds ratio concerning RBK services in Andhra Pradesh is positively influenced by a unit increase in these variables.

***Jatav, Gupta, & Jatav, (2023)*** aimed to study the profile relationship of rural youth, their awareness of the Agri-enterprise establishment, as well as to map their awareness of the Agri-enterprise establishment. The majority of rural youth (74%) only had partial awareness, while 14% had complete awareness and only 14% had limited awareness of agri-enterprise establishment. It highlighted that the independent variables, including education (0.34), training participation (0.30), innovativeness (0.26), family annual income (0.32), was positive and

significantly high correlated to rural youth's awareness of the agri-enterprise establishment at the 0.01 level of significance. At a significance level of 0.05, family land tenure (0.21), the utilization of information (0.22), and economic motivation (0.23) were positively correlated with awareness of the agri-enterprise establishment among rural youth.

***Deepthi et al., (2023)*** ascertained the awareness level among shrimp producers regarding private extension services and to establish an empirical model for the provision of effective extension services. The investigation was conducted in the districts of Krishna, West Godavari, Nellore, and Guntur in Andhra Pradesh, India. To ascertain the degree of significance between shrimp producers' awareness and private extension services, thirteen independent variables were selected. A high level of awareness regarding private extension services was `demonstrated by approximately 40.05% of the participants, while an additional 40.55% also exhibited some level of awareness. The findings imply that a significant proportion of shrimp producers collaborated with private extension service professionals to improve their production levels. The independent factors like age, social participation, annual income, training exposure, educational status, occupational status, source of shrimp seed, mass media exposure, information-seeking behaviour, farming experience (shrimp), and risk orientation were correlated with farmers awareness on private extension services.

***Adhikari et al., (2021)*** the study examined the communicative and socio-economic status of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) beneficiary. There are 240 respondents in the sample and the results indicated that the majority of middle-aged beneficiary completed intermediate education and had medium-

sized farms, and nearly half of them had farming experience. Additionally, the majority had a medium level of orientation, and extension contact, and half had exposure to mass media. Three-fifths of the beneficiary farmers exhibited high innovativeness, while half of the beneficiary had less exposure to training. There was less social participation among farmers with a medium achievement motivation, and preferred less risk. It was found that the percentage of beneficiary farmers was small and marginal, which underscores the lower adoption of micro-irrigation by these farmers. Further, it was reported that farmers had a lack of awareness regarding water user associations. The individuals received a limited amount of training exposure, resulting in lower levels of social participation. Consequently, the rate of adoption of micro-irrigation techniques among recipients was rather low.

***Kumar et al., (2021)*** evaluated farmers' awareness and perceptions of the farmers, about farm laws utilising a comprehensive household survey conducted in 2020 through Bihar, Jharkhand, Eastern Uttar Pradesh, West Bengal and Odisha. The multinomial regression and probit models are employed to analyse the socio-economic aspects affecting farmers' awareness and views regarding the utility of the regulations. The results highlighted Eastern India awareness of new farm legislation was 50% yet, they possess minimal information regarding its contents. Various socio-economic elements within agricultural households are highly correlated with awareness of the new farm legislation and the formation of decisions regarding their use like landholding size, educational attainment of the family head, awareness of governmental initiatives, and attendance at Kisan Melas.

***Ghetiya et al., (2019)*** conducted the study to understand the profile and awareness level of member farmers of the Farmers Interest Group (FIG) about the significance of ATMA. It was discovered that there was a high degree of awareness but a low level of experience among middle age with intermediate education level. The respondents exhibited a high level of cohesiveness and interpersonal skills.

***Shamshadunnisa et al., (2018)*** in their study evaluated the perspective of extension field personnel regarding ATMA. Structured interview schedules were implemented to gather data from respondents. A scale comprising 14 statements regarding ATMA was implemented to gauge attitudes. The data was analyzed using appropriate statistical instruments, such as mean, frequency, standard deviation and percentage. The results showed a low level of participation by small and marginal farmers in ATMA. Additionally, farmers are unaware of ATMA and there is a lack of appropriate coordination among line departments. Therefore, it was realized that the relevant agencies must devise effective strategies to raise awareness among farmers about ATMA and establish conducive conditions to ensure their participation. Additionally, a robust institutional linkage mechanism is required to guarantee the coordination of all line departments, thereby enabling the actual vision and objectives of ATMA to be realized, enhancing the agricultural community.

***Aziz et al., (2018)*** examined the awareness and adoption of agricultural message telecast with socio-economic farmer characteristics on Pakistan Television. Consisted of 120 representations through an interview schedule which was pre-tested in SPSS. An association between certain socio-economic factors, such as size of land holding, age, tenancy status, and education, with the level of adoption and awareness using the test of chi-square ($\chi 2$) test. Results revealed a

significant association of variables with the awareness level. Variables like tenancy status, education and size of land holding do have a significant association while age have no significance with short messages telecast on television.

***Raghuvanshi et al., (2017)*** the research focused on identifying the awareness level among farmers in India regarding climate change and adaptation practices. 110 farmers from two villages are selected in the Kalheth and Dabri districts. SPSS was used and the structured interview was utilized for data collection. The researcher conducted in-person interviews with the farmers. The study's results suggest awareness of change in climate among farmers and identified diminishing agricultural yield, erratic rainfall, and a temperature increase as climate change indicators.

***Duhan & Singh, (2017)*** The primary objective is to study the farmer's awareness level regarding crop insurance in Haryana and awareness of key factors identification. The study is exploratory and relies on primary data. The data collected via a standardized questionnaire was evaluated using basic statistical methods, including percentage analysis and the determination of factor scores for awareness. The present study reveals that farmers' awareness of crop insurance schemes is significantly inadequate. Numerous socio-economic aspects influence farmers' awareness of crop insurance, including age, education, primary revenue sources, farming category, income level, and farming experience. Education is crucial for comprehending plans and the significance of insurance for farmers.

***Madhavan, (2017)*** aimed to identify and analyze the farmers' information needs and found primary agricultural information requirements for government initiatives, particularly those concerning loans and subsidies, followed by market information. In agricultural operations, there is no gap in information regarding production and market conditions, which are crucial pieces of information that farmers regularly access. Simultaneously, there is a complete lack of knowledge in the labor sector, with the lowest level of awareness. It was also reported that the second most significant knowledge gap, behind labor, pertains to agricultural insurance. Despite a high level of awareness, the accessibility to this type of insurance remains limited.

***Sharma & Khare, (2017)*** investigated the obstacles that impede the successful implementation of ATMA in tribal regions. A total of 300 farmer acquaintances were randomly selected as respondents. It was found that the highest percentage of respondents reported a shortage of personnel at the block level. A small percentage of respondents believed that inadequate communication between farmers and agriculture officers was a significant constraint. In terms of socio-economic constraints, the majority of respondents reported that farmers in both districts were unaware of ATMA and that they did not have access to transportation, electricity, or irrigation facilities. It was recommended that consistent extension services should be accessible to raise awareness and offer technical expertise regarding the ATMA program at the village level to address the obstacles to the successful implementation of ATMA in tribal communities. It was determined that farmers were not aware of ATMA, and there was a lack of adequate coordination between the various line departments, which led to a low level of involvement among small and marginal farmers.

### 2.2.2. Measurement of Technology Adoption

***Hebsale Mallappa & Pathak, (2023)*** The study seeks to comprehend farmers' perceptions and the incorporation of technologies focused on climate into their agricultural practices. 240 beneficiaries were employed to examine the awareness and adoption of Climate Smart Agricultural Technologies (CSAT), as well as to determine the main aspects impacting their decisions. A standardized interview was employed to acquire information regarding CSAT. The gathered data were analyzed using suitable statistical methods, including Path analysis, Spearman correlation, Principal Component Analysis, Regression, and Descriptive Statistics. The findings reveal 74 percent farmers exhibit medium awareness, whereas 83 percent demonstrated moderate rate of adoption.

***Bhabor et al., (2019)*** study aimed to examine the association of adoption and personal profile relating to production technology of maize among tribal farmers. The research involved the random selection of ten tribal farmers from each of the fifteen villages in the Dahod district. Consequently, the sample for the study consisted of 150 tribal Rabi maize producers in total. According to the findings of their research, the adoption was significantly and favourably associated with mass media exposure, education and interaction with extension agents. Land demonstrated a favourable relationship that was not statistically significant.

***Thakar et al., (2019)*** conducted a study on various agricultural aspects for selected farmwomen from various villages in Junagadh district, in collaboration with ATMA in various districts of Gujarat. 150 samples from the villages of Gujarat was employed. The study states low knowledge by the majority of respondents at the beginning of the training. The majority of respondents had medium

knowledge after the training. The increase in the medium, high, level of knowledge is the primary distinction between before and after training. The non-adoption of technology was due to the absence of cooperation, family encouragement, financial assistance, and basic materials. Consequently, they should conduct follow-up visits and provide feedback to further enhance the effectiveness of the training sessions. Additionally, there was a low degree of adoption of seed treatment and integrated agricultural systems, and there was no adoption of vermicomposting.

***Agnihotri et al., (2018)*** aimed to assess the technologies adoption related to the production of sugarcane under ATMA Uttar Pradesh (Sitapur district). The sample consisted of 110 respondents from 10 randomly selected villages. The findings indicate that most of the recipients exhibit a moderate to high degree of adoption of sugarcane production techniques, while non-recipients demonstrate a lower to moderate level of adoption. Education, innovativeness along Mass media, have positive significance. On the other hand, annual income and land size were non-significant while age was negatively significant with the adoption level.

***Pawaiya et al., (2018)*** study evaluated the wheat producers' adoption and knowledge with regard to Farmers Field School (FFS). Khajuri, Khushiyari, Jouly, and Bhandhara of Jabalpur district were purposefully chosen as the four villages in Sihora block, as they have been the site of the most Farmer Field Schools under ATMA on wheat cultivation in the past three years. Fifty beneficiaries from the four villages and fifty non-beneficiaries from the same villages were randomly selected. The sample size of 100, which consisted of 50 beneficiaries and 50 nonbeneficiaries. The findings indicated that beneficiaries possessed a high

knowledge and a medium adoption level, while non-beneficiaries possessed a low knowledge and adoption.

***Raghuwanshi & Mazhar, (2017)*** investigated the challenges encountered by the beneficiary in the organic agricultural practice's adoptions for soybean crops under the ATMA program in the Guna district of Madhya Pradesh. The sample consisted of 60 beneficiaries and 60 non-beneficiaries. Consequently, the present survey included a total of 120 respondents. Adoption of organic cultivation had no relationship with age, family size, annual income, and risk preference while extension contact, education, mass media exposure, social participation, economic motivation and innovativeness, had a significant relationship to adoption.

***Damor et al., (2017)*** indicated middle aged papaya growers completed middle to high school, were members of one or more organizations, owned medium to large landholdings, were in the medium annual income group, and utilized medium to low levels of information sources. Two-thirds of the papaya producers had a moderate market orientation, and two-thirds of them followed the Groundnut-Potato-Bajra cropping pattern. In contrast, the majority of farmers adopted the horticultural crops cum field crops cum animal husbandry farming system. The correlation analysis results demonstrated that adoption of the recommended cultivation technology was positively and significantly correlated with variables such as social participation, land ownership, annual income, extension participation, sources of information, market orientation, education, and knowledge level.

***Matto et al., (2017)*** assessed the degree of knowledge among paddy growers regarding different agricultural practices of Budgam region, which consisted of 200 respondents, with 150 being supervised and 50 unsupervised. The middle age farmers of ATMA, had a moderate level of education, a medium-sized family (consisting of 5-8 individuals), and moderate experience in farming (ranging from 16 to 25 years). The adoption level of respondents was shown to be strongly associated with education, land holdings, experience in farming, and social engagement. On the other hand, age, family size, annual income, sources of knowledge, economic incentive, and status of modernization were found to be non-significant. The results state that the respondents had a medium regarding the recommended agricultural practices for paddy cultivation. Paddy cultivators' scientific understanding of the recommended practices for this crop is still in its infancy. Therefore, it is found essential that the stakeholders implement integrated and focused extension initiatives to ensure that paddy farmers are equipped with the necessary information regarding the recommended practices of paddy production.

***Awotide et al., (2012)*** evaluated the influence of household wealth on the adoption of the Improved Rice Varieties (IRVs). The wealth index was generated using Principal Component Analysis (PCA) to divide the respondents into wealthy and non-wealthy households. To evaluate the determinants and intensity of IRV adoption among 600 randomly selected smallholder rice farmers from the three main rice-producing ecologies in Nigeria, the logit and Tobit models were implemented. It was revealed that farmers' organization, access to credit cards, education, access to seed, contact with extension agents, and, wealth index, had positively influenced the adoption of IRVs. Likewise, farm size, income, and

wealth effected positively on the adoption intensity. While the cost of seed effect negatively on both the decision and intensity to adopt. Consequently, it is determined that to achieve the desired adoption rate and intensity of IRVs, it is crucial to implement wealth group-specific policies, programs, and policies that can increase household income and wealth, promote the formation of farmers' organizations, and guarantee that the price of IRV seeds is affordable for rural farmers.

***Raghuvanshi et al., (2012)*** determined the knowledge and adoption of farm schools on wheat crops. The study comprises of 120 respondents out of which 60 are beneficiary farmers and 60 are non-beneficiary farmers. Mean, Percentage and Rank Analysis was employed. The majority of respondents exhibited low, medium and high adoption with regards to production technology of wheat. It was recommended that the availability of fertilizer and other inputs should be timely, with loans freely accessible at a low interest rate. Regular training programs should be organised to provide technical expertise.

***Boahene et al., (1999)*** revealed that factors such as hired labor and bank financing have a substantial positive impact on adoption. Additionally, the extent to which a farmer becomes an adopter is influenced by the level of information they have acquired from extension agents and their level of education. Nevertheless, adoption is not significantly influenced by access to land, income, or skills. The farmers' income had a low impact on adoption. The lack of significance of skills in the adoption decision is likely due to their inadequate operationalization. The hybrid cocoa adoption is significantly influenced by certain resources such as network information and cooperative labor. The impact of these resources on adoption is more marked for smaller-scale farmers than for larger-scale farmers.

### 2.2.3. Assessment of Knowledge Acquired

***Tanwar et al., (2023)*** their study selected a total of 180 respondents, including 90 beneficiaries and 90 non-beneficiaries, from the selected villages. Variables like age, occupation, education, caste, extension agency contact, social participation, source of irrigation, annual income, mass media exposure, information sharing behavior and land ownership, were identified as significant variables that could potentially influence knowledge of the Pradhan Mantri Fasal Bima Yojana. The analysis was conducted with multiple regression analysis and t-test in SPSS. The occupation and annual income were significantly linked with the beneficiary respondents' knowledge level at the 5% level of significance, the results of the study showed that in the case of beneficiary farmers knowledge had a positive and significant relationship with mass media exposure, education, and contact with extension agencies at the 1% level of significance.

***Rasanjali et al., (2021)*** investigated the impact of the training provided by the In-Service Training Institute Bindunuwewa, Bandarawela on the technological knowledge of 82 farmers. The differences in technological knowledge before and after the training were assessed using nonparametric tests, specifically the Chi-square and Wilcoxon sign rank tests. It was found that there is no relationship between practical knowledge adoption and demographic characteristics. In addition, farmers found the number of training days, duration of practical and theoretical training, amount of practical knowledge provided, and quality of presentations by the lecturers to be satisfactory. A study has determined that training has a significant impact on the technological knowledge of farmers.

***Kumar et al., (2020)*** in their study assessed the knowledge level of ATMA and non-ATMA farmers regarding enhanced cultivation practices of wheat. The data was collected from 120 farmers using the interview method. Percentage, frequency, and mean score were used for the analysis of data. It has been discovered that the farmers in the ATMA category exhibited a greater degree of knowledge. The majority of ATMA farmers have medium knowledge of cultivation practices. The non-beneficiary farmer was deprived of opportunity, which resulted in a reduced level of knowledge regarding these technologies. Therefore, it is imperative that all farmers, specifically those in specific villages, be included to enhance their awareness and knowledge.

***Meena et al., (2019)*** The adoption of the suggested mustard production technology was evaluated on a total of 250 mustard producers in the Bharatpur division of Rajasthan state, which included 125 beneficiary farmers and 125 non-beneficiary farmers. Consequently, simple random sampling with proportionate allocation was employed to select 250 mustard growers. The statistical measures that were implemented were the rank correlation, 'z' test, 't' test, and Standard Deviation (S.D.). It was discovered that the level of extension participation, social participation, education level, and source of information used had a significant association with the levels of knowledge, adoption, and yield level of the respondents. The knowledge, adoption, and yield of mustard were all negatively and insignificantly associated with age, risk orientation, and the size of land holding.

***Tankodara et al., (2018)*** results show 40.00 percent of the participants had a low understanding regarding various parts of scientific cultivation technologies for horticultural crops prior to attending the farmers training. A 50 percent majority

possessed a moderate degree of understanding of scientific growing technologies of horticultural crops. The training resulted in a 24.00 percent rise in the medium knowledge level group, and a 10.00 percent increase in the high knowledge level group. The study revealed a notable knowledge increase regarding scientific techniques.

***Shahi et al., (2018)*** determined the impact of the vocational training program on the production of mushrooms to promote entrepreneurship at Krishi Vigyan Kendra, Hajipur, and Muzaffarpur. From 2007 to 2018, a comprehensive list of 400 respondents was randomly generated who participated in training and demonstrations on mushroom production techniques in both districts. It was found that the pre-training knowledge score was not adequate for all aspects of the training program. Nevertheless, the knowledge scores that respondents obtained following the training was more satisfactory in every aspect. The research demonstrated that the knowledge of farmers, farm women, and adolescents regarding mushroom production techniques had increased by 80.75% as a result of exposure to training. The satisfactory change in perception level may be attributed to the participants' keen interest, their well-rounded educational background, and the methods employed to transmit technology to the trainees. Some trainees established their divisions and engaged in mushroom cultivation as a form of self-employment.

***Kumar et al., (2017)*** examined the association between specific independent factors and knowledge of preferred mustard production technology. Both the beneficiary farmers and non-beneficiary farmers were considered for the study. The personal profile of respondents' association with knowledge of recommended mustard production techniques would demonstrate the

dichotomy of dependency and independence among them, thereby facilitating the categorization of clientele in future training programs conducted by ATMA. Size of land holding, Education, and Social Participation had a significant correlation with the farmers' knowledge regarding mustard production technology at a significance level of 1%.

***Sunildutt et al., (2017)*** aimed to assess the socio-personal characteristics of both trainee and non-trainee, evaluate their degree of knowledge regarding Maize farming, and analyze adoption levels among the recipients and non-recipients. Statistical tools such as standard deviation, mean, 'z' test, frequency and percentage were used for analysis. Their research analysis found that beneficiaries exhibited a higher level of education, cultivated a larger amount of land, and had a higher annual income in comparison to non-beneficiaries. In addition, the beneficiaries exhibited a higher degree of knowledge of Maize production compared to the non-beneficiaries. The study also found that the adoption level of beneficiaries of Maize production was higher than that of non-beneficiaries.

***Choudhary et al., (2017)*** in their study assessed the efficiency of the public extension system in Jharkhand. A single district was randomly selected from each of the five divisions of the state. The researcher implemented a multistage random sampling methodology. SPSS was employed to assess the collected data and establish appropriate conclusions through the application of statistical procedures including regression, correlation, and t-tests. The results of the study indicate a statistically significant impact on the attitude, knowledge, and adoption of producers. The exposure to mass media, extension contact, and information technology were identified as critical attributes that can be enhanced through effective extension strategies.

***Kalsariya et al., (2015)*** ascertained the correlation between the pre-training and post-training knowledge levels and assessed the knowledge level concerning various factors. It was discovered that the medium and high knowledge groups were dominant only after undergoing training. Additionally, it has been discovered that teaching young individuals serves as a progressive method for developing technological expertise in the field of agriculture. The results indicated that the amount of knowledge prior to training was associated with socio-economic factors such as education, unirrigated land, cropping intensity, and received training. The only factors that showed a correlation with better agricultural technology following training were education and training received. Therefore, it is concluded that education and training are crucial for enhancing knowledge.

***Bhati et al., (2014)*** A knowledge test was designed to assess Farmers Friends' understanding of a variety of agricultural issues. The gain in knowledge was measured by comparing the understanding of several aspects of agriculture as a source of income before and after training. The findings of this study revealed a considerable gain in comprehension of a number of agricultural factors that were included in the training program. The relationship between trainees' socio-personal characteristics and their agricultural knowledge revealed that contact with extension agents, occupation, caste, annual income, education, mass media exposure, and were positively correlated, whereas family type, scale of holding and age, were negatively correlated.

***Matwa & Deshmukh, (2014)*** examined maize growers' economic, socio-personal, communicational traits, psychological, and socio-techno-economic development. Age, economic motivation, social involvement, education, landholding size, occupation, scientific orientation, maize production

technology understanding, market intelligence, innovativeness, extension participation and mass media exposure, were independent variables. Most respondents had medium to high maize farming technique expertise. Education, economic motivation, land holding size, social participation, scientific orientation, market intelligence, innovativeness, occupation, extension participation, mass media exposure, and maize cultivation technology knowledge all positively and significantly correlated with farmers' socioeconomic changes.

### 2.2.4. Association/ Relationship of Demographic, socio-economic status, Social Participation, information-seeking behavior

***Nagesha et al., (2022)*** examined the relationship between the profile attributes of 120 farmer beneficiaries and their attitude toward Pradhan Mantri Fasal Bima Yojana (PMFBY). The farmers' attitude towards PMFBY was the dependent variable. The Jamanal and Natikar scale was utilized, with appropriate adjustments, to determine the respondents' attitudes towards PMFBY. The scheme was favored by a majority of respondents. The variables, specifically age, land holding, education, credit orientation, extension contact, annual income, social participation, farming experience, crops cultivated, economic motivation, extension participation, scientific orientation, and risk orientation, exhibited a positive association at a significance level of five percent. The variables of cosmo-politeness and accomplishment drive showed a strong and statistically significant positive association at a significance level of one percent. The farmers' mindset has been crucial in ensuring the full acceptance of government developmental programs, such as the Pradhan Mantri Fasal Bima Yojana.

***Bora et al., (2021)*** studied farmers' organic vegetable production information needs, effects, and constraints. Proportionate cum-random sampling selected the 120 respondents for the study. Organic vegetable production information needs were the study's dependent variable. Age, organic vegetable growing experience, risk-bearing ability, annual net income, family type, economic motivation, family size, area under production, management orientation, training exposure, social participation, occupational status, educational level, working capital availability, and scientific knowledge were the study's independent variables. Data was analyzed using mean, frequency, percentage, regression, coefficient of variation, standard deviation, multiple correlations, and t-tests. Age, social engagement, experience as organic vegetable growers, education, management orientation, area under organic vegetable production, scientific orientation, economic motivation, risk-bearing ability, and training affected farmers' information needs.

***Raghuraja et al., (2021)*** investigated the extent of National Horticulture Mission beneficiaries' participation in various extension programs, and comprehend their extension participation. The National Horticulture Mission beneficiaries from 24 villages were randomly selected to comprise the sample size of 144. Family members, neighbors, friends, and relatives are the primary sources of information. Beneficiaries are more inclined to participate in training programs, group meetings, field visits, Krishi mela, and method demonstrations. The KVK, development departments and NGOs that operate routinely organize these extension activities to disseminate knowledge and skills.

***Bora et al., (2021)*** ascertained the factors that influence producer information-seeking for organic vegetable farming. The study employed a multi-stage, purposive-

cum-proportionate random sampling design to identify 120 respondents. The information-seeking behaviour of organic vegetable production was the dependent variable chosen for the study. The data on farmers' information-seeking behaviour was measured using the scale developed by Gogoi (1988) with a minor modification. The study found that most respondents sought knowledge at a medium level. The respondents got their knowledge from friends, family, neighbors, farmers, and input dealers. Many respondents obtained information from progressive farmers, Agricultural Development Officers /block extension, Sub Divisional Agriculture Officer (SDAO)/ Divisional Agriculture Officer (DAO), and NGO staff. Few respondents used agricultural scientists for information. Most respondents got their information from the internet, not mainstream media. Radio, television, newspapers, and agricultural periodicals informed another percentage of respondents about organic vegetable farming. Correlation analysis revealed a positive correlation between farmers' information-seeking behavior and factors such as education, area of economic motivation, risk-taking ability, organic vegetable production, management orientation, and scientific orientation.

***Darsana et al., (2020)*** examined the link between farmer traits and their attitudes towards welfare and perception. A sample of 210 beneficiaries was selected using a control randomization research design. An analysis was conducted using a non-parametric statistical technique. The statistical analysis employed many methods such as percentage, mean, standard deviation, frequency, Spearman's rank correlation, range, and multinomial logistic regression using SPSS version 20. It was revealed that the variables participation extension, risk orientation, external agency help, scientific orientation, economic motivation, information

sharing behavior of farmers and contact extension were positively correlated to the index of welfare. Three variables, attitude towards rewards, farming experience and farming dedication, significantly correlated with awareness. The study demonstrates a favourable effect between communication and psychological behaviour among farmers, which directly impacts their well-being.

***Khule et al., (2019)*** investigated the Wadi project's socio-economic effects on 200 beneficiaries (tribal) and these effects' relationship with their profiles. A standardized schedule was devised to measure the socio-economic impacts. The variables, scientific orientation, land holding, education, source of information, occupation, farming experience, risk orientation, annual income, extension contact, social participation, cohesiveness, aspiration, economic motivation, innovativeness, management orientation, training acquired, market distance and communication skills, positively associated with the beneficiaries profile. Age negatively correlated with the profile of tribal beneficiaries, while family size was positively and non-significant.

***Parthasarathi et al., (2019)*** In their study, the five designated ATMA (Agricultural Technology Management Agency) groups were taken into consideration. By employing random sampling, a total of 100 farmers from five categories were selected. The study examined participation in three dimensions: group sustainability, sustainable agricultural practices, and post-harvest technologies. The investigation was carried out utilizing correlation and simple percentage analysis. The majority of members exhibit a moderate level of participation in sustainable agricultural practices and actively participate in group activities such as group planning, decision-making, planning, maintaining transparency,

shouldering responsibilities, and auditing. Additionally, the study shows the utilization of information sources and information-sharing behavior among group members have significantly correlated with group member's participation in sustainable agricultural practices. The respondents identified two issues: inadequate guidance and the inclusion of new members. The members of the group proposed the implementation of group promotion initiatives and the provision of training on the sustainable operation of groups.

***Jamanal & Natikar, (2019)*** measured the attitudes of insured farmers toward the Crop Insurance Scheme and to identify its correlates. The percentage, standard deviation, frequency, correlation, mean, and regression analysis was used for analysis. The farmers had an unfavourable attitude toward crop-cutting experiment delays, online registration delays, and claims delays. The attitudes of insured farmers were shown to have positive and significant associations with study factors such as land holding, extension contact, annual income, education, loan availed and exposure to mass media. The multiple regression analysis also discovered that the attitudes of insured farmers were influenced by factors such as annual income, interaction with extension agents, exposure to mass media, risk orientation, and the credit availed.

***Barad et al., (2019)*** inferred that the majority of respondents were middle-aged individuals with a secondary level of education. They were engaged in farming and animal husbandry as their employment, had small land holdings, owned 2 to 5 animals, and had more than 10 years of experience. Regarding attitude, trainees who engaged in a greater variety of jobs possessed a better level of agricultural expertise and received a greater number of trainings that incorporated scientific and innovative concepts, and exhibited a positive attitude

towards the training program. Occupation, farming experience, training, scientific orientation, and innovative proneness had a significant relationship with individuals' attitudes toward training programs. The relationship between education and training program attitudes was positively insignificant. However, age, land size, and milch animals had a negatively insignificant relationship.

***Mandal & Jirli, (2018)*** investigated the ATMA participants' socio-economic attributes. Based on the findings, it was determined that male respondents were more prevalent than female respondents. The male respondents were between the ages of 41 and 57 years and lived in nuclear families with a member of five. With a land holding of less than one hectare, more than fifty percent of the people who participated in the survey were purely engaged in farming and did not engage in any other service.

***Patel et al., (2018)*** analyzed the characteristics of the farmers who are members of the Farmers Interest Group to assess their attitudes towards the group. The farmers' attitudes toward FIG were assessed using a scale that their department devised and presented at the most recent *Agricultural Research Council* (AGRESCO). This scale was created using the methodologies implemented by Chauhan, et al. (2015), Chauhan, et al. (2015), and Patel and Chauhan (2013). Most FIG group members were middle-aged, possessed secondary to higher secondary education, minimal to medium farming experience, were milk cooperative members, had marginal to small farm holdings and high mass media exposure, extension contact, and a highly positive overall attitude toward FIG. The attitude of the FIG member farmers toward FIG was found to be negatively and highly significant in relation to their experience related to farm and age, while land holdings and Mass Media exposure was positively significant. The education,

organizational participation, annual income, and extension contact of the FIG member farmers were not significantly correlated with their attitude toward FIG.

***Das & Borua, (2017)*** The training requirements of participants were negatively and significantly related to age, service experience, educational qualification and training exposure. The respondents' training needs are positively related to their decision-making patterns and motivating characteristics. The study found that age, service experience, term of service at the current posting, educational qualification, decision-making style and training exposure, must be assessed before starting any ATMA extended official training program.

***Jakkawad et al., (2017)*** examined the ATMA beneficiaries' socio-economic features, evaluated their understanding of different components of ATMA, and assessed the beneficiaries' participation relating to programme and its activities. Further, advantages received by those beneficiaries and the limitations encountered by the beneficiaries in the participation of the programmes and activities of ATMA were assessed. They exhibited medium social participation and were highly progressive. The representative farmer possessed an adequate knowledge of the various facets of ATMA and reaped the benefits. Beneficiaries' participation is satisfactory; however, it was low in the context of grassroots decision-making.

***Som et al., (2016)*** determined the responsibilities that various institutions have played in the (GAP) Good Agricultural Practices advancement and the grapes export. The majority of farmers had KVK contact, with a maximum percentage of 77.14%, followed by the National Research Centre for Grapes (NRCG) with 57% and Maharashtra Rajya Drkasha Bagayatdar Sangh with 50%. It was found

that only 7.4% of the farmers had contact with ATMA. The majority of the information came from peer groups, and the radio was the second most important source. The beneficiaries got together once a year, and the service that ATMA offered was seen to be of moderate value.

***Paul et al., (2016)*** analyzed the performance of SMSs (Subject Matter Specialists) in North Eastern KVKs and their functioning. The sample included 231 SMSs from 59 regional KVKs. According to the Composite Job Performance Index (CJPI), it was discovered that 81.81 percent of respondents had a work performance that ranged from bad to moderate. Caste, participation in workshops, seminars, and conferences, teamwork, and training programs significantly correlated with job performance. Age, academic qualification, professional experience, marital status, and communication skills were found to be insignificant to job performance.

***Balasubramani et al., (2015)*** aimed to investigate the methods used to identify the women farmers extension needs, their involvement in identification of decision-making bodies of ATMA. The sample sizes for each category were 457, 36, and 36, respectively. The data used percentage calculations, cumulative frequency analysis, and ranking methods. It was revealed that the women farmer was an important source for identification of the representatives and scientists/experts. Additionally, ATMA inquired requirements for various extension activities. It was noted that extension functionaries prioritized the allocation of funds with a greater emphasis on small and marginal women producers.

***Rehman et al., (2013)*** aimed to identify different sources of agricultural information that farmers use, examine their access to this information, and analyse its association with their socio-economic factors. The analysis of the acquired data

was done through basic frequency, percentage, mean, and standard deviation, and commenced through SPSS. The rank order was calculated based on the weighted score. In addition, bivariate analysis was employed to assess the degree of correlation between the chosen variables. The findings indicated that farmers mostly relied on print media and their fellow farmers as their main sources of information. The findings additionally demonstrated a strong and positive relation among the quantity of land holding and education with access to agricultural knowledge. However, a significant relationship was found between farming experience and age. The study's findings indicate a pressing requirement for effective policy implementation for farmers to have convenient access to agricultural information to improve agricultural production.

***Kumaran et al., (2012)*** evaluated extension staff information-seeking behaviour and how socio-personal factors affect it. The study examined twelve specific personal attributes: age, training received, awareness of Better Management Practices (BMP), education, organizational climate, frequency of contact, manpower, resource appraisal, willingness for partnership, extension approach and methodology, aquaculture experience, and linkage with fishery Research and Development (R&D) institutions. The findings were suitably interpreted by performing descriptive statistics and regression analyses using the SPSS 10.0 program. The findings indicated that the participants exhibited a lack of awareness regarding current improvements in the field of aquaculture, including scientific and other related developments. The participants' limited inclination to seek information was seen in their relatively low level of awareness (less than 50%) of the recommended enhanced management methods.

### 2.2.5. Moderation using various Demographic Factors & Socio-Economic Status

***Park et al., (2021)*** This research used the technology acceptance model to determine what motivates customers to use autonomous vehicles. These include perceived utility, simplicity of use, social impact, and conducive conditions. The study also explored how demographic characteristics such as age, marital status income, family size, education, and gender mitigate the link between these predictors and AV usage. The study used multiple regression and integrated moderation tests on 318 respondents. The results show that social impact, conducive environments, and perceived utility influence AV use. Demographic characteristics like age, education, family size and marital status, modify the effect of Perceived Usefulness (PU) and Social Influence (SI) on AV use. Managers should take strategic directions to increase AV acceptance.

***Mohammadkhah et al., (2021)*** the research focus to study the relationship of demographic factors and (HL) Health Literacy with anxiety related to COVID-19 in adult individuals. The researchers employed snowball sampling and convenience techniques, resulting in a total of 560 samples. The demographic questionnaire, COVID-19 Anxiety Scale (CAS), and health literacy questionnaire for adults were accessed online to acquire the data. The data were analyzed using Amos 26 and SPSS 26 software, employing Structural Equation Modeling (SEM) based on covariance. The research determined that the demographic variables (gender, history of chronic diseases, receiving social support, and history of contracting COVID-19) play a moderating role in the relationship between Health Literacy and Anxiety of Covid 19.

***Mandongwe et al., (2021)*** study evaluated the moderating effect of demographic profiles of entrepreneurs and business factors, as well as the direct effect of Religiosity on Cost and Management Accounting Procedures (CMAPs) using Hayes Process Macro in SPSS. With a 95% confidence interval and a 5% margin of error, the Morgan (1971) sample size extract helped one to ascertain the 132 respondents for the study. A single cross-sectional study using a self-administered, regimented questionnaire compiled data. The results showed that the connection between religion and CMAPs is much changed by schooling. Between Religiosity and CMAPs, there was no statistical evidence to show that demographic variables including gender and age, or firm characteristics (revenue, number of employees, and term in business) have a moderating influence, though.

***Katper et al., (2019)*** Social demographics could reduce the link between behavioral biases and investing decisions, according to their study. Total data collection includes 179 Pakistan Stock Exchange investors. Data collection using a five-point Likert scale standardized questionnaire. The questionnaire covers demography, behavioral biases, and investment decision-making. Respondent data is collected via convenience sampling. Following Baron and Kenny's (1986) suggestions, hierarchical regression analysis is used to test hypotheses about socio-demographic component interactions. The results demonstrate that behavioral biases strongly influence investors' decisions. Social factors including education, career, and marital status also affect emotional biases and investment behaviour.

***Chawla & Joshi, (2018)*** investigated if user opinions on mobile banking are influenced by demographic features. There are 365 people in the sample who use online

banking now. Two statistical methods—that of multiple linear regression and Fisher Z transformation—are used to evaluate the moderating power. The study considers income, age, educational background, experience, gender, marital status and occupation, as the moderating elements. The results revealed that demographic factors including age, experience, gender, qualification, income, marital status and employment moderate between antecedents to mobile banking and attitude toward mobile banking adoption. Education could not, however, confirm any moderating influence.

***Ansari & Farooqi, (2017)*** The research purpose is to analyze the moderation effect of demographic variables such as gender, age, income, and experience on the relationship among the behaviour intention and attitude of online consumers. The analysis of the data revealed a clear moderating relationship between the demographic variables being studied, which influences the attitude and behaviour intention relationship. The results state that the 25-50 age range is the most regular online shoppers, whereas customers below and above this age group tend to make fewer online purchases in comparison to this group. Income was found to have a favourable correlation with the attitude and behavioral intention of consumers, along with other demographic characteristics. High-income customers exhibited a greater propensity to make online purchases in comparison to individuals with lower incomes. Furthermore, the gender of consumers has the least influence on the attitude towards online buying.

***Flanigan et al., (2017)*** examined how demographic parameters like age, length as a leader at the current company, industry experience, and education affect leadership style and financial performance in small enterprises in the national distribution wholesale market. Financial, demographic, and leadership data

from 100 small industrial distribution companies was collected. it uses the Multilevel Leadership Questionnaire to collect leadership data. Statistical regression models explored the relationship between transformational and transactional leadership styles and year-over-year sales and profit margin success. Demographic characteristics (age, education, experience, tenure) were also examined as moderators. Transformational leadership was linked to industrial distribution company financial success. The study also found that demographic characteristics did not affect leadership and business performance.

***Akram et al., (2016)*** studied Store Atmosphere and Impulsive Buying Behavior (IBB). It also examines how age, gender, and education affect Store Atmosphere and IBB. Mall intercept was utilized to collect data from 700 customers at 18 major Pakistani shops. Analysis and hypothesis testing were done using Structure Equation Modeling (SEM). Retail influences IBB and has a favourable link. IBB is also heavily influenced by one demographic factor—age—which is crucial. Gender and education don't affect IBP too much. Age moderates shop environment-IBB association.

***Pitchayadejanant & Nakpathom (2016)*** examined the service quality and customer satisfaction relationship along with customer loyalty and satisfaction, and the influence of demography as a moderator on these relationships. The demographic characteristics, namely gender, age, education level, and income, are regarded as the moderating factors. Structural Equation Modeling is employed for the identification of study objective effects. The questionnaire comprises three sections: personal information; general behaviour when using low-cost airlines; and perception of service quality about airline services. The evaluation of service usage is measured through a 5-point Likert scale. The

perception measurement consists of seven dimensions: five items for tangibility, four items for reliability, three for responsiveness, four items for assurance, four items for empathy, one item for overall satisfaction, and seven items for loyalty. The validity of the instrument is rectified and translated into the local language. The instrument reliability was found to be 0.914. The findings demonstrate a negative influence of gender while age has a positive influence. Gender has a positive influence on the relationship between empathy and satisfaction of the customer. The income level exhibited a negative effect on the relationship between reliability and customer satisfaction. Finally, the level of education displayed a negative influence on customer loyalty and satisfaction.

***Marumbwa, (2014)*** aims to explore how socio-demographic characteristics such as age, income, gender, employment position and education influence the Frequency of Usage (FOU), use of Mobile Money Transfer Services (MMTs), and user acceptance. The survey data was collected through a non-probability sampling technique (convenient and purposive) with 350 respondents. There is no text provided. The results indicated that the frequency of MMT usage is largely influenced by education level and employment status, whereas age, gender, and income level had insignificant influence. Similarly, the utilization of particular MMT applications is very consistent across different socio-demographic factors, except employment status. Age, gender, and income levels exhibit a negative correlation with the actual user adoption of MMTs. Essentially, the employment status and level of education greatly influence the socio-demographic factors that determine the user acceptability of MMTs.

***Matin et al., (2012)*** investigated how demographic factors affected the relationship between job tiredness and its consequences among employees of an Iranian

public sector enterprise. This study looks at job burnout as an independent variable, with organizational commitment, desire to resign, and employee work satisfaction as dependent variables. Additional moderating factors include age, marital status, education level and gender. The findings of this study show that job burnout among employees in organizations is connected with a drop in organizational commitment and job satisfaction, as well as an increase in the intention to resign. Furthermore, the demographic characteristics considered in this study—age, marital status, gender, and educational attainment—do not reduce the relationship between job tiredness and its repercussions among employees of an Iranian public sector firm.

***Nasir et al., (2011)*** investigated among a 450-person sample the correlation between job satisfaction and task performance. The study also looked at how work satisfaction and task performance responded to age, education, tenure and gender. This study used demographic questionnaires, job description index (JDI), and supervisors' assessments of task performance among other data-collecting tools. Descriptive and inferential statistics were used for the analysis of the data. The results revealed a significant correlation between task performance and work satisfaction. Furthermore, shows how gender and education affected job satisfaction and task performance rather than age and tenure.

## 2.3. RESEARCH GAP

In the majority of the studies (a). ***Awareness Level is mapped (****b)*. ***Technology Adoption*** by the ATMA beneficiaries has been mapped *(*c) ***Knowledge Acquisition*** about various ***Demographic and Socio-Economic factors*** has been mapped. The Awareness will provide a base for the technology adoption likewise the technology adoption will provide a base for the knowledge acquisition. Therefore, Awareness, Technology Adoption, and Knowledge Acquisition are sequential progress that will result in the formation of competencies of an individual. The collective mapping of Awareness, Technology Adoption, and Knowledge Acquisition has not been studied.

Although a lot of studies have been done on the moderating effect of demographic and socio-economic variables taking into consideration the different agricultural aspects not particularly focussing on competency mapping ***Park, Hong, & Le, (2021); Ansari & Rahela, (2017); Mandongwe, Zaravaza, & Makudza, (2021); Mandongwe, Zaravaza, & Makudza, (2021)***. The moderating effect of Demographic and Socio-Economic factors between the Overall Information Seeking Behaviour (OISB) and Competency score (CS) of the beneficiaries taking Overall Social Participation Behaviour (OSPB) as a mediator, particularly has not been explored. Much of the existing literature focuses on the direct relationship between information behaviour and farming outcomes ***Das, Mohanty, & Acharya, (2024); Ruikar et. al., (2024); Bera et. al., (2024); Priyanka & Jayashankar (2024)***, or the other areas of study without considering the competencies. Furthermore, research analyzing competency assessments generally overlooks the social and demographic aspects that influence behavioural patterns.

# Chapter – III
# Research Design

# CHAPTER – 3

# RESEARCH DESIGN

## 3.1 RATIONALE

In the last few decades, the central government has acknowledged the necessity of combining and aligning the extension and research systems and activities at the district level, ***Naidu, 2017***. The public agricultural extension system of the country has been the subject of intense scrutiny and its efficacy has been thoroughly questioned over the past years. Consequently, a significant innovation in extension has been achieved by the establishment of the Agriculture Technology Management Agency (ATMA) as a mechanism to address this question. It is considered a major advancement in the field of agricultural extension programs. The ATMA is one of the most important steps within the extensive network of extension service providers ***Paul et. al., (2016)***.

Thus, this study results in an understanding of the role of ATMA initiatives in creating Beneficiary Awareness, Technology Adoption, and Knowledge Acquired among beneficiaries, in the context of upgrading the technical skills of the farmers in the agriculture and allied sectors in Sikkim. Based on the knowledge acquired by the beneficiaries, they are segmented into various clusters. The study discloses the influence of the Beneficiary's Demographic & Socio-Economic Status and Information Seeking & Social Participation Behaviour, on their Competency. Additionally, it investigates the mediating-moderating role of ***Demographic Variables*** on ***Information-Seeking Behaviour***, and ***Competency Score*** with ***Overall Social Participation Behaviour*** as mediating factor and ***Demographic Variables*** as moderating factors. This will immensely help the policymakers to understand whether their initiatives have yielded the desired results. Accordingly, they can reframe their extension services training policy.

## 3.2 STATEMENT OF THE PROBLEM

Better insight can be gauged as to the effectiveness of initiatives taken by national agencies like ATMA for the past 19 years in Sikkim and how far they have resulted in the dissemination of technology transfers among the beneficiaries joining such initiatives. It is highly imperative to measure the level of benefits derived and the technical skills developed among the beneficiaries through the ATMA activities. To measure benefits derived and the technical skills imparted by ATMA among their beneficiary an extensive study. Against this backdrop, the present study is scientifically planned to be undertaken.

## 3.3 OBJECTIVES

1. To measure the ***Beneficiary Awareness of Extension Services, Technology Adoption, and Knowledge Acquired*** along with ***Demographic & Socio-Economic Status and Information Seeking & Social Participation Behaviour*** of beneficiaries relating to the various activities of ATMA

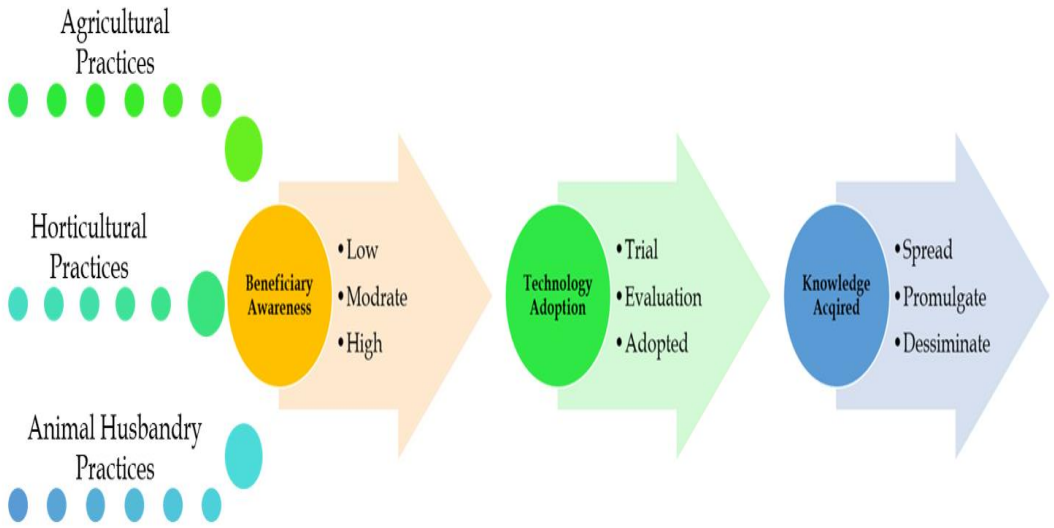
2. To measure the ***competencies*** of ATMA beneficiaries and map them into various clusters based on ***their competency*** & to identify the association and relationship between the competency of beneficiaries and their ***Demographic & Socio-Economic Status and Information Seeking & Social Participation Behaviour***

3. To examine the mediating-moderating role of ***Demographic Variables*** & ***Socio-Economic Status*** on ***Information-Seeking Behaviour***, and ***Competency Score*** with ***Overall Social Participation Behaviour*** as mediating factor and ***Demographic & Socio-Economic Variables*** as moderating factors

## 3.4. CONCEPTUAL FRAMEWORK OF THE STUDY

The *Agricultural Technology Management Agency* (ATMA) involves the activities related to the Agri and Allied Sectors. By considering the *Agricultural, Horticultural and Animal Husbandry Practices*, the study measures the *Levels of Beneficiary Awareness, Technology Adoption and Knowledge Acquired*. The different levels of *Beneficiary Awareness* (*i.e., Low, Moderate and High*) are given a score of 1 for the *Low*, 2 for the *Moderate* and 3 for the *High* awareness. Similarly, for *Technology Adoption* (*i.e., Trial, Evaluation and Adopted*), a score of 1 is given for *Trial*, 2 for *Evaluation* and 3 for *Adopted*. Finally, for *Knowledge Acquired* (*i.e., Spread, Promulgate and Disseminate*), a score of 1 is given for *Spread*, 2 for *Promulgate* and 3 for *Disseminate*. Thus, the total of these scores 1, 2 and 3 are assigned for different participation and involvement levels and the sum of their respective participation and involvement scores help to obtain the *Beneficiary Awareness Score, Technology Adoption Score and Knowledge Acquired Score*.

*Figure No. 3.1:* **Conceptual Model for Construction of BA, TA and KA**

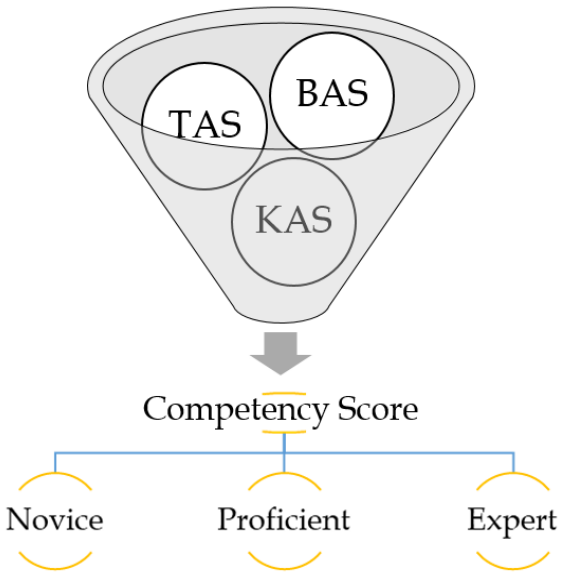



*Source: Model developed by the researcher*

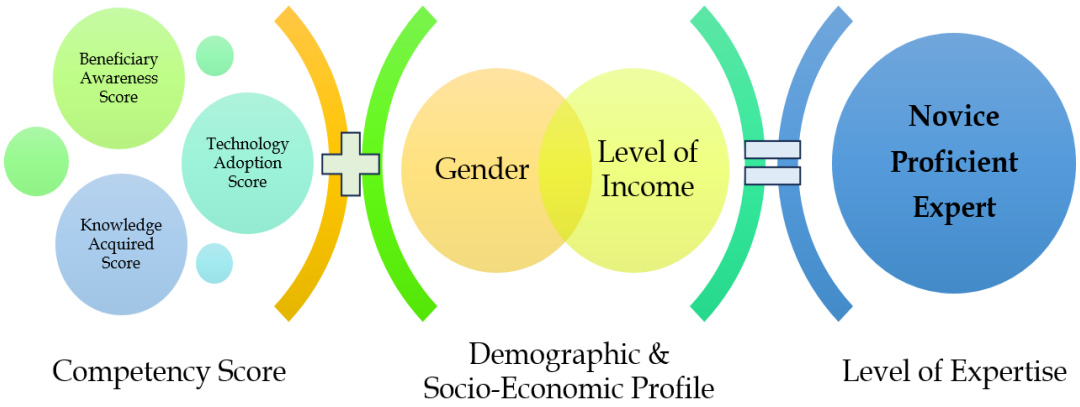
Thereafter, the calculated summative scores for *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), and *Knowledge Acquired Score* (KAS) collectively constitute the *Competency Score* (CS).

