Original Research Article

Knowledge, Skills and Adoption of Value Addition Practices Among FTI and KVK Participants: A Comparative Analysis

**Abstract**

|  |
| --- |
| **Aims:** Despite efforts to enhance farm productivity and profitability through value addition, Farmers Training Institutes (FTIs) and Krishi Vigyan Kendras (KVKs) in India's agricultural sector face challenges in providing quality training. This study aims to assess the impact of training among FTI and KVK participants based on the perceived knowledge, skill acquisition, and adoption levels of value-added practices and investigate the contribution of independent variables.  **Study Design:** The study employed an ex-post facto research design, measuring a continuous phenomenon without direct intervention from the concomitant variation of independent and dependent variables.  **Place and Duration of study:** The study was conducted in Bangalore Rural District of Karnataka state, India.  **Methodology:** This study performed a well-structured questionnaire survey of 100 selective respondents. Multiple regression analysis was conducted to determine key contributing indicators to perceived knowledge, acquisition of skill, and adoption level of value addition among the FTI and KVK participants.  **Results**: A higher proportion of KVK participants (75%) demonstrated medium to high levels of perceived knowledge in value addition compared to FTI participants, with an overall 60% achieving such knowledge. Additionally, KVK participants showed superior skills in value addition, with 52% acquiring high skills compared to FTI participants who mostly achieved low to medium skills. However, no significant differences were observed between the two groups regarding the adoption level of these practices. Key factors influencing these outcomes included education and post-harvest knowledge, as well as entrepreneurship and self-help groups.  **Conclusion:** While KVK participants outperformed FTI counterparts in terms of knowledge and skill acquisition, both groups showed similar levels of practice adoption. The findings will provide insights into enhancing the impact of such programs on farmers' productivity and income while addressing existing gaps in research on value addition training initiatives. |

***Keywords:*** Krishi Vigyan Kendras, Farmer Training Institutes, value-added products, perceived knowledge, skills acquisition, adoption levels

**1. Introduction**

India has made an impressive stride on the agricultural front during the last three decades. In the 21st century, agriculture remains fundamental to economic growth, poverty alleviation, and environmental sustainability (World Bank, 2009). In the face of shrinking natural resources and ever-increasing demand for larger food and agricultural production due to high population and income growth, agrarian diversification is the main course of the future development of agriculture in the region. World Development Report (2008) recommended that agriculture, including smallholder farming and employment in the “new agriculture” of high-value products and entrepreneurship are the pathways out of poverty in the developing world (World Bank, 2008). Diversified value-added products and labour-intensive commodities can provide adequate income and employment to small-size farmers (Roy et al., 2015). Hence, proper attention is important to developing post-harvest handling, agro-processing, and value-addition technologies to reduce the heavy post-harvest losses and improve quality through proper storage, packaging, handling, and transport.

It is estimated that fruit and vegetable postharvest losses amount to about 40 percent of total annual production in India equal to a year’s consumption in the United Kingdom (CII-McKinsey & Co., 1997). This loss has to be minimized by developing human resources and adopting appropriate post-harvest handling, agro-processing, and value-addition technologies not only to prevent the high losses but also to improve quality through proper storage, packaging, handling, and transport (Born & Bachmann, 2006; Roy et al., 2014). With the thrust on globalization and increasing competitiveness, it is possible to improve the agricultural export contribution of India, which is proportionately extremely low. Negi *et. al.* (2009) estimated the trends in the past few years that show the production cost of agricultural produce is increasing and it is becoming difficult for farmers to find new sources of income.

Value addition is the processing of biological products through which the value of the commodities can be increased by converting them to different products by using conventional or modern processing techniques, thereby the storage life of the produce can be enhanced (Parveen *et al.,* 2014). National Academy for Agricultural Sciences (2002) opined that value addition is often understood in the context of adding value to the product. The value addition of the product is the solution to get higher profits from agricultural produce, providing more value to the producer as well as to consumers (Coltrain *et al.,* 2000). Concerted efforts are required to utilize fully the strengths and diversity among the rural people and their institutions, to manage innovatively the risks and challenges associated with rapid changes in the sector, and to ensure that growth reaches the rural poor (Davis *et al.,* 2012). Diversified training programs offered by Krishi Vigyan Kendra (KVK) or Farm Science Centre and Farmers Training Institute (FTI) must play a leading role in this effort. Krishi Vigyan Kendras (KVKs) are grassroots-level training centers that focus on bridging the technology gap by providing skill-oriented training to farmers, farm women, and extension workers. They offer training in agriculture and allied vocations, as well as income-generating activities like value addition in various crops and dairy products (Dubey & Srivastava, 2007). KVKs conduct on-farm testing to identify location-specific technologies and organize frontline demonstrations to showcase crop production potential (Kumbhare & Khonde, 2009). In contrast, the Farmers Training Institute (FTI), established in 1967, conducts sponsored training programs for farmers and groups like Self Help Groups (SHGs), offering advisory services and exposure visits to progressive farms. While both institutions aim at enhancing agricultural knowledge, KVKs emphasize location-specific technological assessments and demonstrations.

Among developing countries, India has taken an early lead in agricultural training, which is crucial for its farming population. Given India's agricultural context, training farmers requires significant investment in infrastructure to ensure regular access (Pal, 2023). As agriculture evolves, these institutions focus on value addition to enhance farm productivity and profitability (Roy et al., 2013). Despite the efforts, the limited number of trainers at these centers fails to meet the high demand for quality training among farmers and farm women. To improve outcomes, it is essential to connect KVKs and FTIs with their respective agricultural departments at universities or research institutes. Farmers possess valuable experience and insights into their challenges; thus, involving progressive farmers in training programs can amplify their impact (Remya & George 2015). Research has primarily focused on evaluating extension methods and organizational performance of KVKs (Dubey & Srivastava, 2007; Kumbhare & Khonde, 2009) but lacks studies on value addition training programs. This study aims to assess the impact of value addition training provided by FTIs and KVKs while identifying challenges faced by trainees. Thus, the research was conceptualized with the following objectives a) To compare the FTI and KVK participants based on perceived knowledge, skills acquisition, and adoption levels of value addition, b) To assess the contribution of independent variables into perceived knowledge, acquisition of skill and adoption level of value addition among the FTI and KVK participants.

**2. Materials and Methods**

**2.1 Study Location**

The study was conducted in Bangalore Rural District of Karnataka state, India. The villages for conducting the study were randomly selected in Doddaballapura and Devanahalli Taluk of Bangalore Rural District (Fig. 1). This district was purposively selected as all participants of the FTI and KVK were from this district only. The FTI located in the GKVK campus of the University of Agricultural Sciences (UAS), Bangalore, and KVK located in Hodonahalli village in the Bangalore Rural District were selected.

**2.2 Research Design**

An ex-post facto research design was employed for conducting the study since it is a systematic empirical inquiry for measuring the phenomenon that has already occurred and is continuing. The researcher has no control over independent variables as their manifestation has already occurred or they are inherent and cannot be manipulated. Thus, inferences about relations among variables were made without direct intervention from concomitant variation of independent and dependent variables. A list of training programs related to value addition, names of participants, and their addresses were collected from the FTI and KVK offices, and the villages were selected randomly (Table 1).

The interview schedule was developed based on an extensive review of the FTI and KVK's value addition training contents. A panel of experts, including value addition trainers, economists, extension faculty members, faculty members of the home science programme, and the coordinator of the FTI and KVK, assessed the content and face validity. The study sample includes all participants who took part in the value-addition training. The face-to-face interviews were conducted by using a structured questionnaire.

**Table 1. Taluks, Villages, and Respondents selected for the study**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of the Institution** | **Taluks** | **Selected villages** | **No. of respondents** |
| Farmers Training Institute (FTI), GKVK, University of Agricultural Sciences (UAS), Bangalore | Devanahalli | Karamanggola | 17 |
| Dinnur | 09 |
| Venkatenahalli | 08 |
| Doddaballapura | Lakshmidevipura | 10 |
| T. Begur | 06 |
| **Total** | | | **50** |
| Krishi Vigyan Kendra (KVK), Bangalore Rural District | Doddaballapura | Vaddarahalli | 15 |
| Aradshnahalli | 21 |
| Devanahalli | Bommanahalli | 06 |
| Chokkanahalli | 08 |
| **Total** | | | **50** |
| **Grand total** | | | **100** |