*Figure No. 3.2*: **Conceptual Model for Construction of Competency Score & Level of Expertise based on Manual & Machine Based Classification**

**Manual ($K^{th}$ 33.33 Percentile) Classification**




**Machine (Cluster Analysis) Classification**

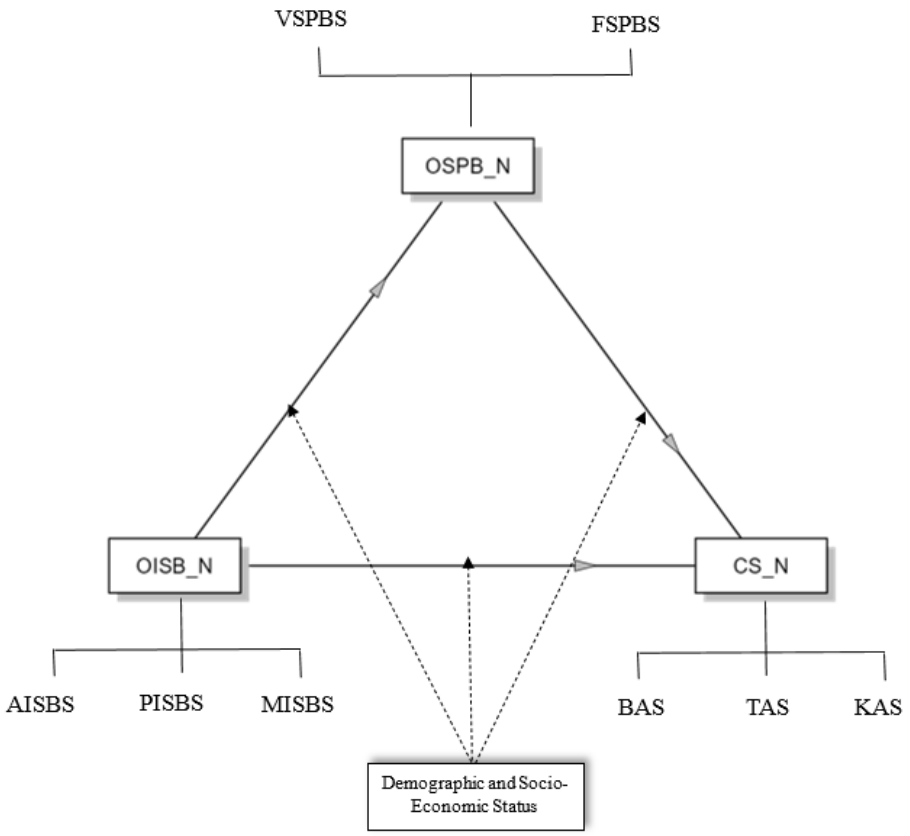



*Source: Model developed by the researcher* | Note*: BAS: Beneficiary Awareness Score; TAS: Technology Adoption Score; KAS: Knowledge Acquired Score*

However, the competencies are assessed and developed based on the *Level of Expertise* (*i.e., Low, Moderate, High*) that the beneficiaries possess. Additionally, *Manual*

*Classification and Machine Based Cluster Classification* are performed that map the beneficiaries into three different clusters namely *Novice, Proficient, and Expert* based on the *Level of Expertise* they execute.

*Figure No. 3.3*: **Conceptual Model Med-Mod Analysis**




*Source: Model developed by the researcher*

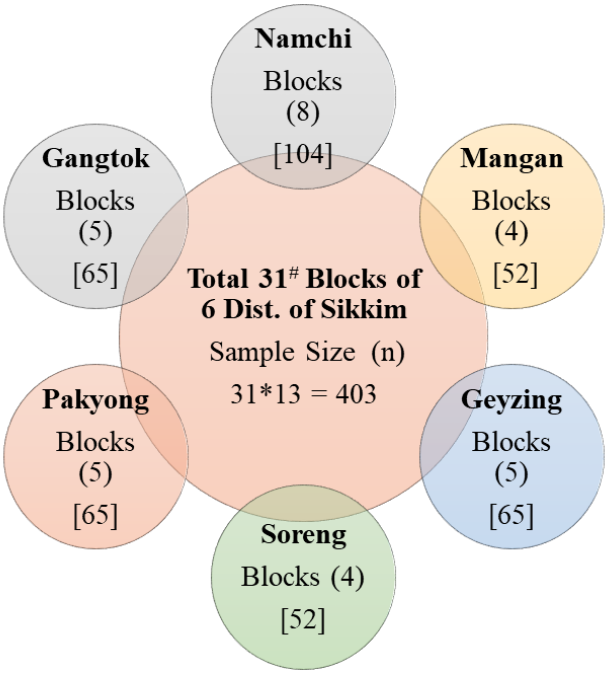
*NOTE: VSPBS: Voluntary Social Participation Behaviour Score; FSPBS: Focused Social Participation Behaviour Score; AISBS: Authenticated Information Seeking Behaviour Score; PISBS: Public Information Seeking Behaviour Score; MISBS: Media Information Seeking Behaviour Score; BAS: Beneficiary Awareness Score; TAS: Technology Adoption Score; KAS: Knowledge Acquired ScoreOISB_N: Overall Information Seeking Behaviour; OSPB_N: Overall Social Participation Behaviour; CS_N: Competency Score; Direct Path: ⟶ ; Indirect Path: ⇢*

Finally, the mediating-moderating effect of ***Demographic Variables*** & ***Socio-Economic Status*** on ***Information-Seeking Behaviour*** and ***Competency Score*** with ***Overall Social Participation Behaviour*** as mediating factor and ***Demographic & Socio-Economic Variables*** as moderating factor is shown in *Figure No. 3.3*.

## 3.5 SAMPLE DESIGN & SOURCE OF DATA

The study used the primary as well as the secondary data. The primary data, the population of the study is overall beneficiaries of ATMA during the period of 2018 – 2022 having attended the various types of ATMA activities. The district-wise cum activity-wise beneficiaries' details are gathered from *State Agricultural Management and Extension Training Institute* (SAMETI) Sikkim by the researcher and the same will be used as a sample frame for identifying the sampling unit from the population. The infographic of the sample distribution is in the *Figure No. 3.4*.

*Figure No. 3.4*: **District & Block Wise Sample Distribution**




*Source: Designed by the researcher*
*Note: #No. of. Selective Blocks in Parenthesis & No. of samples in Squared Brackets*

The year-wise total no. of activities organized by ATMA & total no. of beneficiaries who participated is exhibited in (*Table No. 1.1 p.19)*. According to the *Rao-soft* sample size calculator, the required sample size is 371 with a population *(i.e. No. of beneficiaries who participated in ATMA activities during 2018 – 2022) size* of 10,108

at a 95% confidence level. Even though the study includes 403 ATMA beneficiaries. It consists of 13 beneficiaries from each block and includes the 31 blocks from the entire six districts of Sikkim, through the *Block Wise Equal Proportionate Ratified Random Sampling Technique* as one of the probability sampling methods.

The secondary data was captured from the various authenticated sources of Union and State Government departments' (i.e. *Food Security & Agricultural Development Department of Sikkim* and *State Agricultural Management and Extension Training Institute (SAMETI) Sikkim)* official documents and their annual reports.

### 3.6 STRUCTURE OF THE SAMPLE SURVEY INSTRUMENT

The researcher intends to gather the necessary information using a pretested standardized structured interview schedule as a sample survey instrument. The interview schedule consists of four sections. First and second ***Sections – A & B*** relate to the *Demographic and Socio-Economic Status* and *Details about the Training Program Participated by the Respondents* through the closed-ended dichotomous/multinomial questions.

The Third, ***Section – C*** relates to gathering the responses of *Information Seeking Behavior* (ISB), *& Social Participation Behavior* (SPB) of ATMA beneficiaries, relating to the various sources of Information Seeking & Social Participation through the self-tested dichotomous question *(i.e. Yes/No)* and its level of accessibility through the ordered three-point ordinal responses *(i.e. Rarely/Occasionally/Frequently).* Further, OIBS is divided into *Authenticated, Public and Media* I*nformation Seeking Behaviour* (*i.e. AISB, PISB & MISB*)*,* whereas in the case of OSPB, it is bifurcated into *Voluntary & Focused* Social *Participation Behaviour* (*i.e. VSPB & FSPB*).

The Fourth, ***Section – D*** relates to beneficiary responses on *Beneficiary Awareness* (BA), *Technology Adoption* (TA) and *Knowledge Acquired* (KA) relating to the various ATMA (*Agriculture & Horticulture [30] and Animal Husbandry [12]*) overall 42 activities were measured for the level of participation of ATMA beneficiaries. The case of *Beneficiary Awareness* was measured through the ordered three-point ordinal responses *(i.e. Low/Moderate/High)*.

The case of *Technology Adoption* was measured through ordered three-point ordinal responses *(i.e. Trial / Evaluation / Adopted)*. The term *"Trial"* in this context denotes an assessment of a new technology or concept in a farmer's field, under their supervision and conditions. Similarly, the term *"Evaluation"* refers to the process of analyzing the results of a trial to ascertain the acceptability of technology to farmers. Lastly, the term *"Adopted"* refers to the incorporation of new technologies into the *Agri-Horti & Animal Husbandry Practices* of the beneficiaries.

The case of *Knowledge Acquired* was measured through the ordered three-point ordinal responses *(i.e. Spread/Promulgate/Disseminate)*. The term *"Spread"* means that the knowledge that has been acquired can be shared by the beneficiaries rapidly and informally. The term *"Promulgate"* means that the knowledge acquired can be distributed publicly to a lesser extent. The term *"Disseminate"* means that the knowledge acquired can be disseminated by the beneficiaries through a formal structured distribution of information widely.

## 3.7 CLASSIFICATION OF DEMOGRAPHIC AND SOCIO-ECONOMIC PROFILE OF THE ATMA BENEFICIARIES

Once the data has been codified, it is entered into MS Excel to do basic data cleaning and compute the summative scores for *Beneficiaries Awareness Score* (BAS),

*Technology Adoption Score* (TAS) and *Knowledge Acquired Score* (KAS). In addition, the quantitative variables (*referred to as Scores*) are transformed into an ordered categorical variable with three levels (*Low, Moderate, and High*) using the three equal percentiles method. This method categorizes the data based on percentiles, specifically below the *33rd percentile, between the 33rd and 66th percentiles and above the 66th percentile*. This transformation is done in the Visual Binning option of SPSS Statistics for analytical convenience. *Table No. 3.1* exhibits the classification of the ordered categorical variable as well as the range of the selected variables in the *Demographic & Socio-economic* study.

*Table No. 3.1:* **Classification of Categorical (Ordered / Unordered) Variable of Demographic & Socio-Economic Profile of the Respondents**

| **Study Variable** | **Variable (Ordered) Categories [Range]** | | | | | |
|---|---|---|---|---|---|---|
| **Age Group n = 403** | ***Young Adults*** [< 39 Yrs.] | ***Middle Age*** [39–49 Yrs.] | ***Old Age*** [>49 Yrs.] | | | |
| | **140** (34.74) | **129** (32.00) | **134** (33.26) | | | |
| **Size of Land Holding n = 403** | ***Low*** [< 0.8 Acre] | ***Medium*** [0.8 –1.5 Acre] | ***Large*** [> 1.5 Acre] | | | |
| | **135** (33.50) | **142** (35.24) | **126** (31.26) | | | |
| **Annual Income n = 403** | ***Low – Inc. Group*** [< Rs. 1 Lakh] | ***Mid – Inc. Group*** [Rs. 1 to 1.5 Lakh] | ***Upper – Inc. Group*** [> Rs. 1.5 Lakh] | | | |
| | **181** (44.92) | **100** (24.81) | **122** (30.27) | | | |
| **Gender n = 403** | ***Male*** | | ***Female*** | | | |
| | **225** (55.83) | | **178** (44.17) | | | |
| **Family Type n = 403** | ***Joint Family*** | | ***Nuclear Family*** | | | |
| | **238** (59.05) | | **165** (40.95) | | | |
| **District n = 403** | ***Gangtok*** | ***Pakyong*** | ***Gyalshing*** | ***Soreng*** | ***Namchi*** | ***Mangan*** |
| | **65** (16.13) | **65** (16.13) | **65** (16.13) | **52** (12.90) | **104** (25.81) | **52** (12.90) |
| **Educational Status n = 403** | ***Primary*** | | ***Middle School & Above*** | | | |
| | **121** (30.02) | | **282** (69.98) | | | |

*Source: Computed and Complied by the Researcher*
*Note: The percentage of respondents stated in Parenthesis & Range of the Orderedc/Categorical classification are stated in Squared Brackets.*

## 3.8 MEASUREMENT OF INFORMATION SEEKING BEHAVIOUR (ISB)

Agricultural information is beneficial for farmers as it aids them in addressing their deficiencies in understanding essential practices, which may encompass technical, social, and legal aspects of agriculture ***Owolade and Arimi, (2012)***. The way individuals look for information that help them with their problems is called how they seek information. Farmers usually want information that will help them solve problems that come up with different farming tasks. The things that people do to get information from different sources are called Information-Seeking Behaviour ***Emmanuel, (2012)***. Thus, it is found important to study the *Information Seeking Behaviour* of an individual. In the study, the *Information Seeking Behaviour* consists mainly of three parts i.e., *Authenticated Information Seeking Behaviour* (AISB), *Public Information Seeking Behaviour* (PISB) and *Media Information Seeking Behaviour* (MISB).

### 3.8.1 Frequency Distribution of *Authenticated Information Seeking Behaviour* (AISB)

The first part maps how frequently they seek information from authenticated sources, and is termed as *Authenticated Information Seeking Behaviour*.

*Table No.3.2:* **Authenticated Information Seeking Behaviour (AISB)**

| Sl. No | Source / Method of Capturing the AISB | [ in %] | | If YES, [ in %] | | |
|---|---|---|---|---|---|---|
| | | NO | YES | R | O | F |
| **1** | Block Agriculture Officer | NA | 100 | 6.7 | 93.3 | NA |
| **2** | District Agriculture Officer | NA | 100 | 6.9 | 93.1 | NA |
| **3** | Block Technology Manager | NA | 100 | NA | 7.9 | 92.1 |
| **4** | Assistant Technology Manager | NA | 100 | NA | 8.9 | 91.1 |
| **5** | Farmers friend, FIGs/CIGs/FSGs | NA | 100 | 1 | 72 | 27 |
| **6** | Agriculture coordinator | NA | 100 | 0.5 | 72.5 | 27 |

*Source: Computed and Complied by the Researcher*
*Note: R - Rarely, O- Occasionally, F– Frequently, NA-Not Applicable*

*Table No. 3.2* Shows that the beneficiaries seek information (100%) from different sources of *Authenticated Information Seeking Behaviour*. Specifically, here, the beneficiaries seek information *frequently* from the *Block Technology Manager* (92.1%) and *Assistant Technology Manager* (91.1%), *occasionally* from the *Block Agriculture Officer* (93.3%), *District Agriculture Officer* (93.1%), *Farmers friend, FIGs/CIGs/ FSGs* (72%), and *Agriculture coordinators* (72.5%).

### 3.8.2 Frequency Distribution of Public Information Seeking Behaviour (PISB)

Similarly, the second part maps how frequently they seek information from public sources, and is termed as *Public Information Seeking Behaviour*.

*Table No. 3.3:* **Public Information Seeking Behaviour (PISB)**

| Sl. No | Source/Method of Capturing the PISB | [ in %] | | If YES, [ in %] | | |
|---|---|---|---|---|---|---|
| | | NO | YES | R | O | F |
| **1** | Family members | NA | 100 | NA | 4.7 | 95.3 |
| **2** | Neighbour | NA | 100 | 1.5 | 98 | 0.5 |
| **3** | Friends | NA | 100 | 1.5 | 98 | 0.5 |
| **4** | Relatives | NA | 100 | 82.8 | 16.7 | 0.5 |
| **5** | Progressive farmers/ experienced farmers | NA | 100 | NA | 74.2 | 25.8 |
| **6** | FIG farmers | NA | 100 | NA | 75.2 | 24.8 |

*Source: Computed and Complied by the Researcher*
*Note: R -Rarely, O- Occasionally, F- Frequently, , NA- Not Applicable*

*Table No. 3.3* shows that the beneficiaries seek information (100%) from different sources of *Public Information Seeking Behaviour*. Specifically, here, the beneficiaries seek information *frequently* from *Family members* (95.3%); and occasionally seek information from *Neighbours* (98%), *Friends* (98%), *Progressive farmers/Experienced farmers* (74.2%), and *FIG farmers* (75.2%).

### 3.8.3Frequency Distribution of Media Information Seeking Behaviour (MISB)

Further, the third part maps how frequently they seek information from media sources and is termed as *Media Information Seeking Behaviour*.

*Table No. 3.4:* **Media Information Seeking Behaviour (MISB)**

| Sl. No | Source / Method of Capturing the MISB | [ in %] | | If YES, [ in %] | | |
|---|---|---|---|---|---|---|
| | | NO | YES | R | O | F |
| **1** | News Paper | 16.9 | 83.1 | 84.2 | 15.8 | NA |
| **2** | Farm Literature | 16.6 | 83.4 | 84.2 | 15.8 | NA |
| **3** | Radio | 5.5 | 94.5 | 1 | 83.2 | 15.7 |
| **4** | Television | NA | 100 | 3.2 | 88.6 | 8.2 |
| **5** | Agricultural Film Show | NA | 100 | 4.7 | 71 | 24.3 |
| **6** | Farmer fair/ Agricultural exhibition | NA | 100 | 3 | 72.5 | 24.6 |

*Source: Computed and Complied by the Researcher*
*Note: R - Rarely, O-Occasionally, F- Frequently, , NA- Not Applicable*

*Table No. 3.4* shows that the beneficiaries seek information (100%) from different sources of *Media Information Seeking Behaviour* like *Television, Agricultural Film Shows, and Farmer Fair/ Agricultural Exhibition*. They Seek Information from *Radio* (94.5%), *Farm Literature* (83.4%) and *Newspapers* (83.1%). Specifically, the beneficiaries moreover seek information occasionally from *Radio* by listen to agriculture radio programmes (83.2%), *Television* by watching agriculture TV programmes (88.6%), *Agricultural Film Shows* (71%) and *Farmer Fairs / Agricultural exhibitions* (72.5%). They rarely seek information from *Newspapers* (84.2%) and *Farm Literature* through *Farm magazines, Leaflets, Folders, Circular letters, and Journals* (84.2%).

### 3.8.4 Construction of Overall *(Authenticated, Public & Media)* Information Seeking Behaviour Score (OISBS) and Its Level of Overall Information Seeking Behaviour (LOISB)

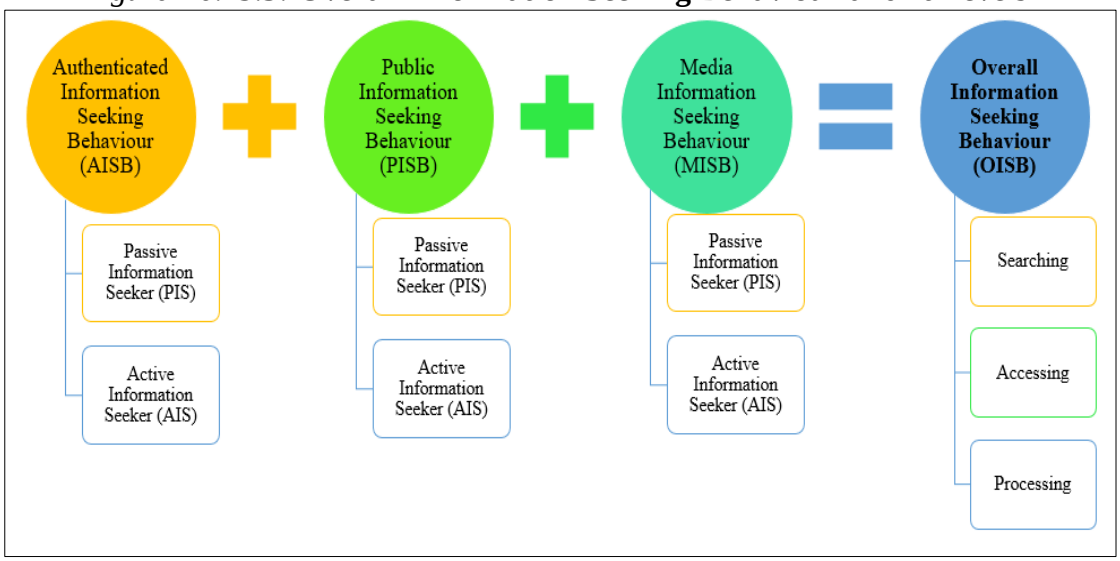
The *Authenticated Information Seeking Behaviour Score* (AISBS) is collected from the responses of the beneficiaries relating to the six statements based on their responses, whether they are accessing that particular source or not. If the response is *Yes*, then the researcher measures their frequency of access as "*Rarely"* for which a score of 1 is assigned, "*Occasionally"* for which a score of 2 is assigned, and "*Frequently"* for which a score of 3 is assigned. Thus, the summative scores of *Rarely, Occasionally, and Frequently* based on the six various responses we get leads for the computation of the score of *Authenticated Information Seeking Behaviour* termed as *Authenticated Information Seeking Behaviour Score* (AISBS).

In case of the *Public Information Seeking Behaviour Score* (PISBS) is also collected from the responses of the beneficiaries relating to the six statements based on their responses, whether they are accessing that particular source or not. If the response is *Yes*, then the researcher measures their frequency of access as "*Rarely"* for which a score of 1 is assigned, "*Occasionally"* for which a score of 2 is assigned, and "*Frequently"* for which a score of 3 is assigned. Thus, the summative scores of *Rarely, Occasionally, and Frequently* based on the six various responses we get lead for the computation of the score of *Public Information Seeking Behaviour* which is termed as *Public Information Seeking Behaviour Score* (PISBS).

Whereas in the *Media Information Seeking Behaviour Score* (MISBS) is also collected from the responses of the beneficiaries relating to the six statements based on their responses, whether they are accessing that particular source or not. If the response is *Yes*, then the researcher measures their frequency of access as "*Rarely"* for which a score of 1 is assigned, "*Occasionally"* for which a score of 2 is assigned, and

"*Frequently"* for which a score of 3 is assigned. Thus, the summative scores of *Rarely, Occasionally, and Frequently* based on the six various responses we get lead for the computation of the score for *Media Information Seeking Behaviour* termed as, *Media Information Seeking Behaviour Score* (MISBS).

*Figure No. 3.5:* **Overall Information Seeking Behaviour and It Levels**




*Source: Designed by the Researcher*

Further, based on the *Authenticated Information Seeking Behaviour Score,* the respondents are bifurcated into *Passive Information Seeker* (PIS) and *Active Information Seeker* (AIS) by using the mid (50%) percentiles technique i.e., below mean and above mean values employing visual binning in IBM SPSS.

In case the *Authenticated Information Seeking Behaviour Score* of a respondent is less than or below the average mean score [14] of the AISBS of the entire sample respondents, they are segregated and termed as *Passive Information Seekers* (PIS) who seek information from official sources to a lesser extent.

Whereas those respondents whose *Authenticated Information Seeking Behaviour Score* is above the average mean score [14], and are the individuals who seek information

from official sources to a greater extent or seek actively, this segment of respondents is termed *Active Information Seekers* (AIS).

The detailed data profiling and classification of various *Authenticated, Public and Media Information Seeking Behaviours* and their levelling is exhibited in *Table No. 3.5*

*Table No. 3.5:* **Classification of ordered categorical variable along with a range of the selected Information Seeking Behavior (ISB)**

| Classifying Variable | Variable (Ordered) Categories [Range] | | |
|---|---|---|---|
| **Authenticated Information Seeking Behaviour Score (AISBS)** | *Passive Information Seeker* [<14] | | *Active Information Seeker* [>14] |
| | **n = 293** (72.70%) | | **n = 110** (27.30) |
| **Public Information Seeking Behaviour Score (PISBS)** | *Passive Information Seeker* [<10] | | *Active Information Seeker* [>10] |
| | **n = 205** (50.86%) | | **n = 198** (49.14%) |
| **Media Information Seeking Behaviour Score (MISBS)** | *Passive Information Seeker* [<10] | | *Active Information Seeker* [>10] |
| | **n = 266** (66%) | | **n = 137** (34%) |
| **Overall Information Seeking Behaviour Score (OISBS)** | *Searching* [<34] | *Accessing* [34-36] | *Processing* [>36] |
| | **n = 226** (56%) | **n = 48** (12%) | **n = 129** (32%) |

*Source: Computed and Complied by the Researcher*

Similarly, based on the *Public Information Seeking Behaviour Score* the respondents are bifurcated into *Passive Information Seeker* (PIS) and *Active Information Seeker* (AIS) by using the mid (50%) percentiles technique i.e., below mean and above mean values employing visual binning in IBM SPSS.

In case the *Public Information Seeking Behaviour Score* of a respondent is less than or below the average mean score [10] of the PISBS of the entire sample respondents, they are segregated and termed as *Passive Information Seekers* (PIS) who seek information from public sources to a lesser extent.

Whereas those respondents whose *Public Information Seeking Behaviour Score* is above the average mean score [10], and are the individuals who seek information from

public sources to a greater extent or seek actively, this segment of respondents is termed *Active Information Seekers* (AIS).

Likewise, based on the *Media Information Seeking Behaviour Score* the respondents are bifurcated into *Passive Information Seeker* (PIS) and *Active Information Seeker* (AIS) by using the mid (50%) percentiles technique i.e., below mean and above mean values employing visual binning in IBM SPSS.

In case the *Media Information Seeking Behaviour Score* of a respondent is less than or below the average mean score [10] of the MISBS of the entire sample respondents, they are segregated and termed as *Passive Information Seekers* (PIS) who seek information from mass media sources to a lesser extent.

Whereas those respondents whose *Media Information Seeking Behaviour Score* is above the average mean score [10], and are the individuals who seek information from mass media sources to a greater extent or seek actively, this segment of respondents is termed *Active Information Seekers* (AIS).

Likewise, the *Levels of Overall Information Seeking Behaviour* (LOISB) are *Searching, Accessing, and Processing*. This categorization is done by employing the 33-percentile technique in the visual binning in IBM SPSS.

The individuals in the "*Searching"* stage are the ones whose *OISBS* is [<34]. The term *"Searching"* signifies that individuals are finding or collecting the information to implement the course of action.

The individuals in the "*Accessing"* stage are the ones whose OISBS is [34-36]. *"Accessing"* refers to the retrieving of information for the execution of a planned course of action, while "*Processing*" denotes the transforming of information.

The individuals in the "*Processing"* stage are the ones whose OISBS is [>36] *(Refer Table No. 3.5)*.

## 3.9 MEASUREMENT OF SOCIAL PARTICIPATION BEHAVIOUR (SPB)

The exchange of information and the reduction of participation barriers are all potential outcomes of social interactions or social participation ***Hong et. al., (2004)***. Previous research has conducted a comprehensive examination of the impact of social interaction on the adoption of technology by farmers and the results have been favourable ***Manski, (2000)***. It shows that Social Participation is an important factor influencing farmers' adoption and knowledge creation thus the *Social Participation Behaviour* is taken as one of the variables to undertake this study. In this study, the *Social Participation Behaviour* consists of two parts i. e., *Voluntary Social Participation Behaviour* (VSPB) and *Focused Social Participation Behaviour* (FSPB).

### 3.9.1 Frequency Distribution of Voluntary Social Participation Behaviour (VSPB)

The first part maps how frequently they seek information from voluntary sources, and is termed as *Voluntary Social Participation Behaviour* (VSPB).

*Table No. 3.6:* **Voluntary Social Participation Behaviour**

| Sl. No | Source / Method of Capturing the VSPB | [ in %] | | If YES, [ in %] | | |
|---|---|---|---|---|---|---|
| | | NO | YES | R | O | F |
| **1** | Co-operative society | 2.2 | 97.8 | 1 | 97.5 | 1.5 |
| **2** | Panchayat Samiti | NA | 100 | 1.2 | 97.5 | 1.2 |
| **3** | Zilla Parishad | 6 | 94 | 40.9 | 58.6 | 0.5 |
| **4** | FIG, CIG, FSG, NGOs, SHGs | 1 | 99 | 0.5 | 26.8 | 72.7 |
| **5** | Village Level Committee | 3.2 | 96.8 | 3.3 | 83.6 | 13.1 |
| **6** | Farmers Club | 3.2 | 96.8 | 3.3 | 83.8 | 12.8 |

*Source: Computed and Complied by the Researcher*
*Note: R -Rarely, O- Occasionally, F- Frequently, NA- Not Applicable*

*Table No. 3.6* shows that the beneficiaries' social participation behaviour is (100%) from *Panchayat Samitee* followed by 99% from FIG, CIG, FSG, NGOs, and SHGs, 97.8% from *Co-operative society*, 96.8% from *Village Level Committee* and *Farmers Club*, and finally 94% from *Zilla Parishad*. Specifically, here, the beneficiaries seek information *Frequently* from the *FIG, CIG, FSG, NGOs,* and *SHGs* (72.7%) while they seek information occasionally from the *Co-operative society* (97.5%), *Panchayat Samiti* (97.5%), *Zilla Parishad* (58.6%), *Farmers Club* (83.8%) and *Village level committee* (83.6%). This results in the computation of the *Voluntary Social Participation Behaviour Score* (VSPBS).

### 3.9.2 Frequency Distribution of Focused Social Participation Behaviour (FSPB)

Similarly, the second part maps how frequently they seek information from focused sources, and is termed as *Focused Social Participation Behaviour* (FSPB).

***Table No. 3.7:*** **Focused Social Participation Behaviour (FSPB)**

| Sl. No | Source/Method of Capturing the FSPB | [ in %] | | If YES, [ in %] | | |
|---|---|---|---|---|---|---|
| | | NO | YES | R | O | F |
| **1** | Demo Visit/Demo in own field | NA | 100 | 5.2 | 73.4 | 21.3 |
| **2** | Training and Meetings | NA | 100 | 5.2 | 72.7 | 22.1 |
| **3** | Field Visit, Field Day | NA | 100 | 6 | 73.9 | 20.1 |
| **4** | Exposure Visit | 12.4 | 87.6 | 45.3 | 47.3 | 7.4 |
| **5** | Exhibition | 14.6 | 85.4 | 76.5 | 22.4 | 1.2 |
| **6** | Kisan Ghosties | 15.4 | 84.6 | 76.2 | 22.6 | 1.2 |

*Source: Computed and Complied by the Researcher*
*Note: R - Rarely, O- Occasionally, F- Frequently, NA- Not Applicable*

*Table No. 3.7* shows that the beneficiaries' social participation behaviour is (100%) from *Demo Visit/Demo in their own field*, *Training and Meetings, Field Visit and Field Day* followed by 87.6%% from *Exposure Visit*, 85.4% from *Exhibition*, and finally 84.6% from *Kishan Ghosties*. Specifically, here, the beneficiaries seek information

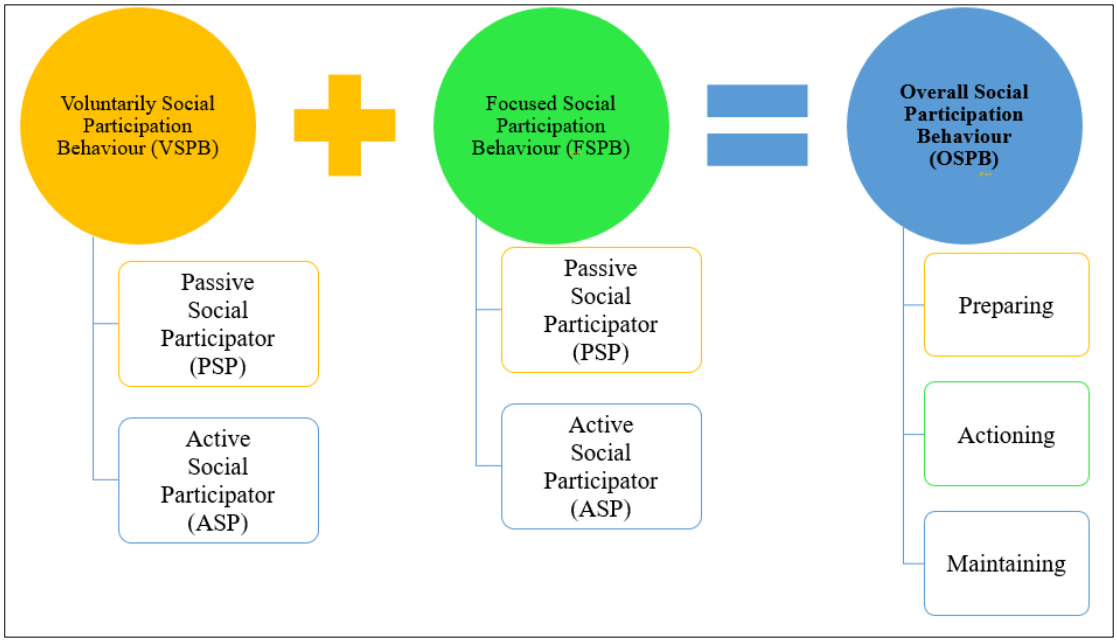
*Occasionally* from *Demo Visits/ Demo in their own field* (73.4%), *Training and Meetings* (72.7%), *Field Visits* (73.9%), *Field Days* (73.9%), *Exposure Visit* (47.3%). They rarely seek information from *Exhibition* (76.5%) and *Kisan Ghosties* (76.2%). This results in the computation of the *Focused Social Participation Behaviour Score* (FSPBS).

### 3.9.3 Construction of Overall *(Voluntary & Focused)* Social Participation Behaviour Score (OSPBS) and its Level of Overall Social Participation Behaviour (LOSPBS)

The *Voluntary Social Participation Behaviour Score* (VSPBS) is collected from the responses of the beneficiaries relating to the six statements based on their responses, whether they are accessing that particular source or not. If the response is *Yes*, then we measure their frequency of access as "*Rarely"* for which a score of 1 is assigned, "*Occasionally"* for which a score of 2 is assigned and "*Frequently"* for which a score of 3 is assigned. Thus, the summative scores of *Rarely, Occasionally, and Frequently* based on the six various responses we get leads to the computation of the score of *Voluntary Social Participation Behaviour* termed as *Voluntary Social Participation Behaviour Score* (VSPBS).

The *Focused Social Participation Behaviour Score* (FSPBS) is also collected from the responses of the beneficiaries relating to the six statements based on their responses, whether they are accessing that particular source or not. If the response is *Yes*, then we measure their frequency of access as "*Rarely"* for which a score of 1 is assigned, "*Occasionally"* for which a score of 2 is assigned, and "*Frequently"* for which a score of 3 is assigned. Thus, the summative scores of *Rarely, Occasionally, and Frequently* based on the six various responses we get lead for the computation of the score of *Focused Social Participation Behaviour* termed as *Focused Social Participation Behaviour Score* (FSPBS).

*Figure No. 3.6:* **Overall Social Participation Behaviour and It Levels**




*Source: Designed by the Researcher*

Further based on the *Voluntary Social Participation Behaviour Score* the respondents are bifurcated into *Passive Social Participator* (PSP) and *Active Social Participator* (ASP) by using the mid ($50^{th}$) percentiles technique employing visual binning in IBM SPSS.

In case the *Voluntary Social Participation Behaviour Score* of a respondent is less than or below the average mean score [12] of the VSPBS of the entire sample respondents, they are segregated and termed as *Passive Social Participators* (PSP). They are less interested in participating and thus they participate to a lesser extent.

Whereas those respondents whose *Voluntary Social Participation Behaviour Score* is above the average mean score [12], and are the individuals who are more interested in participating to a greater extent or seek actively, this segment of respondents is termed *Active Social Participator* (ASP).

The detailed data profiling and classification of various *Voluntary & Focused Social Participant Behaviours* and their leveling is exhibited in *Table No. 3.8.*

*Table No. 3.8:* **Classification of Ordered categorical variable along with a range of the Social Participation Behavior (SPB)**

| Classifying Variable | Variable (Ordered) Categories [Range] | | |
|---|---|---|---|
| **Voluntary Social Participation Behaviour Score (VSPBS)** | *Passive Social Participator* [< 12] | *Active Social Participator* [> 12] | |
| | **n = 182** (45.20%) | **n = 221** (54.80%) | |
| **Focused Social Participation Behaviour Score (FSPBS)** | *Passive Social Participator* [< 9] | *Active Social Participator* [> 9] | |
| | **n = 205** (50.90%) | **n = 198** (49.10%) | |
| **Overall Social Participation Behavior Score (OSPBS)** | *Preparing* [< 21] | *Actioning* [21-23] | *Maintaining* [> 23] |
| | **n = 176** (43.70%) | **n = 130** (32.30%) | **n = 97** (24%) |

*Source: Computed and Compiled by the Researcher*

Similarly based on the *Focused Social Participation Behaviour Score* the respondents are bifurcated into *Passive Social Participator* (PSP) and *Active Social Participator* (ASP) by using the mid ($50^{th}$) percentiles technique i.e., below mean and above mean values employing visual binning in IBM SPSS.

In case the *Focused Social Participation Behaviour Score* of a respondent is less than or below the average mean score [9] of the VSPBS of the entire sample respondents, they are segregated and termed as *Passive Social Participators* (PSP). They are less interested in participating and thus they participate to a lesser extent.

Whereas those respondents whose *Voluntary Social Participation Behaviour Score* is above the average mean score [9], and are the individuals who are more interested in participating and participating to a greater extent or seek actively, this segment of respondents is termed *Active Social Participator* (ASP).

Likewise, the Levels of OSPB are *Preparing, Actioning and Maintaining*. This categorization is done by employing the $33^{rd}$ -percentile technique in the visual binning

in IBM SPSS. The individuals in the "*Preparing"* stage are the ones whose *OSPBS* is [< 21]. The term *"Preparing"* signifies that persons are strategizing and organizing to implement the course of action. The individuals in the "*Actioning"* stage are the ones whose OSPBS is [21-23]. *"Actioning"* refers to the implementation of specific activities or the execution of a planned course of action, while "*Maintaining*" denotes the ongoing preservation of that process of action in an optimal condition. The individuals in the "*Maintaining"* stage are the ones whose OSPBS is [> 23] *(Refer Table No.3.8)*.

## 3.10 MEASUREMENT OF BENEFICIARY AWARENESS (BA), TECHNOLOGY ADOPTION (TA), AND KNOWLEDGE ACQUIRED (KA) BY THE ATMA BENEFICIARIES

As a conceptual framework, it is appropriate to envision extension as achieving its ultimate economic impact by delivering information and educational or training services to induce the following sequence— *Beneficiaries' Awareness, Technology Adoption, and Knowledge Acquired*. The sequence follows a natural order, it is evident that actual resources, such as skills and activities, from the beneficiaries are necessary to go through this sequence. Awareness is not Adoption. Adoption requires awareness, and the ability to evaluate data and evidence. Thus, Adoption leads to knowledge. Each of these sequences has an important role in achieving the goal of the extension services. Therefore, supporting the above importance the study intends to further assess the *Beneficiary Awareness, Technology Adoption and Knowledge Acquired*. The mapping is done based on the *Agri & Horticultural Practices* [30 Activities] and *Animal Husbandry Practices* [12 Activities] which constitutes the total of [42] Activities.

### 3.10.1 Frequency Distribution of *Beneficiary Awareness* (BA)

The frequency distribution for *Beneficiary Awareness, Technology Adoption, and Knowledge Acquired* concerning the *Agri and Horti practices* along with the *Animal Husbandry practices* are listed below.

*Table No. 3.9* depicts the *Beneficiary Awareness* regarding the various *Agri & Horti Practices* was assessed, which highlighted that the beneficiaries had more of medium awareness of the practices like *Cropping patterns* (64.8%), *Mulching practices* (63%), *Crop diversity* (63%), *Weeding schedule* (65%), *Irrigation schedule* (62.5%), *Biofertilizers* (46.1%), *Store seeds of flowers and vegetables* (59.8%), *Germination test on the seeds* (59.8%), *Seeds type soaked before sowing* (59.3%), *Sowing pattern* (52.4%), *Hybrid seeds* (53.1%), *Seedbed* (51.9%), *Seedlings covering pattern* (52.1%), *Pheromone trap* (64.5%), *Disease management of crops* (55.3%), *Preparation of Azola* (55.3%), *Preparation of Vermi-Compost* (55.6%), *Packing techniques* (63.5%), *Knapsack Sprayer* (63.5%), *Irrigation sprinkler* (61.8%), *Ploughing machine* (58.1%), *Poly house* (59.8%), *Farmers Producer Organisation* (FPO) (63%), *Cooperative Societies* (64.3%), *Incentive schemes for produced Outcomes* (54%). The beneficiaries had a high awareness of the practices like *Organic Farming* (71%), *Departmental stalls & small outlets* (72.5%) whereas the beneficiaries possessed low awareness of the practices like *Fertility status in the field* (47.8%), *Preservation of vegetables, and fruits* (72.9%), *Storage houses* (83.7%).

The *Beneficiary Awareness* regarding the various *Animal Husbandry Practices*, which highlighted that the beneficiaries had more of a medium awareness of all the listed practices like *Minor and routine animal health treatments* (65%), *Burial of the deceased animal body* (62.8%), *Conception Identification* (60.5%), *Litter management* (59.1%), *Vaccination schedule* (57.6%), *Basic ill-health symptoms* (57.3%), *Gestation Period* (56.3%), *Shelter pattern* (56.1%), *Routine and balanced quality feeds* (55.8%), *Hygiene Practices* (52.6%), *Breeding Practices* (51.4%), *Pest and Disease Management* (49.4%).

### 3.10.2 Frequency Distribution of Technology Adoption (TA)

The *Technology Adoption* regarding the various *Agri & Horti Practices* was assessed at three levels i.e., *Trail, Evaluation and Adopted,* which highlighted that the beneficiaries were in the evaluation stage for the practices like *Pheromone trap* (64.3%), *Crop diversity* (62.3%), followed by *Cropping patterns* (61.8%), *Mulching practices* (61.8%), *Knapsack Sprayer* (61%), *Packing techniques* (60.9%), *Weeding schedule* (60.3%), *Preparation of Vermi- Compost* (59.6%), *Irrigation schedule* (58.8%), *Preparation of Azola* (58.8%), *Germination test on the seeds* (58.6%), *Irrigation sprinkler* (57.8%), *Store seeds of flowers and vegetables* (57.3%), *Seeds type soaked before sowing* (54.3%), *Disease management of crops* (54.3%), *Farmers Producer Organisation (FPO)* (53.5%), *Sowing pattern* (52.1%), *Cooperative Societies* (51.7%), *Ploughing machine* (51.2%), *Hybrid seeds* (50.4%), *Seedbed* (48.1%), *Seedlings covering pattern* (47.4%), *Poly house (*44.6%), *Biofertilizers* (42.4%). The beneficiaries adopted practices like *Organic Farming* (68.7%), *Departmental stalls & small outlets* (63.6%) whereas the beneficiaries were in the *trial phase* for practices like *Preservation of vegetables and fruits* (81%), *Storage houses* (72.8%), and *Incentive schemes for produced Outcomes* (59%) *Fertility status in the field* (55.2%). Likewise, for the *Animal Husbandry Practices beneficiaries* had adopted the *hygiene practices* (50.9%) however, *Pest and Disease Management* (48.7%) was in a *trial phase*.