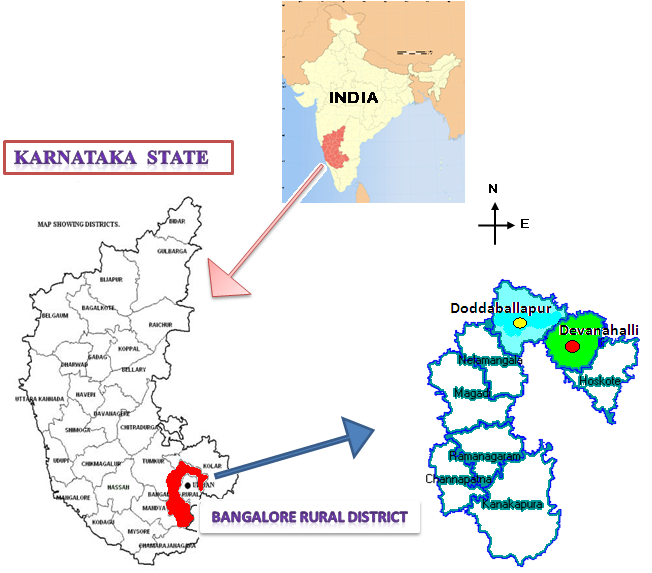
**2.3 Measurement of Dependent and Independent Variables**

Measurement of dependent (*e.g.,* Knowledge, skill, and adoption) and independent variables (Table 2) was done in authors constructed scoring method discussed in the following sections. For demonstrating key contributing factors towards perceived knowledge, acquisition of skill, and adoption level of value addition among the FTI and KVK participants multiple regression analysis was performed.

**Knowledge:** Perceived knowledge was assessed by measuring participants' understanding of value addition concepts. A set of 10 statements related to value addition products were carefully selected in consultation with experts. Participants rated their knowledge level for each statement on a scale from 1 (not knowledgeable) to 5 (very knowledgeable). The total knowledge score was calculated by summing the scores for all statements.

**Skill:** Skill acquisition was measured based on participants' self-reported proficiency in performing specific activities related to value addition. 10 common statements about these activities were developed based on training content, expert consultations, and relevant literature. Participants rated their skill level for each statement on a scale from 1 (not at all skilled) to 5 (very skilled), and a total skill score was calculated.

**Adoption:**The adoption level refers to the extent to which participants have implemented value-adding practices. Based on training content and expert input, a structured schedule was used to identify 15 value-added practices. Participants indicated whether they had 'adopted' (3 points), 'not adopted' (2 points), or 'haven't tried' (1 point) each practice, with a total adoption score calculated based on their responses.



**Fig. 1. Maps showing the study area Doddballapur and Devanahalli Taluks of Bangalore Rural District**

**Table 2. Measurement of independent variables**

| **Characteristic** | **Measurement** |
| --- | --- |
| Gender | Categorized as either male or female. |
| Age | Measured in completed calendar years. Respondents were grouped into three categories: Young (18-30 years), Middle (31-50 years), and Old (above 50 years). |
| Education | Measured by the number of formal schooling years completed. Categories assigned scores from 0 (Illiterate) to 6 (Graduate). Respondents were categorized based on these scores. |
| Family Size | Measured by the total number of family members residing together. Families were categorized into Small (1-4 members), Medium (5-8 members), and Big (more than eight members). |
| Land Holding | Measured as the extent of land owned by the family in acres, converted to standard acres based on the Karnataka Land Reforms Act of 1966. Categories for KVK participants are Low (<1.04 acres), Medium (1.04 – 2.6 acres), and High (>2.6 acres). |
| Family Annual Income | Measured as the total income earned by the family from agricultural and allied enterprises in one year (in Rupees). Categories for KVK participants are Low (<Rs. 11880.78), Medium (Rs. 11880.78 – Rs. 17379.22), and High (>Rs. 17379.22). |
| Training Experience | Measured based on participation in value addition training from institutions other than KVK. Scores were assigned for the duration of training and covered subject matter. KVK participants: Low (<1.74), Medium (1.74 – 4.82), High (>4.82). |
| Post-Harvest Knowledge | Measured based on understanding of post-harvest practices (processing, cleaning, grading, etc.). Participants indicated "know" (1 point) or "don't know" (0 points) for eight practices. KVK participants: Low (<4.33), Medium (4.33 – 6.39), High (>6.39). |
| ICT Exposure | Measured by applying ICT tools for obtaining information in the rural domain, with a primary focus on agriculture. KVK participants: Low (<2.84), Medium (2.84 – 5.64), High (>5.64). |
| Membership of SHGs | Measured based on membership and duration in Self Help Groups. KVK participants: Low (<5.46), Medium (5.46 – 6.72), High (>6.72). |
| Attitude toward Value Addition | Measured using a standardized 12-statement scale assessing beliefs and opinions about value addition. Positive statements scored 5-1, and negative statements scored 1-5. KVK participants: Less favorable (<36.19), Favorable (36.19 – 42.77), More favorable (>42.77). |