*Table No.3.9:* **The beneficiary Responses on Beneficiary Awareness (BA), Technology Adoption (TA), and Knowledge Acquired (KA) Relating to the various ATMA (Agriculture & Horticulture [30] and Animal Husbandry [12]) Overall 42 Activities and their Level of Participation of the ATMA Beneficiaries**

| Sl. No | Agriculture, Horticulture & Animal Husbandry Practices | Beneficiary Awareness (BA) | | | | | Technology Adoption (TA) | | | | | Knowledge Acquired (KA) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NO | YES | If YES, | | | NO | YES | If YES, | | | NO | YES | If YES, | | |
| | | | | L | M | H | | | T | E | A | | | S | P | D |
| 1 | *Cropping pattern* | NA | 100 | 4.0 | 64.8 | 31.3 | NA | 100 | 4.5 | 61.8 | 33.7 | NA | 100 | 11.2 | 62.5 | 26.3 |
| 2 | *Mulching practices* | NA | 100 | 9.4 | 63 | 27.5 | NA | 100 | 10.2 | 61.8 | 28.0 | NA | 100 | 14.1 | 60.0 | 25.8 |
| 3 | *Crop diversity* | NA | 100 | 9.2 | 64.5 | 26.3 | NA | 100 | 10.7 | 62.3 | 27.0 | NA | 100 | 15.4 | 61.5 | 23.1 |
| 4 | *Organic farming* | NA | 100 | 3.0 | 26.1 | 71.0 | NA | 100 | 3.0 | 28.3 | 68.7 | NA | 100 | 6.7 | 35.7 | 57.6 |
| 5 | *Weeding schedule* | NA | 100 | 11.7 | 65 | 23.3 | NA | 100 | 14.4 | 60.3 | 25.3 | NA | 100 | 21.3 | 58.3 | 20.3 |
| 6 | *Irrigation schedule* | NA | 100 | 18.9 | 62.5 | 18.6 | NA | 100 | 24.6 | 58.8 | 16.6 | NA | 100 | 28.4 | 57.0 | 14.7 |
| 7 | *Fertility status in the field* | 2.5 | 97.5 | 47.8 | 43.0 | 9.2 | 3.0 | 97.0 | 55.2 | 40.4 | 4.3 | 2.5 | 97.5 | 59.7 | 36.0 | 4.3 |
| 8 | *Biofertilizers* | 1.0 | 99 | 39.6 | 46.1 | 14.3 | 0.5 | 99.5 | 43.4 | 42.4 | 14.2 | 1.0 | 99.0 | 46.1 | 42.6 | 11.2 |
| 9 | *Store seeds of flowers and vegetables* | NA | 100 | 7.9 | 59.8 | 32.3 | NA | 100 | 13.9 | 57.3 | 28.8 | NA | 100 | 16.6 | 59.3 | 24.1 |
| 10 | *Germination test on the seeds* | NA | 100 | 6.7 | 59.8 | 33.5 | NA | 100 | 10.7 | 58.6 | 30.8 | NA | 100 | 14.6 | 61.5 | 23.8 |
| 11 | *Seeds type soaked before sowing* | NA | 100 | 9.7 | 59.3 | 31.0 | NA | 100 | 17.6 | 54.3 | 28.0 | NA | 100 | 18.6 | 57.8 | 23.6 |
| 12 | *Sowing pattern* | NA | 100 | 18.8 | 52.4 | 29.3 | NA | 100 | 21.6 | 52.1 | 26.3 | NA | 100 | 22.9 | 55.7 | 21.4 |
| 13 | *Hybrid seeds* | NA | 100 | 17.1 | 53.1 | 29.8 | NA | 100 | 20.8 | 50.4 | 28.8 | NA | 100 | 25.1 | 53.1 | 21.8 |
| 14 | *Seed bed* | NA | 100 | 17.9 | 51.9 | 30.3 | NA | 100 | 22.6 | 48.1 | 29.3 | NA | 100 | 24.8 | 52.4 | 22.8 |
| 15 | *Seedlings covering pattern* | NA | 100 | 17.4 | 52.1 | 30.5 | NA | 100 | 22.3 | 47.4 | 30.3 | NA | 100 | 24.3 | 52.6 | 23.1 |
| 16 | *Pheromone trap* | NA | 100 | 6.9 | 64.5 | 28.5 | NA | 100 | 8.4 | 64.3 | 27.3 | NA | 100 | 12.7 | 66.0 | 21.3 |

*Table No.3.9:* **The beneficiary Responses on Beneficiary Awareness (BA), Technology Adoption (TA), and Knowledge Acquired (KA) Relating to the various ATMA (Agriculture & Horticulture [30] and Animal Husbandry [12]) Overall 42 Activities and their Level of Participation of the ATMA Beneficiaries**

| Sl. No | Agriculture, Horticulture & Animal Husbandry Practices | Beneficiary Awareness (BA) | | | | | Technology Adoption (TA) | | | | | Knowledge Acquired (KA) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NO | YES | If YES, | | | NO | YES | If YES, | | | NO | YES | If YES, | | |
| | | | | L | M | H | | | T | E | A | | | S | P | D |
| 17 | *Disease management of crops* | NA | 100 | 22.6 | 55.3 | 22.1 | NA | 100 | 24.8 | 54.3 | 20.8 | NA | 100 | 30.8 | 52.1 | 17.1 |
| 18 | *Preparation of Azola* | NA | 100 | 4.2 | 55.3 | 40.4 | NA | 100 | 4.7 | 58.8 | 36.5 | NA | 100 | 11.2 | 64.0 | 24.8 |
| 19 | *Preparation of Vermi- Compost* | NA | 100 | 4.2 | 55.6 | 40.2 | NA | 100 | 5.2 | 58.6 | 36.2 | NA | 100 | 11.7 | 63.9 | 24.4 |
| 20 | *Preservation of vegetables and fruits* | 1.0 | 99.0 | 72.9 | 25.3 | 1.8 | 3.5 | 96.5 | 81.0 | 18.5 | 0.5 | 1.0 | 99.0 | 79.7 | 19.5 | 0.8 |
| 21 | *Storage house* | 5.7 | 94.3 | 83.7 | 15.8 | 0.5 | 95.4 | 4.5 | 72.8 | 27.8 | NA | 5.7 | 94.3 | 87.1 | 11.8 | 1.1 |
| 22 | *Packing techniques* | NA | 100 | 10.7 | 63.5 | 25.8 | 0.2 | 99.8 | 21.6 | 60.9 | 17.4 | NA | 100 | 23.9 | 61.7 | 14.4 |
| 23 | *Knapsack Sprayer* | NA | 100 | 10.4 | 63.5 | 26.1 | NA | 100 | 19.6 | 61.0 | 19.4 | NA | 100 | 22.8 | 62.0 | 15.1 |
| 24 | *Irrigation sprinkler* | NA | 100 | 12.9 | 61.8 | 25.3 | NA | 100 | 23.3 | 57.8 | 18.9 | NA | 100 | 26.8 | 59.1 | 14.1 |
| 25 | *Ploughing machine* | NA | 100 | 15.6 | 58.1 | 26.3 | 3.0 | 97.0 | 30.2 | 51.2 | 18.7 | NA | 100 | 34.5 | 51.6 | 13.9 |
| 26 | *Poly house* | NA | 100 | 17.1 | 59.8 | 23.1 | 6.0 | 94.0 | 41.4 | 44.6 | 14.0 | NA | 100 | 43.3 | 47.7 | 9.0 |
| 27 | *Farmers Producer Organisation* | NA | 100 | 22.6 | 63 | 14.4 | 43.4 | 56.6 | 36.0 | 53.5 | 10.5 | NA | 100 | 48.5 | 44.7 | 6.8 |
| 28 | *Cooperative Societies* | NA | 100 | 20.6 | 64.3 | 15.1 | 41.4 | 58.6 | 40.3 | 51.7 | 8.1 | NA | 100 | 53.0 | 42.0 | 5.0 |
| 29 | *Incentive for produced Outcomes* | 0.2 | 99.8 | 35.6 | 54.0 | 10.4 | 43.2 | 56.8 | 59.0 | 38.0 | 3.1 | 0.2 | 99.8 | 58.8 | 37.3 | 3.9 |
| 30 | *Departmental stalls and small outlets* | NA | 100 | 0.2 | 27.3 | 72.5 | 99.5 | 0.5 | 1.0 | 35.4 | 63.6 | NA | 100 | 2.2 | 56.1 | 41.7 |
| 31 | *Hygiene practices* | NA | 100 | 3.7 | 52.6 | 43.7 | NA | 100 | 3.7 | 45.4 | 50.9 | NA | 100 | 5.2 | 60.3 | 34.5 |
| 32 | *Basic ill-health symptoms* | NA | 100 | 4.5 | 57.3 | 38.2 | NA | 100 | 5.0 | 52.4 | 42.7 | NA | 100 | 6.7 | 63.5 | 29.8 |

*Table No.3.9:* **The beneficiary Responses on Beneficiary Awareness (BA), Technology Adoption (TA), and Knowledge Acquired (KA) Relating to the various ATMA (Agriculture & Horticulture [30] and Animal Husbandry [12]) Overall 42 Activities and their Level of Participation of the ATMA Beneficiaries**

| Sl. No | Agriculture, Horticulture & Animal Husbandry Practices | Beneficiary Awareness (BA) | | | | | Technology Adoption (TA) | | | | | Knowledge Acquired (KA) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NO | YES | If YES, | | | NO | YES | If YES, | | | NO | YES | If YES, | | |
| | | | | L | M | H | | | T | E | A | | | S | P | D |
| 33 | *Vaccination schedule* | NA | 100 | 4.0 | 57.5 | 38.5 | NA | 100 | 4.7 | 50.6 | 44.7 | NA | 100 | 6.0 | 63.8 | 30.3 |
| 34 | *Routine animal health treatment.* | NA | 100 | 12.7 | 65 | 22.3 | NA | 100 | 18.9 | 53.6 | 27.5 | NA | 100 | 22.3 | 57.1 | 20.6 |
| 35 | *Pest and Disease Management* | 1 | 99 | 40.9 | 49.4 | 9.8 | 1.2 | 98.8 | 48.7 | 45.7 | 5.5 | 1.0 | 99 | 58.5 | 37.7 | 3.8 |
| 36 | *Routine and balanced quality feeds* | NA | 100 | 5.0 | 55.8 | 39.2 | 0.2 | 99.8 | 7.7 | 53.2 | 39.1 | NA | 100 | 11.7 | 59.6 | 28.8 |
| 37 | *Shelter Pattern* | NA | 100 | 5.5 | 56.1 | 38.5 | NA | 100 | 9.4 | 52.9 | 37.7 | NA | 100 | 11.2 | 61 | 27.8 |
| 38 | *Breeding Practices* | NA | 100 | 28.8 | 51.4 | 19.9 | NA | 100 | 37.2 | 47.9 | 14.9 | NA | 100 | 39.2 | 47.9 | 12.9 |
| 39 | *Gestation Period* | NA | 100 | 22.1 | 56.3 | 21.6 | NA | 100 | 31 | 52.1 | 16.9 | NA | 100 | 34.7 | 52.6 | 12.7 |
| 40 | *Conception Identification* | NA | 100 | 13.6 | 60.5 | 25.8 | NA | 100 | 18.6 | 53.6 | 27.8 | NA | 100 | 24.6 | 56.1 | 19.4 |
| 41 | *Litter Management* | NA | 100 | 4.2 | 58.1 | 37.7 | NA | 100 | 4.5 | 55.6 | 40.0 | NA | 100 | 7.4 | 60.3 | 32.3 |
| 42 | *Burial of the deceased animal body* | NA | 100 | 5.5 | 62.8 | 31.8 | NA | 100 | 6.2 | 58.8 | 35.0 | NA | 100 | 7.9 | 64.0 | 28.0 |

*Source: Computed and Complied by the Researcher*

*Note:* ***BA:*** *L- Low, M Moderate, H-High | **TA:** T-Trial, E- Evaluation, A- Adopted |* ***KA:*** *S- Spread, P- Promulgate, D- Disseminate | NA: Not Applicable | The Figures are in Percentage*

### 3.10.3 Frequency Distribution of Knowledge Acquired (KA)

The *Knowledge Acquired* regarding the various *Agri & Horti Practices* was assessed at three levels i.e., *Spread, Promulgate and Disseminate*, which highlighted that the beneficiaries were in the *Promulgate stage* for practices like *Pheromone trap* (66%), *Preparation of Azola* (64%), *Preparation of Vermi- Compost* (63.9%), *Cropping patterns* (62.5%), *Knapsack Sprayer* (62%), *Packing techniques* (61.7%), *Germination test on the seeds* (61.5%), *Crop diversity* (61.5%), *Mulching practices* (60%), *Store seeds of flowers and vegetables* (59.3%), *Irrigation sprinkler* (59.1%), *Weeding schedule* (58.3%), *Seeds type soaked before sowing* (57.8%), *Irrigation schedule* (57%), *Departmental stalls & small outlets* (56.1%), *Sowing pattern* (55.7%), *Hybrid seeds* (53.1%), *Seedbed* (52.4%), *Seedlings covering pattern* (52.6%), *Disease management of crops* (52.1%), *Ploughing machine* (51.6%), *Poly house* (47.7%), *Farmers Producer Organisation* (FPO) (47.7%), *Cooperative Societies* (42%). The beneficiaries disseminated the *Knowledge Acquired* for practices like *Organic Farming* (57.6%), whereas the beneficiaries were in the spread phase for practices like *Storage houses* (87.1%), *Preservation of vegetables and fruits* (79.7%), *Fertility status in the field* (59.7%), *Incentive schemes for produced Outcomes* (58.8%) and *Biofertilizers* (46.1%).

Likewise, for the *Animal Husbandry Practices*, the beneficiaries were in the *Promulgate Stage of Knowledge Acquired* for all the listed practices apart from *Pest and Disease Management* (58.5%) for which they were in the *Spread phase* of *Knowledge Acquired*.

### 3.10.4 Score Construction of Beneficiary Awareness Score (BAS), Technology Adoption Score (TAS), Knowledge Acquired Score (KAS) and its Levels of Beneficiary Awareness (LBA), Technology Adoption (LTA), Knowledge Acquired (LKA)

The *Beneficiary Awareness Score* (BAS) is a summative score of the beneficiary responses on *Beneficiary Awareness* (BA) relating to the various ATMA (*Agriculture & Horticulture [30] and Animal Husbandry [12]*) activities and their level of participation collected from the responses of the beneficiaries, to capture whether they are practicing that particular activity or not. If the response is *Yes*, then the researcher further measures their self–assessed opinion about their level of awareness which was ranked as "*Low"* for which a score of 1 is assigned, "*Moderate"* for which a score of 2 is assigned, and "*High"* for which a score of 3 is assigned. The aim is to understand the relationship between the *Beneficiary Awareness Score* (BAS) and the various dimensions of *Information Seeking Behaviour* (ISB) and *Social Participation Behaviour* (SPB) of the beneficiaries and also to find the significant BAS mean rank of difference based on various dimensions of ISB and SPB of the beneficiaries.

In addition to that, the *Beneficiary Awareness Score* (BAS) is converted into the three-level ordinal categorical variable (*i.e. Low, Moderate, and High*) based on $K^{th}$ *percentile* of the frequency sample distribution of *Beneficiary Awareness Scores* into three-level equal proportionate distribution (i.e. $33^{rd}$ percentile) techniques in the visual binning process of IBM SPSS. Thereafter, the three equal proportionate sample groups are named based on their level of awareness of ATMA activities such as the individuals in the "*Low"* level are the ones whose BAS is [< 79]. They are the individuals who fall under the lower percentile (*i.e., < $33^{rd}$ Percentile*). The individuals in the "*Moderate"* level are the ones whose BAS is [79 to 96] and fall under the mid percentile (i.e., $33^{rd}$ - $66^{th}$). The individuals in the "*High"* stage are the ones whose BAS is [>96] and fall under the high percentile (i.e., > $66^{th}$) details are in the below *Table No 3.10.* The aim

is to understand the association between the *Level of Beneficiary Awareness* (LBA) and the various *Demographic and Socio-economic profiles* of the beneficiaries. The detailed data profiling and classification of various *Beneficiary Awareness, Technology Adoption & Knowledge Acquired* by the beneficiaries, and their levelling is exhibited in *Table No. 3.10*

*Table No. 3.10:* **Classification of Ordered Categorical Classification of Level of Beneficiary Awareness, Technology Adoption & Knowledge Acquired**

| **Study Variable** | **Variable (Ordered) Categories [Range]** | | |
|---|---|---|---|
| | **< 33rd Percentile** | **33rd – 66th Percentile** | **> 66th Percentile** |
| **Level of Beneficiary Awareness n = 403** | **Low** [< 79] **139** (34.50) | ***Moderate*** [79 - 96] **132** (32.75) | ***High*** [> 96] **132** (32.75) |
| **Level of Technology Adoption n = 403** | ***Trial*** [< 71] **135** (33.50) | ***Evaluation*** [71 - 92] **137** (34) | ***Adopted*** [> 92] **131** (32.50) |
| **Level of Knowledge Acquired n = 403** | ***Spread*** [< 69] **135** (33) | ***Promulgate*** [69 - 86] **140** (35) | ***Disseminate*** [> 86] **128** (32) |

*Source: Computed and Complied by the Researcher*
*Note: The percentage of respondents stated in Parenthesis & Range of the Ordered / Categorical classification are stated in Squared Brackets.*

The *Technology Adoption Score* (TAS) is a summative score of the beneficiary responses on *Technology Adoption* (TA) relating to the various ATMA (*Agriculture & Horticulture [30] and Animal Husbandry [12]*) activities and their level of participation collected from the responses of the beneficiaries, to capture whether they are practicing that particular activity or not. If the response is *Yes*, then the researcher further measures their self- assessed opinion about their level of adoption which was ranked as "*Trial"* for which a score of 1 is assigned, "*Evaluation"* for which a score of 2 is assigned and "*adopted"* for which a score of 3 is assigned. The aim is to understand the relationship between the *Technology Adoption Score* (TAS) and the various dimensions of *Information Seeking Behaviour* (ISB) and *Social Participation Behaviour* (SPB) of the

beneficiaries and also to find the significant *TAS* mean ranks of difference based on various dimensions of ISB and SPB of the beneficiaries.

In addition to that, the *Technology Adoption Score* (TAS) is converted into the three-level ordinal categorical variable (*i.e. Trial, Evaluation and Adopted*) based on the $K^{th}$ *percentile* of the frequency sample distribution of *Technology Adoption Score* into three-level equal proportionate distribution (i.e. $33^{rd}$ percentile) techniques in the visual binning process of IBM SPSS. Thereafter, the three equal proportionate sample groups are named based on their level of adoption of ATMA activities such as the individuals in the "*Trial"* level are the ones whose TAS is [< 71]. They are the individuals who fall under the lower percentile (*i.e., < $33^{rd}$ Percentile*). The individuals in the "*Evaluation"* level are the ones whose TAS is [71 to 92] and fall under the mid percentile (i.e., $33^{rd}$ - $66^{th}$). The individuals in the "*Adopted"* stage are the ones whose TAS is [>92] and fall under the high percentile (i.e., > $66^{th}$) *(Refer Table No. 3.10)*. The aim is to understand the association between the *Level of Technology Adoption* (LBA) and the various *Demographic and Socio-economic Profiles* of the beneficiaries.

The *Knowledge Acquired Score* (KAS) is a summative score of the beneficiary responses on *Knowledge Acquired* (KA) relating to the various ATMA (*Agriculture & Horticulture [30] and Animal Husbandry [12]*) activities and their level of participation collected from the responses of the beneficiaries, to capture whether they are practicing that particular activity or not. If the response is *Yes*, then the researcher further measures their self- assessed opinion about their level of *Knowledge Acquired* which was ranked as "*Spread"* for which a score of 1 is assigned, "*Promulgate"* for which a score of 2 is assigned, and "*Disseminate"* for which a score of 3 is assigned. The aim is to understand the relationship between the *Knowledge Acquired Score* (KAS) and the various dimensions of *Information Seeking Behaviour* (ISB) and *Social Participation*

*Behaviour* (SPB) of the beneficiaries and also find the significant *KAS* mean rank of different based on various dimensions of ISB and SPB of the beneficiaries.

In addition to that, the *Knowledge Acquired Score* (KAS) is converted into the three-level ordinal categorical variable (*i.e. Spread, Promulgate and Disseminate*) based on $K^{th}$ *percentile* of the frequency sample distribution of *Knowledge Acquired Score* into three-level equal proportionate distribution (*i.e.* $33^{rd}$ *percentile*) techniques in the visual binning process of IBM SPSS. Thereafter, the three equal proportionate sample groups are named based on their level of knowledge acquired of ATMA Activities such as the individuals in the "*Spread"* level are the ones whose KAS is [< 69]. They are the individuals who fall under the lower percentile (*i.e.,* $< 33^{rd}$ *Percentile*). The individuals in the "*Promulgate"* level are the ones whose KAS is [69 to 86] and fall under the mid percentile (i.e., $33^{rd}$ -$66^{th}$). The individuals in the "*Disseminate"* stage are the ones whose KAS is [>86] and fall under the high percentile (i.e., > $66^{th}$) *(Refer Table No. 3.10)*. The aim is to understand the association between the *Level of Knowledge Acquired* (LBA) and the various *Demographic and Socio-economic Profiles* of the beneficiaries.

The subsequent chapters will comprehend the analysis for each of the objectives set for the present study.

# Chapter – IV

# Computation Of Beneficiary Awareness Score (BAS), Technology Adoption Score (TAS), Knowledge Acquired Score (KAS), Information Seeking Behaviour (ISB), Social Participation Behaviour (SPB) and Its Levels

# CHAPTER – 4

# COMPUTATION OF BENEFICIARY AWARENESS SCORE (BAS), TECHNOLOGY ADOPTION SCORE (TAS), KNOWLEDGE ACQUIRED SCORE (KAS), INFORMATION SEEKING BEHAVIOUR (ISB), SOCIAL PARTICIPATION BEHAVIOUR AND ITS LEVELS

## 4.1 BACKGROUND OF THE STUDY

More than half of the people of India, where the economy is mostly agricultural, work in and depend on agricultural activities for their living. Unquestionably, as time goes on, need for rural and agricultural knowledge and extension programs will rise in the foreseeable future. In many parts of the world, the difficulty of integrating the fast population increase with a limited area available for farming procedures agriculture. Farmers will have to maximize their effectiveness and focus on their domains of knowledge. From the government's perspective, regardless of importance placed on output, extension services will remain as a vital policy tool for encouraging environmentally and socially sustainable agricultural practices, ***Jones & Garforth, (1997)***.

New technology has emerged over time in India's agricultural development, and initiatives have been launched to assist farmers in following the most recent technical innovations. Thus, the *Agricultural Technology Management Agency* (ATMA) has implemented technological extension services as a substitute for traditional farming practices. Agricultural extension policy is an essential component of both national development policy and agricultural and rural development policy; hence, it aims to decentralize the operational control of public agricultural research and extension activities and promotes awareness of new technologies and demand-driven training to facilitate the adoption of technology and the knowledge acquired. By so empowering

farmers and farm women groups, agricultural extension helps to foster agricultural development, ***Contado (1988)***.

As a conceptual framework, it is appropriate to envision extension as achieving its ultimate economic impact by delivering information and educational or training services to induce the following sequence- *Beneficiaries' Awareness, Technology Adoption and Knowledge Acquired*. The sequence follows a natural order, it is evident that actual resources such as skills and activities from the beneficiaries are necessary to go through this sequence. *Awareness* is not *Adoption*. *Adoption* requires *awareness*, coupled with ability to evaluate data and evidence. Thus, *Adoption* leads to *knowledge*. Each of these sequences has an important role in achieving the goal of the extension services. Research on the impact of extension services has assessed the level of awareness among farmers (*and the sources of that awareness*), the extent to which they have adopted these practices, and their knowledge *(implementation of recommended practices*). Not all research have investigated every aspect of the sequence.

The ATMA is an instrumental mechanism in the public agricultural extension system, as it bridges the gap between the identification of technology needs in accordance with current demand and its adoption in the fields of farmers. The present chapter assesses the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA) and *Level of Knowledge Acquired* (LKA) of the ATMA Beneficiaries that results in an understanding of the role of ATMA initiatives in creating *Beneficiary Awareness, Technology Adoptions and Knowledge Acquired* among beneficiaries in the context of upgrading the technical skills of the farmers in the agriculture and allied sectors in Sikkim. The findings will throw light on the effectiveness of ATMA initiatives as they will reflect upon the extent to which the beneficiaries are aware of, adopted, and acquired knowledge about ATMA initiatives. It will help the policymakers to

understand how these initiatives contribute to enhance agriculture development and allied sectors in Sikkim.

In the majority of the studies (a). Awareness Level is mapped ***[Ghetiya, Patel , & Patel, (2019); Shamshadunnisa et. al., (2018); Aziz et. al., (2018); Madhavan (2017)]*** (b). Technology Adoption by the ATMA beneficiaries has been mapped [***Bhabor, Patel, & Makwana, (2019)***; ***Agnihotri, Bose, & Jahanara, (2018); Pawaiya, Khare, & Rajan, (2018); Raghuwanshi & Mazhar, (2017)]***; (c) Knowledge Acquired about various Demographic and Socio-Economic factors have been mapped ***[Tanwar et. al., (2023)***; ***Rasanjali et al., (2021)***; ***Kumar et al., (2020)]*** Awareness serves as a foundation for adopting technology, just as adopting technology serves as a foundation for acquiring knowledge. Thus, the sequential progression *of Awareness, Technology Adoption, and Knowledge Acquired* leads to the development of an individual's competencies. Not all researches have investigated every aspect of the sequence resulting in a collective study.

Similarly, in the majority of the studies, the Information Seeking Behaviour of ATMA Beneficiaries is mapped in relation to their demographic and socio-economic profile ***Bora et. al., (2021); Som et al., (2016); Parthasarathi et. al., (2019); Balasubramani, Uma, & Shah (2015); Abraham (2020)***. In accordance with the demographic and socio-economic profiles of ATMA beneficiaries, the Social Participation Behaviour of ATMA Beneficiaries has been mapped ***Kumar et. al.; (2017); Kumar & Jirli (2018) Das & Borua, (2017); Choudhary et. al., (2017); Jakkawad, Sawant, & Pawar, (2017)***. There is dearth of research on the collective relationship between *Information Seeking Behaviour* and *Social Participation Behaviour* with *Beneficiaries' Awareness* (BA), *Technology Adoption* (TA), and *Knowledge Acquired* (KA).

## 4.2 RESEARCH QUESTION

The research gap addressed leads to answering the following research questions:

1. Is the measurement of the *Level of Beneficiaries' Awareness (LBA), Level of Technology Adoption (LTA),* and *Level of Knowledge Acquired (LKA)* of the ATMA, associated with their *Demographic Profile*?

2. Is the measurement of the Level of *Beneficiaries' Awareness (LBA), Level of Technology Adoption (LTA),* and *Level of Knowledge Acquired (LKA)* of the ATMA, associated with their *Socio-Economic Status*?

3. Does the *Beneficiary Awareness Score*, *Technology Adoption Score* and *Knowledge Acquired Score* relate to the various dimensions of *Information Seeking Behaviour Scores* [*Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS)*] and *Social Participation Behaviour Score* [*Voluntary Social Participation Behaviour Score (VSPBS), Focused Social Participation behaviour Score (FSPBS), Overall Social Participation Behaviour (OSPB)*]?

4. Does the measurement of the *Level of Beneficiaries' Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA)* among the beneficiaries, have mean rank differences based on the *Level of Information-Seeking Behavior* and *Social Participation Behaviour*?

## 4.3 Results and Discussions

The first part of the results includes the *measurement of the Level of Beneficiary Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) in association with the Demographic Profile (Age, Gender, District,*

*Type of Family) of Respondents*. Additionally, the second part of the result includes *the Level of Beneficiary Awareness (BA), the Level of Technology Adoption (TA), and the Level of Knowledge Acquired (KA) in association with the Socio-Economic Profile (Educational Status, Occupation, Land Size, Annual Income) of Respondents*.

Likewise, the third part includes the results of *the Level of Beneficiary Awareness (BA), Level of Technology Adoption (TA), and Level of Knowledge in relation to Information Seeking Behaviour and Social Participation Behaviour*. Finally, the fourth part depicts the results *of the significant mean difference between the Level of Beneficiary Awareness (LBA),* based on the *Overall Information Seeking Behavior Scores (OISBS), Authenticated Information Seeking Behaviour (AISBS), Public Information Seeking Behaviour (PISBS), Media Information Seeking Behaviour (MISBS), & Overall Social Participation Behavior Score (OSPBS), Voluntary Social Participation Score (VSPBS), Focused Social Participation Score (FSPBS) is presented.*

### 4.3.1 The Association of *Demographic Profile* of Respondents and the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA)

The adoption of modern technologies is significantly influenced by the demographic profile of an individual ***Crabbe et. al., (2009)***. Determining whether the participants in a given study are a representative sample of the target population for generalization purposes requires the research participants' demographic information ***Lee and Schuele, (2010)***. Thus, the study aims to assess the ***Association of Demographic Profile of Respondents and the Level of Beneficiary Awareness (LBA), Technology Adoption (LTA), and Knowledge Acquired (LKA)***.

The above research questions (1) result in framing the following hypothesis:

*$H_{04.1}$: No association exists among the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), Level of Knowledge Acquired (LKA), and Age of the Respondents.*

*$H_{4.1}$: An association exists among the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), Level of Knowledge Acquired (LKA), and Age of the Respondents.*

*$H_{4.2}$: An association exists between the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), Level of Knowledge Acquired (LKA), and Level of Gender of the Respondents.*

*$H_{4.3}$: An association exists among the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), Level of Knowledge Acquired (LKA), and, District of the Respondents.*

*$H_{4.4}$: An association exists among the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), Level of Knowledge Acquired (LKA), and Type of Family of the Respondents.*

Finally, the researcher employs cross-tabulation of *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA) and *Level of Knowledge Acquired* (LKA) based on *Demographic Profile* (*Age, Gender, District, Type of Family*). Additionally, the researcher uses the *Chi-square* test of the hypothesis to demonstrate the statistically significant association between these variables.

### *4.3.1 (a). Demographic Variable: Age*

Age as a demographic factor may affect many spheres of human life, including legislation, behavior and social roles. Therefore, one must have a strong grasp of society. Age offers a structural framework for comprehending how people's actions, experiences, and obligations change with their life. The historical and cultural setting

in which people were raised could have affected the unique ideas and values of several age groups. By use of age analysis, researchers can better grasp the differences in attitudes, beliefs, and behaviors among generations. Hence, this study was carried out to measure the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of knowledge Acquired* (LKA) in association with the age group of the respondents.

The *Level of Beneficiary Awareness* among the beneficiaries were observed as per the age group they belonged i.e., *Young Adults* (n =140); *Middle Age* (n= 129); *Elder Age* (134). The Awareness Level among the *Young Adults* showed a *Low Level of Awareness* on various initiatives of ATMA in Sikkim i.e. 36.43% followed by *Moderate* (34.28%) and *High* (29.28%). It was also found that the *Middle- Age* respondents (n= 129); exhibited almost the same level of percentage in the group *High* (37.20%) and *Low* (37.20%). In the case of the *Elder Age*, the *Level of Awareness was Moderate* (38.05%), *High* (32.09%), and *Low* (29.85%).

The *Level of Technology Adoption* among the beneficiaries were observed as per the age group they belonged i.e., *Young Adults* (n= 140); *Middle Age* (n= 129); *Elder Age* (134). The *Young Adults* showed a *Moderate Level of Technology Adoption* on various initiatives of ATMA i.e. 35.00% followed by *Low* (33.57%) and *High* (31.42%). It was also found that the *Middle-Age* respondents (n= 129); exhibited almost the same level of percentage in the group *High* (35.66%) and *Low* (36.66%) followed by *Moderate* (28.68%). In the case of the *Elder Age*, the *Level of Technology Adoption* among the beneficiaries was *Moderate* (39.53%), *Low* (32.55%), and *High* (31.78%).

*Table No. 4.1:* **The Cross Tabulation on *The Level of Beneficiary Awareness* (BA), *Technology Adoption* (TA), and *Knowledge Acquired* (KA) in association with *Demographic Profile* (*Age, Gender, District, Type of Family*) of Respondents**

| Demographic Factors | Group | Level of Beneficiary Awareness | | | Level of Technology Adoption | | | Level of Knowledge Acquired | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low | Moderate | High | Trial | Evaluation | Adopted | Spread | Promulgate | Disseminate |
| **Age Group {n=403}** | 20 – 39 Yrs. Young Adults [n =140] | 51 (36.43) | 48 (34.28) | 41 (29.28) | 47 (33.57) | 49 (35.0) | 44 (31.42) | 47 (33.57) | 50 (35.71) | 43 (30.71) |
| | 40 – 49 Yrs. Middle Aged [n=129] | 48 (37.20) | 33 (25.58) | 48 (37.20) | 46 (35.66) | 37 (28.68) | 46 (35.66) | 46 (35.65) | 40 (30.00) | 43 (33.33) |
| | > 50 Yrs. Elder Aged [n=134] | 40 (29.85) | 51 (38.05) | 43 (32.09) | 42 (32.55) | 51 (39.53) | 41 (31.78) | 42 (31.34) | 50 (37.31) | 42 (31.34) |
| | **Total** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi 2$** | **5.857 $^{NS}$** | | | **2.724 $^{NS}$** | | | **1.333 $^{NS}$** | | |
| **Gender {n=403}** | Male [n=225] | 61 (27.11) | 77 (34.22) | 87 (38.66) | 65 (28.88) | 70 (31.11) | 90 (40.00) | 59 (26.22) | 79 (35.11) | 87 (38.66) |
| | Female [n=178] | 78 (43.82) | 55 (30.89) | 45 (25.28) | 70 (39.32) | 67 (37.64) | 41 (23.03) | 76 (42.69) | 61 (34.26) | 41 (23.03) |
| | **Total** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi 2$** | **13.816$^{***}$** | | | **13.278$^{***}$** | | | **15.719$^{***}$** | | |
| **District {n=403}** | Gangtok [n=65] | 30 (46.15) | 21 (32.30) | 14 (21.53) | 28 (43.07) | 26 (40.00) | 11 (16.92) | 34 (52.30) | 18 (27.69) | 13 (20.00) |
| | Pakyong [n=65] | 17 (26.15) | 21 (32.30) | 27 (41.53) | 15 (23.07) | 23 (35.38) | 27 (41.53) | 14 (21.53) | 26 (40.00) | 25 (38.46) |
| | Gyalshing [n=65] | 23 (35.38) | 22 (33.84) | 20 (30.76) | 22 (33.84) | 21 (32.30) | 22 (33.84) | 22 (33.84) | 24 (36.92) | 19 (29.23) |

*Table No. 4.1:* **The Cross Tabulation on *The Level of Beneficiary Awareness* (BA), *Technology Adoption* (TA), and *Knowledge Acquired* (KA) in association with *Demographic Profile* (*Age, Gender, District, Type of Family*) of Respondents**

| Demographic Factors | Group | Level of Beneficiary Awareness | | | Level of Technology Adoption | | | Level of Knowledge Acquired | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low | Moderate | High | Trial | Evaluation | Adopted | Spread | Promulgate | Disseminate |
| District {n=403} | Soreng [n=52] | 14 (26.92) | 17 (32.69) | 21 (40.38) | 20 (38.46) | 13 (25.00) | 19 (36.53) | 15 (28.84) | 16 (30.76) | 21 (40.38) |
| | Namchi [n=104] | 29 (27.88) | 37 (35.57) | 38 (36.53) | 26 (25.00) | 37 (35.57) | 41 (39.42) | 25 (24.03) | 16 (15.38) | 39 (37.50) |
| | Mangan [n=52] | 26 (50.00) | 14 (26.92) | 12 (23.07) | 24 (46.15) | 17 (32.69) | 11 (21.15) | 25 (48.07) | 16 (30.76) | 11 (21.15) |
| | **TOTAL** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi 2$** | **$17.490^{NS}$** | | | **$21.497^{*}$** | | | **$26.498^{**}$** | | |
| Family Type {n=403} | Joint [n=238] | 69 (28.99) | 88 (36.97) | 81 (34.03) | 69 (28.99) | 90 (37.81) | 79 (33.19) | 70 (29.41) | 85 (35.71) | 83 (34.87) |
| | Nuclear [n=165] | 70 (42.42) | 44 (26.66) | 51 (30.90) | 66 (40.00) | 47 (28.48) | 52 (31.51) | 65 (39.39) | 55 (33.33) | 45 (27.27) |
| | **TOTAL** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi 2$** | **$8.549^{**}$** | | | **$6.105^{*}$** | | | **$4.830^{NS}$** | | |

*Source: Computed and compiled by researcher | figures exhibited in the parentheses are percentages to the total of the respective subgroups|* NS= *non-significant*, $^{*}$= *Significant at 0.01 Level,* $^{**}$= *Significant at 0.005 Level*, $^{***}$= *Significant at 0.001 Level & 0.00 Level*

The *Level of Knowledge Acquired* among the beneficiaries were observed as per the age group they belonged i.e., *Young Adults* (n=140); *Middle Age* (n=129); *Elder Age* (134). The *Young Adults* showed a *Moderate Level of Knowledge Acquired* on various initiatives of ATMA i.e. 35.71% followed by *Low* (33.57%) and *High* (30.71%). It was also found that the *Middle- Age respondents* (n=129); exhibited *Low* (35.65%), *High* (33.33%), and *Moderate* (30.00%). In the case of the *Elder Age*, the *Level of Knowledge Acquired* among the beneficiaries was *Moderate* (37.31%), *High* (31.34%), and *Low* (31.34%).

The study found that there was no statistically significant association among the variables (*Refer Table No. 4.1 p.8*). The *chi-square* test results were as follows: $\chi 2$ (4, N= 403) = 5.857, p= .210 for (LBA), $\chi 2$ (4, N= 403) = 2.724, p= .605 for (LTA), and $\chi 2$ (4, N= 403) = 1.333, p= .856 for (LKA). Given that the calculated P values for the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) are .210, .605, and .856 respectively, and these values are greater than 0.05, we lack sufficient statistical evidence to establish a significant association between the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), *Level of Knowledge Acquired* (LKA), and the Age group of the respondents. The results are consistent with the studies conducted by ***Amlaku et. al. (2012), Sirin, Sheela, & P., (2022), Christopher & Manish, (2021) Gonshetwad B.M., (2016)***.

### *4.3.1 (b). Demographic Variable: Gender*

***Shirin, Thomas, et. al., (2016)*** Gender is the socially created roles, behaviors, and identities connected with men, women, and persons of all sexes. It shapes a distribution of power, person's behavior, self-image, view of others, contacts, and resources in

society. Understanding and addressing the social, political, economic, and personal factors influencing individuals and society depends on knowledge of gender as a demographic component. This aspect of research has a crucial role in uncovering disparities, providing insights for policymaking and advancing the cause of social equity. Hence, this study aims to assess the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) in association with the Gender of the respondents.

The *Level of Awareness Beneficiaries* as per *Gender*, i.e., *Male* (n=225) and *Female* (n=178) was measured. The *Male* beneficiaries depicted a *High* (38.66%), *Moderate* (34.22%) and *Low* (27.11%) *Level of Beneficiaries Awareness* on different initiatives of ATMA. Likewise, the *Female* beneficiaries showed *Low* (43.82%), *Moderate* (30.89%) and *High* (25.28%) *Level of Beneficiaries Awareness* regarding different ATMA initiatives.

As per *Gender* the *Level of Technology Adoption* among the beneficiaries i.e., *Male* (n=225), and *Female* (n=178) was also mapped. The *Male* beneficiaries depicted a *High* (40.00%), *Moderate* (31.11%) and *Low* (28.88%) *Level of Technology Adoption* on different initiatives of ATMA. Likewise, the Female beneficiaries showed *Low* (39.32%), *Moderate* (37.64%) and *High* (23.03%) *Level of Technology Adoption* regarding different ATMA initiatives.

The *Level of Knowledge Acquired* among the beneficiaries as per *Gender* i.e., *Male* (n=225), and *Female* (n=178) were measured. The *Male* beneficiaries depicted a *High* (38.66%), *Moderate* (35.11%) and *Low* (26.22%) *Level of Knowledge Acquired* on different initiatives of ATMA. Likewise, the Female beneficiaries showed *Low*

(42.69%), *Moderate* (34.26%) and *High* (23.03%) *Level of Knowledge Acquired* regarding different ATMA initiatives.

The study revealed significant associations among the variables (refer to Table 2). Specifically, the association for (LBA) was significant with a $\chi 2$ value of 13.816, p= .001. Similarly, the association for (LTA) was significant with a $\chi 2$ value of 13.278, p= .001. Lastly, the association for (LKA) was significant with a $\chi 2$ value of 15.719, p= .000. Given that the estimated P values for *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) are all less than 0.05 (specifically, .001 for LBA, .001 for LTA, and .000 for LKA), we can confidently conclude with statistical evidence that there is a significant association between the degree of these factors and *Gender*.

#### *4.3.1 (c). Demographic variable: District*

Districts are often used to refer to different geographical areas with distinct economic, environmental, and cultural traits. Examining districts helps researchers to understand how these geographical differences affect social behavior, economic activities. Usually, it serves as the basic entities in charge of carrying out policies and initiatives. Data analysis at the district level helps one to assess the effectiveness of government initiatives, the distribution of resources, and the effects of policies on local communities. Thus, the study further aims to measure ***the level of Beneficiary Awareness (LBA), Technology Adoption (LTA), and Knowledge Acquired (LKA) in association with the District of Respondents***.

As per *Districts* i.e., *Gangtok* (n=65), *Pakyong* (n=65), *Gyalshing* (n=65), *Soreng* (n=52), *Namchi* (n=104), *Mangan* (n=52) level of awareness were measured. It was found that in *Gangtok District* the *Level of Beneficiary Awareness* was *Low* (46.15%),

*Moderate* (32.10%) and *High* (21.53%); *Pakyong* was *High* (41.53%), *Moderate* (32.30%), and *Low* (26.15%); *Gyalshing* was *Low* (35.38), *Moderate* (33.84%), and *High* (30.76%); *Soreng* was *High* (40.38%), *Moderate* (32.69%) and *Low* (26.92%); *Namchi* was *High* (36.53%), *Moderate* (35.57%) and *Low* (27.88%); *Mangan* was *Low* (50%), *Moderate* (26.92%) and *High* (23.07%).

Based on the Districts of Sikkim the *Level of Technology Adoption* was measured. It was found that in the District of *Gangtok*, the *Level of Technology Adoption* was *Low* (43.07%), *Moderate* (40.00%) and *High* (16.92%). In the District of *Pakyong*, the *Level of Technology Adoption* was *High* (41.53%), *Moderate* (35.38%), and *Low* (23.07%). Similarly, in the District of *Gyalshing* the *Level of Technology Adoption* was almost the same in the category of *Low* (33.84%) followed by *moderate* (32.30%), and *High* (33.84%); *Soreng* District was *Low* (38.46%), *High* (36.53%) and *Moderate* (25.00%); *Namchi* District was *High* (39.42%), *Moderate* (35.57%) and *Low* (25.00%); and lastly in *Mangan* District was *Low* (46.15%), *Moderate* (32.69%) and *High* (21.15%).

The *Level of Knowledge Acquired* as per Districts i.e., *Gangtok* (n=65), *Pakyong* (n=65), *Gyalshing* (n=65), *Soreng* (n=52), *Namchi* (n=104), *Mangan* (n=52) was measured. It was found that in *Gangtok* Districts the *Level of Knowledge Acquired* was *Low* (52.30%), *Moderate* (27.69%) and *High* (20.00%); *Pakyong* was *Moderate* (40.00%), *High* (38.46%), and *Low* (21.53%); *Gyalshing* was *Moderate* (36.92%), *Low* (33.84%) and *High* (29.23%); *Soreng* was *High* (40.38%), *Moderate* (30.76%), and *Low* (28.84%); *Namchi* was *High* (37.50%), *Low* (24.03%), and *Moderate* (15.38%); *Mangan* was *Low* (48.07%), *Moderate* (30.76%) and *High* (21.15%).

The analysis indicated that there was no statistically significant association among the variables (*Refer to Table 2*) indicated by the *chi-square* test, results with $\chi 2$ (10, N=

403) = 17.490, p= .064. Given that the computed p-value (.064) is above the threshold of 0.05, we lack sufficient statistical evidence to establish a significant association between the *Level of Beneficiary Awareness* (LBA) and *Districts*.

The association between the variables was statistically significant, with $\chi 2$ (10, N= 403) = 21.497, p= .018 for (TA) and $\chi 2$ (10, N= 403) = 26.498, p= .003 for (KA) respectively. Given that the calculated P values for *Level of Technology Adoption* (LTA) and *Level of Knowledge Acquired* (LKA) are .018 and .003 respectively, which are both less than the significance level of 0.05, we may conclude that there is sufficient statistical evidence to support the existence of a significant association between the *Level of Technology Adoption* (LTA), *Level of Knowledge Acquired* (LKA) with Districts.

#### *4.3.1 (d). Demographic Variable: Type of Family*

The type of family is a critical demographic factor in social science research, as it influences the interaction, development, and decision-making of individuals. This has significant implications for the comprehension of activities, social structures, and outcomes in a diverse array of life situations. The composition of a family significantly influences economic activities and decision-making within the home. Additionally, a person's accomplishments are significantly influenced by their family history. So, the study further assesses ***the Level of Beneficiary Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) in association with the Type of Family of Respondents.***

It was also found that the *Level of Beneficiary Awareness* among the beneficiaries based on the *Type of the Family*, was *Moderate* (36.97%), *High* (34.03%) and *Low* (28.99%) for *Joint Family* Category. The *Nuclear Family Type* had a *Low* (42.42%), *High* (30.90%) and *Moderate* (26.66%) *Level of Beneficiary* Awareness.

The *Level of Technology Adoption* of beneficiaries based on the *Type of Family*, categorized into *Joint* (n=238) and *Nuclear* (n=165) *Family Types* was measured. Among the *Joint Family Type* the *Level of Technology Adoption* was *Moderate* (37.81%), High (33.19%) and *Low* (28.99%). The *Nuclear Family Type* had a *Low* (40.00%), *High* (31.51%) and *Moderate* (28.48%) *Level of Technology Adoption*.

The *Level of Knowledge Acquired* by beneficiaries based on the *Type of Family*, categorized into *Joint* (n=238) and *Nuclear* (n=165) was measured. Among the *Joint Family Type* the *Level of Knowledge Acquired* was *Moderate* (35.71%), *High* (34.87%) and *Low* (29.41%). The *Nuclear Family Type* had a *Low* (39.39%), *Moderate* (33.33%), and *High* (27.27%) *Level of Knowledge Acquired*.

The study found a significant association among the variables. The *Chi-square* test yielded a value of 8.549 (df=2, N=403) with a p-value of .014 for (LBA), and a value of 6.105 (df=2, N=403) with a p-value of .047 for (LTA). Given that the estimated p values for *Level of Beneficiary Awareness* (LBA) and *Level of Technology Adoption* (LTA) are .014 and .047 respectively, which are both less than 0.05, we conclude that there is sufficient statistical evidence to support a significant association between the *Level of Beneficiary Awareness* (LBA) and *Level of Technology Adoption* (LTA) with the *Type of Family*. The findings are in line with the findings of ***Sirin, (2022), Pola, Upali, & N.K., (2022)***.

### 4.3.2 The Association of Socio-Economic Status of Respondents with the *Level of Beneficiary Awareness (LBA)*, *Level of Technology Adoption (LTA)*, and *Level of Knowledge Acquired* (LKA)

In social science research and studies, socioeconomic level is a fundamental factor. It influences a sample's psychological and behavioral traits as well as adoption, inventiveness, knowledge, economic incentive, and attitude, ***Daniel et. al. (2022).*** Adoption studies, follow-up polls, and reviews of economic farmers all show how important socioeconomic level is in technology assessment. It offers insightful data and analysis relevant for the evaluation of possible new technologies and the setting of agricultural research objectives, ***Pachigo, (1987)***. Thus, the study aims to assess the ***Association of the Socio-Economic Status of Respondents with the Level of Beneficiary Awareness (BA), Level of Technology Adoption (TA), and Level of Knowledge Acquired (KA).*** Therefore, the following research hypotheses are framed:

*$H_{4.5}$: An association exists between the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) with the Educational Status of Respondents.*

*$H_{4.6}$: An association exists between the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) with the Size of Land of Respondents.*

*$H_{4.7}$: An association exists among the Level of Beneficiaries Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) with the Annual Income of Respondents.*

Finally, the researcher employs cross-tabulation of *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) based on *Socio-economic Status* (*Educational level, Land Size, and Annual Income*) of respondents. Additionally, the researcher uses the *Chi-square* test of the hypothesis to demonstrate the statistically significant association between these variables.

### *4.3.2.(a). Socio-Economic Factor: Educational Status*

Typically assessed by completing recognized tests, educational level is a measure of the total formal education one has received. It speaks of a person's degree of education. It influences someone's capacity for communication of basic ideas, knowledge, intelligence, and confidence. Through encouraging the acceptance of common values, standards, and knowledge, education helps to promote social cohesiveness. It also helps people to appreciate and grasp diverse points of view. Examining the educational status helps researchers to identify skill shortages, probe labor market trends, and evaluate how education affects output and economic growth. Thus, the study furthermore **checks *the Level of Beneficiary Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) in association with Educational Status of Respondents***.

The *Level of Beneficiary Awareness* based on the *Educational Status* categorized into *Primary School* (n=121) and *Middle School and Above* (n=255) were measured where it was found that the *Primary School* had *Moderate* (36.36%), *Low* (33.05%) and *High* (30.57%), *Level of Beneficiary Awareness*. In the case of *Middle School and Above*, the *Level of Beneficiary Awareness* was *Low* (35.10%), *High* (33.68%), and *Moderate* (31.20%).

The *Level of Technology Adoption* of beneficiaries based on the *Educational Status* categorized into *Primary School* (n=121) and *Middle School and Above* (n=255) was measured where it was found that the *Primary School* had *Moderate* (41.32%), *Low* (33.88%) and *High* (24.79%), *Level of Technology Adoption*. In the case of *Middle School and Above*, the *Level of Technology Adoption* were *High* (35.81%), *Low* (33.33%), and *Moderate* (30.85%).

*Table No. 4.2:* **The Cross Tabulation on *The Level of Beneficiary Awareness* (LBA), *Technology Adoption* (LTA) and *Knowledge Acquired* (LKA) in Association with Socio-Economic Profile *(Educational Status, Land Size, Annual Income)* of Respondents**

| Socio-Economic Factors | Group | Level of Beneficiary Awareness | | | Level of Technology Adoption | | | Level of Knowledge Acquired | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low | Medium | High | Trial | Evaluation | Adopted | Spread | Promulgate | Disseminate |
| **Education {n=403}** | Primary School [n=121] | 40 (33.05) | 44 (36.36) | 37 (30.57) | 41 (33.88) | 50 (41.32) | 30 (24.79) | 42 (34.71) | 48 (39.66) | 31 (25.61) |
| | Middle School and Above [n=282] | 99 (35.10) | 88 (31.20) | 95 (33.68) | 94 (33.33) | 87 (30.85) | 101 (35.81) | 93 (32.97) | 92 (32.62) | 97 (34.39) |
| | **TOTAL** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi^2$** | **1.041$^{NS}$** | | | **5.903$^{NS}$** | | | **3.339$^{NS}$** | | |
| **Size of Land Holding {n=403}** | Low [n=135] | 52 (38.51) | 48 (35.55) | 35 (25.92) | 55 (40.74) | 44 (32.59) | 36 (26.66) | 55 (40.74) | 44 (32.59) | 36 (26.66) |
| | Medium [n=142] | 45 (31.69) | 45 (31.69) | 52 (36.61) | 39 (27.46) | 58 (40.84) | 45 (31.69) | 39 (27.46) | 58 (40.84) | 45 (31.69) |
| | Large [n=126] | 42 (33.33) | 39 (30.95) | 45 (35.71) | 41 (32.53) | 38 (30.15) | 47 (37.30) | 41 (32.53) | 38 (30.15) | 47 (37.30) |
| | **TOTAL** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi^2$** | **4.411$^{NS}$** | | | **12.259$^{*}$** | | | **8.477$^{NS}$** | | |
| **Annual Income {n=403}** | Low Inc. [n=181] | 86 (47.51) | 58 (32.04) | 37 (20.44) | 86 (47.51) | 58 (32.04) | 37 (20.44) | 87 (48.06) | 53 (29.28) | 41 (22.65) |
| | Mid Inc. [n=100] | 20 (20.00) | 44 (44.00) | 36 (36.00) | 20 (20.00) | 44 (44.00) | 36 (36.00) | 24 (24.00) | 42 (42.00) | 34 (34.00) |
| | Upper Inc. [122] | 29 (23.77) | 35 (28.68) | 58 (47.54) | 29 (23.77) | 35 (28.68) | 58 (47.54) | 24 (19.67) | 45 (36.88) | 53 (43.44) |
| | **TOTAL** | **139 (34.49)** | **132 (32.75)** | **132 (32.75)** | **135 (33.49)** | **137 (33.99)** | **131 (32.50)** | **135 (33.49)** | **140 (34.73)** | **128 (31.76)** |
| | **$\chi^2$** | **27.471$^{***}$** | | | **40.620$^{***}$** | | | **34.481$^{***}$** | | |

*Source: Computed and compiled by researcher | figures exhibited in the parentheses are percentages to the total of the respective subgroups |*
*$^{NS}$= non-significant, $^{*}$= Significant at 0.01 Level, $^{**}$= Significant at 0.005 Level, $^{***}$= Significant at 0.001 Level & 0.00 Level*

The *Level of Knowledge Acquired* by beneficiaries based on the Education categorized into *Primary School* (n=121) and *Middle School and Above* (n=255) were measured where it was found that the *Primary School* had *Moderate* (39.66%), *Low* (34.71%) and *High* (25.61%), *Level of Knowledge Acquired*. In the case of *Middle School and above*, the *Level of Knowledge Acquired* was *High* (34.39%), *Low* (32.97%), and *Moderate* (32.62%).

The study found that the association between the variables was not statistically significant. The *Chi-square* test results were $\chi 2$ (4, N= 403) = 1.041, p= .594 for (BA), $\chi 2$ (4, N= 403) = 5.903, p= .052 for (TA), and $\chi 2$ (4, N= 403) = 3.339, p= .188 for (KA) accordingly. Based on the calculated P values of .594 (BA), .052 (TA), and .188 (KA), which are all greater than 0.05, we lack sufficient statistical evidence to establish a significant association between the *Levels of Beneficiary Awareness* (LBA), *Levels of Technology Adoption* (LTA), and *Levels of Knowledge Acquired* (LKA) with *Education*. The findings are in line with ***Sahu Prasad Bedu, (2013)***.

### *4.3.2 (b) Socio-Economic Factor: Size of Land*

***Agricultural Census, Department of Agriculture and Farmers Welfare, (n.d.)*** The term "operational landholding" denotes "all land which is used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others without regard to title, legal form, size or location" . The extent of landholdings has a considerable impact on income distribution and agricultural output, both of which affect economic stability, particularly in agrarian cultures. The analysis of landholding size influences policy, particularly in regions where agriculture is the primary economic sector. This permits the formulation of policies that address the diverse requirements of the population. ***Binswanger et. al., (2009)***. It is important for

rural development since smallholders may have trouble obtaining resources like technology and credit facilities, which are necessary for enhancing livelihoods ***Deininger & Binswanger, (1999)***. *Hence, the study* ***aims to assess the Level of Beneficiary Awareness (LBA), Level of Technology Adoption (LTA), and Level of Knowledge Acquired (LKA) in association with the land size of the respondents.***

The study also revealed that the *Level of Beneficiary Awareness* of Beneficiaries as per the *Size of Land*, the *Marginal* Land Holders had a *Low* (38.51%), *Moderate* (35.55%), and *High* (25.92%) *Level of Beneficiaries Awareness*; The *Medium* Land Holders had a *High* (36.61%), *Moderate* (31.69%), and *Low* (31.69%) *Level of Awareness*. It was also found that the *Large* Land Holders had a *High* (35.71%), *Low* (33.33%), and *Moderate* (30.95%) *Level of Beneficiary Awareness*.