*\*Source: Authors’ constructed*

**3. Results and Discussion**

**3.1 Comparison Based on Perceived Knowledge, Skill Acquisition, and Adoption Level of Value Addition Practices**

**3.1.1 Comparison based on perceived knowledge**

A perusal of Table 3 reveals that an almost similar percentage of the FTI and KVK participants were very knowledgeable about the importance of value addition, value-added balanced food from ragi, and the role of self-help groups in creating awareness for value addition, whereas, dissimilarities were observed for other knowledge statements like 4, 5, 6, 7 and 8 (Table 3). The FTI participants showed a moderate level of knowledge, with a mean score above 3. They understood key aspects of value addition, including its importance and the role of SHGs. However, their knowledge was limited in other areas, with mean scores below 2. This lack of understanding may be due to factors such as low education levels, insufficient financial resources, limited access to raw materials, brief training programs, and minimal contact with extension services.

Moreover, only 2% of the FTI and 34% and 40% KVK participants had moderate knowledge of the evaluation of quality standards of value-added products and the role of self-help groups in creating awareness (Table 3). A higher percentage of FTI participants had some knowledge in several areas compared to KVK participants. Results have revealed significant differences between the FTI and KVK participants' knowledge of value addition (Table 5). However, KVK participants have easy access to information and services due to the convenient location of their center in Bangalore Rural District. This allows them to participate in various educational events like campaigns, demonstrations, and workshops. Notably, FTI participants were less knowledgeable about value-added activities and production costs. Overall, KVK participants showed more knowledge of value addition than FTI participants based on mean values of knowledge statements (Table 3). Approximately 80% of FTI and KVK participants were knowledgeable about the role of Self-Help Groups (SHGs) in creating awareness for value addition, likely due to continuous training. SHGs have gained momentum in rural development, as noted by Narayanaswamy et al. (2007). Participants showed moderate knowledge about tomato and ragi value-added products, possibly because these crops are significant in Karnataka. Over half were knowledgeable about income-generating activities related to value addition, which aligns with their interest in increasing income through small businesses.

***3.1.1.1 Distribution of FTI and KVK participants based on overall perceived knowledge of value addition***

Specifically, more numbers of FTI participants were found in low and medium perceived knowledge categories and the percentage of KVK participants was five times higher than the FTI participants in high perceived knowledge categories (Table 4). The findings indicate that a higher percentage of the participants was observed under the medium level (36%), followed by low (33%) and high groups (31%). Similar findings were also reported by Deepti and Varma (2009), Sunil and Manjula (2009), Verma *et. al.* (2005). The probable reason why more than half of KVK participants fall into the high knowledge category could be that KVK provides training not only in agriculture and allied vocations but also in other income-generating activities. The training methods are formal, non-formal, or a combination of both, with an emphasis on work experience. This approach is assumed to effectively improve participants' knowledge of value addition.