The *Level of Technology Adoption* of beneficiaries as per the *Size of Land*, categorized into *Marginal* (n=135), *Medium* (n=142) and *Large* (n=126) Land Holding was measured. The *Marginal* Land Holders had a *Low* (40.74%), *Moderate* (32.59%), and *High* (26.66%) *Level of Technology Adoption*; The *Medium* Land Holders had a *Moderate* (40.84%), *High* (31.69%), and *Low* (27.46%) *Level of Technology Adoption*; *Large* Land Holders had a *High* (37.30%), *Low* (32.53%), and *Moderate* (30.15%) *Level of Technology Adoption*.

The *Level of Knowledge Acquired* of beneficiaries as per the *Size of Land*, categorized into *Marginal* (n=135), *Medium* (n=142) and *Large* (n=126) Land Holding was measured. The *Marginal Land Holders* had a *Low* (40.74%), *Moderate* (32.59%), and *High* (26.66%) *Level of Knowledge Acquired*; the *Medium* Land Holders had a *Moderate* (40.84%), *High* (31.69%), and *Low* (27.46%) *Level of Knowledge Acquired*; *Large* Land

Holders had a *High* (37.30%), *Low* (32.53%), and *Moderate* (30.15%) *Level of Knowledge Acquired*.

The $\chi 2$ test results showed that for (BA), $\chi 2$ (4, N= 403) = 4.411, p= .353, and for (KA), $\chi 2$ (4, N= 403) = 8.477, p= .076. Given that the calculated P values for *Level of Beneficiary Awareness* (LBA) and *Level of Knowledge Acquired* (LKA) are .353 and .076 respectively, which are both greater than the significance level of 0.05, we cannot establish sufficient statistical evidence to support the existence of a significant association between the *Level of Beneficiary Awareness* (LBA) and *Level of Knowledge Acquired* (LKA) with *Size of Land*. The findings are in line with the findings of ***Satya & Depak (2008); Tomar et. al. (2016)***.

The association between the variables was statistically significant, as indicated by the $\chi 2$ (4, N= 403) = 12.259, p= .016 for (LTA). Given that the calculated P value of 0.016 for *Level of Technology Adoption* (LTA) is below the threshold of 0.05, we have sufficient statistical evidence to establish a significant association between the *Level of Technology Adoption* (LTA) and *Size of Land*. The results are consistent with the studies conducted by ***Lemma, Mitiku, & Gitachew, (2020), Matto (2017), Sirin, Sheela, & P., (2022), Jakkawad, Sawant, & Lomte, (2017), Gonshetwad B.M., (2016). Tomar A., (2016).***

### *4.3.2 (c). Socio-Economic Factor: Annual Income*

Annual income is the basis for socioeconomic level or living conditions and so greatly affects human decision-making processes. It directly affects farming households' capability to resist economic instability, their capacity to invest in agricultural inputs, and their livelihoods. Farmers' income levels directly determine their purchasing power, which in turn influences their capacity to obtain necessary resources including seeds,

fertilizers, machinery, and other inputs that are fundamental for improving production and sustainability in agriculture, ***Ellis (2000)***. By including annual income as a socioeconomic component, researchers can better grasp the economic feasibility of farming, the welfare of rural people, and the wider ramifications for rural development policies. Therefore, the study further intends to check the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) in association with the Annual Income of Respondents.

Based on the Beneficiaries' *Annual Income*, the *Low* Annual Income group had a *Low* (47.51%), *Moderate* (32.04%), and *High* (20.44%) *Level of Beneficiary Awareness*. The *Middle*-Income Group had a *Moderate* (44.00%), *High* (36.00%), and *Low* (20.00%) *Level of Beneficiary Awareness* and the *Upper-Class* Income Group had a *High* (47.54%), *Moderate* (28.68%), and *Low* (23.77%) *Level of Beneficiary Awareness*.

The *Level of Technology Adoption* of the Beneficiaries based on the *Annual Income*, categorized as *Low* (n=181), *Middle* (n=100) and *Upper Class* (n=122) was mapped. The *Low* Annual Income group had a *Low* (47.51%), *Moderate* (32.04%), and *High* (20.44%) *Level of Technology Adoption*; the *Middle*-Income Group had a *Moderate* (44.00%), *High* (36.00%), and *Low* (20.00%) *Level of Technology Adoption*; *Upper-Class* Income Group had a *High* (47.54%), *Moderate* (28.68%), and *Low* (23.77%) *Level of Technology Adoption*.

The *Level of Knowledge Acquired* by the Beneficiaries based on the *Annual Income*, categorized as *Low* (n=181), *Middle* (n=100) and *Upper Class* (n=122) was mapped. The *Low* Annual Income group had a *Low* (48.06%), *Moderate* (29.28%), and *High* (22.65%) *Level of Knowledge Acquired*; the *Middle*-Income Group had a *Moderate* (42.00%), *High* (34.00%), and *Low* (24.00%) *Level of Knowledge Acquired*; *Upper-*

*Class* Income Group had a *High* (43.44%), *Moderate* (36.88%), and *Low* (19.67%) *Level of Knowledge Acquired*.

The analysis found significant associations among the variables. The chi-square test results were as follows: $\chi 2$ (4, N/= 403) = 27.471, p= .000 for (BA), $\chi 2$ (4, N= 403) = 40.620, p= .000 for (TA), and $\chi 2$ (4, N= 403) = 34.481, p= .000 for (KA). Given that the derived P-values for *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) are all less than 0.05, we have sufficient statistical evidence to establish a significant association between the levels of LBA, LTA, and LKA with Annual Income. The results are consistent with the studies conducted by ***Lemma, Mitiku, & Gitachew, (2020), Sirin et. al. (2022), Jakkawad, Sawant, & Lomte, (2017).***

### 4.3.3 The *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), and *Knowledge Acquired Score* (KAS) in relation to *Information Seeking Behaviour Score* and *Social Participation Behaviour Score*

The process by which people search for knowledge and apply it to finish their given tasks is known as information-seeking behavior. People need knowledge anywhere they live, ***Tubachi (2018)***. Modern information and communication technologies considered technological triumphs may have significant consequences in rural areas. They help farmers' expertise to be shared, information to be distributed, their participation in other kinds of activities to be encouraged, and so on. ***Kumar and Jahanara (2023)***. The influence of social participation on farmers' adoption behavior and decision-making in the future agricultural service promotion process is becoming progressively important in order to support sustainable agricultural development, ***Zhang et. al., (2023)***. Thus, the study further aims to assess the Beneficiary Awareness Score (BAS), Technology Adoption Score (TAS), and Knowledge Acquired Score (KAS) in relation to *Information Seeking Behaviour Score* and *Social Participation Behaviour Score*.

The following hypotheses are framed for the study:

*$H_{4.8}$: A positive relationship exists between Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS), Voluntary Social Participation Behaviour Score (VSPBS), Focused Social Participator Behaviour Score (FSPBS), Overall Social Participation Behaviour Score (OSPB) and Beneficiary Awareness Score (BAS).*

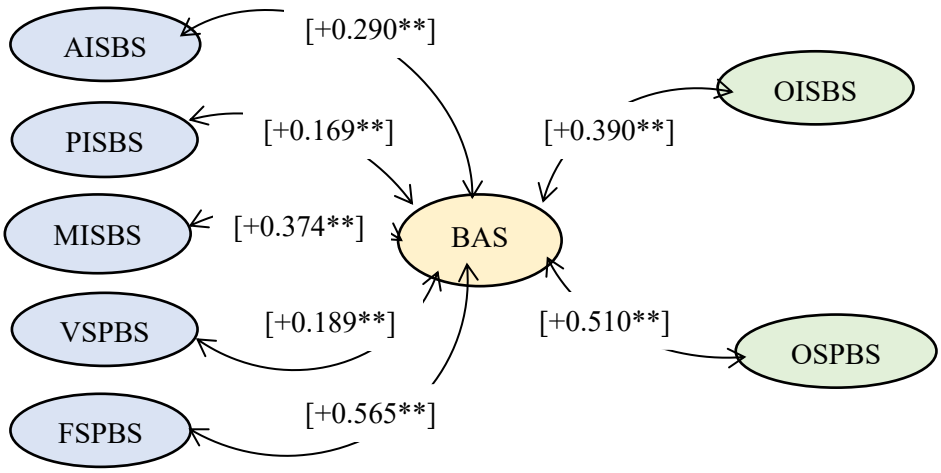
*$H_{4.9}$: A positive relationship exists between Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS), Voluntary Social Participation Behaviour Score (VSPBS), Focused Social Participation Behaviour Score (FSPBS), Overall Social Participation Behaviour Score (OSPBS) and Technology Adoption Score (TAS).*

*$H_{4.10}$: A positive relationship exists between Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS), Voluntary Social Participation Behaviour Score (VSPBS), Focused Social Participation Behaviour Score (FSPBS), Overall Social Participation Behaviour Score (OSPBS) and Knowledge Acquired Score (KAS).*

#### *4.3.3 (a). BAS on Relationship ISBS and SPBS*

The relationship between *Beneficiary Awareness Score* (BAS) and the following variables: *Authenticated Information Seeking Behaviour Score* (AISBS), *Public Information Seeking Behaviour Score* (PISBS), *Media Information Seeking Behaviour* Score (MISBS), *Overall Information Seeking Behaviour* (OISBS), *Voluntary Social Participation Behaviour* (VSPBS), *Focused Social Participation Behaviour Score* (FSPBS), and *Overall Social Participation Behaviour Score* (OSPBS).

*Figure No. 4.1:* **Inter- Relationship between Information Seeking Behaviour and Social Participation Behaviour with Beneficiary Awareness**



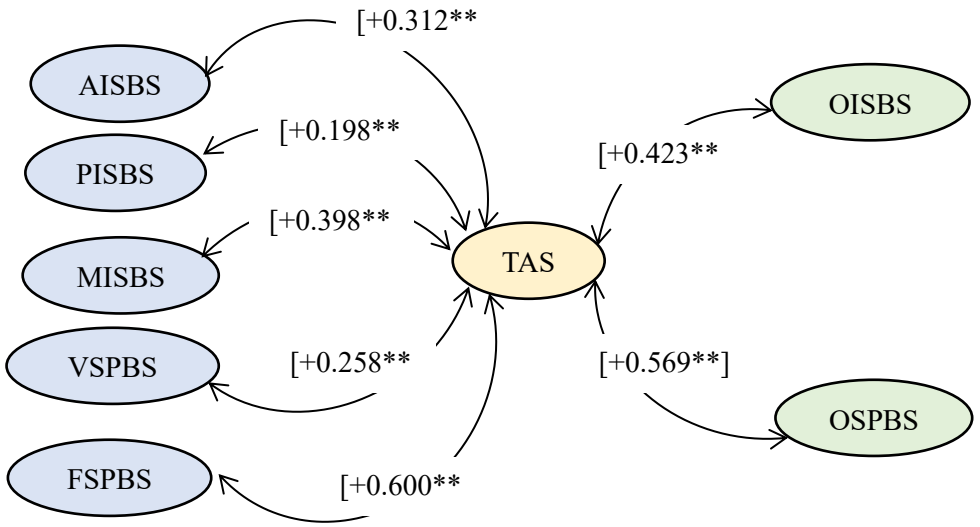

*Source: Computed by the Researcher*
**OISB**: *Overall Information Seeking Behaviour*; **AISBS**: *Authenticated Information Seeking Behaviour Score***; PISBS**: *Public Information Seeking Behaviour Score*; **MISBS**: *Media Information Seeking Behaviour Score*; **OSPBS**: *Overall Social Participation Behaviour Score*; **VSPBS**: *Voluntary Social Participation Score*; **FSPBS**: *Focused Social Participation Score*; **BAS**: *Beneficiary Awareness Score*

*Figure No. 4.1* reveals that there is a weak positive correlation $r(401) = [+0.390^{***}]$, p = [0.001]between OISBS and BAS, AISBS and BAS $r(401) = [+0.290^{***}]$, p = [0.001], and MISBS and BAS $r(401) = [+0.374^{***}]$, p = [0.001]. Additionally, there is a very weak positive correlation between PISBS and BAS $r(401) = [+0.169^{***}]$, p = [0.001], VSPBS and BAS $r(401) = [+0.1891^{***}]$, p = [0.001], and a moderate positive correlation between OSPBS and BAS $r(401) = [+0.510^{***}]$, p = [0.001], FSPBS and BAS $r(401) = [+0.565^{***}]$, p = [0.001].

### *4.3.3 (b). TAS on Relationship ISBS and SPBS*

The relationship between *Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS), Voluntary Social Participation Behaviour Score (VSPBS), Focused Social Participation Behaviour Score (FSPBS), and Overall Social Participation Behaviour Score (OSPBS) with Technology Adoption Score (TAS).*

*Figure No. 4.2:* **Inter-Relationship Relation between Information Seeking Behaviour and Social Participation Behaviour with Technology Adoption**




*Source: Computed by the Researcher*
**OISB**: *Overall Information Seeking Behaviour*; **AISBS**: *Authenticated Information Seeking Behaviour Score***; PISBS**: *Public Information Seeking Behaviour Score*; **MISBS**: *Media Information Seeking Behaviour Score*; **OSPBS**: *Overall Social Participation Behaviour Score*; **VSPBS**: *Voluntary Social Participation Score*; **FSPBS**: *Focused Social Participation Score*; **TAS**: *Technology Adoption Score*

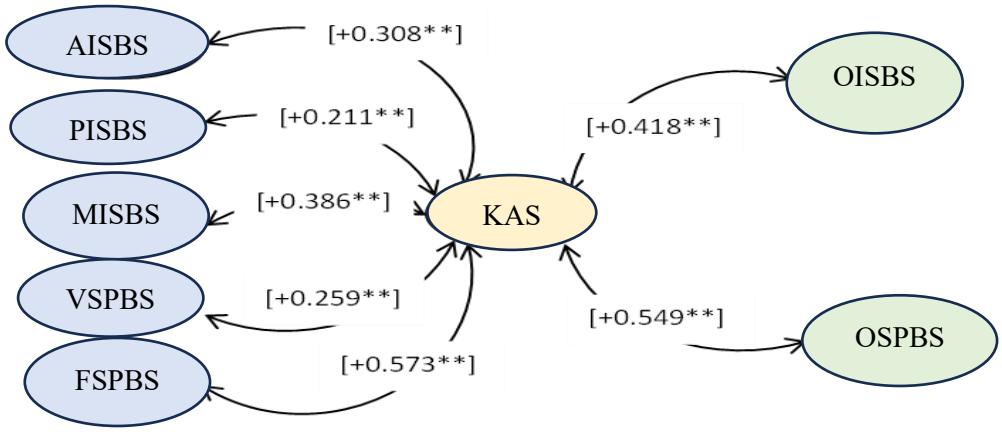
*Figure No. 4.2* reveals that there is a moderate positive correlation *r(401)* = [+0.423$^{***}$], p = [0.001] between OISBS and TAS, OSPBS and TAS *r(401)* = [+0.569$^{***}$], p = [0.001]. Additionally, there is a weak positive correlation between AISBS and TAS *r(401)* = [+0.312$^{***}$], p = [0.001], MISBS and TAS *r(401)* = [+0.398$^{***}$], p = [0.001], and VSPBS and TAS *r(401)* = [+0.258$^{***}$], p = [0.001]. Furthermore, there is a very weak positive correlation between PISBS and TAS *r(401)* = [+0.198$^{***}$], p = [0.001], and a fairly strong positive correlation between FSPBS and TAS *r(401)* = [+0.600$^{***}$], p = [0.001].

### *4.3.3 (c). KAS on Relationship ISBS and SPBS*

The relationship between*, Authenticated Information Seeking Behaviour Score (AISBS), Public Information Seeking Behaviour Score (PISBS), Media Information Seeking Behaviour Score (MISBS), Overall Information Seeking Behaviour Score (OISBS), Voluntary Social Participation Behaviour Score (VSPBS), Focused Social*

*Participation Behaviour Score (FSPBS), and Overall Social Participation Behaviour Score (OSPBS) with Knowledge Acquired Score (KAS).*

*Figure No. 4.3:* **Inter-Relationship between Information Seeking Behaviour and Social Participation Behaviour with Knowledge Acquired**




*Source: Computed by the Researcher*
**OISB**: *Overall Information Seeking Behaviour*; **AISBS**: *Authenticated Information Seeking Behaviour Score*; **PISBS**: *Public Information Seeking Behaviour Score*; **MISBS**: *Media Information Seeking Behaviour Score*; **OSPBS**: *Overall Social Participation Behaviour Score*; **VSPBS**: *Voluntary Social Participation Score*; **FSPBS**: *Focused Social Participation Score*; **KAS**: *Knowledge Acquired Score*

*Figure No. 4.3* highlighted that there is a moderate positive correlation *r(401)* = [+0.41$^{***}$], p = [0.001] between OISBS and KAS. Similarly, there is a moderate positive correlation *r(401)* = [+0.549$^{***}$], p = [0.001] between OSPBS and KAS. Additionally, there is a moderate positive correlation *r(401)* = [+0.573$^{***}$], p = [0.001] between FSPBS and KAS. On the other hand, there is a weak positive correlation *r(401)* = [+0.308$^{***}$], p = [0.001] between AISBS and KAS. Similarly, there is a weak positive correlation *r(401)* = [+0.211$^{***}$], p = [0.001] between PISBS and KAS. Furthermore, there is a weak positive correlation *r(401)* = [+0.386$^{***}$], p = [0.001] between MISBS and KAS. Lastly, there is a weak positive correlation *r(401)* = [+0.259$^{***}$], p = [0.001] between VSPBS and KAS.

### *4.3.4 The Significant Mean Difference Between the Level of Beneficiary Awareness (LBA), Based on the Overall Information Seeking Behavior Scores (OISBS), & Overall Social Participation Behavior Score (OSPBS).*

The *Authenticated Information Seeking Behaviour* (AISB) involves the beneficiaries who seek information from the official sources of ATMA like *Block Technology Manager, Assistant Technology Manager, Block Agriculture Officer, Districts Agriculture Officer, Farmers friend, FIGs/CIGs/FSGs and Agriculture coordinators; Public Information Seeking Behaviour (PISB)* involves the beneficiaries who seek information from the public sources like *Family members, Neighbours, Friends, Progressive farmers/Experienced farmers and FIG farmers; Media Information Seeking Behaviour (MISB)* involves the beneficiaries who seek information from the mass media sources like *Television, Agricultural Film Shows, Farmer Fair/ Agricultural Exhibition, Radio, Farm Literature and Newspapers*.

*Voluntary Social Participation Behaviour* involves the beneficiaries who seek information from the sources social sources like *Panchayat Samity, FIG, CIG, FSG, NGOs, and SHGs, Co-operative society, Village Level Committee and Farmers Club, Zilla Parishad; Focused Social Participation Behaviour (FSPB)* involves the beneficiaries who seek information from the confined sources like *Demo Visit/Demo in own field, Training and Meetings, Field Visit and Field Day, Exposure Visit, Exhibition and Kishan Ghosties.*

The following hypotheses are framed to the commencement of the study

$H_{4.11}$: *A significant mean rank difference exists between the Study Variables ("i.e.") Beneficiaries Awareness Score (BAS), Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the Level of Overall Information Seeking Behavior* (LOISB).

$H_{4.12}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge*

*Acquired Score* (KAS), *and the Level of Authenticated Information Seeking Behaviour* (LAISB).

$H_{4.13}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the Level of Public Information Seeking Behaviour* (LPISB).

$H_{4.14}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the Level of Media Information Seeking Behaviour* (LMISB).

$H_{4.15}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the Level of Overall Social Participation Behavior* (LOSPB).

$H_{4.16}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the level of Voluntary Social Participation Behaviour (LVSPB*).

$H_{4.17}$: *A significant mean rank difference exists between the Study Variables ("i.e.,") Beneficiaries Awareness Score, Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS), *and the level of Focused Social Participation Behaviour* (LFSPB).

The researcher then endeavours to verify the assumptions of the normality test for the different scores. The normality test indicated that the data does not follow a normal distribution. Consequently, the researcher employed the appropriate non-parametric tests, namely the *Mann Whitney Test U-Test* (*for two independent groups*), *Kruskal Wallis test* (for three independent groups), and *Dunn-Bonferroni Post Hoc Test of hypothesis*, to demonstrate the statistically significant difference.

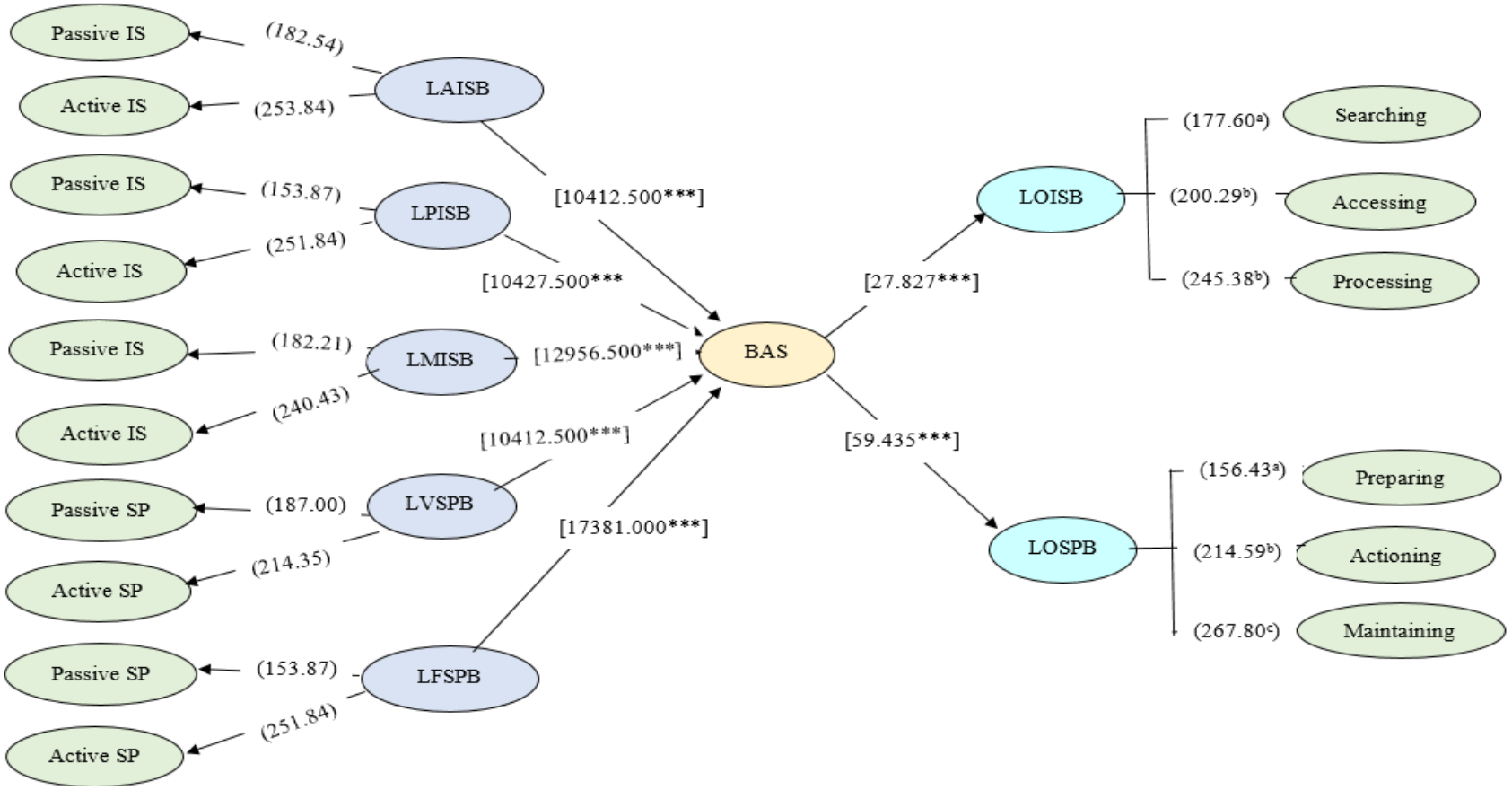
The researcher finally accomplished a research question (4) by cross-tabulating the *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), and

*Knowledge Acquired Score (*KAS) based on different dimensions of *Information Seeking Behaviour* (ISB), and *Social Participation Behaviour* (SPB).

A *Kruskal-Wallis* test was used to assess if there is a statistically significant difference in the mean ranks between *Beneficiary Awareness Score* (BAS) and *Level of Overall Information Seeking Behavior* (LOISB), as well as between *Beneficiary Awareness Score* (BAS) and *Level of Overall Social Participation Behavior* (LOSPB). The results indicate a significant difference in mean ranks between BAS and LOISB, (H (2) = 27.827, p = .000) and between BAS and LOSPB, (H (2) = 59.435, p = .000).

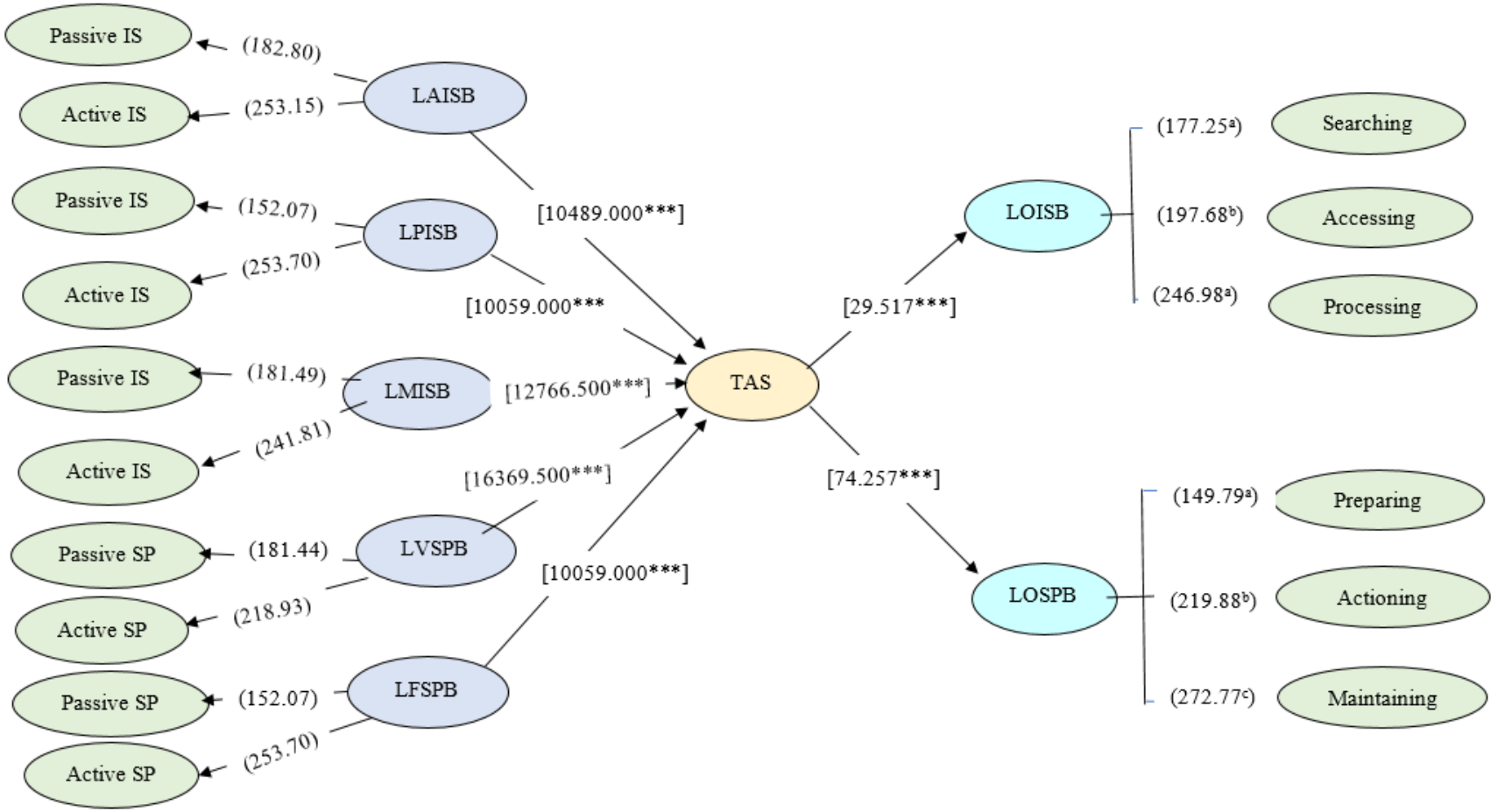
A *Mann-Whitney U-Test* was performed to assess if there is a statistically significant difference in the mean ranks between the *Levels of Authenticated Information Seeking Behaviour* (LAISB) and *Beneficiary Awareness Score* (BAS), *Level of Public Information Seeking Behaviour* (LPISB) and *Beneficiary Awareness Score* (BAS), *Level of Media Information Seeking Behaviour* (LMISB) and *Beneficiary Awareness Score* (BAS), *Level of Voluntary Social Participation Behaviour* (LVSPB) and *Beneficiary Awareness Score* (BAS), *Level of Focused Social Participation Behaviour* (LFSPB) and *Beneficiary Awareness Score* (BAS).

*Figure No. 4.4:* **The Measurement of the Level of Beneficiary Awareness (BA) and Analysis of the Statistically Significant Mean Rank Difference based on the Information Seeking Behavior (ISB) & Social Participation Behavior (SPB) of the Respondents**



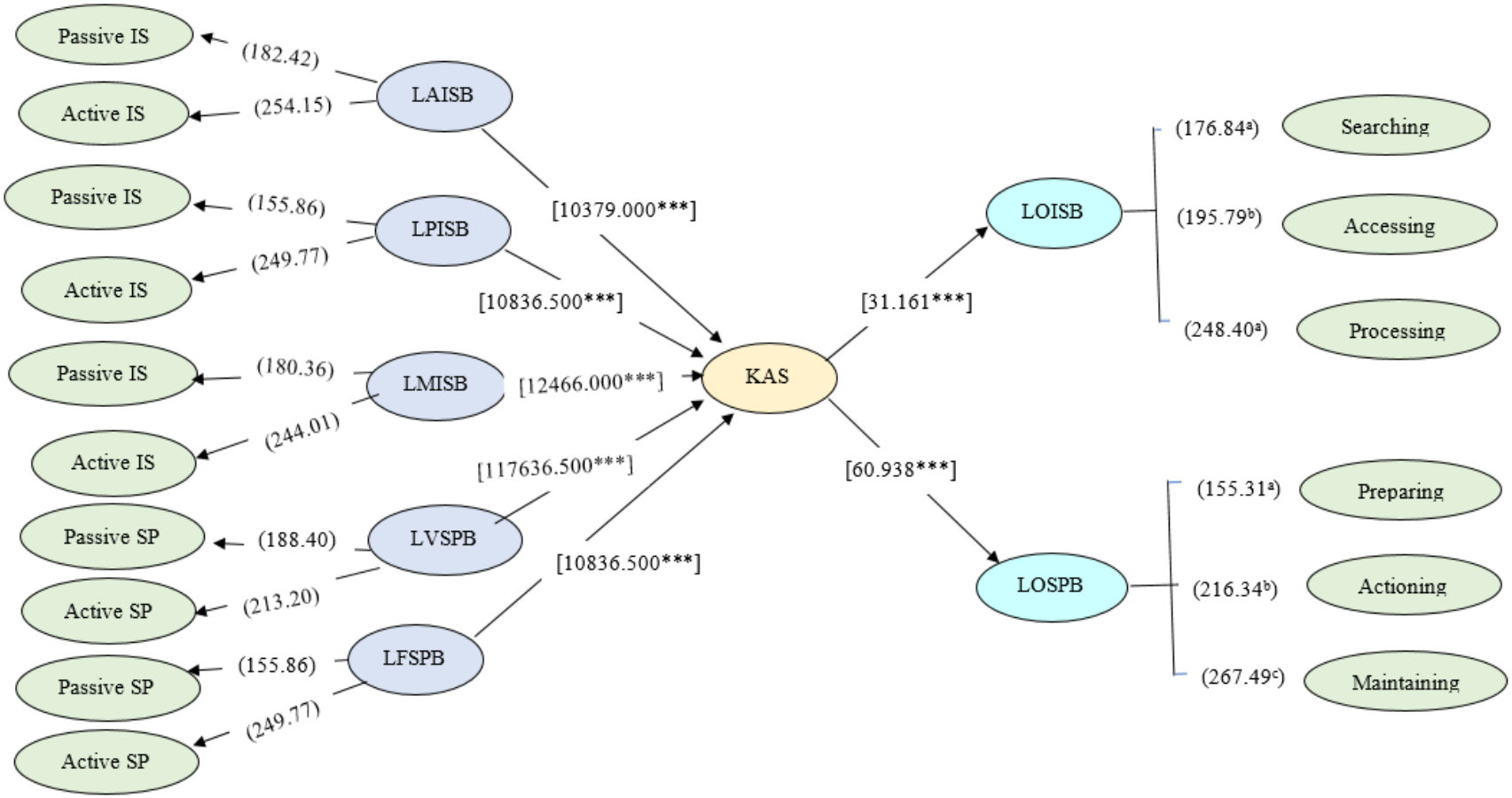

*Source: Computed & Designed by the researcher |* ***LOISB****: Level of Overall Information Seeking Behaviour;* ***LAIS****: Level of Authenticated Information Seeking Behaviour****; LPISB****: Level of Public Information Seeking Behaviour;* ***LMISB:*** *Level of Media Information Seeking Behaviour;* ***LOSPB****: Level of Overall Social Participation Behaviour;* ***LVSPB****: Level of Voluntary Social Participation Behaviour;* ***LFSPB****: Level of Focused Social Participation Behaviour;* ***BAS****: Beneficiary Awareness Score;* ***Passive IS****: Passive Information Seeker;* ***Active IS****: Active Information Seeker;* ***Passive SP****: Passive Social Participator;* ***Active SP****: Active Social Participator;* ***(values)****-Mean Rank Values;* ***[values]****: Test Statistics Value, Note: The letter "a" on the top of values represents the Level denotes the same group. Similarly, the letters "b" and "c" represent the Level denote the different group*

*Figure No. 4.5:* **The Measurement of the Level of Technology Adoption (TA) and Analysis of the Statistically Significant Mean Rank Difference based on the Information Seeking Behavior (ISB) & Social Participation Behavior (SPB) of the Respondents**




*Source: Computed & Designed by the researcher | **LOISB**: Level of Overall Information Seeking Behaviour; **LAIS**: Level of Authenticated Information Seeking Behaviour**; LPISB**: Level of Public Information Seeking Behaviour; **LMISB:** Level of Media Information Seeking Behaviour; **LOSPB**: Level of Overall Social Participation Behaviour; **LVSPB**: Level of Voluntary Social Participation Behaviour; **LFSPB**: Level of Focused Social Participation Behaviour; **TAS**: Technology Adoption Score; **Passive IS**: Passive Information Seeker; **Active IS**: Active Information Seeker; **Passive SP**: Passive Social Participator; **Active SP**: Active Social Participator; **(values)**-Mean Rank Values; **[values]**: Test Statistics Value, Note: The letter "a" on the top of values represents the Level denotes the same group. Similarly, the letters "b" and "c" represent the Level denote the different group*

*Figure No. 4.6:* **The Measurement of the Level of Knowledge Acquired (KA) and Analysis of the Statistically Significant Mean Rank Difference based on the Information Seeking Behavior (ISB) & Social Participation Behavior (SPB) of the Respondents**




*Source: Computed & Designed by the researcher* ***LOISB****: Level of Overall Information Seeking Behaviour;* ***LAIS****: Level of Authenticated Information Seeking Behaviour****; LPISB****: Level of Public Information Seeking Behaviour;* ***LMISB:*** *Level of Media Information Seeking Behaviour;* ***LOSPB****: Level of Overall Social Participation Behaviour;* ***LVSPB****: Level of Voluntary Social Participation Behaviour;* ***LFSPB****: Level of Focused Social Participation Behaviour;* ***KAS****: Knowledge Acquired Score;* ***Passive IS****: Passive Information Seeker;* ***Active IS****: Active Information Seeker;* ***Passive SP****: Passive Social Participator;* ***Active SP****: Active Social Participator;* ***(values)****-Mean Rank Values;* ***[values]****: Test Statistics Value, Note: The letter "a" on the top of values represents the Level denotes the same group. Similarly, the letters "b" and "c" represent the Level denote the different group*

The analysis shows that there is a significant difference in the mean ranks between the variables LAISB and BAS (U=10412.500, p=.000), LPISB and BAS (U=10427.500, p=.000), LMISB and BAS (U=12956.500, p=.000), LVSPB and BAS (U=17381.000, p=.019), and LFSPB and BAS (U=10427.500, p=.000).

The significant mean difference of the *Technology Adoption Score* (TAS), based on the *Level of Overall Information Seeking Behavior* (LOISB), *Levels of Authenticated Information Seeking Behaviour* (LAISB), *Public Information Seeking Behaviour* (LPISB), *Media Information Seeking Behaviour* (LMISB) and *Overall Social Participation Behavior* (LOSPB), *Voluntary Social Participation Behaviour* (LVSPB), *Focused Social Participation Behaviour* (LFSPB) is assessed.

A *Kruskal-Wallis* test was used to assess if there is a significant difference in the mean rank between *Technology Adoption Score* (TAS) and *Levels of Overall Information Seeking Behaviour* (LOISB), *Technology Adoption Score* (TAS), and *Overall Social Participation Behaviour* (LOSPB). Figure No. 5 shows that there is a significant difference in the mean ranks between TAS and LOISB, H (2) = 29.517, p= .000. Similarly, there is a significant difference in mean ranks between TAS and LOSPB, H (2) = 74.257, p= .000.

A *Mann-Whitney U-Test* was performed to ascertain if there is a statistically significant difference in mean ranks between the following variables: *Levels of Authenticated Information Seeking Behaviour* (LAISB) and *Technology Adoption Score* (TAS), *Public Information Seeking Behaviour* (LPISB) and *Technology Adoption Score* (TAS), *Media Information Seeking Behaviour* (LMISB) and *Technology Adoption Score* (TAS), *Voluntary Social Participation Behaviour* (LVSPB) and *Technology Adoption Score* (TAS), *Focused Social Participation Behaviour* (LFSPB) and *Technology Adoption Score* (TAS). The analysis shows that there is a significant difference in the mean ranks

between the variables LAISB and TAS (U=10489.000, p=.000), LPISB and TAS (U=10059.000, p=.000), LMISB and TAS (U=12766.500, p=.000), LVSPB and TAS (U=16369.500, p=.001), and LFSPB and TAS (U=10059.000, p=.000).

The significant mean difference between the *Knowledge Acquired Score* (KAS), based on the *Levels of Overall Information Seeking Behaviour* (LOISB), *Levels of* Authenticated Information Seeking Behaviour (LAISB), *Levels of Public Information Seeking Behaviour* (LPISB), *Levels of Media Information Seeking Behaviour* (LMISB) & *Levels of* Overall Social Participation Behavior (LOSPB), *Levels of Voluntary Social Participation Behaviour* (LVSPB), *Levels of Focused Social Participation Behaviour* (LFSPB) is assessed.

A *Kruskal - Wallis test* was used to assess if there is a statistically significant difference in the mean ranks between *Knowledge Acquired Score* (KAS) and *Levels of Overall Information Seeking Behaviour* (LOISB), as well as between *Knowledge Acquired Score (KAS)* and the *Levels of Overall Social Participation Behaviour* (LOSPB). The results indicate a significant difference in mean ranks between KAS and LOISB, (H (2) = 31.161, p = .000), as well as between KAS and LOSPB, (H (2) = 60.938, p = .000).

A *Mann-Whitney U-Test* was performed to assess if there is a statistically significant difference in the mean ranks between *Levels of Authenticated Information Seeking Behaviour* (LAISB) and *Knowledge Acquired Score* (KAS), *Levels of Public Information Seeking Behaviour* (LPISB) and *Knowledge Acquired Score* (KAS), *Levels of Media Information Seeking Behaviour* (LMISB) and *Knowledge Acquired Score* (KAS), *Levels of Voluntary Social Participation Behaviour* (LVSPB) and *Knowledge Acquired Score (KAS)*, *Levels of Focused Social Participation Behaviour (LFSPB)* and *Knowledge Acquired Score* (KAS). The analysis reveals that there is a significant difference in the mean ranks between the variables LAISB and KAS (U=10379.000,

p=.000), LPISB and KAS (U=10836.500, p=.000), LMISB and KAS (U=12466.000, p=.000), LVSPB and KAS (U=17636.500, p=.033), and LFSPB and KAS (U=10836.500, p=.000).

## 4.4 CONCLUSION

The significant associations observed between the *Demographic and Socio-Economic Profile* and the study variables provide a clear direction for refining agricultural extension services. By addressing the diverse needs of beneficiaries based on *Gender, Annual Income, Districts, Type of Family, and Size of Land*, the effectiveness of programs like ATMA can be enhanced, ultimately contributing to more inclusive and sustainable agricultural development.

The positive correlations and significant mean rank differences identified in this study emphasize the crucial role of *Information-Seeking Behaviour & Social Participation Bahaviour* in influencing *Beneficiary Awareness, Technology Adoption, and Knowledge Acquired*. By leveraging these insights, stakeholders can draft more effective strategies to empower individuals and communities, ultimately fostering a more informed, technologically adept, and knowledgeable society.

Further, the next chapter additionally groups the beneficiaries based on the *Beneficiary Awareness Score*, *Technology Adoption Score*, and *Knowledge Acquired Score*, into various *Clusters* and checks the association and relationship with the *Demographic and Socio-Economic Profile & Information Seeking, and Social Participation Behaviour*. This will provide a clear picture of the status of the beneficiaries' *Competencies Acquired*.

# Chapter – V

# Measurement Of Competency Score (CS) and Level of Expertise Mapping Through Manual & Machine (Cluster) Based Classification

# CHAPTER – 5

# MEASUREMENT OF *COMPETENCY SCORE* (CS) AND LEVEL OF EXPERTISE MAPPING THROUGH MANUAL & MACHINE (*CLUSTER*) BASED CLASSIFICATION

## 5.1 BACKGROUND OF THE STUDY

Agriculture and Allied sectors currently contribute 18.3% to India's GDP (2022-23) ***IBEF, (2024)***. Between 2014 and 2023, the States/UTs (including MANAGE) received a total of Rs. 5189.08 crore (Central Share) to facilitate extension activities. The Scheme's varied extension programs have empowered 3,66,10,873 producers to benefit from these initiatives. In the fiscal year 2013-14, the Ministry of Agriculture and Farmers' Welfare allocated Rs. 27,662.67 crore to its budget. In the 2023-24 fiscal year, this amount has surged more than fivefold to Rs. 1,25,035.79 crore. Consequently, the Gross Value Added (GVA) of the Agriculture and Allied Sector has grown at an annual rate of 4.4 percent over the past seven years, ***Increase in Income of Farmers, (2024)***.

Under the centrally financed project, ATMA (Agricultural Technology Management Agency), the Indian government sought to increase farmers' output and income by arming them with necessary technology, information and knowledge, so advancing sustainable agriculture. The initiative also seeks to encourage cooperation among several entities engaged in agricultural development, including farmer groups, research and extension agencies, NGOs, and input dealers so fostering convergence. By giving farmers access to modern technologies and expertise, thereby boosting their self-reliance, the ATMA project is expected to help the Indian agriculture sector to undergo a revolution. ***Jangde et. al., (2024)***.

The expansion and viability of Indian agriculture depend critically on the Agricultural Technology Management Agency (ATMA). By means of its contributions to

agricultural expansion, rural development, self-reliance, and agricultural expertise, ATMA's vital part in India's economic strategy is amply illustrated

The significance of the present study resides in the emergence of ATMA as a vital collaborator in the sectors of social and rural development. Therefore, the transfer of technology through ATMA with government assistance provides a unique and novel way for the growth of the rural and agricultural sectors. Thus, it is hypothesized that this study significantly contributes to assessing the extent of the level of *Beneficiary Awareness, Technology Adoption and Knowledge Acquired* in the process of building competencies of an individual. Further, it segregates the beneficiaries into clusters of Novice, Proficient, and Expert which will help to understand the status of the beneficiaries who benefitted through this scheme.

The study suggests corrective measures and guidelines to ATMA, NGOs, KVKs, administrators, researchers, extension personnel and planners, in their respective roles. This may include making modifications to training programs restructuring course content to align with the needs of the programs, and enhancing training methodologies to be more practical and skill-oriented. It is beneficial to comprehend the farmers' awareness, adoption, and expertise of the various innovative interventions of ATMA. Additionally, it sheds light on their knowledge regarding the operations of ATMA.

The majority of the research maps either the level of awareness, the use of technology, or the Acquired of knowledge of the ATMA Beneficiaries. The consecutive advancement of *Beneficiary Awareness, Technology Adoption* and *Knowledge Acquired* results in the enhancement of an individual's skills and abilities which facilitates to competency building of an individual. Every aspect of the sequence has not been investigated in every research effort. Furthermore, it is worth noting that there has been

no investigation of the Beneficiaries Competencies Cluster Analysis. There is a lack of studies that consider the cluster analysis of the beneficiaries based on their *Demographic & Socio-Economic Status and Information Seeking & Social Participation Behaviour*.

## 5.2 RESEARCH QUESTIONS

1. Is there any association between the *Manual and Machine* (i.e. *Cluster Analysis*) *Based Classification* of Beneficiaries' *Level of Expertise* (i.e. *Novice, Proficient & Expert*) on the basis of the *Demographic and Socio-Economic Profile* of the ATMA Beneficiaries?

2. Is there any association between the *Manual and Machine* (i.e. Cluster Analysis) *Based Classification* of Beneficiaries' *Level of Expertise* (i.e. *Novice, Proficient & Expert*) on the basis of various dimensions of *Information-Seeking Behaviour* (ISB) and *Social Participation Behaviour* (SPB) of the ATMA Beneficiaries?

## 5.3 METHOD OF ANALYSIS

### 5.3.1 Conceptual Model of the Study

The *Competency Scores* are measured and developed based on the summative scores of *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS) and *Knowledge Acquired Score* (KAS). Further the *Competency Score* is categorized into the *Level of Expertise* (*i.e., Novice, Proficient, and Expert*). The conceptual model that the researcher developed to address the aforementioned research questions was based on the *Manual and Machine* (Cluster Analysis) *Based Classification*. This model served as the basis for the study being conducted. A detailed explanation has been given in the *Figure No. 3.2 p 58*.

### 5.3.2 Study Variable Description

The ATMA beneficiaries' *Level of Expertise* was measured with the help of the *Competency Score* (CS). The CS is a summative score of the three elements of *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS) and *Knowledge Acquired Score* (KAS). The detailed computation is graphically exhibited in the (*Figure No. 3.2 p 58*.). Furthermore, the *Level of Expertise* is determined in two ways i.e., the *Manual Classification* and the *Machine Based (Cluster) Classification*. The *Manual Classification* is done based on the $K^{th}$ *percentile* of the frequency sample distribution into three-level equal proportionate distribution (i.e. $33^{rd}$ percentile) techniques in the visual binning process of IBM SPSS.

Whereas the *Machine based Cluster Classification* is performed by *Two-Step Cluster Analysis* in IMP SPSS by using the *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), and *Knowledge Acquired Score* (KAS) along with *Gender* and *Level of Income* from the *Demographic & Socio-Economic profile* as an input variable to segment the ATMA beneficiaries into the different clusters based on their *Level of Expertise*.

### 5.3.3 Tools for Analysis

The collected primary data was coded and entered into MS Excel for basic data cleaning and the calculated summative scores of *BAS, TAS and KAS* computed the *Competency Score* (CS) of the Beneficiaries.

The *Competencies Scores* (CS) are converted into the three levels of ordered categories (*i.e., Novice, Proficient, and Expert*) and these categorizations are constructed based on the *Level of Expertise*, that the beneficiaries possess. The *Level of Expertise* is determined in two ways i.e., the *Manual Classification* and the *Machine Cluster*

*Classification*. The *Manual Classification* is done based on the $K^{th}$ *percentile* of the frequency sample distribution into three-level equal proportionate distribution (i.e. 33rd percentile) techniques in the visual binning process of IBM SPSS.

The *Machine Cluster Classification* is performed by *Two-Step Cluster Analysis* in IBM SPSS. However, *Machine Based* (*i.e. Cluster Analysis*) *Classification* is used to classify the whole beneficiary based on *Gender, Income, Beneficiary Awareness Score, Technology Adoption Score and Knowledge Acquired Score* into the three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*). The Profiling of the *Manual Classification* is done as follows:

*Table No.5.1:* **Profiling of the Manual Classification**

| **Demographic Socio -Economic Profile** | ***Group # 1*** | ***Group # 2*** | ***Group # 3*** | ***Total Sample*** |
|---|---|---|---|---|
| | **Novice** | **Proficient** | **Expert** | |
| **Group Membership** | 136 (33.74%) | 134 (33.25%) | 133 (33.00%) | 403 (100%) |
| **Age** | *Middle Age & Young Adults Age* (69.2%)# | *Old Age & Young Adults Age* (71.6%)# | *Young Adults Age* (33.8%) | *Young Adults Age* (34.7%) |
| **Gender** | *Female* (52.9%) | *Male* (53.0%) | *Male* (67.7%) | *Male* (55.8%) |
| **District** | *Gangtok & Namchi* (42.6%) | *Namchi* (27.6%) | *Namchi* (28.6%) | *Namchi* (25.8%) |
| **Family Type** | *Joint & Nuclear* (100%) | *Joint* (64.9%) | *Joint* (62.4%) | *Joint* (59.1%) |
| **Educational Status** | *Middle School & Above* (70.6%) | *Middle School & Above* (63.4%) | *Middle School & Above* (75.9%) | *Middle School & Above* (70%) |
| **Size of Land** | *Marginal* (36.8%) | *Medium* (38.8%) | *Medium* (37.6%) | *Medium* (35.2%) |
| **Income Group** | *Low Inc.* (64.0%) | *Low Inc.* (38.1%) | *Upper Inc.* (39.8%) | *Low Inc.* (44.9%) |

*Source: Computed and Compiled by the Researcher*
*Note: # Representation from each group is equally proportionate.*

*Table No. 5.1* depicts the data profiling of the *Manual Classification* of the respective sample beneficiaries and their *Demographic and Socio-Economic Profile (Age, Gender, District, Family Type, Educational Status, Size of Land and Income Group)* dominance.

The basic nature of the first group (*Group #1*) is that the majority of the members (i.e. 69.2% of 136 beneficiaries) belong to the *Young Adults* and *Middle Age* Group having a low-income (i.e. < Rs. 1 Lakh) (64%). Among 136 beneficiaries, 52.9% of beneficiaries are *Female* of the *Gangtok* and *Namchi* District. They are from the *Joint* and *Nuclear* Family Type (100%) having a *Marginal* size of land (36.8%). Their *Level of Education* is *Middle School and Above* (70.6%).

The second group (*Group #2*) is characterized by the fact that the majority of the members (71.6% of 134 beneficiaries) are from the *Young Adults* and *Elder* Age Group with a *Low* Income (less than Rs. 1 Lakh) (38.1%). Among the 134 beneficiaries, 53.0% are *Male* from the *Namchi* District (27.6%). They belong to the *Joint Family Type* (64.9%) with a *Medium* land size (38.8%). Their level of *Education* is *Middle School and Above* (63.4%).

The third group (*Group #3*) is fundamentally characterized by the fact that the majority of the members (*i.e., 33.8% of 133 beneficiaries*) are from the *Young Adults*, belonging to *Upper Class* Group (i.e., < Rs. 1 Lakh) (41.5%). Additionally, 67.7% of the 133 beneficiaries are *Male* and reside in the *Namchi* District (28.6%). They belong to the *Joint Family Type* (62.4%) and possess a *Medium* Land Size (37.6%). Their level of *Education* is *Middle School and Above* (75.9%).

The *Table No. 5.2* represents the data profiling of the cluster membership of the respective sample beneficiaries, their gender majority, the income group and the mean

and range of the respective cluster members' *Beneficiaries Awareness Score* (BAS), *Technology Adoption Score* (TAS), and *Knowledge Acquired Score* (KAS).

*Table No.5.2*: **Profiling of the Cluster Members**

| **Classify Variables** | ***Cluster # 1*** | ***Cluster # 2*** | ***Cluster # 3*** | ***Total Sample*** |
|---|---|---|---|---|
| | **Novice** | **Proficient** | **Expert** | |
| **Cluster Membership** | 118 (29.28%) | 167 (41.44%) | 118 (29.28%) | 403 (100%) |
| **Gender** | Female (50.8%) | Male (52.7%) | Male (66.9%) | Male (55.8%) |
| **Income Group** | Low Inc. (64.4%) | Low Inc. (41.3%) | Upper Inc. (41.5%) | Low Inc. (44.9%) |
| **Beneficiaries Awareness Score** | 39 – 82 $\bar{x} = 67$ | 73 – 118 $\bar{x} = 85$ | 94 – 126 $\bar{x} = 114$ | 39 – 126 $\bar{x} = 88$ |
| **Technology Adoption Score** | 35 – 75 $\bar{x} = 59$ | 67 – 99 $\bar{x} = 80$ | 91 – 123 $\bar{x} = 107$ | 35 – 123 $\bar{x} = 82$ |
| **Knowledge Acquired Score** | 34 – 75 $\bar{x} = 57$ | 63 – 95 $\bar{x} = 77$ | 85 – 124 $\bar{x} = 106$ | 34 – 124 $\bar{x} = 79$ |

*Source: Computed and Compiled by the Researcher*

The basic nature of the first cluster (*Cluster # 1*) is that the majority of the members (i.e. *64.40% of 118 beneficiaries*) belong to the *Low*-income group (*i.e. < Rs. 1 Lakh*) out of 118 beneficiaries (i.e. 50.80%) of beneficiaries are *Female*. *Beneficiarry Awareness Score* ranges between 39 to 82 with a mean score of 67; the *Technology Adoption Score* ranges from 35 to 75 with a mean score of 59 whereas in the case of *Knowledge Acquired Score* between 34 to 75 with a mean of 57. All these ranges and mean scores are below the mean score of the overall sample. Therefore, this group of beneficiaries is beginning to become aware of the ATMA programme and has limited experience in adopting or trial of the technologies promoted by ATMA. Ultimately, they

acquire knowledge through ATMA and strive to disseminate it to other farmers and those in need. Therefore, this group is named "*Novice*".

The second cluster (*Cluster # 2*) is characterized by the fact that the majority of the members (*i.e. 41.3% of 167 beneficiaries*) belong to the *Low*-income group (*i.e. < Rs. 1 Lakh*) out of 167 beneficiaries (*i.e., 52.7%*) of beneficiaries are *Male*. The range of *Beneficiary Awareness Score* is between 73 to 118 with a mean score of 85 and the *Technology Adoption Score* ranges from 67 to 99 with a mean score of 80 whereas in the case of *Knowledge Acquired Score* between 63 to 95 with a mean of 77. All these ranges and mean scores are more or less equal to the mean score of the overall sample. Therefore, this group of beneficiaries is becoming good and skilled in adopting the technologies promoted by ATMA. Ultimately, they acquire knowledge through ATMA and strive to disseminate it to other farmers and those in need. Therefore, this group is named "*Proficient*".

In the third cluster (Cluster # 3) the majority of the members (i.e. 41.5% of 118 beneficiaries) belong to the *Upper-Class* group (i.e. > Rs. 1.5 Lakh) out of 118 beneficiaries (i.e., 66.9%) of beneficiaries are *Male*. *Beneficiary Awareness Score* ranges between 94 to 126 with a mean score of 114; the *Technology Adoption Score* ranges from 91 to 123 with a mean score of 107 whereas in the case of *Knowledge Acquired Score* between 85 to 124 with a mean of 106. All these ranges and mean scores are more than the mean score of the overall sample. Therefore, this group of beneficiaries is becoming extra-ordinarily capable or knowledgeable in the technologies promoted by ATMA. Ultimately, they acquired knowledge through ATMA and disseminated it to other farmers and those in need. Therefore, this group is named "*Expert*".

The *Chi-square* test and *Phi and Cramer's V* test are implemented by the researcher to confirm the significant association. Additionally, the *Confusion Matrix* was utilized to validate the cross-validation of *Manual* and *Machine Based* (*Cluster) Classification*.

*Table No. 5.3:* **Confusion Matrix Manual & Machine Based Classification of Beneficiaries Competency Score based Level of Expertise Segmentation**

| Crosstabulation of Manual & Machine Based Classification | | Competency Score (Manual) | | | Total |
|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | |
| Competency Score Machine (Cluster Analysis) Based Classification | Expert | 0 | 0 | 118 | **118** |
| | | (0.0%) | (0.0%) | (100.0%) | **100.0%** |
| | | [0.0% ] | [0.0% ] | [88.7%] | |
| | Proficient | 18 | 134 | 15 | **167** |
| | | (10.8%) | (80.2%) | (9.0%) | **100.0%** |
| | | [13.2%] | [100.0%] | [11.3%] | |
| | Novice | 118 | 0 | 0 | **118** |
| | | (100.0%) | (0.0%) | (0.0%) | **100.0%** |
| | | [86.8%] | [ 0.0%] | [ 0.0%] | |
| **Total** | | **136** | **134** | **133** | **403** |
| | | **100.0%** | **100.0%** | **100.0%** | |

*Source: Computed and Complied by the Researcher*
*Note: Parenthesis & Squared Brackets indicates the Row Total Percentage &Column Total Percentage*

The matrix suggests that *Cluster Analysis* and *Manual Classification* do not exhibit any discrepancies in their ability to predict *Expert and Novice*. Nevertheless, *Proficient* has been accurately anticipated 80.2% of the time, while 10.8% was incorrectly predicted as *Novice* and 9.0% as *Expert*. Thus, the researcher was further keen to analyse the association and relationship between both classification models based on the ***Demographic Profile*** *(i.e. age, gender, district, type of family)*, ***Socio-Economic Profile*** *(i.e. educational level, land size, annual income),* ***Level of Information Seeking Behaviour*** *(i.e. Active Information Seeker [AIS]/Passive Information Seeker [PIS])* and ***Level of Overall Social Participation Behaviour*** *(i.e., Searching/Assessing/ Processing).*

## 5.4 RESULTS AND DISCUSSIONS

### 5.4.1 The *Level of Expertise* Based on the *Manual and Machine (i.e. Cluster Analysis) Classification* and the *Demographic and Socio-Economic Profile* of the Beneficiaries

The sequential development of *Beneficiary Awareness*, *Technology Adoption*, and *Knowledge Acquired* leads to the improvement of an individual's skills and abilities, thereby enabling the development of their *Competency*. Previous research endeavor has not examined every aspect of the sequence. Additionally, it is important to mention that the *ATMA Beneficiaries Competencies Cluster Analysis* has not been examined. There is a scarcity of research that examines the Cluster Analysis of ATMA beneficiaries based on their *Demographics & Socio-Economic Profile* and *Information Seeking & social participation behaviour*. Thus, this study aims to assess the *Level of Expertise* based on the *Manual* and *Machine (i.e. Cluster Analysis)* Classification based on the *Demographic* and *Socio-Economic Profile* of the ATMA Beneficiaries.

The following Hypothesis are framed to carry out the analysis:

$H_{5.1}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Age.*

$H_{5.2}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Gender.*

$H_{5.3}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with the District.*

$H_{5.4}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Family Type.*

$H_{5.5}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Education.*

$H_{5.6}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis and with Size of the Land.*

$H_{5.7}$: *A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Annual Income.*

The researcher incorporates both **classification models** *(i.e. Manual and Machine Based Classification)* into a cross-tabulation for further analysis to understand the association between both classification models based on the **Demographic Profile** *(i.e. age, gender, district, type of family)*, **Socio-Economic Status** *(i.e. educational level, land size, annual income)*. The *Chi-square* test and *Phi and Cramer's V* test are implemented by the researcher to confirm the significant association.

### *5.4.1 (a). Demographic Factor: Age*

The study of age as a demographic variable in research is important for comprehending how different life stages influence human experiences and results, customizing treatments and formulating well-informed policies that cater to the requirements of various age groups. The world may be perceived differently by different generations as a result of cultural, technological and social changes. By researching these distinctions it is possible to modify products, services and policies to accommodate the changing demands of society. Hence, this study was undertaken to examine the association between the *Level of Expertise*, as determined by the *Manual Classification* and *Machine Based Cluster Analysis Classification* with the *Age* of the respondents.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies based on *Manual* and *Machine Based* (*Cluster) Classification*. The results were observed as per the age group they belonged i.e., Young Adults, (n =140); *Middle Age* (n=129); *Elder Age* (134).

*Table No. 5.4:* **Segmentation of Level of Expertise based on the Manual (K$^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Demographic and Socio-Economic Profile of the ATMA Beneficiaries**

| Variables | Levels | Classification of Level of Expertise Based on K$^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| Age | Young Adults Adults | 47 [33.57] | 48 [34.28] | 45 [32.14] | **140 (100) [34.73]** | 38 [27.14] | 64 [45.71] | 38 [27.14] |
| | Middle Age | 47 [36.43] | 38 [29.45] | 44 [34.10] | **129 (100) [32.00]** | 42 [32.55] | 45 [34.88] | 42 [32.55] |
| | Elder Age | 42 [31.34] | 48 [35.82] | 44 [32.83] | **134 (100) [33.25]** | 38 [28.35] | 58 [43.28] | 38 [28.35] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | 1.45$^{NS}$ | | | | 3.52$^{NS}$ | |
| Gender | Male | 64 [28.44] | 71 [31.55] | 90 [40] | **225 (100) [55.83]** | 58 [25.77] | 88 [39.11] | 79 [35.11] |
| | Female | 72 [40.44] | 63 [35.39] | 43 [24.15] | **178 (100) [44.16]** | 60 [33.70] | 79 [44.38] | 39 [21.91] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 (100) [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | 12.24*** | | | | 8.71** | |
| **Phi- Cramer's V** | | | 0.174*** | | | | 0.147** | |
| District | Gangtok | 29 [44.61] | 21 [32.30] | 15 [23.07] | **65 (100) [16.12]** | 26 [40] | 28 [43.07] | 11 [16.92] |
| | Pakyong | 15 [23.07] | 25 [38.46] | 25 [38.46] | **65 (100) [16.12]** | 13 [20] | 27 [41.53] | 25 [38.46] |
| | Gyalshing | 22 [33.84] | 21 [32.30] | 22 [33.84] | **65 (100) [16.12]** | 21 [32.30] | 27 [41.53] | 17 [26.15] |

*Table No. 5.4:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Demographic and Socio-Economic Profile of the ATMA Beneficiaries**

| Variables | Levels | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| District | Soreng | 17 [32.69] | 13 [25.00] | 22 [42.30] | **52 (100) [12.90]** | 14 [26.92] | 19 [36.53] | 19 [36.53] |
| | Namchi | 29 [27.88] | 37 [35.57] | 38 [36.53] | **104 (100) [25.80]** | 23 [22.11] | 46 [44.23] | 35 [33.65] |
| | Mangan | 24 [46.15] | 17 [32.69] | 11 [21.15] | **52 (100) [12.90]** | 21 [40.38] | 20 [38.46] | 11 [21.15] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | $16.23^{NS}$ | | | | $17.69^{NS}$ | |
| Type of Family | Joint | 68 [28.57] | 87 [36.55] | 83 [34.87] | **238 (100) [59.05]** | 58 [24.36] | 108 [45.37] | 72 [30.25] |
| | Nuclear | 68 [41.21] | 47 [28.48] | 50 [30.30] | **165 (100) [40.94]** | 60 [36.36] | 59 [35.75] | 46 [27.87] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | 7.13* | | | | 7.15* | |
| **Phi- Cramer's V** | | | 0.133* | | | | 0.133* | |
| Educational Status | Primary | 40 [33.05] | 49 [40.49] | 32 [26.44] | **121 (100) [30.02]** | 36 [29.75] | 58 [47.93] | 27 [22.31] |
| | Middle School &Above | 96 [34.04] | 85 [30.14] | 101 [35.81] | **282 (100) [69.97]** | 82 [29.07] | 109 [38.65] | 91 [32.26] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | $5.00^{NS}$ | | | | $4.63^{NS}$ | |

*Table No. 5.4:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Demographic and Socio-Economic Profile of the ATMA Beneficiaries**

| Variables | Levels | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| Size of the Land | Marginal | 50 [37.03] | 50 [37.03] | 35 [25.92] | **135 (100) [33.49]** | 43 [31.85] | 63 [46.66] | 29 [21.48] |
| | Medium | 40 [28.16] | 52 [36.61] | 50 [35.21] | **142 (100) [35.23]** | 37 [26.05] | 60 [42.25] | 45 [31.69] |
| | Large | 46 [36.50] | 32 [25.39] | 48 [38.09] | **126 (100) [31.26]** | 38 [30.15] | 44 [34.92] | 44 [34.92] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [29.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | $8.68^{NS}$ | | | | $7.50^{NS}$ | |
| Annual Income | Low | 87 [48.06] | 51 [28.17] | 43 [23.75] | **181 (100) [44.91]** | 76 [41.98] | 69 [38.12] | 36 [19.88] |
| | Middle Class | 22 [22] | 41 [41] | 37 [37] | **100 (100) [24.81]** | 18 [18] | 49 [49] | 33 [33] |
| | Upper Class | 27 [22.13] | 42 [34.42] | 53 [43.44] | **122 (100) [30.27]** | 24 [19.67] | 49 [40.16] | 49 [40.16] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | | 32.42*** | | | | 30.94*** | |
| **Phi-Cramer's V** | | | 0.284***/.201*** | | | | 0.277***/.196*** | |

*[Source: Computed and Compiled by Researcher] | [ ] percentage of row total, () percentage of Column Total | NS= non-Significant, *= Significant at 0.01 Level, **= Significant at 0.005 Level, ***= Significant at 0.001 Level & 0.00 Level*

The *Manual Classification* results indicate that beneficiaries in the *Young Adults* Group were classified as follows: 33.57% in the *Novice* category, 34.28% in the *Proficient* category and 32.14% in the *Expert* category; the *Middle-Age Group* were classified as follows: 33.43% in the *Novice* category, 29.45% in the *Proficient* category and 34.10% in the *Expert category*; the *Elder-Age* Group was classified as follows: 31.34% in the *Novice* category, 35.82% in the *Proficient* category and 32.83% in the *Expert* category.

The *Machine Based* (Cluster) *Classification* indicates that beneficiaries in the *Young Adults* Group were classified as follows: 27.14% in the *Novice* category, 45.71% in the *Proficient* category and 27.14% in the *Expert* category; the *Middle-Age* Group were classified as follows: 32.55% in the *Novice* category, 34.88% in the *Proficient* category and 32.55% in the *Expert* category; the *Elder Age* Group were classified as follows: 28.35% in the *Novice* category, 43.28% in the *Proficient* category, and 28.35% in the *Expert* category.

The analysis found that there was no significant association between the variables of *Level of Expertise* determined by the *Manual Classification* and Age $\chi 2$ (4, N= 403) = 1.45, p= .834; and *Level of Expertise* determined by the *Cluster Analysis* and Age, $\chi 2$ (4, N= 403) = 3.52, p= .474. The calculated p-value for the *Level of Expertise* determined by the *Manual Classification* and Age is .834. The *Level of Expertise* determined by the *Machine Based* (Cluster) *Classification* and Age is .474, which is greater than the significance level of 0.05. Therefore, we do not have sufficient statistical evidence to establish a significant association between the *Level of Expertise* based on the *Manual and Machine* (Cluster) *Classification* with *Age*.

### *5.4.1 (b). Demographic Factor: Gender*

The gender-based analysis is vital as it provides insights into the variations in individuals' experiences, behaviours, demands and outcomes that are influenced by gender. Gender is a significant factor in determining societal roles, access to resources and policy implications. From an agricultural extension perspective, incorporating gender analysis into research offers policymakers vital insights allowing them to develop policies that successfully address the needs of both males and females. Consequently, this promotes comprehensive and enduring agricultural advancement. It assures that both males and females reap the advantages of agricultural advancements and contribute to the overall progress of rural areas. Thus, this study was done to examine the association between the *Level of Expertise* as determined by the *Manual and Machine Based (Cluster) Classification* for *Gender*.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies based on *Manual and Machine Based (Cluster) Classification*. The results were observed as per the *Gender* group, they belonged i.e., *Male* (n=225) and *Female* (n=178). The *Manual Classification* results indicate that beneficiaries in the *Male* Group were classified as follows: 28.44% in the *Novice* category, 31.55% in the *Proficient* category, and 40% in the *Expert* category; the *Female* Group was classified as follows: 40.44% in the *Novice* category, 35.39% in the *Proficient* category and 24.15% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries in the *Male* Group were classified as follows: 25.77% in the *Novice* category, 39.11% in the *Proficient* category and 35.11% in the *Expert* category; the *Female* Group was

classified as follows: 33.70% in the *Novice* category, 44.38% in the *Proficient* category, and 21.91% in the *Expert* category.

The Analysis found a significant association between the variables of *Level of Expertise* determined by the *Manual Classification* and *Gender* $\chi 2$ (4, N= 403) = 12.24, p= .002; and *Level of Expertise* determined by the *Machine Based (Cluster) Classification* and *Gender*, $\chi 2$ (4, N= 403) = 8.71, p= .013. The calculated p-values for the association between *Level of Expertise* determined by *Manual Classification* and *Gender*, as well as *Level of Expertise* determined by Machine Based (Cluster) Classification and *Gender*, are .002 and .013 respectively, both of which are less than the significance level of 0.05. Therefore, there is sufficient statistical evidence to support a significant association between the *Level of Expertise* determined by *Manual Classification* and *Machine Based (Cluster) Classification* with *Gender*. Phi and Cramer's V was employed to assess the level of association. The results showed that the *Phi and Cramer's values* for *Level of Expertise* and *Gender* (*Manual Classification*) was .174, with a p-value of .002. Similarly, for *Level of Expertise* and *Gender [Machine Based (Cluster) Classification]*, the value was .147, with a p-value of .013. These values are below the 5% significance level, leading us to reject the null hypothesis. Therefore, we can conclude that there is a strong association between *Level of Expertise* and *Gender (Manual Classification)*, a moderate association between *Level of Expertise and Gender [Machine Based (Cluster) Classification].*

### *5.4.1 (c). Demographic Factor: District*

Districts exhibit significant disparities in economic conditions *(including income levels, market access and infrastructure)*. Certain districts may possess superior proximity to markets and transportation infrastructure, while others are very distant and offer limited

economic prospects. This impacts the agricultural practices that farmers can use and the way they promote their produced outcome. Conducting research at the district level allows for the development of customized solutions that take into account specific socio-economic conditions. Analysing districts enables researchers to comprehend the influence of local regulations and institutional frameworks on farming practices and propose necessary enhancements. Therefore, the study further aimed to examine the association between the *Level of Expertise* as determined by the *Manual Classification*, and *Machine Based (Cluster) Classification* with the *District*.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were measured as per the *District,* belonging to *Gangtok* (n=65), *Pakyong* (n=65), *Gyalshing* (n=65), *Soreng* (n=52), *Namchi* (n=104), *Mangan* (n=52). The *Manual Classification* results indicate that beneficiaries belonging to *Gangtok* District were classified as follows: 44.61% in the *Novice* category, 32.30% in the *Proficient* category and 23.07% in the *Expert* category; beneficiaries belonging to *Pakyong* District was classified as follows: 23.07% in the *Novice* category, 38.46% in the *Proficient* category and 38.46% in the *Expert* category; beneficiaries belonging to *Gyalshing* District was classified as follows: 33.84% in the *Novice* category, 32.30% in the *Proficient* category and 33.84% in the *Expert* category; beneficiaries belonging to *Soreng* District was classified as follows: 32.69% in the *Novice* category, 25% in the *Proficient* category and 42.30% in the *Expert* category; beneficiaries belonging to *Namchi* District was classified as follows: 27.88% in the *Novice* category, 35.57% in the *Proficient* category and 36.53% in the *Exper*t category; beneficiaries belonging to

*Mangan* District was classified as follows: 46.15% in the *Novice* category, 32.69% in the *Proficient* category and 21.15% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to *Gangtok* District were classified as follows: 40% in the *Novice* category, 43.7% in the *Proficient* category, and 16.92% in the *Expert* category; beneficiaries belonging to *Pakyong* District was classified as follows: 20% in the *Novice* category, 41.53% in the *Proficient* category, and 38.46% in the *Expert* category; beneficiaries belonging to *Gyalshing* District was classified as follows: 32.30% in the *Novice* category, 41.53% in the *Proficient* category, and 26.15% in the *Expert* category; beneficiaries belonging to *Soreng* District was classified as follows: 26.92% in the *Novice* category, 36.53% in the *Proficient* category, and 36.53% in the *Expert* category; beneficiaries belonging to *Namchi* District was classified as follows: 22.11% in the *Novice* category, 44.23% in the *Proficient* category, and 33.65% in the *Expert* category; beneficiaries belonging to *Mangan* District was classified as follows: 40.38% in the *Novice* category, 38.46% in the *Proficient* category, and 21.15% in the *Expert* category.

The analysis found that there was no significant association between the variables of *Level of Expertise* and *District* $\chi 2$ (4, N= 403) = 16.23, p= .093 based on the *Manual Classification*; and *Level of Expertise* and *District*, $\chi 2$ (4, N= 403) = 17.69, p= .060 based on the *Machine Based (Cluster) Classification*. The calculated p-value for the *Level of Expertise* based on the *Manual Classification* and *District* is .093, while the *Level of Expertise* based on the *Machine Based (Cluster) Classification* and *District* is .060. Since both p-values are greater than 0.05, we do not have sufficient statistical evidence to establish a significant association between the *Level of Expertise* based on the *Manual Classification* and *Machine Based (Cluster) Classification* with the *District*.

### *5.4.1 (d). Demographic Factor: Type of Family*

The Type of Family plays a pivotal role in shaping agricultural practices, the organization of labour, resource management and the ability of individuals to adjust to changes. Family types must be taken into account by policymakers when developing agricultural interventions, as certain policies (such as subsidies or training programs) may be more effective for specific family structures than others. It has important consequences for the understanding of social structures, actions and outcomes in a diverse range of life domains. The composition of the family may influence the decision-making process and economic endeavors' within a household.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies based on *Manual Classification* and *Cluster Analysis*. The results were observed as per the *Type of Family group*, they belonged i.e., *Joint* (n=238) and *Nuclear* (n=165). The *Manual Classification* results indicate that beneficiaries in the *Joint* Family Type were classified as follows: 28.57% in the *Novice* category, 36.55% in the *Proficient* category and 34.87% in the *Expert* category; the *Nuclear* Family Type was classified as follows: 41.21% in the *Novice* category, 28.48% in the *Proficient* category and 30.30% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries in the *Joint* Family Type were classified as follows: 24.36% in the *Novice* category, 45.37% in the *Proficient* category and 30.25% in the *Expert* category; the *Nuclear* Family Type was classified as follows: 36.36% in the *Novice* category, 35.75% in the *Proficient* category and 27.87% in the *Expert* category.

The Analysis found a significant association between the variables of *Level of Expertise* determined by the *Manual Classification* and *Type of Family*, with a $\chi 2$ value of 7.13 (df=4, N=403) and a p-value of .028. Similarly, there was a significant association between the *Level of Expertise* determined by the *Machine Based (Cluster) Classification* and *Type of Family*, with a $\chi 2$ value of 7.15 (df=4, N=403) and a p-value of .028. The calculated p-value for the association between the *Level of Expertise* and *Type of Family* is .028 determined by the *Manual Classification*, and the p-value for the association between the *Level of Expertise* and *Age* is also .028 determined by the *Machine Based (Cluster) Classification*. Both p-values are less than 0.05, indicating strong statistical evidence of a significant association between the *Level of Expertise* and *Type of Family* determined by *Manual Classification* and *Machine Based (Cluster) Classification*. Additionally, *Phi and Cramer's V* were employed to assess the level of association. The results revealed that the *Phi and Cramer's value* for the *Level of Expertise* and *Type of Family* determined by *Manual Classification* is 0.133, with a p-value of 0.028. Similarly, for the *Level of Expertise* and *Type of Family* determined by *Machine Based (Cluster) Classification*, the *Phi and Cramer's value* is 0.133, with a p-value of 0.028. These values are below the 5% significance level, leading us to reject the null hypothesis. Consequently, we can conclude that there is a moderate association between the *Level of Expertise* and *Type of Family* determined by *Manual Classification*, as well as the *Level of Expertise* and *Type of Family* determined by *Machine Based (Cluster) Classification*.

### *5.4.1 (e). Socio-Economic Factor: Educational Status*

Educational status as a socio-economic variable denotes the extent of education that an individual has achieved significantly influencing their socio-economic upright within society. Individuals with diverse educational backgrounds may exhibit varying

behaviours in different contexts *(including financial decision-making, health practices, or participation in society)*. Comprehending educational status aids in forecasting behaviour and customizing interventions for particular groups according to their educational requirements. This study aimed to examine the association between the *Level of Expertise* and *Education* as determined using *Manual Classification* and *Machine Based (Cluster) Classification*.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies based on *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per the Educational Status, they belonged i.e., *Primary School* (n=121) and *Middle School and Above* (n=282). The *Manual Classification* results indicate that beneficiaries in the *Primary School* were classified as follows: 33.05% in the *Novice* category, 40.49% in the *Proficient* category and 26.44% in the *Expert* category; the *Middle School and Above* was classified as follows: 34.04% in the *Novice* category, 30.14% in the *Proficient* category and 35.81% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries in the *Primary School* were classified as follows: 29.75% in the *Novice* category, 47.93% in the *Proficient* category and 22.31% in the *Expert* category; the *Middle School and Above* was classified as follows: 29.07% in the *Novice* category, 38.65% in the *Proficient* category, and 32.26% in the Expert category.

The analysis revealed that the association between the variables was insignificant for the *Level of Expertise* and *Education* based on the *Manual Classification* at $\chi 2$ (4, N= 403) = 5.00, p=.082 and the *Level of Expertise* and *Education* based on the *Machine*

*Based (Cluster) Classification* at $\chi 2$ (4, N= 403) = 4.63, p=.098. The statistical evidence is insufficient to establish a significant association between the *Level of Expertise* and *Education* based on the *Manual Classification* and *Machine Based (Cluster) Classification*, as the calculated p-value for the *Level of Expertise* and Education based on the *Manual Classification* is .082 and *Level of Expertise* and *Education* based on the *Machine Based (Cluster) Classification* is .098, both of which are greater than 0.05. The findings are in line with those of ***Choudhary et. al., (2017), Patel et. al., (2018), Sudipta et. al., (2016), and Barad et. al. (2019)***.

### *5.4.1 (f). Socio-Economic Factor: Size of Land*

In agrarian societies, land holding may significantly influence the economic and social status of an individual, family and group by indicating the quantity of land they own or control. In rural economies, where agriculture is the primary source of income, land ownership has historically been one of the most significant indicators of social status. It is imperative to comprehend the extent of landholdings to develop effective agricultural policies and development programs (*including subsidies, land reforms, and access to agricultural extension services*). This study further aimed to examine the association between the *Level of Expertise* and the *Size of Land*, determined using *Manual Classification* and *Machine Based (Cluster) Classification*.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per the *Size of Land*, they possessed i.e., *Marginal* (n=135), *Medium* (n=142), and *Large* (n=126). The *Manual Classification* results indicate that beneficiaries possessing *Marginal* Land Size were

classified as follows: 37.03% in the *Novice* category, 37.03% in the *Proficient* category and 25.92% in the *Expert* category; the *Medium* Land Size was classified as follows: 28.16% in the *Novice* category, 36.61% in the *Proficient* category and 35.21% in the *Expert* category; the *Large* Land Size was classified as follows: 36.50% in the *Novice* category, 25.39% in the *Proficient* category and 38.09% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries possessing *Marginal* Land Size were classified as follows: 31.85% in the *Novice* category, 46.66% in the *Proficient* category and 21.48% in the *Expert* category; the *Medium* Land Size was classified as follows: 26.05% in the *Novice* category, 42.25% in the *Proficient* category and 31.69% in the *Expert* category; the *Large* Land Size was classified as follows: 30.15% in the *Novice* category, 34.92% in the *Proficient* category and 34.92% in the *Expert* category.

The analysis indicated that the association between the variables was insignificant for the *Level of Expertise* and *Size of Land* determined by *Manual Classification* $\chi 2$ (4, N= 403) = 8.68, p= .070; and for the *Level of Expertise* and *Size of Land* determined by *Machine Based (Cluster) Classification* $\chi 2$ (4, N= 403) = 7.50, p= .112. The computed p-values for the *Level of Expertise* and *Size of Land* determined by *Manual Classification* are .070, while for the *Level of Expertise* and *Size of Land* determined by *Machine Based (Cluster) Classification* is .112. Both values exceed 0.05, indicating insufficient statistical evidence to establish a significant association between the *Level of Expertise* and *Size of Land* determined by *Manual Classification* and *Machine Based (Cluster) Classification*. The findings are in line with ***Kalsariya, Bharad, & Jadeja, (2015), Choudhary, et. al. (2017), Bhabhor, Patel, & Makwana, (2019).***

### *5.4.1 (g). Socio-Economic Factor: Annual Income*

Comprehending economic disparities, and formulating effective rural development policies all rely on studies concerning annual income as a socioeconomic indicator in agriculture. It provides critical insights into the effects of income on resource availability, risk management, sustainability, and overall well-being in agricultural communities. In agrarian societies, the income level of farmers directly influences their capacity to enhance productivity, mitigate risks, and sustain sustainable livelihoods. The study was further conducted to investigate the association between the Level of Expertise and annual income as determined by the Manual Classification and Cluster Analysis.

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per the *Annual Income* Group, they belonged i.e., *Low* (n=181), *Middle Class* (n=100), and *Upper Class* (n=122). The *Manual Classification* results indicate that beneficiaries belonging to *Low Annual Income* Group were classified as follows: 48.06% in the *Novice* category, 28.17% in the *Proficient* category and 23.75% in the *Expert* category; the *Middle-Class Annual Income* Group was classified as follows: 22% in the *Novice* category, 41% in the *Proficient* category and 37% in the *Expert* category; the *Upper-Class Annual Income* Group was classified as follows: 22.13% in the *Novice* category, 34.42% in the *Proficient* category and 43.44% in the *Expert* category.

The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to *Low Annual Income* Group were classified as follows: 41.98% in the *Novice* category,

38.12% in the *Proficient* category and 19.88% in the *Expert* category; the *Middle-Class Annual Income* Group was classified as follows: 18% in the *Novice* category, 49% in the *Proficient* category and 33% in the *Expert* category; the *Upper-Class Annual Income* Group was classified as follows: 19.67% in the *Novice* category, 40.16% in the *Proficient* category and 40.16% in the *Expert* category.

The analysis indicated a significant association between the variables concerning the *Level of Expertise* and *Annual Income* based on *Manual Classification* $\chi 2$ (4, N= 403) = 32.42, p= .000; as well as the *Level of Expertise* and *Annual Income* based on *Machine Based (Cluster) Classification* $\chi 2$ (4, N= 403) = 30.94, p= .000. The computed p-value for *Level of Expertise* and *Annual Income* based on *Manual Classification* is .000, as is the p-value for *Level of Expertise* and *Annual Income* based on *Machine Based (Cluster) Classification*. Since both values are less than 0.05, we possess sufficient statistical evidence to establish a significant association between the *Level of Expertise*, as determined by both *Manual Classification* and *Machine Based (Cluster) Classification*, and *Annual Income*. The findings are in line with ***Jamanal & Natikar, (2019)***.

Additionally, *Phi and Cramer's V* are employed to assess the degree of association, revealing that the *Phi and Cramer's values* for the *Level of Expertise* and *Annual Income* determined by *Manual Classification* are .284 {.201}, with a p-value of .000; for *Level of Expertise* and *Annual Income* determined by *Machine Based (Cluster) Classification*, the values are .277 {.196}, with a p-value of .000. Since these p-values are below the 5% significance threshold, we reject the null hypothesis and conclude that there exists a moderately strong association between the *Level of Expertise* and *Annual Income* determined by *Manual Classification*, as well as between *Level of Expertise* and *Annual Income* determined by *Machine Based (Cluster) Classification*.

### 5.4.2 The *Level of Expertise* Based on the *Manual and Machine-Based (Cluster) Classification* with *Information Seeking Behaviour* (ISB) and *Social Participation Behaviour* (SPB)

As per the viewpoint of Agricultural Extension, *Information Seeking Behaviour* (ISB) is essential for the effective dissemination of innovations to the appropriate individuals, the reduction of social disparities, the promotion of economic development in rural areas, and the enhancement of production. It enables a more sophisticated understanding of how various socio-economic groups interact with agricultural information, thereby facilitating more efficient research, policy initiatives and support systems. The study of ISB assists in the development of communication strategies that are optimized for the effective delivery of pertinent information. Farmers who actively pursue information can enhance their decision-making on resource management, thereby influencing both productivity and income. Hence, the study further aims to examine the association between the *Level of Expertise* determined by *Manual Classification* and *Machine Based (Cluster) Classification*, *Information-Seeking Behaviour* (ISB), and *Social Participation Behaviour* (SPB).

The following hypothesis are framed for the execution of the study:

*$H_{5.8:}$ A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Authenticated Information Seeking Behaviour (AISB).*

*$H_{5.9:}$ A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Public Information Seeking Behaviour (PISB).*

*$H_{5.10:}$ A significant association exists association between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Media Information Seeking Behaviour (MISB).*

*$H_{5.11}$: A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Focused Social Participation Behaviour (FSPB).*

*$H_{5.12}$: A significant association exists between the Level of Expertise based on the Manual Classification and Machine Cluster Analysis with Voluntary Social Participation Behaviour (VSPB).*

The researcher incorporates both **classification models** *(i.e. Manual and Machine Based Classification)* into a cross-tabulation for further analysis to understand the association between both classification models based on the **Level of Information Seeking Behaviour** *(i.e. Active Information Seeker [AIS]/Passive Information Seeker [PIS])* and **Level of Social Participation Behaviour** *(i.e. Searching/Assessing/ Processing).* The Chi-square test and Phi and Cramer's V test are implemented by the researcher to confirm the significant association.

### 5.4.2 (a). *Manual and Machine Based (Cluster) Classification* for *Authenticated Information Seeking Behaviour* (AISB)

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Cluster Analysis*. The results were observed as per the *Authenticated Information Seeking Behaviour* (AISB), they belonged i.e., *Active Information Seeker* (AIS) (n=110) and *Passive Information Seeker (PIS)* (n=293). The *Manual Classification* results indicate that beneficiaries belonging to the *Active Information Seeker* (AIS) group were classified as follows: 17.27% in the *Novice* category, 32.72% in the *Proficient* category and 50% in the *Expert* category; the *Passive Information Seeker (PIS)* was classified as follows: 39.93% in the *Novice* category, 33.44% in the *Proficient* category and 26.62% in the *Expert* category.

The results were observed as per the *Authenticated Information Seeking Behaviour* (AISB), they belonged i.e., *Active* (n=110) and *Passive* (n=293). The *Cluster Analysis* results indicate that beneficiaries belonging to the *Active Information Seeker* group were classified as follows: 16.36% in the *Novice* category, 38.18% in the *Proficient* category and 45.45% in the *Expert* category; the *Passive Information Seeker* was classified as follows: 34.12% in the *Novice* category, 42.66% in the *Proficient* category and 23.20% in the *Expert* category.

*Table No. 5.4* shows a statistically significant association between the *Level of Expertise* and *Information Seeking Behaviour* (ISB) determined by the *Manual Classification*. The Level of Expertise, and *Authenticated Information Seeking Behaviour* determined using *Manual Classification*, had a $\chi 2$ (4, N= 403) = 25.42, p= .000. The corresponding Phi and Cramer's V values were .251 {.251}. The p-value of .000 indicates a statistically significant association between the *Level of Expertise* and *Authenticated Information Seeking Behaviour* determined by *Manual Classification*; therefore, it can be concluded that there is a very strong association between the *Level of Expertise* and *Authenticated Information Seeking Behaviour* determined by *Manual Classification*.

The *Machine Based (Cluster) Classification* revealed a significant association between the *Level of Expertise* and *Information Seeking Behaviour*. Specifically, the analysis showed that there is a moderate association between the *Level of Expertise* and *Authenticated Information Seeking Behaviour* determined by *Machine Based (Cluster) Classification*, with a $\chi 2$ value of 25.52, p= .000, Phi and Cramer's V value of .236, and p value of .000 which indicates that there is a strong association between the *Machine Based (Cluster) Classification* and *Authenticated Information* Seeking Behaviour.

### 5.4.2 (b). *Manual and Machine Based (Cluster) Classification* for *Public Information Seeking Behaviour* (PISB)

The results were observed as per the *Public Information Seeking Behaviour* (PISB), they belonged i.e., *Active Information Seeker* (n=198) and *Passive Information Seeker* (n=205). The *Manual Classification* results indicate that beneficiaries belonging to the *Active Information Seeker* group were classified as follows:16.16 % in the *Novice* category, 33.33% in the *Proficient* category, and 50.50% in the *Expert* category; the *Passive Information Seeker* was classified as follows: 50.73% in the *Novice* category, 33.17% in the *Proficient* category, and 16.09% in the *Expert* category.

The results were observed as per the *Public Information Seeking Behaviour* (PISB), they belonged i.e., *Active Information Seeker* (n=198) and *Passive Information Seeker* (n=205). The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to the *Active Information Seeker* group were classified as follows: 13.13% in the *Novice* category, 41.41% in the *Proficient* category, and 45.45% in the *Expert* category; the *Passive Information Seeker* was classified as follows: 44.87% in the *Novice* category, 41.46% in the *Proficient* category, and 13.65% in the *Expert* category.

*Level of Expertise* and *Public Information Seeking Behaviour* determined by *Manual Classification* had a $\chi 2$ (4, N= 403) = 71.79, p= .000. The Phi and Cramer's V values are .422 {.422} and the p-value is .000. Based on the statistical analysis with a significance level of less than 5%, it can be concluded that there is a very strong association between the *Level of Expertise* and *Public Information Seeking Behaviour* determined by *Manual Classification*.

Additionally, there is a very strong association between the *Level of Expertise* and *Public Information Seeking Behaviour* determined by *Machine Based (Cluster)*

*Classification*, with a $\chi 2$ value of 69.44, p= .000, Phi and Cramer's V value of .415, and p-value of .000.

### 5.4.2 (c). *Manual and Machine (Cluster) Based Classification* for *Media Information Seeking Behavior* (MISB)

The results were observed as per the *Media Information Seeking Behaviour* (MISB), they belonged i.e., *Active Information Seeker* (n=137) and *Passive Information Seeker* (n=266). The *Manual Classification* results indicate that beneficiaries belonging to the *Active Information Seeker* group were classified as follows: 20.43% in the *Novice* category, 32.84% in the *Proficient* category and 46.71% in the *Expert* category; the *Passive Information Seeker* was classified as follows: 40.60% in the *Novice* category, 33.45% in the *Proficient* category and 25.93% in the *Expert* category.

The results were observed as per the *Media Information Seeking Behaviour* (MISB), they belonged i.e., *Active Information Seeker* (n=137) and *Passive Information Seeker* (n=266). The *Cluster Analysis* indicates that beneficiaries belonging to the *Active Information Seeker* group were classified as follows: 18.24% in the *Novice* category, 42.33% in the *Proficient* category and 39.41% in the *Expert* category; the *Passive Information Seeker* was classified as follows: 34.96% in the *Novice* category, 40.97% in the *Proficient* category and 24.06% in the *Expert* category.

The *Level of Expertise* of the *Media Information Seeking Behaviour* determined by *Manual Classification* was $\chi 2$ (4, N= 403) = 22.73, p= .000. The Phi and Cramer's V values were found to be .237 and the p-value was .000. Given a significance level of less than 5%, it can be inferred that there exists a strong association between the *Level of Expertise* and *Media Information Seeking Behaviour* determined by *Manual Classification*.

*Table No. 5.5:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Various Dimension of Information Seeking Behaviour (ISB) & Social Participation Behaviour (SPB) of the ATMA Beneficiaries**

| Classifying Variables | Levels of Participation | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| **Authenticated Information Seeking Behaviour (AISB)** | Active Information Seeker (AIS) | 19 [17.27] | 36 [32.72] | 55 [50] | **110 (100) [27.29]** | 18 [16.36] | 42 [38.18] | 50 [45.45] |
| | Passive Information Seeker (PIS) | 117 [39.93] | 98 [33.44] | 78 [26.62] | **293 (100) [72.70]** | 100 [34.12] | 125 [42.66] | 68 [23.20] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 25.425*** | | | | 22.526*** | | |
| **Phi- Cramer's V** | | 0.251*** {0.251***} | | | | 0.236*** {0.236***} | | |
| **Public Information Seeking Behaviour (PISB)** | Active Information Seeker (AIS) | 32 [16.16] | 66 [33.33] | 100 [50.50] | **198 (100) [49.13]** | 26 [13.13] | 82 [41.41] | 90 [45.45] |
| | Passive Information Seeker (PIS) | 104 [50.73] | 68 [33.17] | 33 [16.09] | **205 (100) [50.86]** | 92 [44.87] | 85 [41.46] | 28 [13.65] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 71.799*** | | | | 69.445*** | | |
| **Phi- Cramer's V** | | 0.422*** {0.422***} | | | | 0.415*** {0.415***} | | |

*Table No. 5.5:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Various Dimension of Information Seeking Behaviour (ISB) & Social Participation Behaviour (SPB) of the ATMA Beneficiaries**

| Classifying Variables | Levels of Participation | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| **Media Information Seeking Behaviour (MISB)** | Active Information Seeker (AIS) | 28 [20.43] | 45 [32.84] | 64 [46.71] | **137 (100) [33.99]** | 25 [18.24] | 58 [42.33] | 54 [39.41] |
| | Passive Information Seeker (PIS) | 108 [40.60] | 89 [33.45] | 69 [25.93] | **266 (100) [66.00]** | 93 [34.96] | 109 [40.97] | 64 [24.06] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 22.731*** | | | | 15.950*** | | |
| **Phi- Cramer's V** | | 0.237*** {0.237***} | | | | 0.199*** {0.199***} | | |
| **Overall Information Seeking Behaviour (OISB)** | Searching | 95 [35.71] | 73 [27.44] | 58 [21.80] | **266 (100) [66.00]** | 81 [30.45] | 92 [34.58] | 53 [19.92] |
| | Accessing | 16 [33.33] | 18 [37.50] | 14 [29.16] | **48 (100) [11.91]** | 15 [31.25] | 23 [47.91] | 10 [20.83] |
| | Processing | 25 [19.37] | 43 [33.33] | 61 [47.28] | **129 (100) [32.00]** | 22 [17.05] | 52 [40.31] | 55 [42.63] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 (100) [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 24.69*** | | | | 22.17*** | | |

*Table No. 5.5:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Various Dimension of Information Seeking Behaviour (ISB) & Social Participation Behaviour (SPB) of the ATMA Beneficiaries**

| Classifying Variables | Levels of Participation | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| **Phi- Cramer's V** | | 0.248*** {0.175***} | | | | 0.235*** {0.166***} | | |
| **Voluntary Social Participation Behaviour (VSPB)** | Active Social Participator (ASP) | 62 [28.05] | 78 [35.29] | 81 [36.65] | **221 (100) [54.83]** | 52 [23.52] | 96 [43.43] | 73 [33.03] |
| | Passive Social Participator (PSP) | 74 [40.65] | 56 [30.76] | 52 [28.57] | **182 (100) [45.16]** | 66 [36.26] | 71 [39.01] | 45 [24.72] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 7.288*** | | | | 8.352** | | |
| **Phi- Cramer's V** | | 0.134** {0.134**} | | | | 0.144** {0.144**} | | |
| **Focused Social Participation Behaviour (FSPB)** | Active Social Participator (ASP) | 32 [16.16] | 66 [33.33] | 100 [50.50] | **198 (100) [49.13]** | 26 [13.13] | 82 [41.41] | 90 [45.45] |
| | Passive Social Participator (PSP) | 104 [50.73] | 68 [33.17] | 33 [16.09] | **205 (100) [50.86]** | 92 [44.87] | 85 [41.46] | 28 [13.65] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 71.799*** | | | | 69.445*** | | |
| **Phi- Cramer's V** | | 0.422*** {0.422***} | | | | 0.415*** {0.415***} | | |

*Table No. 5.5:* **Segmentation of Level of Expertise based on the Manual ($K^{th}$ Percentile) & Machine (Cluster Analysis) Based Classification and Report Association & Relationship Based on Various Dimension of Information Seeking Behaviour (ISB) & Social Participation Behaviour (SPB) of the ATMA Beneficiaries**

| Classifying Variables | Levels of Participation | Classification of Level of Expertise Based on $K^{th}$ Percentile | | | Total | Classification of Level of Expertise Based on Cluster Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | Novice | Proficient | Expert | | Novice | Proficient | Expert |
| **Overall Social Participation Behaviour (OSPB)** | Preparing | 94 [53.40] | 47 [26.70] | 35 [19.88] | **176 (100) [43.67]** | 84 [47.72] | 64 [36.36] | 28 [15.90] |
| | Actioning | 28 [21.53] | 59 [45.38] | 43 [33.07] | **130 (100) [32.25]** | 25 [19.23] | 64 [49.23] | 41 [31.53] |
| | Maintaining | 14 [14.43] | 28 [28.86] | 55 [56.70] | **97 (100) [24.06]** | 9 [9.27] | 39 [40.20] | 49 [50.51] |
| **Total** | | **136 [33.74]** | **134 [33.25]** | **133 [33.00]** | **403 [100]** | **118 [28.28]** | **167 [41.43]** | **118 [29.28]** |
| **Test Statistics $\chi^2$** | | 70.89*** | | | | 67.13*** | | |
| **Phi - Cramer's V** | | 0.419*** {0.297***} | | | | 0.408*** {0.289***} | | |

*Source: Computed and Compiled by Researcher*

*Note: [ ] percentage of row total, ( ) percentage of Column Total {} Cramer's Value |* NS= *non-Significant*, *= *Significant at 0.01 Level,* **= *Significant at 0.005 Level*, ***= *Significant at 0.001 Level & 0.00 Level*

The *Machine Based (Cluster) Classification* yielded a $\chi 2$ value of 15.95 (df=4, N=403) and a p-value of .000, indicating a strong association between the *Level of Expertise* and *Media Information Seeking Behaviour*. The Phi and Cramer's V values were .199 and the p-value was .000.