**Table 3.** **Comparison based on perceived knowledge of value addition practices between FTI and KVK participants**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Knowledge statements** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **Mean** | |
| **VK** | | **MK** | | **SwK** | | **NK** | | **NaaK** | | **FTI** | **KVK** |
| 1 | Importance of value addition | 7  (14) | 9  (18) | 8  (16) | 16  (32) | 18  (36) | 12  (24) | 16  (32) | 11  (22) | 1  (2) | 2  (4) | 3.08 | 3.38 |
| 2 | Value added income generating activities | 1  (2) | 4  (8) | 7  (14) | 27  (54) | 29  (58) | 8  (16) | 13  (26) | 9  (18) | 0  (0) | 2  (4) | 2.92 | 3.44 |
| 3 | Importance of packaging of value-added food items | 1  (2) | 8  (16) | 12  (24) | 22  (44) | 16  (32) | 13  (26) | 21  (42) | 7  (14) | 0  (0) | 0  (0) | 2.86 | 3.63 |
| 4 | Economics of production costs are involved in value-added products | 0  (0) | 20  (40) | 6  (12) | 21  (42) | 34  (68) | 9  (18) | 10  (20) | 0  (0) | 0  (0) | 0  (0) | 2.92 | 4.22 |
| 5 | Diversity of value added ragi products, viz. halwa, malt, etc. | 0  (0) | 14  (28) | 6  (12) | 17  (34) | 27  (54) | 18  (36) | 17  (34) | 1  (2) | 0  (0) | 0  (0) | 2.78 | 3.88 |
| 6 | Knowledge of the evaluation of quality standards of value-added products related to ragi | 0  (0) | 10  (20) | 1  (2) | 17  (34) | 16  (32) | 11  (22) | 32  (64) | 12  (24) | 1  (2) | 0  (0) | 2.34 | 3.5 |
| 7 | Value addition in ragi bakery food items. | 0  (0) | 5  (10) | 12  (24) | 28  (56) | 28  (56) | 3  (6) | 9  (18) | 14  (28) | 1  (2) | 0  (0) | 3.02 | 3.48 |
| 8 | Value added tomato food items, viz. jam, chutney, etc. | 0  (0) | 3  (6) | 18  (36) | 24  (48) | 30  (60) | 11  (22) | 1  (2) | 12  (24) | 1  (2) | 0  (0) | 3.3 | 3.36 |
| 9 | Knowledge of value-added balanced food from ragi, viz. samber powder, mixture, etc. | 5  (10) | 6  (12) | 18  (36) | 11  (22) | 16  (32) | 21  (42) | 9  (18) | 11  (22) | 2  (4) | 1  (2) | 3.3 | 3.2 |
| 10 | Role of self-help groups in creating awareness for value addition | 12  (24) | 13  (26) | 1  (2) | 20  (40) | 27  (54) | 7  (14) | 10  (20) | 9  (18) | 0  (0) | 1  (2) | 3.3 | 3.7 |

*\*Note: VK= Very Knowledgeable; MK= Moderate Knowledgeable; SwK= Somewhat Knowledgeable; NK= Not Knowledgeable; NaaK = Not at all Knowledgeable*

*Note: Figures in the bracket are percentages*

**Table 4. Overall perceived knowledge of value addition practices among FTI and KVK participants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Knowledge category** | **FTI participants n=50** | | **KVK participants n=50** | | **Total n=100** | |
| **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
| **Low** | 22 | 44 | 11 | 22 | 33 | 33 |
| **Medium** | 23 | 46 | 13 | 26 | 36 | 36 |
| **High** | 5 | 10 | 26 | 52 | 31 | 31 |

**3.1.2 Comparison based on skills acquisition**

70% of the FTI and 50% of KVK participants had not acquired skills in mushroom processing, and packaging for value addition (Table 6). Similarly, the highest (42%) number of FTI participants acquired moderate skills in value-added sambar powder preparation and 52% of KVK participants acquired moderate skills in quality control. FTI and KVK participants were somewhat skilled in all skill practices considered in the study (Table 6). More than half of the FTI participants lacked skills in quality control, preparing value-added tomato products, and instant nutritious ragi rotti. Similarly, over one-third of KVK participants hadn't acquired skills in making value-added ragi and tomato products like sauce and jam. A negligible percentage of both FTI and KVK participants were unskilled in various practices considered in the study. Both FTI and KVK participants showed moderate to somewhat advanced skills in value-addition practices. Limited literacy, brief training programs, lack of resources, and inadequate support from government or private organizations may have contributed to these limitations.