### 5.4.2 (d). *Manual and Machine (Cluster) Based Classification* for *Overall Information Seeking Behaviour* (OISB)

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories (*i.e., Novice, Proficient, and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Cluster Analysis*. The results were observed as per the *Overall Information Seeking Behaviour (OISB)*, they belonged i.e., *Searching* (n=226), *Assessing* (n=48), and *Processing* (n=129). The *Manual Classification* results indicate that beneficiaries belonging to the *"Searching"* group were classified as follows: 35.71% in the *Novice* category, 27.44% in the *Proficient* category and 21.80% in the *Expert* category; the "*Assessing*" Group was classified as follows: 33.33% in the *Novice* category, 37.50% in the *Proficient* category and 29.16% in the *Expert* category; the "*Processing*" Group was classified as follows: 19.37% in the *Novice* category, 33.33% in the *Proficient* category and 47.28% in the *Expert* category.

The results were observed as per the *Overall Information Seeking Behaviour* (OISB), they belonged i.e., *Searching* (n=226), *Assessing* (n=48), and *Processing* (n=129). The *Cluster Analysis* indicates that beneficiaries belonging to the "*Searching*" group were classified as follows: 30.45% in the *Novice* category, 34.58% in the *Proficient* category, and 19.92% in the *Expert* category; the "*Assessing*" Group was classified as follows: 31.25% in the *Novice* category, 47.91% in the *Proficient* category and 20.83% in the

*Expert* category; the "*Processing*" Group was classified as follows: 17.05% in the *Novice* category, 40.31% in the *Proficient* category and 42.63% in the *Expert* category.

The *Level of Expertise* as determined by the *Manual Classification* and *Overall Information Seeking Behaviour* is $\chi 2$ (4, N= 403) = 24.69, p=.000, Phi and Cramer's V value is $.248^{***}$ {$.175^{***}$}, and p value is .000. Given that the level of significance is less than 5%, it can be inferred that there is a strong association between the *Level of Expertise* and the *Overall Information Seeking Behaviour*.

The *Machine Based (Cluster) Classification* $\chi 2$ (4, N= 403) = 22.17, p= .000, Phi and Cramer's V value is $.235^{***}$ {$.166^{***}$} and p value is .000 indicates a strong association between the *Level of Expertise* and *Overall Information Seeking Behaviour*. The computed p-value for all the study variables is .000, which is less than 0.05. This provides sufficient statistical evidence to establish a significant association between the *Level of Expertise* and *Information Seeking Behaviour* (ISB) based on the *Manual Classification* and *Machine Based (Cluster) Classification*.

### 5.4.2 (e). *Manual and Machine (Cluster) Based Classification* for *Voluntary Social Participation Behaviour* (VSPB)

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per *Voluntary Social Participation Behaviour* (VSPB), they belonged i.e., *Active Social Participator* (n=221) and *Passive Social Participator* (n=182). The *Manual Classification* results indicate that beneficiaries belonging to the "*Active Social Participator*" group were classified as follows: 28.05% in the *Novice* category, 35.29% in the *Proficient* category and 36.65% in the *Expert* category; the "*Passive Social Participator*" Group was

classified as follows: 40.65% in the *Novice* category, 30.76% in the *Proficient* category, and 28.57% in the *Expert* category.

The results were observed as per *Voluntary Social Participation Behaviour* (VSPB), they belonged i.e., *Active Social Participator* (n=221) and *Passive Social Participator* (n=182). The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to the "*Active Social Participator*" group were classified as follows: 23.52% in the *Novice* category, 43.43% in the *Proficient* category and 33.03% in the *Expert* category; the "*Passive Social Participator*" Group was classified as follows: 36.26% in the *Novice* category, 39.01% in the *Proficient* category and 24.72% in the *Expert* category.

A statistically significant association between the *Level of Expertise* and *Social Participation Behaviour* (SPB) determined by the *Manual Classification*. The *Level of Expertise* and *Voluntary Social Participation Behaviour* determined using *Manual Classification*, had a $\chi 2$ (4, N= 403) = 7.288, p= .000. The corresponding Phi and Cramer's V values were .134 {.134}. The p-value of .000 indicates a statistically significant association between the *Level of Expertise* and *Voluntary Social Participation Behaviour* determined by *Manual Classification*; therefore, it can be concluded that there is a moderate association between the *Level of Expertise* and *Voluntary Social Participation Behaviour* determined by *Manual Classification*.

The *Machine Based (Cluster) Classification* revealed a significant association between the *Level of Expertise* and *Information Seeking Behaviour*. Specifically, the analysis showed that there is a moderate association between the *Level of Expertise* and *Voluntary Social Participation Behaviour* determined by *Machine Based (Cluster) Classification*, with a $\chi 2$ value of 8.35, p= .001, Phi and Cramer's V value of .144, and

p value of .001 which indicates that there is a moderate association between the *Machine Based (Cluster) Classification* and *Voluntary Social Participation Behaviour*.

### 5.4.2 (f). *Manual and Machine (Cluster) Based Classification* for *Focused Social Participation Behaviour* (FSPB)

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per *Focused Social Participation Behaviour* (FSPB), they belonged i.e., *Active Social Participator* (n=198) and *Passive Social Participator* (n=205). The *Manual Classification* results indicate that beneficiaries belonging to the "*Active Social Participator*" group were classified as follows: 16.16% in the *Novice* category, 33.33% in the *Proficient* category and 50.50% in the *Expert* category; the "*Passive Social Participator*" Group was classified as follows: 50.73% in the *Novice* category, 33.17% in the *Proficient* category and 16.09% in the *Expert* category.

The results were observed as per *Focused Social Participation Behaviour* (FSPB), they belonged i.e., *Active Social Participator* (n=198) and *Passive Social Participator* (n=205). The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to the "*Active Social Participator*" group were classified as follows: 13.13% in the *Novice* category, 41.41% in the *Proficient* category and 45.45% in the *Expert* category; the "*Passive Social Participator*" Group was classified as follows: 44.87% in the *Novice* category, 41.46% in the *Proficient* category and 13.65% in the *Expert* category.

*Level of Expertise* and *Focused Social Participation Behaviour* determined by *Manual Classification* had a $\chi 2$ (4, N= 403) = 71.79, p= .000. The Phi and Cramer's V values

are .422 {.422} and the p-value is .000. Based on the statistical analysis with a significance level of less than 5%, it can be concluded that there is a very strong association between the *Level of Expertise* and *Focused Social Participation Behaviour* determined by *Manual Classification*.

The *Machine Based (Cluster) Classification* revealed a significant association between the *Level of Expertise* and *Information Seeking Behaviour*. Specifically, the analysis showed that there is a moderate association between the *Level of Expertise* and *Focused Social Participation Behaviour* determined by *Machine Based (Cluster) Classification*, with a $\chi 2$ value of 69.44, p= .000, Phi and Cramer's V value of .415, and p value of .000 which indicates that there is a strong association between the *Machine Based (Cluster) Classification* and *Focused Social Participation Behaviour*.

### 5.4.2 (g) *Manual and Machine (Cluster) Based Classification* for *Overall Social Participation Behaviour* (OSPB)

The *Level of Expertise* possessed by the beneficiaries is determined in three levels of ordered categories. (*i.e., Novice, Proficient and Expert*) that are used to classify the level of competencies on the basis of *Manual Classification* and *Machine Based (Cluster) Classification*. The results were observed as per the *Overall Social Participation Behaviour* (OSPB), they belonged i.e., *Preparing* (n=176), *Actioning* (n=130), and *Maintaining* (n=97). The *Manual Classification* results indicate that beneficiaries belonging to the "*Preparing*" group were classified as follows: 53.40% in the *Novice* category, 26.70% in the *Proficient* category and 19.88% in the *Expert* category; the "*Actioning*" Group was classified as follows: 21.53% in the *Novice* category, 45.38% in the *Proficient* category, and 33.07% in the *Expert* category; the "*Maintaining*" Group was classified as follows: 14.43% in the *Novice* category, 28.86% in the *Proficient* category and 56.70% in the *Expert* category.

The results were observed as per the *Overall Social Participation Behaviour* (OSPB), they belonged i.e., *Preparing* (n=176), *Actioning* (n=130), and *Maintaining* (n=97). The *Machine Based (Cluster) Classification* indicates that beneficiaries belonging to the "*Preparing*" group were classified as follows: 47.72% in the *Novice* category, 36.36% in the *Proficient* category, and 15.90% in the *Expert* category; the "*Actioning*" Group was classified as follows: 19.23% in the *Novice* category, 49.23% in the *Proficient* category and 31.53% in the *Expert* category; the "*Maintaining*" Group was classified as follows: 9.27% in the *Novice* category, 40.20% in the *Proficient* category and 50.51% in the *Expert* category.

*Level of Expertise* and *Overall Social Participation Behaviour* determined by *Manual Classification* had a $\chi 2$ (4, N= 403) = 70.89, p= .000. The Phi and Cramer's V values are .419 {.297} and the p-value is .000. Based on the statistical analysis with a significance level of less than 5%, it can be concluded that there is a very strong association between the *Level of Expertise* and *Overall Social Participation Behaviour* determined by *Manual Classification*.

The *Machine Based (Cluster) Classification* revealed a significant association between the *Level of Expertise* and *Information Seeking Behaviour*. Specifically, the analysis showed that there is a moderate association between the *Level of Expertise* and *Overall Social Participation Behaviour* determined by *Machine Based (Cluster) Classification*, with a $\chi 2$ value of 67.13, p= .000, Phi and Cramer's V value of .408 {.297}, and p-value of .000 which indicates that there is a very strong association between the *Machine Based (Cluster) Classification* and *Overall Social Participation Behaviour*.

## 5.5 CONCLUSION

The study's findings present strong evidence of significant associations between the *Level of Expertise*, as measured by both *Manual and Machine-Based (Cluster) classifications* and important *Demographic and Socio-Economic Profile* such as *Gender, Annual Income and Type of Family*. The *Manual Classification* as well as *Machine Based (Cluster) Classification* approach reveals a strong association between *Level of Expertise* and *Gender* as well as *Annual Income* with a confidence level of 99%. However, *Type of Family* shows an association at a confidence level of 90%. The *Machine Based (Cluster) Classification* shows a strong association with *Annual Income* at a 99% confidence level, Gender at a 95% confidence level and *Type of Family* at a 90% confidence level. These findings illustrate the robust performance of both categorization approaches for identifying significant socio-economic patterns and emphasize the differing degrees of association among different variables. This provides vital insights for future research and policy development in this domain.

The study's results present strong evidence of statistically significant associations between the *Level of Expertise* and different dimensions of I*nformation Seeking Behaviour* (AISB, PISB, MISB, OISB) and *Social Participation Behaviour* (VSPB, FSPB, OSPB), using both *Manual and Machine Based (Cluster) Classification* techniques. The *Manual Classification* approach demonstrates a significant strong association between the *Level of Expertise* and all the variables examined, including AISB, PISB, MISB, OISB, VSPB, FSPB,and OSPB with a confidence level of 99%. Moreover, the *Machine Based (Cluster) Classification* reveals a significant strong association between the *Level of Expertise* and AISB, PISB, MISB, OISB, FSPB, and OSPB with a confidence level of 99%. The findings of this study validate the significance of *Information-Seeking* and *Social Participation Behaviours* in the

development of expertise across various classifications by showing a significant association between them and competence levels.

The subsequent chapter will investigate the *mediation-moderation* effect of *Overall Information Seeking Behaviour* (OISB) on *Competency Score* (CS) considering selective *Demographic and Socio-Economic Profile* as moderating factors and *Overall Social Participation Behaviour* (OSPB) as mediating factors. The study intends to uncover the main factors that influence the competency levels of beneficiaries by studying these influences. Additionally, it seeks to gain insights into how socio-economic and behavioural variables contribute to developing skills and expertise. This enhanced comprehension will contribute to the development of focused interventions, training initiatives and policy suggestions aimed at improving competencies among various demographic domains.

# Chapter – VI

## Mediation – Moderation Relationship Between Overall Information Seeking Behaviour (OISB) → Competency Score (CS) with Mediating Effect of Overall Social Participation Behaviour (OSPB) and Moderating Effect of Demographic & Socio-Economic Profile

# CHAPTER - 6

# MEDIATION – MODERATION RELATIONSHIP BETWEEN OVERALL INFORMATION SEEKING BEHAVIOUR (OISB) → COMPETENCY SCORE (CS) WITH MEDIATING EFFECT OF OVERALL SOCIAL PARTICIPATION BEHAVIOUR (OSPB) AND MODERATING EFFECT OF DEMOGRAPHIC & SOCIO-ECONOMIC PROFILE

## 6.1 BACKGROUND OF THE STUDY

Agri-Extension programs in India have developed in line with agricultural advancements. Still, the main challenge is developing mechanisms to guarantee the efficient and effective spread of technology to the lowest levels of society so that people may benefit from present developments. ***Gulati (2018)***. Modern agriculture depends on knowledge to maximize output, sustainability, and thorough farm management. Working with other production components requires cooperation using agricultural knowledge as a fundamental component. Information helps farmers to better control their resources and decision-making procedures. A well-designed and effective release system of necessary information and technical services helps the farmers in the decision-making process to raise agricultural productivity. The provision of sufficient knowledge by educational, scientific, and agricultural institutions helps farmers gain from it thereby facilitating improved decision-making. ***Duhan & Singh (2017)***.

Farmers seek knowledge about innovative agricultural technologies, market trends, and government project access from many different sources. Information Seeking Behaviour (ISB) then is the active search and application of information by farmers towards informed decisions. Still, one major factor influencing a person's knowledge is their level of social interaction, ***Husain, Sundaramari, & Sreekumar (2016)***. Farmers must engage in social participation behavior (SPB) if they are to coordinate, grow

knowledge and experience, and effectively apply shared resources. By means of social groupings including farmer cooperatives, extension networks, and community organizations, farmers can acquire useful knowledge and improve their agricultural capacity.

In this context, the competency score indicates a farmer's skill in utilizing information and social participation to enhance farming results *(including productivity, profitability and sustainability)*. Thus, demographic variables like age, education level, gender, landholding size and income are some of the important demographic characteristics that can significantly influence a farmer's Information-Seeking Behaviour, Social Participation, and Competency possessed by an individual. These demographic variables may exert a moderating influence on how farmers access and utilize information, their level of social participation and the level of competencies they possess.

It is imperative to comprehend the factors that influence farmers' Information-Seeking Behaviour, Social Participation and Competency to enhance agricultural productivity and guarantee sustainable development given the significance of agriculture in the development of economies such as India. The results of this research assist in the identification of the demographic segments that are most likely to benefit from agricultural extension services and social networks thereby enabling more precise and effective interventions. The present study is conducted to examine the mediating-moderating effect of the demographic & Socio-Economic variables (moderators) on the relationship between Overall Information-Seeking Behaviour (OISB) and Competency Score (CS) with Overall Social Participation Behaviour (OSPB) as a mediating factor. It will forecast the influence of demographic variables on the relationships between Overall Information Seeking Behaviour (OISB) and Competency Score (CS).

Comprehending these moderating impacts is essential for policymakers, extension agents and agricultural institutions when formulating tailored interventions for various beneficiaries' demographics.

Although a lot of studies have been done on the moderating effect of demographic and socio-economic variables taking into consideration the different agricultural aspects not particularly focussing on competency mapping ***Park, Hong, & Le, (2021); Ansari & Rahela, (2017); Mandongwe, Zaravaza, & Makudza, (2021); Mandongwe, Zaravaza, & Makudza, (2021)***. The moderating effect of Demographic and Socio-Economic factors between the Overall Information Seeking Behaviour (OISB) and Competency score (CS) of the beneficiaries taking Overall Social Participation Behaviour (OSPB) as a mediator, particularly has not been explored. Much of the existing literature focuses on the direct relationship between Information Behaviour and farming outcomes ***Das, Mohanty, & Acharya, (2024); Ruikar et. al., (2024); Bera et. al., (2024); Priyanka & Jayashankar (2024)*** or the other areas of study without considering the competencies. Furthermore, research analysing competency assessments generally overlooks the social and demographic aspects that influence behavioural patterns. A comprehensive study of the influence of demographic and socio-economic status is essential as these elements eventually impact their total competency levels. This study seeks to address the gap by examining how Demographic and Socio-Economic variables influence the relationships between Overall Information Seeking Behaviour (OISB) and Competency Score (CS) with Overall Social Participation Behaviour (OSPB) as Mediating factors and Demographic & Socio-Economic factors as moderating factors. Comprehending these moderating impacts is essential for policymakers, extension agents and agricultural institutions when formulating tailored interventions for various beneficiaries' demographics.

## 6.2 RESEARCH QUESTIONS

1. Is there any ***mediating-moderating effect*** of ***Overall Information-Seeking Behaviour*** (OISB) on ***Competency Score*** (CS) considering ***Overall Social Participation Behaviour*** (OSPB) as a ***mediating*** role and ***Demographic and Socio-Economic Profile*** of ATMA beneficiaries as ***moderating*** factors?

## 6.3 METHOD OF ANALYSIS

### 6.3.1 Conceptual Framework

The researcher has developed a conceptual model to address the aforementioned research questions, as illustrated in *(Figure No 3.3 p.59)*. This model examines the mediating-moderating role of *Demographic & Socio-Economic factors* on *Overall Information Seeking Behaviour* (OISB) and *Competency Score* (CS), with *Overall Social Participation Behaviour* (OSPB) serving as the mediating factor and *Demographic & Socio-Economic factors* acting as the moderating factor.

### 6.3.2 Variable Description

The study has been conducted by taking into consideration the variables such as *Overall Information Seeking Behaviour Score* (OISBS) (*(i.e., summative score of Authenticated, Public & Media Information Seeking Behaviour)*, *Overall Social Participation Behaviour Score* (OSPBS) *(i.e., summative score of Voluntary & Focused Social Participation Behaviour)*, the *Competency Score* (CS) as illustrated in detail in *(Figure No 3.2 p.58).* The independent variable was *Overall Information-Seeking Behaviour*, the dependent variable was *Competency Score* (CS) and *Overall Social Participation Behaviour* (OSPB) functioned as the mediator. The *Demographic and Socio-Economic Status* served as moderators for the study.

Demographic data is essential for comprehending the present condition, past trends and future directions of communities. It can monitor temporal changes and disclose a community's requirements and advantages to inform strategic planning, policymaking and decision-making***, Dan, V. (n.d.)***. As individuals age, they undergo substantial modifications in the areas of memory, reasoning, concentration, executive functions and information processing speed, ***Osmani, (2016)***. The term "gender" refers to the socially constructed roles, behaviours and identities that are associated with males, females and individuals of all genders. It affects an individual's behaviour, interactions, self-image, perception of others, and the distribution of authority and resources in society, ***Shirin, Thomas, et. al. (2016)***.

Education is regarded as vital for agricultural productivity in a technological or economic environment that is perpetually evolving, as per ***Weir (1999)***. The capacity to assimilate knowledge can be improved through the use of new technology or the enhancement of previous access to external information sources through education. The analysis of landholding size is particularly beneficial in the formulation of policy in countries where agriculture is the Primary School economic activity. This facilitates the formulation of policies that are customized to meet the diverse requirements of the public, ***Binswanger et al. (2009)***. Annual income is a fundamental socioeconomic determinant that shapes an individual's perceptions and behaviours, with those possessing greater income levels exhibiting distinct goals, interests, and motivations compared to their lower-income counterparts, ***Baffa, Maiyaki, & Baffa, (2023)***. Thus, the study has been undertaken taking into account these Demographic and Socio-Economic Profile (*Age, Gender, Education, Size of Land, Annual Income*) that are used as moderators for the study.

### 6.3.3 Tool for Analysis

The variable scores employed in the study namely the *Overall Information Seeking Behaviour Score* (OISBS), *Overall Social Participation Behaviour Score* (OSPBS), and *Competency Score* (CS) do not conform to a normal distribution. To perform the *Mediating-Moderation Analysis* the variable scores must be normally distributed. Consequently, the researcher transformed the requisite summative scores into normalized scores to satisfy the data normality criteria for conducting the moderation analysis. The normalisation of the scores is performed by creating the *Fractional Rank* for the scores i.e., OISBS, OSPBS and CS. Thereafter, the researcher used *Function of idf. normal (fractional rank, mean, SD)*.

*Table No. 6.1:* **Descriptive Profiling of the Study Variables**

| ***Study Variables*** | **Nature** | ***Mean*** | ***SD*** | ***Skewness*** | ***Kurtosis*** | ***Test Stat.*** |
|---|---|---|---|---|---|---|
| *Competency Score* | *Summative* | 249.60 | 60.10 | .141 | –.625 | .077*** |
| | *Normalized* | 249.89 | 59.61 | .005 | –.169 | .012$^{NS}$ |
| *OISB Score* | *Summative* | 35.34 | 3.83 | -.058 | .630 | .198*** |
| | *Normalized* | 35.35 | 3.76 | -.002 | –.173 | .012$^{NS}$ |
| *OSPB Score* | *Summative* | 22.22 | 4.07 | -.066 | 1.4 | .184*** |
| | *Normalized* | 22.24 | 4.02 | .132 | .275 | .011$^{NS}$ |

*Source: Computed and Complied by the Researcher*
*Note: n > 50 Kolmogorov-Smirnov test is used for checking the normality assumption*

Five Mediation Moderation analyses were performed to assess the relationships among the various factors included in the study.

The JAMOVI a Free Open-Source Software (Version 2.3.13) is employed to conduct the analysis. The *Mediation Moderation* relationship (OISB → OSPB → CS) was examined for different *Demographic and Socio-Economic Profile* of the beneficiaries shown below in *Table No. **6**.2:*

*Table No. 6.2:* **Classification of Demographic & Socio-Economic Profile of the Beneficiaries based on the Equal Proportionate ($K^{th}$ / 33.33 Percentile) Method#**

| Study Variable | Variable (Ordered) Categories [Range] | | |
|---|---|---|---|
| **Age Group# n = 403** | *Young Adults* [< 39 Yrs.] | *Middle Age* [39 - 49 Yrs.] | *Old Age* [>49 Yrs.] |
| | **140** (34.74) | **129** (32.00) | **134** (33.26) |
| **Gender n = 403** | *Male* | | *Female* |
| | **225** (55.83) | | **178** (44.17) |
| **Educational Status n = 403** | *Primary School* | | *Middle School & Above* |
| | **121** (30.02) | | **282** (69.98) |
| **Size of Land Holding# n = 403** | *Marginal* [< 0.8 Acre] | *Medium* [0.8 - 1.5 Acre] | *Large* [> 1.5 Acre] |
| | **135** (33.50) | **142** (35.24) | **126** (31.26) |
| **Annual Income# n = 403** | *Low* [Rs. 1 Lakh] | *Middle Class* [Rs. 1 to 1.5 Lakh] | *Upper Class* [> Rs. 1.5 Lakh] |
| | **181** (44.92) | **100** (24.81) | **122** (30.27) |

*Source: Computed and Compiled by the Researcher | Note: # indicated the beneficiaries classified based on the Equal Proportionate ($K^{th}$ / 33.33 Percentile) Method.*

The moderated mediation study was partially exploratory due to the scarcity of prior research on the particular topic, complicating the identification of the paths to be moderated. Consequently, moderation analysis was conducted on all potential paths within the mediation model. It is difficult to forecast the effect sizes which include the anticipated mediation effect sizes at each moderator level. A sample size of at least 15 respondents per predictor is generally considered sufficient for the acquisition of reliable results in Social Science Regression analysis, which serves as the foundation of mediation and moderation models ***Wilski, (2024)***. The sample size of 403 beneficiaries in our study appears to be adequate for this form of study, given the number of variables and effects in the estimated model.

## 6.4 RESULTS AND DISCUSSIONS

The results of *Mediation Moderation Analysis* of *Overall Information Seeking Behaviour* (OIBS)→ *Competency Score* (CS) with *Mediating Effect* of *Overall Social Participation Behaviour* (OSPB) and *Moderating Effect* of *Demographic & Socio-Economic Profile* (*Age, Gender, Education, Size of Land and Annual Income*) is presented below.

### 6.4.1 Overall Social Participant Behaviour (OSPB) Mediates the Relationship Between Overall Information Seeking Behaviour (OISB) and Competency Score (CS): Analysis AGE (A) as a Moderator.

Age is an important moderating variable in social science research, as it impacts the experiences and responses of individuals to a diverse array of social, psychological and behavioural phenomena. It can influence the intellectual functions, decision-making and problem-solving of individuals, thereby influencing their perceptions and responses to their surroundings. Various life periods *(including adolescence, young adulthood, middle age and old age)* present distinct challenges and experiences. The moderating role of age groups is assessed in different aspects of Competency apart from Agri-allied based competency ***Tiraieyari & Uli, (2011)****;* and the other aspects of the topic apart from competency ***Etuk, Akpan, & Awah, (2024); Merhi, et. al., (2021); Riskinanto, Kelana , & Hilmawan, (2017); Stearns et. al., (2018)***. An individual's age can have an impact on the management of transitions such as professional modifications. Thus, the present study initially aims to assess the relationship between OISB and CS by employing OSPB as the mediator and Age as the Moderator. It has three levels namely, *Young Adults* (YA), *Middle Age* (MA) & *Elder Age* (EA). To run the analysis the following hypothesis and sub hypothesis are framed by the researcher.

***For Interaction Effect:***

**$H_{6.1(a)}$:** *A significant interaction effect of **AGE(A)** exists between OISB and OSPB*

**$H_{6.1(b)}$:** *A significant interaction effect of **AGE (A)** exists between OSPB and CS*

**$H_{6.1(c)}$:** *A significant interaction effect of **AGE (A)**exists between OISB and CS*

***For Direct Effect:***

**$H_{6.6A\ (1)}$:** *A positive link exists between OISB and CS for the **Young Adults***

**$H_{6.6A\ (2)}$:** *A positive link exists between OISB and CS for the **Middle Age***

**$H_{6.6A\ (3)}$:** *A positive link exists between OISB and CS for the **Elder Age***

***For Indirect Effect:***

**$H_{6.11A\ (1)}$:** *A positive link exists between OISB →OSPB →CS for the **Young Adults***

**$H_{6.11A\ (2)}$:** *A positive link exists between OISB →OSPB →CS for the **Middle Age***

**$H_{6.11A\ (3)}$:** *A positive link exists between OISB →OSPB →CS for the **Elder Age***

### 6.4.1. (a) Direct Effect with Interaction (Age*OISB→CS)

*Interaction:* An interaction effect was noted between OISB and CS (b=–0.212, 95% CI [–0.21324, –0.211]); Age*OISB → CS **$H_{6.1(c)}$** ($\beta = -0.14468$, $t = -339.180$, $p = < .001$). This indicates that the link between OISB and CS is dependent on the Level of Age Group suggesting conditional mediation effects supporting **$H_{6.1(c)}$**. The relationship is moderated by age. The moderating role of age implies that the impact of *Overall Information-Seeking Behaviour [OISB]* on the competency levels of *Young Adults, Middle Age and Elder Age* individuals is distinct. The perception of competence may be adversely affected by the fact that younger individuals may be less adept at filtering pertinent information or overwhelmed by the volume of information.

*Table No. 6.3:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: AGE (A) as a Moderator**

**Moderation Effects (Interactions)**

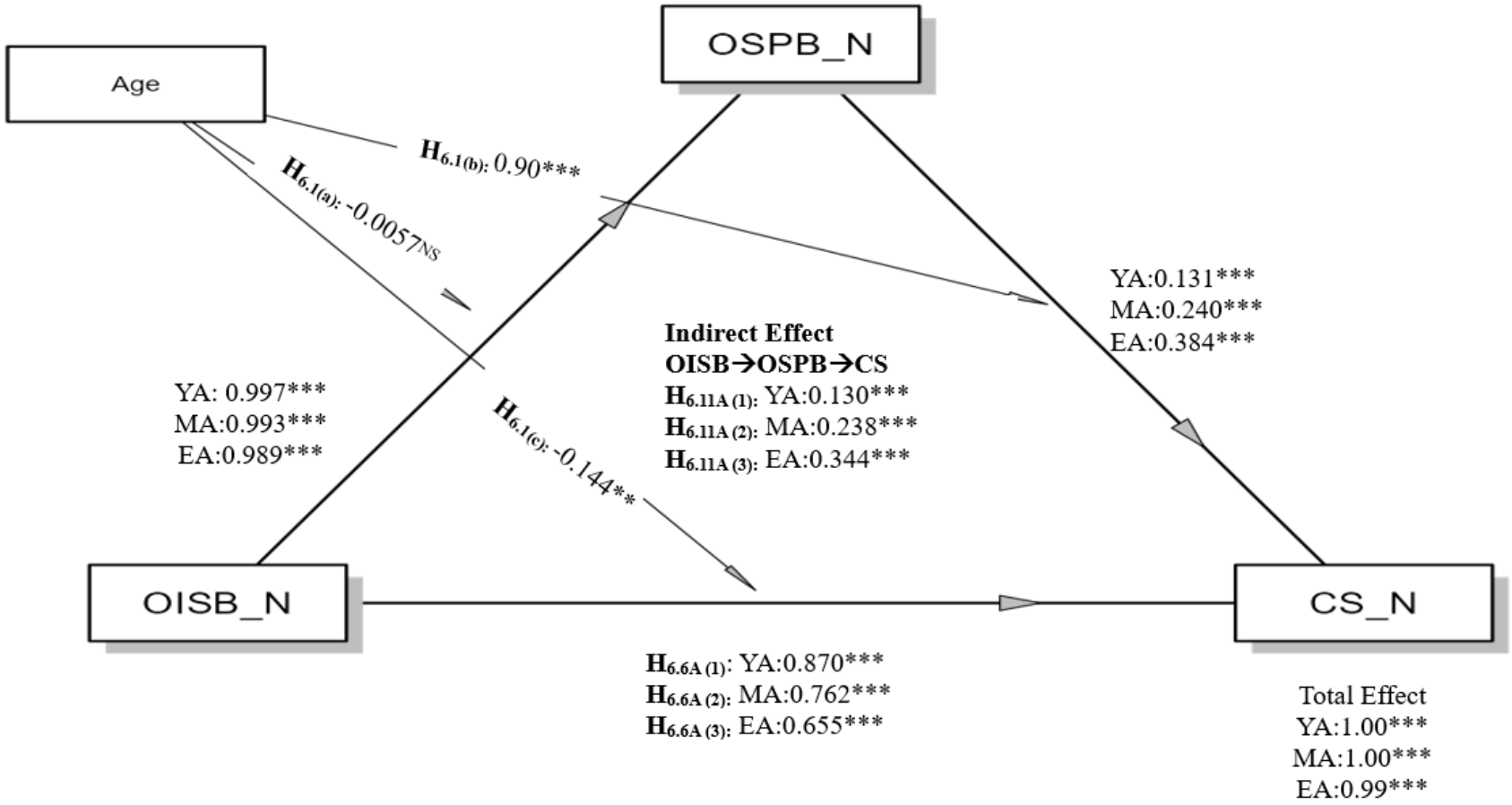
| Moderator | $H_0$ | Interaction | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|---|
| Age (A) | $H_{6.1(a)}$ | Age*OISB → OSPB | -5.68e−4 | 5.92e-4 | -0.00173 | 5.93e-4 | -0.00573 | -0.959 | 0.338 |
| | $H_{6.1(c)}$ | Age*OISB → CS | -0.212 | 6.25e-4 | -0.21324 | -0.211 | -0.14468 | -339.180 | < .001 |
| | $H_{6.1(b)}$ | Age*OSPB → CS | 0.201 | 5.90e-4 | 0.20018 | 0.202 | 0.90171 | 341.221 | < .001 |

**Conditional Mediation**

| Moderator Level: Age Group | $H_0$ | Type | Effect | Estimate | SE | β | z | p |
|---|---|---|---|---|---|---|---|---|
| Younger Adults (YA) | $H_{6.11A(1)}$ | Indirect | OISB→OSPB → CS | 2.07 | 0.01639 | 0.130 | 126 | < .001 |
| | | Path(s) | OISB → OSPB | 1.07 | 0.00820 | 0.997 | 130 | < .001 |
| | | | OSPB→ CS | 1.94 | 0.00388 | 0.131 | 499 | < .001 |
| | $H_{6.6A(1)}$ | Direct | OISB→ CS | 13.78 | 0.00419 | 0.870 | 3288 | < .001 |
| | | Total | OISB→ CS | 15.85 | 0.01920 | 1.001 | 826 | < .001 |
| Middle Age (MA) | $H_{6.11A(2)}$ | Indirect | OISB→ OSPB → CS | 3.77 | 0.02299 | 0.238 | 164 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.06 | 0.00638 | 0.993 | 167 | < .001 |
| | | | OSPB→CS | 3.55 | 0.00388 | 0.240 | 915 | < .001 |
| | $H_{6.6A(2)}$ | Direct | OISB→CS | 12.08 | 0.00415 | 0.762 | 2909 | < .001 |
| | | Total | OISB→CS | 15.84 | 0.01494 | 1.000 | 1060 | < .001 |
| Elder Age (EA) | $H_{6.11A(3)}$ | Indirect | OISB→OSPB→ CS | 5.46 | 0.03984 | 0.344 | 137 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.06 | 0.00768 | 0.989 | 138 | < .001 |
| | | | OSPB→ CS | 5.16 | 0.00388 | 0.348 | 1330 | < .001 |
| | $H_{6.6A(3)}$ | Direct | OISB→ CS | 10.39 | 0.00415 | 0.655 | 2503 | < .001 |
| | | Total | OISB→ CS | 15.83 | 0.01800 | 0.999 | 879 | < .001 |

*Source: Computed and Compiled by the Researcher*
*Note. Confidence intervals computed with method: Standard (Delta method); Betas are completely standardized effect sizes*

*Figure No. 6.1:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: AGE (A) as a Moderator**




*Source: Model Tested by the Researcher through Primary Data | Note: YA: Young Adults; Middle Age; EA: Elder Age | *** :Level of Significance at 1%*

*Direct Effect:* Since the interaction effect of age between OISB and CS is significant further the Direct Paths OISB→CS **$H_{6.6A\ (1)}$** of the *Young Adults* Group is i.e., OISB→CS (ß= 0.870, t= 3288, p= < .001); *Middle Age* Group is i.e., OISB→CS **$H_{6.6A\ (2)}$** (ß=0.762, t= 2909, p= < .001); *Elder Age* Group is i.e., OISB→CS **$H_{6.6A\ (3)}$** (ß=0.655, t=2503, p=< .001) is significant at the level of 0.001.

There is a high standardized coefficient (ß = 0.870) for the direct path from OISB to CS which is the strongest for the *Young Adults* group. This implies that in *Young Adults* group, a higher *CS* is closely associated with a larger emphasis on *OISB*. The path coefficient for the *Middle-Age* group is marginally lower (ß = 0.762) suggesting that the strength of the positive relationship between *OISB* and *CS* is weaker than that of the *Young Adults* group. This result is also statistically significant (t = 2909, p < 0.001), which supports the notion that *OISB* contributes to *CS*, although with a diminished effect in comparison to *Young Adults* group. In the *Elder Age* group, the effect is further diminished, with a path coefficient of (ß = 0.655). Although *OISB* continues to have a positive impact on *CS*, its impact is less evident than that of the *Young* and *Middle-Age* groups. The result is still significant (t = 2503, p < 0.001), indicating that *OISB* is a significant factor in determining *CS*, although to a diminished extent, in *Elder Age* group.

The results suggest that *OISB* has a positive impact on *CS* across all age groups; however, the intensity of this relationship decreases as individuals age. In particular, *Young Adults* group demonstrates a more robust connection between their *OISB* and their *CS*, whereas the *Elder Age* group demonstrates a less robust, yet still significant, relationship. This implies that interventions or programs that emphasize the development of Information Seeking Strategies may be more effective for *Young*

*Adults*, followed by *Middle Age* whereas *Elder Age* groups may necessitate the consideration of distinct or additional factors.

### 6.4.1. (b) Indirect Effect with Interaction (Age*OISB→OSPB) (Age*OSPB→CS)

An interaction effect was insignificant between OISB and OSPB (b=–0.00573, 95% CI [–0.00173, 5.93e-4]); Age*OISB → OSPB **H6.1(a)** (*β = –0.00573, t = –0.959, p = 0.338*). This indicates that there is no link between OISB and OSPB, depending upon the Level of *Age* Group being unable to support **H6.1(a)** Since the **H6.1(a)** is not supported it is least important to check further moderation hypothesis for different levels of age group.

An interaction effect was significant between OSPB and CS (b=0.201, 95% CI [0.20018, 0.202]), Age*OSPB → CS **H6.1(b)** (*β* = 0.90171*, t =341.221, p =* < .001). This indicates the link between OISB and OSPB, depending upon the Level of Age Group supporting **H6.1(b)**. The positive interaction effect (b = 0.201) implies that higher CS is associated with increased OSPB. However, the interaction between *Age* and *OSPB* is not uniform across all age groups indicating that age significantly influences the level of competency. *OSPB* may have a distinct impact on *Young Adults* and *Middle-Age* than on *Elder Age* group, suggesting that the efficacy of *OSPB* in improving *CS* is not consistent across all age groups.

The Indirect Effect for *Young Adults* (ß=0.13), *Middle Age* (ß=0.23), and *Elder Age* (ß=0.34) is found to be significant. Therefore, the Paths OSPB→CS of the *Young Adults* Group i.e., OSPB→CS (ß=0.13, t=499, p=< .001), *Middle Age* Group i.e., OSPB→CS (ß=0.24, t=915, p=< .001) and *Elder Age* Group i.e., OSPB→CS (ß=0.34, t=1330, p=< .001) is significant at 0.001.

*Overall Social Participation Behaviour (OSPB)* has a positive but limited impact on *CS* in *Young Adults* group, as the indirect path from *OSPB* to *CS* for this age group is relatively small (ß = 0.13). The effect size is reduced but it indicates that *OSPB* is still beneficial for *CS*. *OSPB* has a more significant impact on *CS* in the *Middle-Age* group than in *Young Adults* as evidenced by the stronger indirect effect of *OSPB* on *CS* (ß = 0.24). This effect is also highly significant (t = 915, p < 0.001) which further confirms that *OSPB* is a critical factor in the improvement of *CS* in *Middle Age* group. The *Elder Age* group experiences the most significant effect (ß = 0.34) indicating that *OSPB* has the most significant impact on *CS* for *Elder Age* group. This finding is statistically significant (t = 1330, p < 0.001) implying that *OSPB* is a critical factor in the preservation or enhancement of *CS* as individuals age. This implies that *OSPB* becomes more critical for the improvement of *CS* in *Elder Age* group, likely as a result of the increased dependence on social interactions to maintain mental and social activity in *Elder Age* group.

The results indicate that *OSPB* has a positive impact on *CS* through indirect effects in all age groups; however, the efficacy of this relationship increases with age. The impact of *OSPB* on *CS* is relatively small in *Young Adults* group, but it increases considerably in *Middle-Age* and *Elder Age* group. This implies that as individuals age, *OSPB* becomes increasingly important for the purpose of maintaining or enhancing their *CS*. Consequently, programs that are intended to encourage Social Participation may be particularly advantageous for *Elder Age* group in terms of increasing their competency levels. However, the Indirect effect of OISB→OSPB→CS is significant for YA (ß=0.13, t=124, p=< .001) **$H_{6.11A\ (1)}$**; MA (ß=0.24, t=499, p=< .001) **$H_{6.11A\ (2)}$** and EA (ß=0.34, t=137, p=< .001) **$H_{6.11A\ (3)}$.**

### 6.4.1. (c) Total Effects (OISB→CS)

The Total effect for *Young Adults* (ß=1.00), *Middle Age* (ß=1.00), and *Elder Age* (ß=0.99) is found to be significant at 0.001 level of significance.

The total effect of OISB and OSPB have a very strong and positive impact on CS for young individuals as evidenced by the ß = 1.00. Both behaviours (OISB and OSPB) are essential for improving the competency of *Young Adults* group as indicated by the high total effect. In the *Middle Age* group, the combined influence of *OISB* and *OSPB* is equally robust and positive as evidenced by the ß = 1.00. These findings indicate that *Middle Age* group derive significant advantages from both *OSPB* and *OISB*, as both activities considerably enhance their *CS*. The *Elder Age* group experiences a total effect of ß = 0.99 which is still extremely robust but slightly less than that of the *Young Adults* and *Middle Age* groups. The relatively small reduction in the total effect for the *Elder Age* group may indicate that although both behaviours continue to contribute to *CS*, the relative significance of *OISB* diminishes and other factors may begin to influence this age group more significantly.

### 6.4.1. (d) Mediation Effect

Since the direct effect [DE] and indirect effect [IDE] are significant for YA [DE: ß= 0.870, t= 3288, p= < .001, IDE: ß= 0.130, t=126, p= < .001]; for MA [DE: ß= 0.762, t= 2909, p= < .001, IDE: ß= 0.238, t= 164, p= < .001]; and for EA [DE: ß= 0.655, t= 2503, p=< .001, IDE: ß= 0.344, t= 137, p=< .001]. There is a partial mediation between OISB→OSPB→CS.

*Young Adults* Group: The *Young Adults* group is partially mediated, as both the direct and indirect effects are substantial. This implies that, although a significant part of the

relationship between *OISB* and *CS* is direct, a portion of it is mediated by *OSPB*. The impact of *OISB* on *CS* in *Young Adults* group is marginally enhanced by *OSPB*.

*Middle Age* Group: The *Middle Age* group exhibits partial mediation with both *OISB* and *OSPB* making significant contributions to *CS*. In comparison to the *Young Adults* group, the mediation is more robust in this group indicating that *OSPB* has a greater impact on the enhancement of *CS* through *OISB*.

*Elder Age* Group: The *Elder Age* group also experiences partial mediation; however, the indirect effect through *OSPB* is stronger. This implies that *OSPB* becomes increasingly significant in the development of *CS* through *OISB* in Elder individuals.

### 6.4.2 Overall Social Participant Behaviour (OSPB) Mediates the Relationship Between Overall Information Seeking Behaviour (OISB) and Competency Score (CS): Analysis of Gender (G) as a Moderator.

The moderating role of gender is assessed in other aspects of competency-building ***Alkathiri, Alrayes, & Khatiry, (2024); Al-Edenat & Alhawamdeh, (2022)****;* and other aspects of the discipline ***Izkair & Lakulu, (2023); Gwiazdzinski, (2022); Heo et. al., (2006)***. The examination of gender as a moderator in social science research reveals how the effects of a variety of social, psychological and environmental factors differ between men, women and non-binary individuals. Through the examination of these gendered effects researchers can develop interventions that are more effective and equitable for all genders, address inequalities and gain a more comprehensive understanding of complex social phenomena. Gender may influence individuals' engagement in social relationships and professional encounters. It can determine the extent to which relationship fulfilment or conflict affects well-being and life outcomes. Thus, the present study further aims to assess the relationship between OISB and CS by employing OSPB as the mediator and Gender as the Moderator. It has two categories

namely, Male and Female. To run the analysis the following hypothesis and sub hypothesis are framed by the researcher.

***For Interaction Effect***

**$H_{6.2\,(a)}$:** A significant interaction effect of ***Gender*** exists between OISB and OSPB

**$H_{6.2\,(b)}$:** A significant interaction effect of ***Gender*** exists between OSPB and CS

**$H_{6.2\,(c)}$:** A significant interaction effect of ***Gender*** exists between OISB and CS

***For Direct Effect***

**$H_{6.7G\,(1)}$:** A positive link exists between OISB and CS for the Male

**$H_{6.7G\,(2)}$:** A positive link exists between OISB and CS for the Female

***For Indirect Effect***

**$H_{6.12G\,(1)}$:** A positive link exists between OISB→OSPB→CS for the Male

**$H_{6.12G\,(2)}$:** A positive link exists between OISB→OSPB→CS for the Female

### 6.4.2 (a). Direct Effect with Interaction (Gender*OISB→CS)

An interaction effect was noted between OISB and CS (b=5.2538, 95% CI [5.23791, 5.2697]); Gender * OISB → CS **$H_{6.2(c)}$** ($\beta$ = 0.1631, $t$ = 647.02, $p$ = < .001). This indicates that the link between *OISB* and *CS*, is dependent on the *Gender* Category, as gender functions as a moderator suggesting conditional mediation effects supporting **$H_{6.2(c)}$**. In this context, "conditional mediation" indicates the intensity or direction of the relationship between *OISB* and *CS* is contingent upon the gender category. The finding illustrates that the influence of *OISB* on *CS* is either more or less evident depending on the gender of the individual, whether it be male or female. The relationship between *OISB* and *CS* is not consistent across genders. The narrow confidence interval suggests that as *OISB* increases, *CS* also increases.

*Table No. 6.4:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: GENDER (G) as a Moderator**

**Moderation Effects (Interactions)**

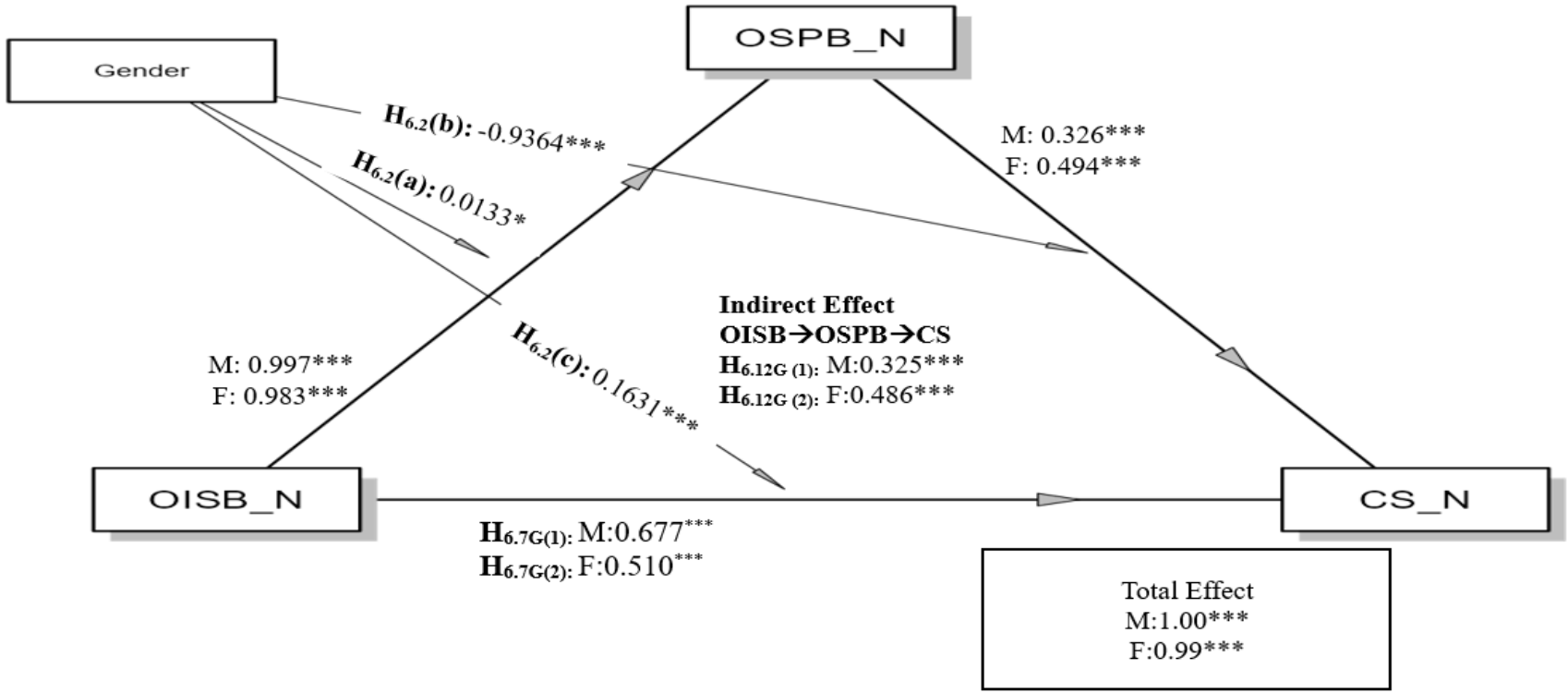
| Moderator | $H_0$ | Interaction | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|---|
| Gender (G) | $H_{6.2(a)}$ | Gender*OISB → OSPB | 0.0290 | 0.01301 | 0.00345 | 0.0545 | 0.0133 | 2.23 | 0.026 |
| | $H_{6.2(c)}$ | Gender*OISB → CS | 5.2538 | 0.00812 | 5.23791 | 5.2697 | 0.1631 | 647.02 | < .001 |
| | $H_{6.2(b)}$ | Gender*OSPB → CS | -4.9902 | 0.00755 | -5.00502 | -4.9754 | -0.9364 | -660.83 | < .001 |

**Conditional Mediation**

| Moderator Level: Gender | $H_0$ | Type | Effect | Estimate | SE | β | z | p |
|---|---|---|---|---|---|---|---|---|
| Male (M) | $H_{6.12G(1)}$ | Indirect | OISB→OSPB → CS | 5.16 | 0.03170 | 0.325 | 163 | < .001 |
| | | Path(s) | OISB → OSPB | 1.07 | 0.00651 | 0.997 | 164 | < .001 |
| | | | OSPB→ CS | 4.83 | 0.00378 | 0.326 | 1280 | < .001 |
| | $H_{6.7G\ (1)}$ | Direct | OISB→ CS | 10.73 | 0.00406 | 0.677 | 2642 | < .001 |
| | | Total | OISB→ CS | 15.85 | 0.01524 | 1.000 | 1040 | < .001 |
| Female (F) | $H_{6.12G(2)}$ | Indirect | OISB→ OSPB → CS | 7.72 | 0.06181 | 0.486 | 125 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.05 | 0.00842 | 0.983 | 125 | < .001 |
| | | | OSPB→CS | 7.33 | 0.00378 | 0.494 | 1941 | < .001 |
| | $H_{6.7G\ (2)}$ | Direct | OISB→CS | 8.10 | 0.00403 | 0.510 | 2012 | < .001 |
| | | Total | OISB→CS | 15.82 | 0.01972 | 0.998 | 802 | < .001 |

*Source: Computed and Compiled by the Researcher*
*Note. Confidence intervals computed with method: Standard (Delta method); Betas are completely standardized effect sizes*

*Figure No. 6.2:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: Gender (G) as a Moderator**




*Source: Model Tested by the Researcher through Primary Data | Note: M: Male; F: Female | *** : Level of Significance at 1%; * : Level of Significance at 10%*

*Direct Effect:* Since the interaction effect of gender between OISB and CS is significant further the Direct Paths OISB→CS **H6.7G (1)** of the *Male* is i.e., OISB→CS (ß= 0.667, t=2642, p= < .001); **H6.7G (2)** *Female* is i.e., OISB→CS (ß= 0.510, t= 2012, p= < .001 is significant at the level of 0.001. The direct path between *OISB* and *CS* is significant for males (ß = 0.667, t = 2642, p < .001) suggesting a robust positive relationship. This implies that the *CS* of *Males* increases significantly as their *OISB* increases. The direct path between *OISB* and *CS* is also significant for *Females* (ß = 0.510, t = 2012, p < .001) indicating a positive but somewhat weakened relationship in comparison to its *Male* counterpart. The higher β value for *Males* (0.667) than for *Females* (0.510) suggests that the impact of *OISB* on *CS* is more pronounced in *Males*. In other words, *Males* seem to derive greater advantages from *OISB* in terms of enhancing their *CS* than *Females*.

### 6.4.2 (b). Indirect Effect with Interaction (Gender*OISB→OSPB) (Gender*OSPB→CS)

An interaction effect was significant between OISB and OSPB (b=0.0290, 95% CI [0.00345, 0.0545]); Gender*OISB → OSPB **H6.2(a)** is found to be significant ($\beta$ = 0.0133, $t$ = 2.23, $p = 0.026$). This indicates that there is a link between OISB and OSPB, depending upon the *Gender* category supporting **H6.2(a)**. The interaction effect between *OSPB* and *OISB* (b = 0.0290) suggests that there is a positive relationship between *OSPB* and *OISB*. Individuals' *OSPB* tends to increase as *OISB* increases. Although this effect is comparatively moderate in extent, the confidence interval indicates that it is statistically significant. For instance, *Males* may have *OSPB* as a direct consequence of their *OISB*, while *Females* may encounter distinct social contexts or obstacles that influence the extent to which their *OISB* equates to *OSPB*. This underscores the significance of examining gender-specific pathways when attempting to comprehend the relationship between *OISB* and *OSPB*.

The Indirect Effect was noted for *Male* (ß=0.32) and *Female* (ß= 0.049). Therefore, the Paths OISB→OSPB **$H_{6.12G\ (1)}$** of the Male i.e., OISB→ OSPB (ß= 0.99, t=164, p= < .001), **$H_{6.12G\ (2)}$** Female i.e., OISB→OSPB (ß= 0.98, t= 125, p= < .001) is significant at 0.001. The results indicate that *Overall Information Seeking Behaviour (OISB)* is a robust predictor of *Overall Social Participation Behaviour (OSPB)* for both *Males* and *Females*. Although the direct effect is virtually identical between the two genders, *Males* exhibit a slightly stronger relationship (ß = 0.99) than *Females* (ß = 0.98). Both effects are highly significant, indicating that individuals who engage in information-seeking are also more likely to participate in social activities.

An interaction effect was significant between OSPB and CS (b= –4.9902, 95% CI [–5.00502, –4.9754]), Gender*OSPB → CS **($H_{6.2b}$)** ($\beta$ = −0.9364, $t$ = -660.83, $p$ = < .001). This indicates the link between OISB and OSPB, depending upon the Gender category supporting **($H_{6.2b}$)**. In particular, the relationship between *OSPB* and *CS* is less positive (or more negative) when *Gender* is taken into account. The link between *OSPB* and *CS* is negatively moderated by *Gender*, as indicated by a negative β. In other words, the impact of *OSPB* on *CS* is either reduced or more adverse for a specific *Gender* category.

The Indirect Effect for *Male* (ß= 0.32) and *Female* (ß= 0.049). Therefore, the Paths OSPB→CS of the *Male* i.e., OSPB→CS (ß= 0.33, t= 1280, p= < .001), *Female* i.e., OSPB→CS (ß=0.49, t=1941, p=< .001) are significant at 0.001. These indirect effects indicate that the mediating factor has a more significant impact on *Males* than on *Females*. In other words, *Males* are more powerfully influenced by their *OSPB* through indirect mechanisms than females, who exhibit a weaker indirect effect.

However, the Indirect effect of OISB→OSPB→CS is significant for *Male* (ß=0.32, t=163, p=< .001) **H6.12G (1)**; *Female* (ß=0.48, t=125, p=< .001) **H6.12G (2).**

### 6.4.2 (c). Total Effects (OISB→CS)

The Total effect for *Males* (ß=1.00), and *Females* (ß=0.99) is found to be significant at 0.001 level of significance. Both *Males* (β = 1.00) and *Females* (β = 0.99) exhibit total effects that are statistically significant at the 0.001 level. This implies that the independent variable *(OISB)* and the dependent variable *(CS)* have a robust relationship for both *Genders* suggesting that the relationship has strong predictive power. The nearly identical effect sizes (β = 1.00 for *Males* and β = 0.99 for *Females*) indicate that despite small differences the relationship between these variables is equally influential for both *Genders*.

### 6.4.2 (d). Mediation Effect

Since the direct effect [DE] and indirect effect [IDE] are significant for *Male* [DE: ß=0.667, t=2642, p=< .001, IDE: ß=0.32, t=163, p=< .001]; for *Female* [DE: ß=0.510, t=2012, p=< .001, IDE: ß=0.49, t=125, p=< .001]. There is a partial mediation between OISB→OSPB→CS.

The direct effect for *Males* is β = 0.667 (with t = 2642), and the p-value is <.001. This suggests a highly significant direct relationship between *OISB* and *CS* independent of the mediating variable *(OSPB)*. The indirect effect for males is β = 0.32 (with t = 163), which is also highly significant (p <.001). This demonstrates that OSPB mediates a portion of the impact of *OISB* on *CS* indicating that the mediating variable partially elucidates the relationship. The direct effect on *Females* is slightly lower at β = 0.510 (with t = 2012), but it is still highly significant (p <.001). This indicates that the direct path between *OISB* and *CS* is also strong for *Females*, although not as strong as it is for

*Males*. The indirect effect of β = 0.49 (with t = 125) for *Females* is also significant at p <.001. It is important to note that the indirect effect has a greater impact in *Females* than in *Males* suggesting that the mediating variable *(OSPB)* has a more significant impact on the relationship between *OISB* and *CS* in *Females*.

In summary, the relationship between *OISB* and *CS* is significantly influenced by the partial mediation effect of *OSPB* for both *Males* and *Females*. Males experience a more robust direct effect, while *Females* have a stronger indirect effect, despite the fact that the overall effect is almost identical for both *Genders*. The proposed hypotheses are confirmed by these findings which offer valuable insights into *Gender* differences in the mediation process.

### 6.4.3 Overall Social Participant Behaviour (OSPB) Mediates the Relationship Between Overall Information Seeking Behaviour (OISB) and Competency Score (CS): Analysis of Education as a Moderator

Educational Background is assessed in the studies related to the other subject disciplines ***Norudin et. al., (2024)***; ***Sheikh, Abelsen, & Olsen, (2014); Abu-Shanab, (2011); Chen, Chen, & Chen, (2010); Ivancevich & McMahon, (1977)*** apart from the particular topic being examined in the present chapter. Education can directly augment agricultural productivity by enhancing labour quality, increasing adaptability to imbalances and influencing the likelihood of successfully adopting innovations. Education is considered vital for agricultural output in a continuously evolving technological or economic scenario. Education may either improve the capacity to acquire information through experience with new technology or increase prior access to external sources of information, ***Weir, (1999)***. Therefore, the present study further aims to assess the relationship between OISB and CS by employing OSPB as the mediator and Educational Status as the Moderator. To run the analysis the following hypothesis and sub hypothesis are framed by the researcher.

***For Interaction Effect***

**$H_{6.3(a)}$:** *A significant interaction effect of Education exists between OISB and OSPB*

**$H_{6.3(b)}$:** *A significant interaction effect of Education exists between OSPB and CS*

**$H_{6.3(c)}$:** *A significant interaction effect of Education exists between OISB and CS*

***For Direct Effect***

**$H_{6.8E\ (1)}$:** *A positive link exists between OISB and CS for the Primary School*

**$H_{6.8E\ (2)}$:** *A positive link exists between OISB and CS for the Middle School and Above*

***For Indirect Effect***

**$H_{6.13E\ (3)}$:** *A positive link exists between OISB→OSPB→CS for the Primary School*

**$H_{6.13E\ (4)}$:** *A positive link exists between OISB→OSPB→CS for the Middle School and Above*

### 6.4.3 (a). Direct Effect with Interaction (Education*OISB→CS)

An interaction effect was noted between OISB and CS (b=5.4316, 95% CI [5.4155, 5.4477]); Education* OISB → CS **$H_{6.3\ (c)}$** ($\beta$ = 0.17093, $t$ = 660.58, $p$ = < .001). This indicates that the link between *OISB* and *CS* is dependent on *Education* as *Education* functions as a moderator suggesting conditional mediation effects supporting **$H_{6.3\ (c)}$.** The interaction term between *OISB* and *Education* on *CS* has a positive coefficient (5.4316) indicating that the effect of *OISB* on *CS* becomes stronger as the *Education* level increases. This implies that the *Middle School and Above* are more likely to benefit from *OISB* with respect to their *CS*. A robust and highly significant moderation effect is indicated by the significant β value of 0.17093, a t-value of 660.58 and a p-value <.001. This implies that the relationship between OISB and CS is strengthened by education. In simplified terms, the *Middle School and Above* group experience a greater impact on their *CS* as a result of *OISB*.

*Direct Effect:* Since the interaction effect of Education between OISB and CS is significant further the Direct Paths OISB→CS **$H_{6.8E\ (1)}$** of the *Primary School* is i.e., OISB→CS (ß=0.671, t=2587, p= < .001); **$H_{6.8E\ (2)}$** *Middle School and Above* is i.e., OISB→CS (ß=0.499, t=1908, p= < .001 is significant at the level of 0.001. This path illustrates the significant positive direct impact of *OISB* on *CS* for individuals with a *Primary School* group. The *CS* increases by 0.671 units for each unit increase in *OISB* as indicated by the β value of 0.671. This effect is highly significant as evidenced by the p-value of >.001 and t-value=2587. Compared to individuals in *Primary School* group, the direct effect of *OISB* on *CS* is marginally smaller (β = 0.499) in the *Middle School and Above* group, but the effect remains significant.

This suggests that the relationship between *OISB* and *CS* is somewhat diminished even though *OISB* has a positive impact on respondents in the *Middle School and Above* group. Nevertheless, the robustness of this effect is demonstrated by the high t-value (1908) and p-value, which is >.001.

The results suggest that *Overall Information Seeking Behaviour (OISB)* has a significant positive impact on *Competency Score (CS)* at various *Education* levels; however, the degree of this effect varies. In terms of CS gain, this implies that respondents in the *Primary School* group benefit more from OISB than those in the *Middle School and Above* group. Nevertheless, the impact is considerable in both groups indicating that OISB is a significant factor in the development of CS irrespective of one's educational background.

*Table No. 6.5:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: Education (E) as a Moderator**

**Moderation Effects (Interactions)**

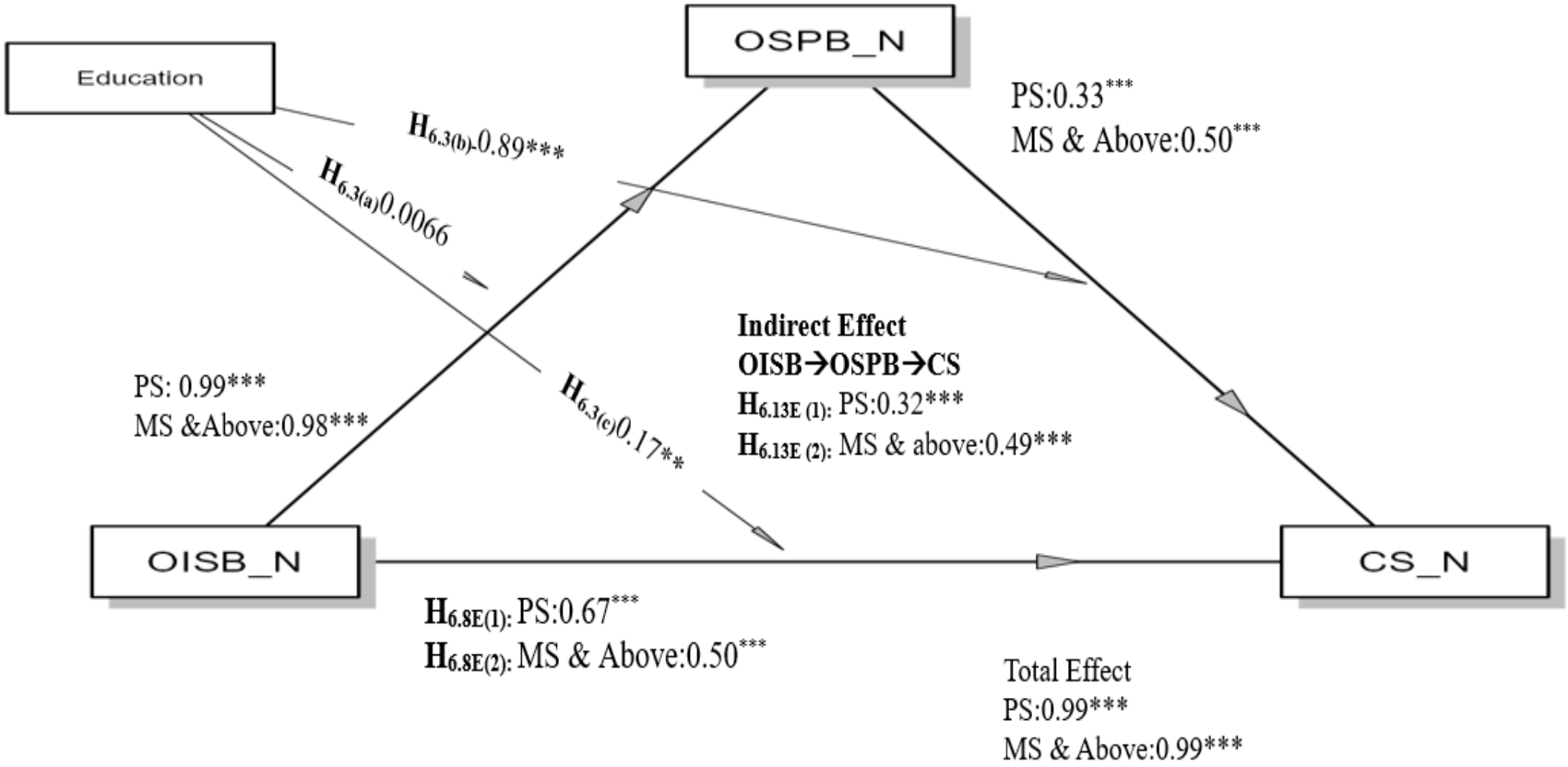
| Moderator | $H_0$ | Interaction | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|---|
| **Education (E)** | $H_{6.3(a)}$ | Education*OISB → OSPB | 0.0142 | 0.01415 | –0.0136 | 0.0419 | 0.00660 | 1.00 | 0.317 |
| | $H_{6.3(c)}$ | Education*OISB → CS | 5.4316 | 0.00822 | 5.4155 | 5.4477 | 0.17093 | 660.58 | < .001 |
| | $H_{6.3(b)}$ | Education*OSPB → CS | –5.1605 | 0.00769 | –5.1756 | –5.1455 | –0.89477 | –671.17 | < .001 |

**Conditional Mediation**

| Moderator Level: Gender | $H_0$ | Type | Effect | Estimate | SE | β | z | p |
|---|---|---|---|---|---|---|---|---|
| **Primary School (PS)** | $H_{6.13E(1)}$ | Indirect | OISB→OSPB → CS | 5.21 | 0.03504 | 0.329 | 148.8 | < .001 |
| | | Path(s) | OISB → OSPB | 1.06 | 0.00708 | 0.990 | 149.8 | < .001 |
| | | | OSPB→ CS | 4.92 | 0.00384 | 0.332 | 1279.4 | < .001 |
| | $H_{6.8E(1)}$ | Direct | OISB→ CS | 10.64 | 0.00411 | 0.671 | 2587.4 | < .001 |
| | | Total | OISB→ CS | 15.83 | 0.01658 | 0.999 | 955.0 | < .001 |
| **Middle School & Above (MS)** | $H_{6.13E(2)}$ | Indirect | OISB→ OSPB → CS | 7.90 | 0.08994 | 0.497 | 87.8 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.05 | 0.01198 | 0.983 | 87.9 | < .001 |
| | | | OSPB→CS | 7.50 | 0.00384 | 0.506 | 1950.6 | < .001 |
| | $H_{6.8E(2)}$ | Direct | OISB→CS | 7.92 | 0.00415 | 0.499 | 1908.0 | < .001 |
| | | Total | OISB→CS | 15.82 | 0.02807 | 0.998 | 563.4 | < .001 |

*Source: Computed and Compiled by the Researcher*
*Note. Confidence intervals computed with method: Standard (Delta method); Betas are completely standardized effect sizes*

*Figure No. 6.3:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS:: Education (E) as a Moderator**




*Source: Model Tested by the Researcher through Primary Data | Note: PS: Primary School; MS & Above: Middle School and Above | *** : Level of Significance at 1%; NS: Non Significant*

### 6.4.3 (b). Indirect Effect with Interaction (Education*OISB→OSPB) (Education*OSPB→CS)

An interaction effect was insignificant between OISB and OSPB (b=0.0142, 95% CI [–0.0136, 0.0419]); Education*OISB → OSPB **H6.3(a)** is found to be significant (*β* = 0.00660*, t* = 1.00*, p = 0.317*). This indicates that there is no link between OISB and OSPB depending upon the Educational Status supporting **H6.3(a)**. Since the **H6.3(a)** is not supported it is least important to check further moderation hypothesis for different groups of education.

An interaction effect was significant between OSPB and CS (b=–5.1605, 95% CI [–5.1756, –5.1455]), Educational Status*OSPB → CS **H6.3(b)** (*β* =–0.89477*, t*=–671.17*, p* = < .001). This indicates the link between OSPB and CS, depending upon the Educational Status supporting **H6.3(b)**. The interaction between OSPB and *Education* has a significant effect on the *Competency Score* (CS). The negative interaction term (β = –0.89477) indicates that the relationship between OSPB and CS is dependent upon Educational Status. Specifically, the negative relationship between OSPB and CS becomes stronger as *Education* increases.

The Indirect Effect for *Primary School* (ß=0.32) and *Middle School and Above* (ß=0.049). Therefore, the Paths OSPB→CS of the *Primary School* Group i.e., OSPB→CS (ß=0.33, t=1280, p=< .001), *Middle School and Above* i.e., OSPB→CS (ß=0.49, t=1941, p=< .001) is significant at 0.001. These findings indicate that the indirect effect is significantly stronger for individuals with "*Primary School*" (a lower educational level) than for those with "*Middle School and Above*" (a higher educational level). The direct path from OSPB to CS for individuals with "*Primary School*" is ß = 0.33, with a t-value of 1280 and a p-value <.001. This indicates a statistically significant and positive direct relationship between OSPB and CS for the *Primary School* group.

CS for individuals in this educational category also increases as OSPB increases. Similarly, the findings illustrate a significant positive relationship between OSPB and CS in the context of *Middle School and Above*. The effect size is greater than that of the *Primary School* group suggesting that individuals with *Middle School* and Above experience a more direct impact of OSPB on their CS.

However, the Indirect effect of OISB→OSPB→CS is significant for *Primary School* (ß=0.32, t=148, p=< .001) **H6.13E (1)**; *Middle School & Above* (ß=0.49, t=87.8, p=< .001) **H6.13E (2).**

### 6.4.3 (c). Total Effects (OISB→CS)

The Total effect for *Primary School* (ß=0.99), and *Middle School and Above* (ß=0.99) is found to be significant at 0.001 level of significance. This finding suggests that CS are significantly positive for respondents with both *Primary School* and *Middle School and Above* educational levels as a consequence of OISB. In particular, CS for both groups increase by approximately 0.99 units for each unit increase in OISB, indicating that the impacts are nearly identical across educational levels.

### 6.4.3 (d). Mediation Effect

Since the direct effect [DE] and indirect effect [IDE] are significant for *Primary School* [DE: ß=0.671, t=2587, p=< .001, IDE: ß=0.329, t=149, p=< .001]; for *Middle School* and Above [DE: ß=0.449, t=1908, p=< .001, IDE: ß=0.50, t=88, p=< .001]. There is a partial mediation between OISB→OSPB→CS.

The direct impact of OISB on CS for those with education is highly significant (β=0.671, t = 2587, p < 0.001). The individuals in the *Primary School* group who actively pursue information demonstrate superior performance in competency assessment. The indirect effect indicates that OISB affects OSPB, which subsequently enhances CS.

Consequently, persons who pursue *Active Information-Seeking Behaviour* typically engage more in social activities, which in turn amplifies their competencies. OISB continues to have a direct significant impact on CS for individuals in the *Middle School* and Above group ($\beta$=0.449, t = 1908, $p < 0.001$). This implies that even at the *Middle School and Above* group the act of actively pursuing information has a direct relationship with improved competency scores. This direct effect is slightly less effective than that of *Primary School* but it remains significant. The indirect effect of *Middle School and Above* is greater than that of *Primary School* ($\beta$=0.50, t = 88, $p < 0.001$), suggesting that a greater portion of the impact of OISB on CS is mediated by *Overall Social Participation Behaviour* (OSPB). This implies that OSPB is even more critical in the development of CS for individuals with the *Middle School and Above* group.

### 6.4.4 Overall Social Participant Behaviour (OSPB) Mediates the Relationship Between Overall Information Seeking Behaviour (OISB) and Competency Score (CS): Analysis of Size of Land as a Moderator

***Chen & Liu, (2023); Li, Qian, & Kong, (2023); Hu, Lin, & Wen, (2024)*** have assessed the moderating role of Farm Size or Size of Land concerning different other aspects of agricultural research apart from Competency Mapping and Information Seeking Behaviour. The size of the land is a vital factor in agri-allied research as it has an impact on economic outcomes, environmental sustainability, technological adoption, resource use and productivity. Researchers can gain a better understanding of the variability in farming practices and responses to policies by studying land size. This understanding can result in more effective and tailored agricultural interventions and guidelines which facilitates more precise predictions and policy-making.

Therefore, the present study further aims to assess the relationship between OISB and CS by employing OSPB as the mediator and Size of Land as the Moderator. The Size

of Land is categorized *Marginal* (MR); *Medium* (M) and *Large* (LR). To run the analysis the following hypothesis and sub hypothesis are framed by the researcher.

***For Interaction Effect***

**$H_{6.4(a)}$:** A significant interaction effect of Size of Land exists between OISB and OSPB

**$H_{6.4(b)}$:** A significant interaction effect of Size of Land exists between OSPB and CS

**$H_{6.4(c)}$:** A significant interaction effect of Size of Land exists between OISB and CS

***For Direct Effect***

**$H_{6.9L\,(1)}$:** A positive link exists between OISB and CS for the Marginal

**$H_{6.9L\,(2)}$:** A positive link exists between OISB and CS for the Medium

**$H_{6.9L\,(3)}$:** A positive link exists between OISB and CS for the Large

***For Indirect Effect***

**$H_{6.14L\,(1)}$:** A positive link exists between OISB→OSPB→CS for the Marginal

**$H_{6.14L\,(2)}$:** A positive link exists between OISB→OSPB→CS for the Medium

**$H_{6.14L\,(3)}$:** A positive link exists between OISB→OSPB→CS for the Large

### 6.4.4 (a). Direct Effect with Interaction (Size of Land*OISB→CS)

*Interaction:* An interaction effect was noted between OISB and CS (b= 1.10, 95% CI [1.06955, 1.12315]); Size of Land*OISB → CS **$H_{6.4(c)}$** ($\beta$ = 0.10594, $t = 80.169$, $p =$ < .001). This indicates that the link between OISB and CS is dependent on the Size of Land, suggesting conditional mediation effects supporting **$H_{6.4(c)}$**. This implies that the relationship between OISB and CS is dependent upon the size of the land possessed. In other words, individuals with larger landholdings who engage in OISB exhibit a greater increase in CS than those with medium and Marginal landholdings.

*Table No. 6.6:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: Size of Land (L) as a Moderator**

**Moderation Effects (Interactions)**

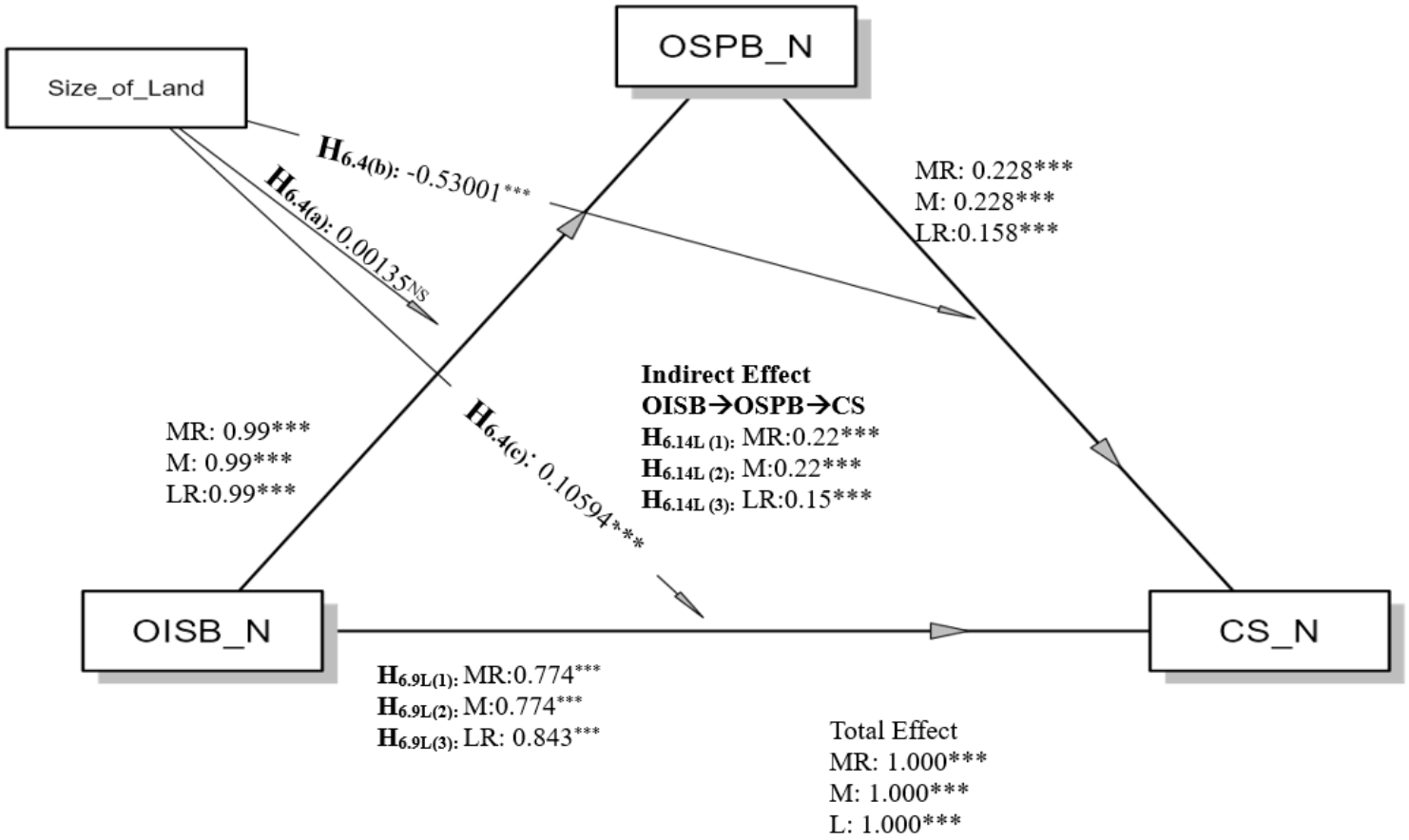
| Moderator | $H_0$ | Interaction | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|---|
| Size of Land (L) | $H_{6.4(a)}$ | Size of Land*OISB → OSPB | 9.47e-4 | 0.00431 | -0.00750 | 0.00939 | 0.00135 | 0.220 | 0.826 |
| | $H_{6.4(c)}$ | Size of Land*OISB → CS | 1.10 | 0.01368 | 1.06955 | 1.12315 | 0.10594 | 80.169 | < .001 |
| | $H_{6.4(b)}$ | Size of Land*OSPB → CS | -1.04 | 0.01298 | -1.06669 | -1.01580 | -0.53001 | -80.210 | < .001 |

**Conditional Mediation**

| Moderator Level: Age Group | $H_0$ | Type | Effect | Estimate | SE | β | z | p |
|---|---|---|---|---|---|---|---|---|
| Marginal (MR) | $H_{6.14L(1)}$ | Indirect | OISB→OSPB → CS | 3.59 | 0.02409 | 0.227 | 149 | < .001 |
| | | Path(s) | OISB → OSPB | 1.06 | 0.00701 | 0.992 | 152 | < .001 |
| | | | OSPB→ CS | 3.38 | 0.00403 | 0.228 | 839 | < .001 |
| | $H_{6.9L(1)}$ | Direct | OISB→ CS | 12.26 | 0.00432 | 0.774 | 2839 | < .001 |
| | | Total | OISB→ CS | 15.84 | 0.01643 | 1.000 | 964 | < .001 |
| Medium (ME) | $H_{6.14L(2)}$ | Indirect | OISB→ OSPB → CS | 3.59 | 0.02409 | 0.227 | 149 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.06 | 0.00701 | 0.992 | 152 | < .001 |
| | | | OSPB→CS | 3.38 | 0.00403 | 0.228 | 839 | < .001 |
| | $H_{6.9L(2)}$ | Direct | OISB→CS | 12.26 | 0.00432 | 0.774 | 2839 | < .001 |
| | | Total | OISB→CS | 15.84 | 0.01643 | 1.000 | 964 | < .001 |
| Large (LR) | $H_{6.14L(3)}$ | Indirect | OISB→OSPB→ CS | 2.49 | 0.01611 | 0.157 | 154 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.06 | 0.00664 | 0.993 | 160 | < .001 |
| | | | OSPB→ CS | 2.34 | 0.00403 | 0.158 | 581 | < .001 |
| | $H_{6.9L(3)}$ | Direct | OISB→ CS | 13.35 | 0.00432 | 0.843 | 3093 | < .001 |
| | | Total | OISB→ CS | 15.84 | 0.01556 | 1.000 | 1018 | < .001 |

*Source: Computed and Compiled by the Researcher*
*Note. Confidence intervals computed with method: Standard (Delta method); Betas are completely standardized effect sizes*

*Figure No. 6.4:* **Results of Med-Mod Analysis of OSPB Mediates the Relationship Between OISB → CS :: Size of Land (L) as a Moderator**




*Source: Model Tested by the Researcher through Primary Data | Note: M: Marginal; M: Medium; LR: Large | ***: Significance at 1%*

*Direct Effect*: Since the interaction effect of the Size of Land between OISB and CS is significant, further the Direct Paths OISB→CS **H6.9L(1)** of the *Marginal* is i.e., OISB→CS (ß=0.774, t=2839, p=< .001); **H6.9L(2)** *Medium* is i.e., OISB→CS (ß=0.774, t=2839, p=< .001); **H6.9L(3)** *Large* is i.e., OISB→CS (ß=0.843, t=3093, p=< .001) is significant at the level of 0.001. The results suggest that the direct effects of Overall *Information Seeking Behaviour* (OISB) on *Competency Score* (CS) are significant across all land size categories—*Marginal, Medium and Large*. The robust relationship between OISB and CS is supported by the statistically significant coefficients for these direct effects, which have p-values of less than 0.001. The OISB has a significant positive effect on CS, for those with *Marginal* and *Medium* landholdings. The CS of these individuals are generally higher when they are more actively involved in the OISB. The respondents with larger landholdings have an even greater positive impact on their CS than those with *Marginal* or *Medium* landholdings because of their OISB.

### 6.4.4 (b). Indirect Effect with Interaction (Size of Land*OISB→OSPB) and (Size of Land*OSPB→CS)

An interaction effect was insignificant between OISB and OSPB (b=9.47e-4, 95% CI [–0.00750, 0.00939]); Size of Land*OISB → OSPB **H6.4(a)** ($\beta$ = 0.00135, $t$ = 0.220, $p$ = 0.826). This indicates that there is no link between OISB and OSPB depending upon the *Size of Land* being unable to support **H6.4(a)**. Since the **H6.4(a)** is not supported it is least important to check further moderation hypothesis for different Land Sizes.

An interaction effect was significant between OSPB and CS (b=–1.04, 95% CI [–1.06669, 1.12315]), Size of Land*OSPB → CS **H6.4(b)** ($\beta$ = –0.53001, $t$ =–80.210, $p$ = < .001). This indicates the link between OSPB and CS depending upon the *Size of the Land* **H6.4(b)**. The findings emphasize that the impact of *Overall Social Participation Behaviour* (OSPB) on *Competency Score* (CS) is not uniform and is significantly

influenced by the size of the land. The adverse effect of OSPB on CS is exacerbated as the size of the land area increases.

The Indirect Effect for *Marginal* (ß=0.227), *Medium* (ß=0.227), and *Large* (ß=0.157) *Land Size* is found to be significant. Therefore, the Paths OSPB→CS of the *Marginal* i.e., OSPB→CS (ß=0.228, t=839, p=< .001), *Medium* i.e., OSPB→CS (ß=0.228, t=838, p=< .001) *Large* i.e., OSPB→CS (ß=0.158, t=581, p=< .001) is significant at 0.001. The path from OSPB→CS has the same strength (β = 0.228) for both *Marginal* and *Medium* land sizes, suggesting that the impact of OSPB on CS is comparable in these land sizes. In *Marginal* and *Medium* land sizes, OSPB seems to have a relatively robust and positive impact on CS. The impact of OSPB → CS is less pronounced in large land sizes (β = 0.158). This implies that the impact OSPB on CS diminishes as the size of the land increases.

However, the Indirect effect of OISB→OSPB→CS is significant for Marginal (ß=0.22, t=149, p=< .001) **$H_{6.14L\ (1)}$**; Medium (ß=0.22, t=149, p=< .001) **$H_{6.14L\ (2)}$** and Large (ß=0.15, t=154, p=< .001) **$H_{6.14L\ (3)}$**.

### 6.4.4 (c). Total Effects (OISB→CS)

The Total effect for *Marginal* (ß=1.00), *Medium* (ß=1.00), and *Large* (ß=0.99) *Land size* is found to be significant at 0.001 level of significance. The overall effect of *Overall Information Seeking Behaviour* (OISB) on *Competency Score* (CS) is highly significant across all land sizes (*Marginal, Medium and Large*), with β=1.00 for *Marginal* and *Medium* land sizes and β=0.99 for large land sizes. This illustrates a robust, positive and virtually uniform relationship between OISB and CS in a variety of settings, indicating that individuals who are proactive in their pursuit of information are more likely to demonstrate higher levels of competence. The *Marginal* moderation by land

size is indicated by the minor difference in effect size for large land areas. However, the relationship is robust and consistent across different land sizes.

### 6.4.4 (d). Mediation Effect

Since the direct effect [DE] and indirect effect [IDE] are significant for *Marginal* Land Size [DE: ß=0.774, t=2839, p=< .001, IDE: ($\beta$ = 0.277, $t$ = 0.149, $p$ = < .001)]; for *Medium* Land Size [DE: ß=0.774, t=2839, p=< .001, IDE: ß=0.227, t=149, p=< .001]; and for *Large* Land Size [DE: ß=0.843, t=3093, p=< .001, IDE: ß=0.157, t=154, p=< .001]. There is a partial mediation between OISB→OSPB→CS.

OISB has a significant impact on CS in *Marginal* and *Medium* land sizes, both directly and indirectly through OSPB. This suggests that OISB directly enhances CS while also facilitating OSPB which in turn positively impacts CS. OSPB's mediating function is more robust in *Medium* and *Marginal* land sizes. The direct impact of OISB on CS is even more significant in large land sizes, suggesting a more robust direct relationship. Nevertheless, the indirect effect through OSPB is less definite indicating that the mediating role of OSPB is weakened in *Larger* land sizes.

### 6.4.5 Overall Social Participant Behaviour (OSPB) Mediates the Relationship Between Overall Information Seeking Behaviour (OISB) and Competency Score (CS): Analysis of Annual Income as a Moderator

The past research by ***Park et al., (2021); Chawla & Joshi, (2018); Ansari & Farooqi, (2017); Pitchayadejanant & Nakpathom (2016); Marumbwa, (2014)*** has been conducted by taking annual income and other demographic & socio-economic factors as a moderating factor considering the other aspects of the study area apart from competency mapping. Individuals with higher income levels may possess distinct desires, interests and motivations compared to those with lower income levels as annual income is a crucial socioeconomic factor influencing an individual's perception and

behaviour, ***Baffa, Maiyaki, & Baffa, (2023)***. Thus, annual income as a moderator is important because it greatly affects access to opportunities, decision-making, career development, psychological well-being and policy efficacy. It facilitates the formulation of inclusive policies, specialized training programs and interventions designed to meet the requirements of various income groups to mitigate competency gaps within society.

Therefore, the present study further aims to assess the relationship between OISB and CS by employing OSPB as the mediator and *Annual Income* as the Moderator. The Annual Income is categorized into *Low, Medium* and *Large*. To run the analysis the following hypothesis and sub hypothesis are framed by the researcher.

***<u>For Interaction Effect</u>***

**$H_{6.5(a)}$:** A significant interaction effect of Annual Income exists between OISB and OSPB

**$H_{6.5(b)}$:** A significant interaction effect of Annual Income exists between OSPB and CS

**$H_{6.5(c)}$:** A significant interaction effect of Annual Income exists between OISB and CS

***<u>For Direct Effect</u>***

**$H_{6.10I\ (1)}$:** A positive link exists between OISB and CS for the Low

**$H_{6.10I\ (2)}$:** A positive link exists between OISB and CS for the Medium

**$H_{6.10I\ (3)}$:** A positive link exists between OISB and CS for the Large

***<u>For Indirect Effect</u>***

**$H_{6.15I\ (1)}$:** A positive link exists between OISB→OSPB→CS for the Low

**$H_{6.15I\ (2)}$**: A positive link exists between OISB→OSPB→CS for the Medium

**$H_{6.15I\ (3)}$**: A positive link exists between OISB→OSPB→CS for the Large

*Table No. 6.7:* **Results of Med-Mod Analysis Between Competency Score (CS) & Overall Information Seeking Behaviour (OISB) using Annual Income (I) as Moderator**

**Moderation Effects (Interactions)**

| Moderator | $H_0$ | Interaction | Estimate | SE | Lower | Upper | β | z | p |
|---|---|---|---|---|---|---|---|---|---|
| **Annual Income (I)** | **$H_{6.5(a)}$** | Annual Income*OISB → OSPB | 0.0129 | 0.00517 | 0.00272 | 0.0230 | 0.0147 | 2.49 | 0.013 |
| | **$H_{6.5(c)}$** | Annual Income*OISB → CS | 2.1435 | 0.00181 | 2.13994 | 2.1470 | 0.1654 | 1185.94 | < .001 |
| | **$H_{6.5(b)}$** | Annual Income*OSPB → CS | –2.0367 | 0.00164 | –2.03995 | –2.0335 | –0.7970 | –1243.12 | < .001 |

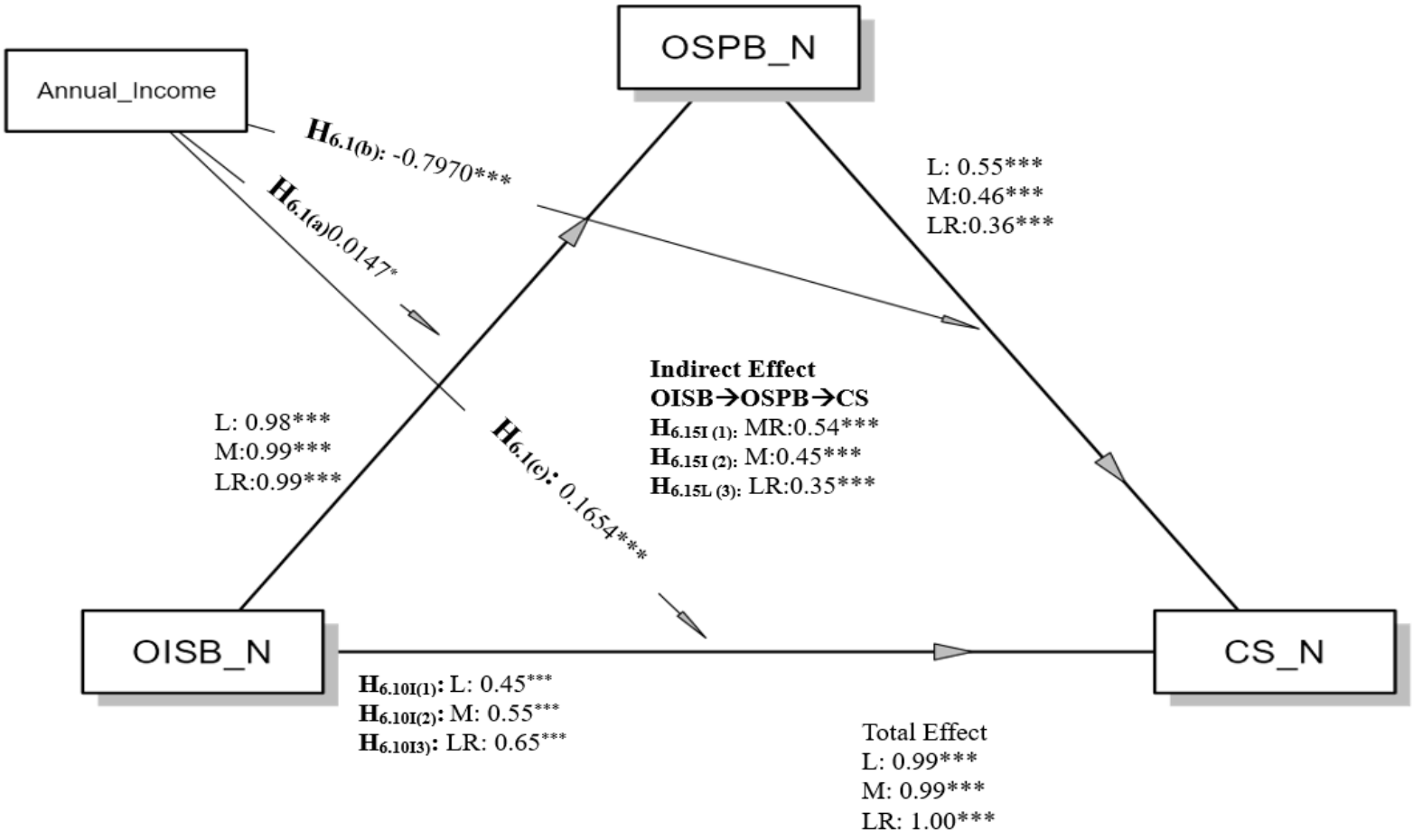
**Conditional Mediation**

| Moderator Level: Annual Income | $H_0$ | Type | Effect | Estimate | SE | β | z | p |
|---|---|---|---|---|---|---|---|---|
| **Low (L)** | **$H_{6.15I\ (1)}$** | Indirect | OISB→OSPB → CS | 8.64 | 0.06264 | 0.544 | 138 | < .001 |
| | | Path(s) | OISB → OSPB | 1.05 | 0.00760 | 0.981 | 138 | < .001 |
| | | | OSPB→ CS | 8.23 | 0.00351 | 0.554 | 2344 | < .001 |
| | **$H_{6.10I\ (1)}$** | Direct | OISB→ CS | 7.15 | 0.00373 | 0.450 | 1920 | < .001 |
| | | Total | OISB→ CS | 15.81 | 0.01781 | 0.998 | 888 | < .001 |
| **Medium (M)** | **$H_{6.15I\ (2)}$** | Indirect | OISB→ OSPB → CS | 7.16 | 0.04499 | 0.451 | 159 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.06 | 0.00664 | 0.990 | 160 | < .001 |
| | | | OSPB→CS | 6.76 | 0.00351 | 0.456 | 1924 | < .001 |
| | **$H_{6.10I\ (2)}$** | Direct | OISB→CS | 8.70 | 0.00375 | 0.548 | 2322 | < .001 |
| | | Total | OISB→CS | 15.83 | 0.01555 | 0.999 | 1018 | < .001 |
| **Large (L)** | **$H_{6.15I\ (3)}$** | Indirect | OISB→OSPB→ CS | 5.65 | 0.04051 | 0.356 | 139 | < .001 |
| | | Path(s) | OISB→ OSPB | 1.07 | 0.00763 | 0.998 | 140 | < .001 |
| | | | OSPB→ CS | 5.28 | 0.00351 | 0.357 | 1505 | < .001 |
| | **$H_{6.10I\ (3)}$** | Direct | OISB→ CS | 10.25 | 0.00379 | 0.647 | 2705 | < .001 |
| | | Total | OISB→ CS | 15.85 | 0.01789 | 1.001 | 886 | < .001 |

*Source: Computed and Compiled by the Researcher*

*Note. Confidence intervals computed with method: Standard (Delta method); Betas are completely standardized effect sizes*

*Figure No. 6.5:* **Med-Mod Analysis Between Competency Score (CS) & Overall Information Seeking Behaviour (OISB) using Annual Income (I) as Moderator**




*Source: Model Tested by the Researcher through Primary Data | Note: L: Low; M: Medium; LR: Large |***: Significance at 1%; **: Significance at 5%*

### 6.4.5 (a). Direct Effect with Interaction (Annual income*OISB→CS)

*Interaction:* An interaction effect was noted between OISB and CS (b=2.1435, 95% CI [2.13994, 2.1470]); Annual Income*OISB → CS **H6.5(c)** ($\beta$ =0.1654, $t$ =1185.94, $p$ = < .001). This indicates that the link between OISB and CS is dependent on the *Annual Income* Group, suggesting conditional mediation effects supporting **H6.5(c)**. The findings indicate that an individual's *Overall Information Seeking Behavior* (OISB) positively influences their *Competency Score* (CS) suggesting that those who actively pursue information generally exhibit better competency levels. The extent to which an individual gains from acquiring information to enhance their competence is affected by their income.

*Direct Effect:* Since the interaction effect of the *Annual Income* between OISB and CS is significant further the Direct Paths OISB→CS **H6.10I(1)** of the Low is i.e., OISB→CS (ß= 0.450, t= 1920, p=< .001; **H6.10I(2)** Medium is i.e., OISB→CS (ß= 0.548, t= 2322, p= < .001); **H6.10I(2)** Large is i.e., OISB→CS (ß= 0.647, t=2705, p= < .001) is significant at the level of 0.001. The findings indicate that OISB exerts a direct positive influence on CS across all income groups. The intensity of this effect varies according to economic level. The effect of OISB on CS is moderate (β = 0.450, t = 1920, p <.001). This implies that individuals with low incomes continue to derive advantages from their Overall Information-Seeking Behaviour; however, the degree of development in their competencies is relatively lower than that of larger-income groups. The effect of OISB on CS for the Medium income group is stronger (β = 0.548, t = 2322, p <.001). OISB results in a more significant increase in competency scores for individuals in this group. The strongest effect of OISB on CS is observed for the *Large* income groups (β = 0.647, t = 2705, p <.001). This indicates that individuals with larger incomes take advantage of OISB, which is likely a result of their improved CS.

### 6.4.5 (b). Indirect Effect with Interaction (Annual Income*OISB→OSPB) (Annual Income*OSPB→CS)

An interaction effect was significant between OISB and OSPB (b=0.0129, 95% CI [0.00272, 0.0230]); Annual Income*OISB → OSPB **$H_{6.5(a)}$** ($\beta$ =0.0147, $t$ = 2.49, $p$ = 0.013). This indicates that there is a link between OISB and OSPB depending upon the Annual Income **$H_{6.5(a)}$**. The analysis indicates that the interaction between *Overall Information Seeking Behavior* (OISB) and *Overall Social Participation Behavior* (OSPB) is significantly influenced by the individual's annual income. The (b = 0.0129, 95% CI [0.00272, 0.0230]) indicates that there is a positive relationship between OSPB and OISB. In simple terms, individuals who are more proactive in their pursuit of information are more likely to engage in *Social Participation Behaviour*.

An interaction effect was significant between OSPB and CS (b= –2.0367, 95% CI [–2.03995, –2.0335]), Annual Income*OSPB → CS **$H_{6.5(b)}$** ($\beta$ = –0.7970, $t$ = –1243.12, $p$ = < .001). This indicates the link between OSPB and CS, depending upon the level of annual income. The results indicate a significant interaction effect between *Competency Score* (CS) and *Overall Social Participation Behaviour* (OSPB), which is moderated by annual income. Although the overall social participation behaviour usually lowers competency scores, the negative impact is especially noticeable for those with low-income groups.