Notably, while FTI participants were less skilled in various practices, about 15% of KVK participants excelled in at least four skills like mushroom processing. This could be due to KVK's skill-based vocational training and "learning by doing" approach, which provides hands-on experience. Additionally, many KVK participants had family dairy businesses compared to FTI participants. KVK participants gained more perceived knowledge and skill than the FTI participants (Table 5). Factors like close contact with farmers, mutual interest among trainers and participants, and interactive relationships between KVKs, local organizations, leaders, and development agencies contribute to differences in knowledge and skills between FTI and KVK participants. Additionally, KVK's resources, advisory body including farmers and farm women delegates, effective management, and support from ICAR have led to more positive feedback. In contrast, FTI offers sponsored training programs based on sponsoring agencies' demands for specific groups but does not provide direct access for individual farmers to training or advisory services.

**Table 5. Perceived knowledge, skills acquisition, and adoption levels variation between the FTI and KVK participants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Dimension** | **FTI** | | **KVK** | | **‘t’ value** | **Significance** |
| **Mean** | **SD** | **Mean** | **SD** |
| Knowledge (10-50) | 29.82 | 4.76 | 35.78 | 7.71 | -.486 | .001\*\* |
| Skill (10-50) | 27.36 | 5.12 | 32.84 | 8.03 | -.406 | .001\*\* |
| Adoption (15-45) | 24.98 | 5.63 | 25.28 | 6.98 | -.237 | .231NS |
| *\*\* Significant at 1% level*  *NS- Non Significant* | | | | | | |

**Table 6. Comparison based on skills acquisition of value addition practices between FTI and KVK participants**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Skill statements** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **Mean** | |
| **VS** | | **MS** | | **SwS** | | **NS** | | **NaaS** | | **FTI** | **KVK** |
| 1 | Preparation of value added ragi products, viz. mithai, halwa, etc. | 3  (6) | 7  (14) | 12  (24) | 12  (24) | 11  (22) | 12  (24) | 16  (32) | 14  (28) | 8  (16) | 5  (10) | 3.72 | 3.04 |
| 2 | Preparation of value-added tomato products, *viz.* sauce, jam, etc | 1  (2) | 4  (8) | 12  (24) | 10  (20) | 11  22) | 15  (30) | 24  (48) | 15  (30) | 2  (4) | 6  (12) | 2.72 | 2.82 |
| 3 | Mushroom processing, packaging for value addition | 0  (0) | 13  (26) | 5  (10) | 10  (20) | 11  (22) | 2  (4) | 32  (64) | 22  (44) | 2  (4) | 3  (6) | 2.38 | 3.16 |
| 4 | Preparation ragi bakery items viz. Vermicelli, pappad, burfi etc | 1  (2) | 10  (20) | 14  (28) | 25  (50) | 15  (30) | 11  (22) | 18  (36) | 4  (8) | 2  (4) | 0  (0) | 2.88 | 3.82 |
| 5 | Preparation of value-added sambar powder | 0  (0) | 5  (10) | 21  (42) | 23  (46) | 14  (28) | 13  (26) | 7  (14) | 8  (16) | 8  (16) | 1  (2) | 2.96 | 3.46 |
| 6 | Preparation of instant nutritious ragi rotti | 0  (0) | 7  (14) | 10  (20) | 21  (42) | 12  (24) | 17  (34) | 19  (38) | 3  (6) | 9  (18) | 2  (4) | 2.46 | 3.56 |
| 7 | Tomato grading, storage for value addition | 0  (0) | 9  (18) | 16  (32) | 18  (36) | 10  (20) | 7  (14) | 24  (48) | 16  (32) | 0  (0) | 0  (0) | 2.84 | 3.4 |
| 8 | Quality control of the value-added different types of ragi food items | 0  (0) | 5  (10) | 7  (14) | 26  (52) | 12  (24) | 12  (24) | 31  (62) | 7  (14) | 0  (0) | 0  (0) | 2.52 | 3.58 |
| 9 | Preparation of value-added weaning foods | 7  (14) | 1  (2) | 15  (30) | 13  (26) | 3  (6) | 24  (48) | 24  (48) | 8  (16) | 1  (2) | 4  (8) | 3.06 | 2.98 |
| 10 | Preparation of value-added milk products, viz. chocolate, sweet bits, etc. | 0  (0) | 3  (6) | 5  (10) | 10  (20) | 32  (64) | 26  (52) | 12  (24) | 7  (14) | 1  (2) | 4  (8) | 2.82 | 3.02 |

*\*Note: VS= Very Skilled; MS= Moderate Skilled’; SwS= Somewhat Skilled; NS= Not Skilled; NaaS= Not at all Skilled*

*Figures in the bracket are percentages*

***3.1.2.1*** ***Distribution of FTI and KVK participants based on overall skill acquisition of value addition***

About 50% of KVK participants acquired high skills, whereas a greater number of FTI participants (80%) acquired low and medium skills (Table 7). The overall acquisition of skill by the FTI and KVK participants in all three categories was surprisingly almost similar. The above results were in accordance with the findings of Noor and Dola (2010), and Deepti and Varma (2009). The reasons that could be attributed to the significant changes in skill on value addition among participants of KVK were not just increased knowledge, but the total community development through the application of science and technology, and the use of human and natural resources, and social learning. On the other hand, FTI participants acquired low to medium skills in different aspects of value addition, however, lack of more knowledge, exploration, demonstrations, hands-on training, hence, they were not able to exhibit their skills.

**Table 7. Overall skills acquisition of value addition practices among FTI and KVK participants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Skill category** | **FTI participants n=50** | | **KVK participants n=50** | | **Total n=100** | |
| **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
| Low skill | 21 | 42 | 12 | 24 | 33 | 33 |
| Medium skill | 22 | 44 | 12 | 24 | 34 | 34 |
| High skill | 7 | 14 | 26 | 52 | 33 | 33 |

**3.1.3 Comparison based on adoption level**

The data presented in Table 8 indicates that more than 8 practices whereas, only 2 practices viz. coconut peeler and weeder were not tried or adopted by KVK participants. More than half of FTI and KVK participants adopted practices like washing vegetables before cutting and and consuming half-boiled vegetables. A significant number of KVK participants began adopting the more value addition practices compared to FTI participants. Both groups showed adoption of similar practices, indicating the influence of value-addition training. However, around 60% of FTI participants did not adopt products like vermicelli due to high costs and unavailability. Many participants from both groups have not tried practices such as vegetable grading or using specialized machines, likely due to lack of knowledge, capital, or inputs, as well as poor perception or complexity issues. None of the FTI have tried or adopted practices like peeler and weeder which may be because of the mechanization of agriculture still out of reach in the study area, lack of awareness of the practices, the extent of the change agency’s efforts, complexities of practices, and lack of extension services. Similarly, above 80 percent of KVK participants have not tried ragi value-added products and samber powder might be because of profitability and suitability for urban areas in the food chain shops. Results have revealed that there were no significant differences existed between the FTI and KVK participant's level of adoption on value addition (Table 5). The possible reasons might be that, lack of participants' awareness, information, proper knowledge, motivation, or value addition practices were costly, not available locally, not suitable all those items. That’s why some common value-addition practices were adopted by the FTI and KVK participants.

***3.1.3.1 Distribution of FTI and KVK participants based on overall adoption level of value addition***

There were no distinct differences in adoption level between the FTI and KVK participants (Table 5). 38 percent of the FTI participants belonged to the medium adoption category, whereas, a somewhat lower percentage (30%) of KVK participants belonged to this category (Table 9). However, a high percentage (36%) of KVK participants and 32% of FTI participants were found high adoption category, whereas, 30 and 34 percent of FTI and KVK participants were found under the low adoption category.