The Indirect Effect for *Low* (ß=0.554), *Medium* (ß=0.451), and *Large* (ß= 0.356) *Annual Income* Group is found to be significant. Therefore, the Paths OSPB→CS of the *Low* i.e., OSPB→CS (ß=0.554, t=2344, p=< .001), *Medium* i.e., OSPB→CS (ß=0.456, t=1924, p= < .001) *Large* i.e., OSPB→CS (ß=0.357, t=1505, p=< .001) is significant at 0.001. The results imply that across various annual income groups (*Low, Medium, and Large*), *Overall Social Participation Behaviour* (OSPB), has a significant indirect effect on *Competency Score* (CS). With a coefficient of 0.554, the findings show that for those

with low income, the relationship between OSPB and CS is statistically strongly significant and positive. With a ß = 0.456, t = 1924, p= 0.001, the indirect effect for the *Medium*-income group is likewise implying that OSPB, still has a positive effect on CS however, the effect is rather less than for the *Low*-income group. The indirect effect on the *Large* Income group is significant, but this effect is the weakest among the three income categories with a coefficient of 0.357.

The results validate that OSPB has a positive effect on CS across all income groups with the strongest effect reported among *Low* -income individuals. The positive impact of OSPB on CS diminishes as the income level rises, but it remains significant. This implies that OSPB can be a valuable instrument for improving CS, particularly for low-income individuals and that targeted interventions should be developed to benefit from this relationship. However, the Indirect effect of OISB→OSPB→CS is significant for *Low* (ß=0.54, t=138, p=< .001) **$H_{6.15I\ (1)}$**; *Medium* (ß=0.45, t=159, p=< .001) **$H_{6.15I\ (2)}$** and *Large* (ß=0.35, t=139, p=< .001) **$H_{6.15I\ (3)}$.**

### 6.4.5 (c). Total Effects (OISB→CS)

The Total effect for *Low* (ß=0.99), *Medium* (ß=0.99), and *Large* (ß=1.00) *Annual Income* is found to be significant at a 0.001 level of significance. The overall effect of *Overall Information Seeking Behaviour* (OISB) on *Competency Score* (CS) is highly significant across all income groups (*Low, Medium, and Large*), with β=0.99 for *Marginal* and *Medium Annual Income* groups and β=1.00 for *Large* income groups. The total effect of OISB on CS is significant at the 0.001 level of significance for all income groups (*Low, Medium and Large*). This implies that the relationship between *Competency Score* (CS) and *Overall Information-Seeking Behaviour* (OISB) is statistically significant and consistent across all income levels.

The coefficient of 0.99 suggests that individuals with *Low* and *Medium Annual Incomes* experience a significant positive impact on their CS as a result of their OISB. This implies that individuals in the *Low and Medium-Income* groups who have more OISB tend to have higher CS. The coefficient of 1.00 for the large income group is marginally higher than that of the other two categories. This suggests that the OISB has the most significant positive impact on the CS of individuals in the *Large* income group,

### 6.4.5 (d). Mediation Effect

Since the direct effect [DE] and indirect effect [IDE] are significant for *Low* Income Group [DE: ß=0.450, t=1920, p=< .001, IDE: ($\beta$ = 0.544, $t$ = 0.138, $p$ = < .001)]; for *Medium* Income Group [DE: ß=0.548, t=2322, p=< .001, IDE: ß=0.451, t=159, p=< .001]; and for *Large* Income Group [DE: ß=0.647, t=2705, p=< .001, IDE: ß=0.356, t=139, p=< .001]. There is a partial mediation between OISB→OSPB→CS. The direct impact of OISB on CS is significant for all income groups.

## 6.5 CONCLUSION

The results of the moderated mediation indicate that the impact of OISB and OSPB activities on one's competency score is significantly influenced by age-specific levels. *OSPB* may enhance *CS* in *Young Adults* groups; however, an excessive emphasis on *OISB* may impede the development of skills or self-perceived competence. The advantages of *OSPB* may be more pronounced or distinct in *Elder Age* groups than in *Young Adults* groups.

The Gender specific moderated mediation analysis demonstrates that *Gender* significantly moderates the relationships between *OISB, OSPB* and *CS*, resulting in conditional mediation effects. Although *OISB* has a positive effect on *CS*, the effect is more apparent in males than in *Females*. On the other hand, *OSPB* seems to impede the

development of *CS*, particularly for *Females*, indicating that gender-specific dynamics are essential in these processes. These results underscore the necessity of gender-sensitive policies and interventions to guarantee that individuals of all *Genders* can equally benefit from *OISB* and *OSPB* to improve their *CS*.

*Table No. 6.8*: **Results of Moderating Effects of Demographic & Socio-Economic Profile on the OISB→CS with OSPB as Mediator**

| Hypothesis | Moderating Effects | Results |
|---|---|---|
| $H_{6.1}$ | (a). Age * OISB→ OSPB | Not Supported |
| | (b). Age*OSPB→CS | Supported |
| | (c). Age*OISB→CS | Supported |
| $H_{6.2}$ | (a). Gender * OISB→ OSPB | Supported |
| | (b). Gender* OSPB→CS | Supported |
| | (c). Gender* OISB→CS | Supported |
| $H_{6.3}$ | (a). Education*OISB→ OSPB | Not Supported |
| | (b). Education* OSPB→ CS | Supported |
| | (c). Education*OISB→CS | Supported |
| $H_{6.4}$ | (a). Size of Land * OISB→ OSPB | Not Supported |
| | (b). Size of Land * OSPB→ CS | Supported |
| | (c). Size of Land * OISB→ CS | Supported |
| $H_{6.5}$ | (a). Annual Income *OISB→ OSPB | Supported |
| | (b). Annual Income * OSPB→ CS | Supported |
| | (c). Annual Income * OISB→ CS | Supported |

*Source: Computed and compiled by the researcher based on the results of Med – Mod Analysis using primary data.*

In med-mod analysis using Education, OSPB is becoming increasingly significant in the conversion of OISB into CS for individuals in Middle School and Above groups. These results indicate that interventions that are designed to enhance competency outcomes may be more effective when they concentrate on the development of both information-seeking and social participation behaviours, particularly in more educated people.

*Table No: 6.9:* **Results of Mediation Effects of OISB→OSPB→CS**

| Hypothesis | Mediation Effect | Moderating Factors | Category | Effects | Results |
|---|---|---|---|---|---|
| **$H_{6.11}$**<br>**$H_{6.6}$** | OISB→OSPB→CS<br>OISB→CS | Age Group (A) | (1). Young<br>(2). Middle<br>(3). Elder | Indirect Effect & Direct Effect | Both Supported |
| **$H_{6.12}$**<br>**$H_{6.7}$** | OISB→OSPB→CS<br>OISB→CS | Gender (G) | (1). Male<br>(2). Female | Indirect Effect & Direct Effect | Both Supported |
| **$H_{6.13}$**<br>**$H_{6.8}$** | OISB→OSPB→CS<br>OISB→CS | Education (E) | (1). Primary School<br>(2). Middle School & Above | Indirect Effect & Direct Effect | Both Supported |
| **$H_{6.14}$**<br>**$H_{6.9}$** | OISB→OSPB→CS<br>OISB→CS | Size of Land (L) | (1). Marginal<br>(2). Medium<br>(3). Large | Indirect Effect & Direct Effect | Both Supported |
| **$H_{6.15}$**<br>**$H_{6.10}$** | OISB→OSPB→CS<br>OISB→CS | Annual Income (I) | (1). Low<br>(2). Medium<br>(3). High | Indirect Effect & Direct Effect | Both Supported |

*Source: Computed and compiled by the researcher*

Furthermore, the research indicates that OISB is more advantageous for larger farms, while both OSPB and OISB are essential for the development of CS on Marginal farms. These results have practical implications for the design of policies and interventions, suggesting that farmers' competencies can be improved through the implementation of customized strategies that are dependent upon the extent of their landholdings.

These results suggest that competency scores (CS) are directly influenced by OISB in all income groups. The CS increases in proportion to the level of OISB, with the effect being greater for individuals with higher incomes. The indirect effect of OISB on CS through OSPB (i.e., the mediation effect of Overall Social Participation Behaviour [OSPB]) is also significant for all annual income groups.

As a result of the fact that the Direct Effect and Indirect Effects for all of the Age Groups, Gender Category, Educational Qualification, Size of Land, and Annual Income are supported, there is a partial mediation [OISB→OSPB→CS].

The subsequent chapter will provide the overall chapter's conclusion, findings and suggestions.

# Chapter – VII

# Summary of Findings and Conclusions

# CHAPTER – 7

# SUMMARY OF FINDINGS AND CONCLUSIONS

## 7.1 SUMMARY OF THE STUDY

For about half of India's population, agriculture is their main source of income. With a 3.3% increase per current pricing, agriculture and related sectors will account for 18.3% of India's GDP in the fiscal year 2022–23. The Green Change Using a mix of physical outreach, creative information use, capacity building, interactive information distribution, public-private partnerships, SMAE, domain expert competency, the Krishna Yojana-Submission on Agricultural Extension, hopes to restructure and improve agricultural extension. The SMAE tries to improve and widen the range of present Extension Schemes. Currently handling the Central Sector and Centrally Sponsored Extension Schemes is the Extension Division/Directorate of Extension. States are still obliged to be crucial in the planning, execution, and monitoring of Central Sector Schemes even if they are now under the Mission. ***Ministry of Agriculture and Farmers Welfare, (2023-24)***. Thus, the *Agricultural Technology Management Agency* (ATMA) is one of the major centrally sponsored schemes that serves as the Support to State Extension Programmes for Extension Reform Schemes.

By bridging the gap between agricultural research and farmers, the Agricultural Technology Management Agency (ATMA) was established to assist in grassroots level distribution of new technologies and advances. Promoting the acceptance of new technologies and enhancing agricultural practices in undeveloped countries where farming is a main source of revenue, depends on initiatives such as ATMA. By means of cooperation among several stakeholders, ATMA serves to guarantee the achievement of the objectives specified by National Agricultural Development Policies, which are

meant to improve food security and rural lives. For a substantial portion of India's agricultural workforce, farmers' incomes are raised in part by it. By means of training, exposure to contemporary practices, and resource availability, it empowers farmers so enabling the adoption of techniques enhancing output and market access. Since they are empowered with new knowledge and skills that lead to competency growth, farmers are more suited to make informed decisions, manage risks, and increase agricultural profitability, thereby helping to contribute to the economy. Currently running in 739 districts spread over 28 states and 5 union territories nationwide is ATMA.

Established in East and South districts of Sikkim between 2005 and 2006, the Agricultural Technology Management Agency (ATMA) grew to include North and West districts by 2008. It has existed for about 19 years. Today, one may look at the effectiveness of policies carried out by national organizations like ATMA in Sikkim over the past 19 years as well as the degree to which these initiatives promoted technical transfers to recipients. It is important to assess the benefits received by recipients as well as the technical competencies obtained by means of ATMA operations. To evaluate these results calls for comprehensive research. Under this environment, the present work has been meticulously created to handle these problems.

The present study provides a comprehensive overview of the *Beneficiary Awareness* (BA) levels of extension services, *Technology Adoption*, and *Knowledge Acquired* taking into consideration *Demographic Variables*, *Socio Economic Status*, *Information-Seeking* & *Social Participation Behaviour* among ATMA beneficiaries in Sikkim. Thereafter, the competencies acquired by ATMA beneficiaries, are classified into specific clusters. The *Beneficiaries' Awareness Score*, *Technology Adoption Score*, and *Knowledge Acquired Score* are used to assess their overall *Competency Score*. This will aid in understanding the beneficiaries' status concerning the competencies they have

acquired, categorized into clusters such as *Novice, Proficient and Expert*. Additionally, an overview of the assessment of the relationship between the competencies obtained by ATMA recipients regarding different *Demographic & Socio-Economic Profile*, as well as *Information-Seeking & Social Participation Behaviour* is performed. Finally, the moderated mediation analysis depicts the interaction effects of *Demographic and Socio-Economic Profile* on the *Overall Information Seeking Behaviour* (OISB) and *Competency Score* (CS) *by using Overall Social Participation Behaviour* (OSPB) *as a mediator*.

## 7.2 FINDINGS OF THE STUDY

### 7.2.1 Computation of *Beneficiary Awareness Score* (BAS), *Technology Adoption Score* (TAS), *Knowledge Acquired Score* (KAS) and its Levels.

The results indicate the Beneficiaries Awareness Score (BAS), Technology Adoption Score (TAS) and Knowledge Acquired Score (KAS) with different Demographic (*Age, Gender, District, Type of Family*) and Socio-Economic Profile (*Education, Size of Land and Annual Income*) of the ATMA beneficiaries.

### 7.2.1 (a). The Level of *Beneficiary Awareness*, *Technology Adoption*, and *Knowledge Acquired* of the Beneficiaries in Association with *Demographic & Socio-Economic Profile*

- No statistically significant association exists between the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), *Level of Knowledge Acquired* (LKA), and the *Age* group of the respondents.
- A significant association exist between the *Level of Beneficiary Awareness* (LBA), the *Level of Technology Adoption* (LTA), and the *Level of Knowledge Acquired* (LKA) with *Gender*.
- No statistically significant association exists between the *Level of Beneficiary Awareness* (LBA) and *District*.

- A significant association exists between the variables between the *Level of Technology Adoption* and *Level of knowledge Acquired* with the *District*.
- A significant association exists between the *Level of Beneficiary Awareness* (LBA) and *Level of Technology Adoption* (LTA) with the *Type of Family*.
- No statistically significant association exists between the *Level of Beneficiary Awareness* (LBA), *Level of Technology Adoption* (LTA), *Level of Knowledge Acquired* (LKA), and the *Education* group of the respondents.
- No significant association exists between the *Level of Beneficiary Awareness* (LBA) and *Level of Knowledge Acquired* (LKA) with the *Size of Land*.
- A significant association exists between the *Level of Technology Adoption* (LTA) and the *Size of Land*.
- A significant association exists between the *Level of Beneficiary Awareness* (BA), *Level of Technology Adoption* (LTA), and *Level of Knowledge Acquired* (LKA) with *Annual Income*.

### 7.2.1 (b). Correlation of *Beneficiary Awareness, Technology Adoption, and Knowledge Acquired* with *Information Seeking Behaviour and Social Participation Behaviour*

- There is a weak positive correlation between *Overall Information Seeking Behaviour* (OISB) and *Beneficiary Awareness* (BA); there is a very weak positive correlation between *Public Information Seeking Behaviour* (PISB) and BA, *Voluntary Social Participation Behaviour* (VSPB) and BA and a moderate positive correlation between *Overall Social Participation Behaviour* (OSPB) and BA, *Focused Social Participation Behaviour* (FSPB B) and BA.
- There is a moderate positive correlation between OISB and *Technology Adoption* (TA); there is a weak positive correlation between *Authenticated Information Seeking Behaviour* (AISB) and TA, *Media Information Seeking*

*Behaviour* (MISB) and TA, and *Voluntary Social Participation Behaviour* (VSPB) and TA. Furthermore, there is a very weak positive correlation between *Public Information Seeking Behaviour* (PISB) and TA; and a fairly strong positive correlation between FSPB and TA.

- There is a moderate positive correlation between OISB and *Knowledge Acquired* (KA); OSPB and KA; FSPB and KA. On the other hand, there is a weak positive correlation between AISB and KA, PISB and KA, MISB and KA, VSPB and KA.

### 7.2.1 (c). The Level of *Beneficiary Awareness*, *Technology Adoption*, and *Knowledge Acquired* of the Beneficiaries in Relationship with *Information Seeking* & *Social Participation Behaviour*

- A significant difference exists in mean ranks exists between *Beneficiary Awareness Score* (BAS) and *Levels of Overall Information Seeking Behaviour* (LOISB), *Beneficiary Awareness Score* (BAS) and *Levels of Overall Social Participation Behaviour (LOSPB)*.
- A significant difference exists in the mean ranks between the variables *Levels of Authenticated Information Seeking Behaviour* (LAISB) and BAS, *Levels of Media Information Seeking Behaviour* (LMISB) and BAS, *Levels of Voluntary Social Participation Behaviour* (LVSPB) and BAS, and *Levels of Focused Social Participation Behaviour* (LFSPB) and BAS.
- A significant difference exists in the mean ranks exists between *Technology Adoption Score* (TSA) and *Levels of Overall Information Seeking Behaviour* (LOISB); *Technology Adoption Score* (TAS) and *Levels of Overall Social Participation Behaviour* (LOSPB).

- A significant difference exists in the mean ranks between the variables LAISB and TAS; LPISB and TAS; LMISB and TAS; LVSPB and TAS; and LFSPB and TAS.
- A significant difference exists in mean ranks between *Levels of Knowledge Acquired Score* (KAS) and LOISB; *Knowledge Acquired Score* (KAS) and LOSPB.
- A significant difference in the mean ranks exists between the variables LAISB and KAS; LPISB and KAS; LMISB and KAS; LVSPB and KAS; and LFSPB and KAS.

### 7.2.2 Measurement of *Competency Score* (CS) and Mapping Through *Manual & Machine Based* (Cluster Analysis) Classification

The results indicate the Competency Scores through both Manual and Machine (Cluster) Based Classification of the ATMA beneficiaries concerning Demographic (*Age, Gender, District, Type of Family*) and Socio-Economic Profile (*Education, Size of Land and Annual Income*) of the ATMA beneficiaries.

### 7.2.2 (a). The *Level of Expertise* Based on the *Manual Classification* and *Machine Based* (Cluster Analysis) in Association with *Demographic and Socio-Economic Profile*

- No significant association exists between the *Level of Expertise* based on the *Manual Classification* and *Machine Based (Cluster Analysis)* Classification with *Age*.
- A significant association exists between the *Level of Expertise* determined by the *Manual Classification* and *Gender*; the *Level of Expertise* determined by the *Machine Based* (Cluster Analysis) and *Gender*. In addition, there is a strong association between *Level of Expertise* and *Gender* (Manual Classification), as

well as between *Level of Expertise* and *Gender* (Machine Based Cluster Analysis) Classification.

- No significant association exists between the *Level of Expertise* and *District* based on the *Manual Classification*; and the *Level of Expertise* and *District*, based on the *Machine Based* (Cluster Analysis) *Classification*.
- A significant association exists between the variables of *Level of Expertise* determined by the *Manual Classification* and *Type of Family*; the *Level of Expertise* determined by the *Machine Based* (Cluster Analysis) and *Type of Family*. Additionally, there is a moderate association between the *Level of Expertise* and *Type of Family* determined by *Manual Classification*, as well as the *Level of Expertise* and *Type of Family* determined by *Machine Based* (Cluster Analysis) Classification.
- No significant association exists between the *Level of Expertise* and *Educational Status* based on the *Manual Classification*; as well as the *Level of Expertise* and *Educational Status* based on the *Machine Based* (Cluster Analysis) Classification.
- No significant association exists between the *Level of Expertise* and *Size of the Land* determined by *Manual Classification*; the *Level of Expertise* and *Size of the Land* determined by *Machine Based* (Cluster Analysis) Classification.
- A significant association exists between the *Level of Expertise* and *Annual Income* based on *Manual Classification*; as well as the *Level of Expertise* and *Annual Income* based on *Machine Based* (Cluster Analysis) Classification. In addition, there exists a moderately strong association between the *Level of Expertise* and *Annual Income* determined by *Manual Classification*, as well as

between *Level of Expertise* and *Annual Income* determined by *Machine Based* (Cluster Analysis) Classification.

### 7.2.2 (b). The Level of Expertise Based on the *Manual Classification* and *Machine Based* (Cluster Analysis) in Association with *Information Seeking Behaviour* and *Social Participation Behaviour*

- A statistically significant association exists between the *Level of Expertise* and all the dimensions of *Information Seeking Behaviour* (ISB) determined by the *Manual Classification*. Specifically, there is a strong association between the *Level of Expertise* and *Authenticated Information Seeking Behaviour* (AISB), and a very strong association between the *Level of Expertise* and *Public Information Seeking Behaviour* (PISB). There exists a strong association between the *Level of Expertise* and *Media Information Seeking Behaviour* (MISB); *Level of Expertise* and the *Overall Information Seeking Behaviour* (OISB).
- The *Machine Based* (Cluster Analysis) *classification* revealed a significant association between the *Level of Expertise* and all the *Information Seeking Behaviour*. Specifically, there is a strong association between the Level of Expertise and *Authenticated Information Seeking Behaviour*, and a very strong association between the *Level of Expertise* and *Public Information Seeker*. There exists a strong association between the *Level of Expertise* and *Media Information Seeking Behaviour (MISB);* the *Level of Expertise* and *Overall Information Seeking Behaviour*.
- A significant association exists between the *Level of Expertise* and *Social Participation Behaviour* (SPB) based on the *Manual Classification*. Specifically, there is a moderate association between the *Level of Expertise* and *Voluntary Social Participation Behaviour* (VSPB) and a very strong association

between the *Level of Expertise* and *Focused Social Participation Behaviour* (FSPB); *Manual Classification* and *Overall Social Participation Behaviour* (OSPB).

- A significant association exists between the *Level of Expertise* and *Social Participation Behaviour* (SPB) based on the *Machine Based* (Cluster Analysis) *Classification*. Specifically, a moderate association between *Level of Expertise* and *Voluntary Social Participation Behaviour* (VSPB) and a strong association between *Level of Expertise* and *Focused Social Participation Behaviour* (FSPB). There exists a very strong association between *Level of Expertise* and *Overall Social Participation Behaviour*.

### 7.2.3 Mediator - Moderation Analysis (I.E., *OISB → OSPB → CS Moderates with Demographic & Socio-Economic Factors)*

- An interaction effect of Age was noted between OISB and CS. The Direct Paths OISB→CS and Indirect Paths OISB →OSPB→CS of the *Young Adults*, *Middle Age* Group and *Elder Age* Group are significant at the level of 0.001.
- An interaction effect of Age was insignificant between OISB and OSPB
- An interaction effect of *Age* Group was significant between OSPB and CS. The Direct Paths OSPB→CS and Indirect Paths of the *Young Adults*; *Middle Age* and *Elder Age* Groups is significant at 0.001.
- An interaction effect of *Gender* was significant between OISB and CS. The Direct Paths OISB→CS and Indirect Paths OISB →OSPB→CS of the *Male* and *Female* are found to be significant at the level of 0.001.
- An interaction effect of *Gender* was significant between OISB and OSPB. The Paths OISB→OSPB of the *Male* and *Female* i.e., OISB→OSPB is significant at 0.001.

- An interaction effect was significant between OSPB and CS. The Paths OSPB→CS of the *Male* and *Female* is significant at 0.001.
- An interaction effect of *Education* was noted between OISB and CS. The Direct Paths OISB→CS and Indirect Paths OISB →OSPB→CS the *Primary School*, *Middle School* and Above are significant at the level of 0.001.
- An interaction effect of Education was insignificant between OISB and OSPB
- An interaction effect of Education was significant between OSPB and CS. The Paths OSPB→CS of the *Primary School, Middle School* and Above is significant at 0.001.
- An interaction effect of the *Size of Land* was noted between OISB and CS. The Direct Paths OISB→CS and Indirect Paths OISB →OSPB→CS of the *Marginal, Medium and Large* is significant at the level of 0.001.
- An interaction effect of the *Size of Land* was insignificant between OISB and OSPB
- An interaction effect was significant between OSPB and CS. The Paths OSPB→CS of the *Marginal, Medium and Large* is significant at 0.001.
- An interaction effect of *Annual Income* was noted between OISB and CS. The Direct Paths OISB→CS and Indirect Paths OISB →OSPB→CS of the *Low, Medium and Large* is significant at the level of 0.001.
- An interaction effect was significant between OISB and OSPB. The Paths OISB→OSPB of the *Low, Medium, and Large* is significant at 0.001.
- An interaction effect was significant between OSPB and CS. The Paths OSPB→CS of the *Low Medium and Large* is significant at 0.001.

## 7.3 CONCLUSION

The study witnessed significant associations between *Demographic & Socio-Economic Profile* and the study variables provide a clear direction for refining agricultural extension services. By addressing the diverse needs of beneficiaries based on *Gender, Annual Income, District, Family Type and Landholding Size* the effectiveness of programs like ATMA can be enhanced, ultimately contributing to more inclusive and sustainable agricultural development. The positive correlations and significant mean rank differences identified in this study emphasize the crucial role of *Information-Seeking Behaviour & Social Participation Behaviour* in influencing *Beneficiary Awareness, Technology Adoption, and Knowledge Acquired*. By leveraging these insights, stakeholders can draft more effective strategies to empower individuals and communities, ultimately fostering a more informed, technologically adept and knowledgeable society.

The study's findings present strong evidence of significant associations between the Level of Expertise as measured by both *Manual and Machine Based* (cluster) *Classifications* and important *Demographic and Socio-Economic Profile* such as *Gender, Annual Income and Type of Family*. The *Manual Classification* reveals a strong association between *Level of Expertise* and *Gender*, and *Annual Income*, with a confidence level of 99%. However, *Type of Family* shows an association at a confidence level of 90%. The *Machine Based Classification* shows strong correlations with *Annual Income* at a 99% confidence level, *Gender* at a 95% confidence level and *Type of Family* at a 90% confidence level. These findings illustrate the robust performance of both categorization approaches for identifying significant Socio-conomic patterns and emphasize the differing degrees of association among different variables. This provides vital insights for future research and policy development in this domain.

The study's results present strong evidence of statistically significant associations between the *Level of Expertise* and dimensions of *Information Seeking Behaviour* (AISB, PISB, MISB, OISB) and Social Participation Behaviour (VSPB, FSPB, OSPB) using both *Manual and Machine Based* (Cluster) *Classification* techniques. The *Manual Classification* approach demonstrates a significant strong association between the *Level of Expertise* and all the variables examined [including *Authenticated Information Seeking Behaviour (AISB), Public Information Seeking Behaviour (PISB), Media Information Seeking Behaviour (MISB), Overall Information Seeking Behaviour (OISB), Voluntary Social Participation Behaviour (VSPB), Focused Social Participation Behaviour (FSPB), and Overall Social Participation Behaviour (OSPB)*] with a confidence level of 99%. Moreover, the *Machine Based Classification* reveals a significant strong association between the *Level of Expertise* and AISB, PISB, MISB, OISB, FSPB , and OSPB with a confidence level of 99%. The association between the *Level of Expertise* and *Voluntary Social Participation Behaviour* (VSPB) exhibited significance at the 95% confidence level. The findings of this study validate the significance of Information-Seeking and Social Participation Behaviours in the development of expertise across various classifications by showing a significant association between them and competence levels.

Age-specific levels significantly affect OISB and OSPB effect on CS, according to moderated mediation analysis. OSPB may improve CS in Young Adults groups, but overemphasizing OISB may hinder CS. The benefits of OSPB may be greater for Elder Age than Young Adults. The Gender-specific moderated mediation analysis shows that Gender strongly moderates OISB, OSPB, and CS with conditional mediation effects. Although OISB improves CS, Males benefit more than Females. However, OSPB hinders CS development, particularly in Females, suggesting Gender-specific dynamics

are crucial. These findings demonstrate the need for gender-sensitive policies and interventions to ensure that all genders can enhance their CS with OISB and OSPB.

OSPB is becoming more important in transforming OISB into CS for Middle School and Above groups in med-mod analysis using Education. These results suggest that interventions that focus on Information-Seeking and Social Participation Behaviour may improve Competency Scores (CS), especially in Middle School and Above groups. The research also shows that OISB is better for larger farms but both OSPB and OISB are necessary for CS development on Marginal farms. The findings imply that OISB directly effects CS across Annual Income groups. The mediation impact of Overall Social Participation Behaviour (OSPB) on CS is significant for all Annual Income categories. Due to the support of Direct and Indirect Effects for all Age Groups, Gender Categories, Education, Size of Land, and Annual Income, there is partial mediation [OISB-OSPB-CS].

## 7.4 RESEARCH IMPLICATIONS

The present study has significant implications for a variety of stakeholders, policymakers and society as a whole. These findings offer practical insights for individuals who are engaged in public awareness campaigns, technology outreach programs and educational initiatives. This research has the potential to support decisions that impact the district's agricultural development, sustainability and livelihood enhancements.

### 7.4.1 Implication for the Stakeholders

The research will disclose the level of expertise acquired after having attended the ATMA technology transfer programmes. The Demographic and Socio-Economic Profile of the Beneficiaries had a substantial interaction effect on their Information

Seeking to Competency Building, with the mediating effect of Social Participation Behaviour. Therefore, the stakeholders may develop programmes that not only impart the knowledge and skills of Agri-Horti and Animal Husbandry Practices, but also enhance their Social Participation and Information-Seeking Behaviour. This will result in better competency attainment, as well as an improvement in the productivity and economic outcomes of agricultural and allied activities. Modules for technology transfer that are more effective and customized can be developed to enhance the knowledge and skills of the beneficiaries.

### 7.4.2 Implication for the Policymakers

Policymakers can leverage the study's results to understand the role of the interaction effect of the beneficiaries' Demographic and Socio-economic Profile to Competency Building. This will yield informed policy amendments that will more effectively align agricultural extension services with the genuine needs of farmers, while also allowing for an understanding of the Information- Seeking and Social Participation Behaviour of the beneficiaries. It may lead to the improvement of the comprehensive design of technology transfer programs, which will facilitate the effective dissemination of technological advancements in the agricultural and allied sectors to needy individuals.

### 7.4.3 Implication for the Society

Through the prism of the mediating influence of Social Participation Behaviour and the moderating impact of Demographic and Socioeconomic Profile, a thorough assessment of competencies would yield significant insights for program administrators and policymakers concerning the efficacy of the ATMA scheme in competency development. This could facilitate the creation of more effective and efficient agricultural extension, education and technology transfer programs aimed at fostering

Sustainable Development Goals (SDGs) like poverty eradication, gender equality, no hunger, good health and well-being etc.

## 7.5 RECOMMENDATIONS

The ATMA may concentrate on the exclusive programs for females to improve their Farm Technologies Adoption which ultimately will lead to improving their knowledge Acquired in farming technology. Similarly, they may consider developing specific programs for low-income group farmers and encourage them to do collective farming activities. It results in improving their technology adoption and knowledge Acquired on Agri and Allied Activities.

The Information-seeking & Social Participation Behaviour of the beneficiary leads to a positive influence on their Competency components such as Beneficiary Awareness, Technology Adoption and Knowledge Acquired; especially in the case of Passive Information seekers/Passive Social Participators who have low mean scores compared to the active information seekers/active social Participators. Therefore, ATMA may plan for formulating the programs to improve upon their Information Seeking & Social Participation Behaviour which will ultimately lead to improving their competency level in farming technology.

Age, Gender, Education, Size of Land Holding and Income have a moderating influence on the Competency of the beneficiary. Therefore, ATMA may strategize their participant selection based on the above demographic and socio-economic factors to make a balanced development of improving the competency level of the beneficiaries on technology adoption and this strategic selection of participants pays the way for achieving the moto of transferring the farming technology among other fellow farmers.

## 7.6 FUTURE SCOPE OF RESEARCH

The present study has been confined to Sikkim, therefore expanding geographical coverage could provide a broader understanding of agricultural dynamics across different regions and reveal region-specific insights and trends, leading to more comprehensive strategies for improvement.

The study has been undertaken employing the Information Seeking and Social Participation Behaviour. Future studies could also incorporate additional variables such as access to credit, mobile technology usage, perception of risk, and the impact of disasters which would provide a richer understanding of the complex factors shaping modern agriculture.

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# Appendix

# APPENDIX – A: Sample Survey Instrument: Interview Schedule

## Competencies Acquired by Beneficiaries through Agricultural Technology Management Agency (ATMA) in Sikkim

**Section A- Demographic and Socio-Economic Status of the Respondents**

| | | |
|---|---|---|
| 1. | Name of Respondent: | _____ |
| 2. | Gender: | (1). Male [ ] (2). Female [ ] |
| 3. | District: | (1). Gangtok [ ] (2). Pakyong [ ] (3).Namchi [ ]<br>(4). Gyalshing [ ] (5). Soreng [ ] (6). Mangan [ ] |
| 4. | Block Name: | |
| 5. | Name of the Village: | |
| 6. | Caste: | (1). ST [ ] (2). SC [ ]<br>(3). OBC [ ] (4). General [ ] |
| 7. | Religion: | (1). Hindu [ ] (2). Buddhist [ ]<br>(3). Muslim [ ] (4). [ ] |
| 8. | Marital Status: | (1). Single [ ] (2). Married [ ]<br>(3). Devoiced [ ] (4). Separated [ ] |
| 9. | Family Type: | (1). Joint [ ] (2). Nuclear [ ] |
| 10. | Educational Status: | (1). Primary [ ] (2). Middle School and Above [ ] |
| 11. | Occupation: | (1). Farming with Agri Allied Activities [ ]<br>(2). Farming with Other Employment [ ]<br>(3). Farming with Other Business Activities [ ] |
| 12. | Land for farming is : | (1). Lease Land [ ] (2). Own Land [ ] |
| 13. | Size of the Land (in Acre) | |
| 14. | Annual Income in Rs.: | |
| 15. | Economic Status: | (1). Below Poverty Line (BPL) [ ]<br>(2). Above Poverty Line (APL) [ ] |
| 16. | Do you avail the credit facility for farming? | (0). NO [ ] (1). YES [ ] |
| 16.1. | ***If YES,*** State the Source for avail the Credit Facilities:<br>***(if requires you can choose the Multiple options)*** | |
| 16.1.1 to 16.1.6. | (1). Friends & Relatives [ ] (2). Local Money Lender [ ]<br>(3). Gramin/ Co-operative Bank [ ] (4). Nationalised Bank [ ]<br>(5). Kisan Credit Card [ ] (6). Self Help Group (SHG) [ ] | |

**Section B – Status of Training Participated by the Respondents**

| | | | |
|---|---|---|---|
| 17. | Types of Training Participated under the ATMA: | | |
| | (1). Agriculture & Horticulture Training (AHT) [ ]<br>(2). Animal Husbandry / Livestock Training (LST) [ ]<br>(3). Agriculture, Horticulture Cum Livestock Training (Both) [ ] | | |
| 18. | Particulars of Training | (I). AHT | (II). LST |
| 18.1. | No. Trainings attended | | |
| 18.2. | Max. Duration (in Days) | | |
| 18.3. | *If any,* tanning attended in the **Last 3 Months** | (0). N [ ] (1).Y [ ] | (0). N [ ] (1).Y [ ] |
| 18.4. | *If any,* tanning attended in the **Last 6 Months** | (0). N [ ] (1).Y [ ] | (0). N [ ] (1).Y [ ] |
| 18.5. | The Year of Last training attended | | |
| 19. | How do you come to know about the training programs to be held?<br>***(if requires you can choose the Multiple options)*** | | |
| 19.1 to 19.3. | (1). Assistant Technology Manager [ ]<br>(2). Block Technology Manager [ ]<br>(3). Framers Friends [ ] | | |
| 20. | Have you received any Financial incentives from ATMA for Attending/completing the training? (0). NO [ ] (1). YES [ ] | | |
| 20.1. | ***If YES,*** Mention the Amount in Rs. _____ | | |

**Section C – Information and Social Participation Behaviour of the Respondents**

| **21** I. | **Information Seeking Behaviour:** *How often do you get information on farm activities from the Personalized Sources of Information mentioned below:* | **[0] NO** | **[1] YES** | **If YES** | | |
|---|---|---|---|---|---|---|
| | | | | **R [1]** | **O [2]** | **F [3]** |
| 1 | Block Agriculture Officer | | | | | |
| 2 | District Agriculture Officer | | | | | |
| 3 | Block Technology Manager | | | | | |
| 4 | Assistant Technology Manager | | | | | |
| 5 | Farmers friend, FIGs/ CIGs/ FSGs | | | | | |
| 6 | Agriculture coordinator | | | | | |

*R- Rarely, O-Occasionally, F- Frequently*

| 21 II. | **Information Seeking Behaviour:** *How often do you get the information on farm activities from the non-professional sources given under:* | **[0] NO** | **[1] YES** | **If YES** | | |
|---|---|---|---|---|---|---|
| | | | | **R [1]** | **O [2]** | **F [3]** |
| 1 | Family members | | | | | |
| 2 | Peer Group | | | | | |
| 3 | Friends | | | | | |
| 4 | Relatives | | | | | |
| 5 | Progressive farmers/ experienced farmers | | | | | |
| 6 | FIG farmers | | | | | |
| 21. III | **Information Seeking Behaviour:** *How often you get the information related to farm activities from the following Mass Media Sources:* | **[0] NO** | **[1] YES** | **If, YES** | | |
| | | | | **R [1]** | **O [2]** | **F [3]** |
| 1 | News Paper | | | | | |
| 2 | Farm Literature (Farm magazines, Leaf lets, Folders, Circular letters, Journals) | | | | | |
| 3 | Social-Media (Internet) | | | | | |
| 4 | Television (Viewing TV programmes on agriculture) | | | | | |
| 5 | Agricultural Film Show | | | | | |
| 6 | Farmer fair/ Agricultural exhibition | | | | | |

| 22. I. | **Social Participation Behaviour:** *How often do you participate in the following programmes and meetings:* | **[0] NO** | **[1] YES** | **If YES,** | | |
|---|---|---|---|---|---|---|
| | | | | **R [1]** | **O [2]** | **F [3]** |
| 1 | Co-operative society | | | | | |
| 2 | Panchayat Samiti | | | | | |
| 3 | Zilla Parishad | | | | | |
| 4 | FIG, CIG, FSG, NGOs, SHGs | | | | | |
| 5 | Village level committee | | | | | |
| 6 | Farmers Club | | | | | |
| 22. II. | **Social Participation Behaviour:** *How often do you participate in the following extension activities related to farming activities* | **[0] NO** | **[1] YES** | **If YES,** | | |
| | | | | **R [1]** | **O [2]** | **F [3]** |
| 1 | Demo Visit/ Demo in own field | | | | | |
| 2 | Training and Meetings | | | | | |
| 3 | Field Visit, Field Day | | | | | |
| 4 | Exposure Visit | | | | | |
| 5 | Exhibition | | | | | |
| 6 | Kisan Ghosties | | | | | |

*R- Rarely, O-Occasionally, F- Frequently*

**Section D – Level of Knowledge in Agriculture, Horticulture, and Animal Husbandry Practices of Agricultural Technology**

| | Agri and Horti Practices | Beneficiary Awareness | | | | | Technology Adoption | | | | | Knowledge Acquired | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | |
| | | | | L [1] | M [2] | H [3] | | | T [1] | E [2] | A [3] | | | S [1] | P [2] | D [3] |
| 1 | Cropping pattern | | | | | | | | | | | | | | | |
| 2 | Mulching practices | | | | | | | | | | | | | | | |
| 3 | Crop diversity | | | | | | | | | | | | | | | |
| 4 | Organic farming | | | | | | | | | | | | | | | |
| 5 | Weeding schedule | | | | | | | | | | | | | | | |
| 6 | Irrigation schedule | | | | | | | | | | | | | | | |
| 7 | Fertility status in the field | | | | | | | | | | | | | | | |
| 8 | Biofertilizers | | | | | | | | | | | | | | | |
| 9 | Store seeds of flowers and vegetables | | | | | | | | | | | | | | | |
| 10 | Germination test on the seeds | | | | | | | | | | | | | | | |
| 11 | Seeds type soaked before sowing | | | | | | | | | | | | | | | |
| 12 | Sowing pattern | | | | | | | | | | | | | | | |
| 13 | Hybrid seeds | | | | | | | | | | | | | | | |
| 14 | Seedbed | | | | | | | | | | | | | | | |
| 15 | Seedlings covering pattern | | | | | | | | | | | | | | | |
| 16 | Pheromone trap | | | | | | | | | | | | | | | |
| 17 | Disease management of crops | | | | | | | | | | | | | | | |
| 18 | Preparation of Azola | | | | | | | | | | | | | | | |

| | Agri and Horti Practices | Beneficiary Awareness | | | | | Technology Adoption | | | | | Knowledge Acquired | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | |
| | | | | L [1] | M [2] | H [3] | | | T [1] | E [2] | A [3] | | | S [1] | P [2] | D [3] |
| 19 | Preparation of Vermi- Compost | | | | | | | | | | | | | | | |
| 20 | Preservation of vegetables and fruits | | | | | | | | | | | | | | | |
| 21 | Storage house | | | | | | | | | | | | | | | |
| 22 | Packing techniques | | | | | | | | | | | | | | | |
| 23 | Knapsack Sprayer | | | | | | | | | | | | | | | |
| 24 | Irrigation sprinkler | | | | | | | | | | | | | | | |
| 25 | Ploughing machine | | | | | | | | | | | | | | | |
| 26 | Poly house | | | | | | | | | | | | | | | |
| 27 | Farmers Producer Organisation (FPO) | | | | | | | | | | | | | | | |
| 28 | Cooperative Societies | | | | | | | | | | | | | | | |
| 29 | Incentive schemes for produced Outcomes | | | | | | | | | | | | | | | |
| 30 | Departmental vending stalls and small outlets | | | | | | | | | | | | | | | |

***Awareness:*** *L- Low, M Moderate, H-High* | ***Adoption:*** *T-Trial, E- Evaluation, A- Adopted* | ***Advise:*** *S- Spread, P- Promulgate, D- Disseminate*

| | Particulars | Beneficiary Awareness | | | | | Technology Adoption | | | | | Knowledge Aquired | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | | [0] NO | [1] YES | If YES, | | |
| | **Animal Husbandry** | | | L [1] | M [2] | H [3] | | | T [1] | E [2] | A [3] | | | S [1] | P [2] | D [3] |
| 31 | Hygiene practices | | | | | | | | | | | | | | | |
| 32 | Basic ill-health symptoms | | | | | | | | | | | | | | | |
| 33 | Vaccination schedule | | | | | | | | | | | | | | | |
| 34 | Minor and routine animal health treatments | | | | | | | | | | | | | | | |
| 35 | Pest and Disease Management | | | | | | | | | | | | | | | |
| 36 | Routine and balanced quality feeds | | | | | | | | | | | | | | | |
| 37 | Shelter pattern | | | | | | | | | | | | | | | |
| 38 | Breeding Practices | | | | | | | | | | | | | | | |
| 39 | Gestation Period | | | | | | | | | | | | | | | |
| 40 | Conception Identification | | | | | | | | | | | | | | | |
| 41 | Litter management | | | | | | | | | | | | | | | |
| 42 | Burial of the deceased animal body | | | | | | | | | | | | | | | |

***Awareness:*** *L- Low, M Moderate, H-High* | ***Adoption:*** *T-Trial, E- Evaluation, A- Adopted* | ***Advise:*** *S- Spread, P- Promulgate, D- Disseminate*

# APPENDIX – B:

## The List of Paper Presentation & Paper Publication Details

Google Scholar

## Susmita Lama

Other names

Research Scholar, Sikkim University
Verified email at sikkimuniversity.ac.in
Human Resource Manage...

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CERTIFICATE OF PAPER PRESENTATION
This is to certify that Miss Susmita Lama , Research Scholar, Department of Commerce, from SIKKIM UNIVERSITY presented a paper titled AWARENESS, TECHNOLOGY ADOPTION AND KNOWLEDGE ACQUISITION OF THE EXTENSION SERVICES BY THE BENEFICIARIES THROUGH AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA): A CRITICAL REVIEW in the ICSSR Sponsored National Seminar on
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# Certificate of Presentation

Presented to

Mr/Ms/Dr. **Ms. Susmita Lama,**

of **Sikkim University**

for presenting a paper titled

**The Manual Vs. Machine(Cluster) Based Classification of Expertise of Agricultural Technology Management Agency(ATMA) Beneficiaries and their Information Seeking & Social Participation Behaviour during Post Pandemic Period in Sikkim**

during the **Eighth Nitte International Conference**

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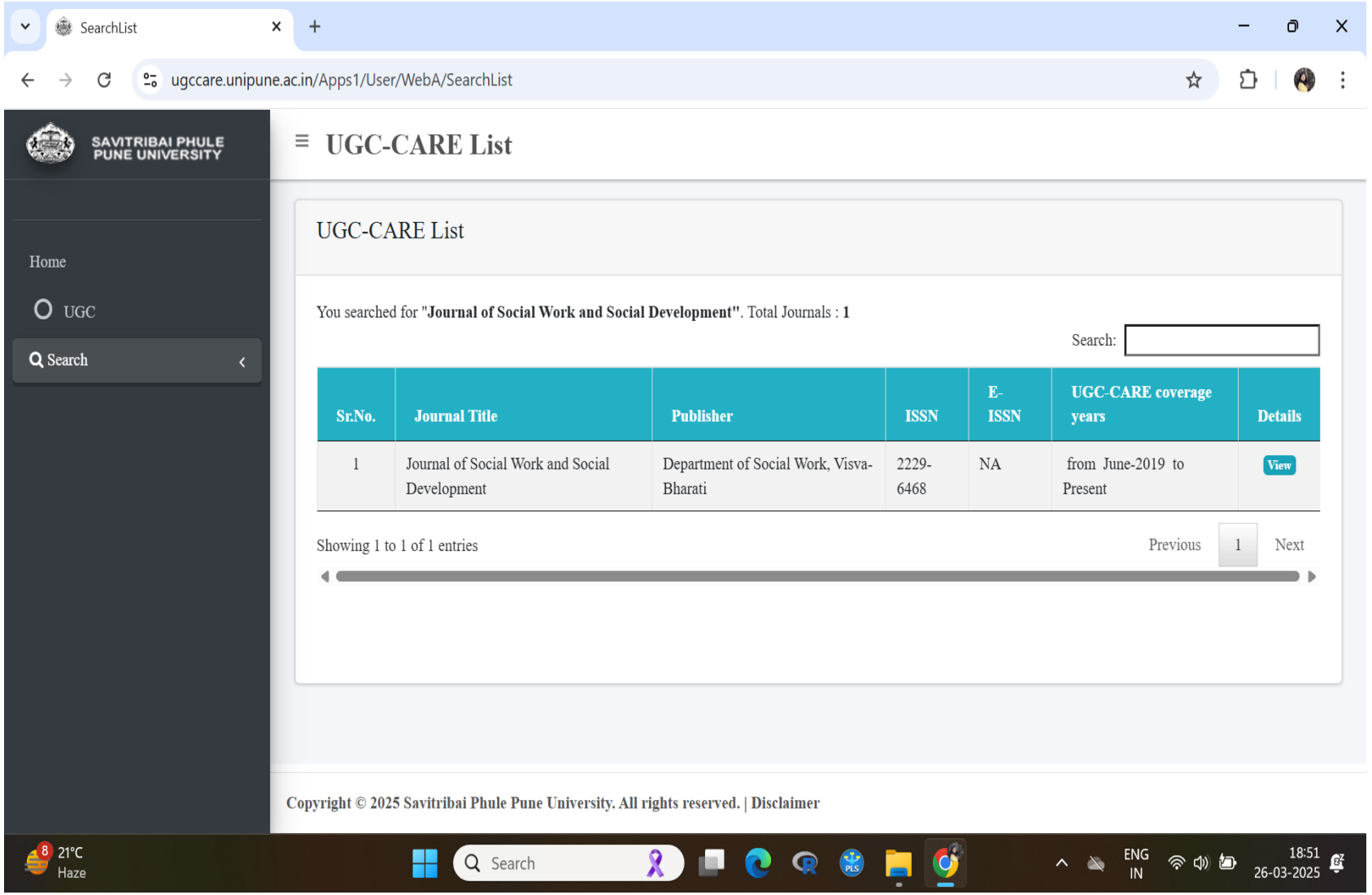
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DEPARTMENT OF SOCIAL WORK
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# Does the beneficiaries' Demographic and Socio-Economic Status Influence the Awareness, Technology Adoption, and Knowledge Acquisition: Insights through Agricultural Technology Management Agency [ATMA] in Sikkim

*Susmita Lama*[1]
*Ravi Shekhar Vishal*[2]
*Muthu Pandian B*[3]

**Abstract**

*In the last 50 years, the Agriculture Industry has seen a profound transformation in technological adoption. The farm equipment has become more robust resulting in added effective harvest and productivity in the Agri Sector. In this backdrop, the Agricultural Technology Management Agency (ATMA) is an initiative of the National Agricultural Technology Project which aims to integrate Research and Extension activities. The study focuses on measuring the level of Beneficiary Awareness (BA), Technology Adoption (TA), and Knowledge Acquisition (KA) of the ATMA beneficiaries and the association with their Demographic and Socio-Economic Status. The respondents are selected through quota sampling under a non-probability sampling technique from six districts of Sikkim; a standardized structured interview schedule is used as a survey instrument. The study reveals that there is a significant association between Gender, Annual Income and Beneficiary Awareness (BA), Technology Adoption (TA), and Knowledge Acquisition (KA) of the beneficiaries; District and Technology Adoption (TA), Knowledge Acquisition (KA); Family Type and Beneficiary Awareness (BA), Technology Adoption (TA) but Size of Land Holding is only dependent on Technology Adoption (TA).*

**Keywords:** Beneficiary Awareness, Technology Adoption, Knowledge Acquisition, Demographic, Socio-Economic Status.

## Introduction

Being an agrarian society, more than half of the population works in agriculture and relies on it for their livelihood. It primarily aims to lower poverty, increase

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| IJICBM-214615 | The Interdependence of Agricultural Technology Management Agency (ATMA)... | 28-Jun-2024 | View Details | Entering Publication Schedule |

- **The Interdependence of Agricultural Technology Management Agency (ATMA) Beneficiaries' Competency Cluster through Unsupervised Learning on their Demographic and Socio-Economic Status in Sikkim**

*by Susmita Lama, Ravi Shekhar Vishal, Muthupandian B*

**Abstract**: The study aims to classify and cross-validate the beneficiaries of the Agricultural Technology Management Agency (ATMA) to map them into manual and machine-based (cluster analysis) competency clusters. The study further intends to investigate the statistically significant association between the level of expertise based on cluster analysis and manual classification (mean

***Keywords***: *Agricultural Technology Management Agency; ATMA; skill clustering; demographic status; socio-economic status; competency mapping.*

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