**Table 8. Comparison based on adoption level of value addition practices between the FTI and KVK participants**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Adoption practices** | **FTI** | **KVK** | **FTI** | **KVK** | **FTI** | **KVK** | **Mean** | | |
| **Adopted** | | **Not adopted** | | **Haven’t tried** | | **FTI** | | **KVK** |
| 1 | Value added Ragi products like Vermicelli, Pakoda | 0(0) | 1(2) | 28(56) | 9(18) | 22(44) | 40(80) | 1.56 | | 1.22 |
| 2 | Value added milk products viz. Butter | 0(0) | 1(2) | 23(46) | 12(24) | 27(56) | 37(74) | 1.46 | | 1.28 |
| 3 | Value added products viz. Samber powder using | 1(2) | 4(8) | 28(56) | 5(10) | 21(42) | 41(82) | 1.6 | | 1.26 |
| 4 | Washing vegetables before cutting | 28(56) | 26 (52) | 8(16) | 14(28) | 14(28) | 16 (32) | 2.28 | | 2.23 |
| 5 | Using rice liquid after boiling | 15(30) | 13(26) | 19(38) | 29(58) | 16(32) | 8(16) | 1.98 | | 2.1 |
| 6 | Half boiled vegetables for nutrient conservation | 25(50) | 27(54) | 8(16) | 11(22) | 17(34) | 12 (24) | 2.16 | | 2.3 |
| 7 | Half boiled egg for nutrient conservation | 35(70) | 12 (24) | 2(4) | 11(22) | 13(26) | 27(54) | 2.44 | | 1.7 |
| 8 | Fruit/vegetables grading and storage | 2(4) | 11(22) | 10(20) | 12(24) | 38(68) | 27(54) | 1.28 | | 1.68 |
| 9 | Vegetable grading and marketing | 0(0) | 2(4) | 12(24) | 13(26) | 38(68) | 35 (70) | 1.24 | | 1.34 |
| 10 | Starting entrepreneurship for value-added products | 0(0) | 11(22) | 14(28) | 9(18) | 36(72) | 30 (60) | 1.28 | | 1.62 |
| 11 | Packaging of value-added products for quality control | 0(0) | 2(4) | 25(50) | 31(62) | 25(50) | 17(34) | 1.5 | | 1.7 |
| 12 | Using Mango fruit harvester for drudgery reduction | 0(0) | 1(2) | 1(2) | 19(38) | 49(98) | 30(60) | 1.02 | | 1.42 |
| 13 | Using a Coconut peeler for drudgery reduction | 0(0) | 0(0) | 7(14) | 23(46) | 43(86) | 27(54) | 1.14 | | 1.46 |
| 14 | Using a weeder for drudgery reduction | 21(42) | 0(0) | 10(20) | 25(50) | 19(38) | 25(50) | 2.04 | 1.5 | |
| 15 | Using a hand pressure machine for Rotti preparation | 0(0) | 1(2) | 0(0) | 17(34) | 50(100) | 32(64) | 1.0 | 1.38 | |

*\*Note: Figures in the bracket are percentages*

Finally, the overall adoption level of the FTI and KVK participants constituted almost similar percentages of low, medium and high adoption categories. The findings of the study conform with Meena and Singh (2010), Meena and Bhati (2010), Choudhuri *et. al.* (2010). The reasons behind these significant changes might be both the training institutes arranging demand-led, farmer-centric, gender-specific, and location-specific specialized training programmes in agriculture and allied aspects both at institutional and village level.

**Table 9. Overall adoption level of value addition practices among FTI and KVK participants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Adoption category** | **FTI participants n=50** | | **KVK participants n=50** | | **Total n=100** | |
| **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
| **Low** | 15 | 30 | 17 | 34 | 32 | 32 |
| **Medium** | 19 | 38 | 15 | 30 | 34 | 34 |
| **High** | 16 | 32 | 18 | 36 | 34 | 34 |

**3.2 Contribution of Independent Variables to Dependent Variables of Value Addition Practices Among FTI and KVK Participants**

**3.2.1** **Contribution of Independent Variables on Perceived Knowledge**

The multiple linear regression analysis showed four independent variables, namely education, post-harvest knowledge, extension agent contact, and attitude towards value addition, significantly contributed to 47.20% of the variation in the perceived knowledge of FTI participants (Table 10). Likewise, among 12 variables, education, small-scale entrepreneurship, self-help groups and attitude towards value addition were significant in regression analysis in explaining 45% variation in perceived knowledge of KVK participants (Table 11). Education and post-harvest knowledge of participants had a significant relationship with their knowledge level. Education provides increased exposure to different communication media and helps to acquire more information through better perception and comprehension, and such influence might have been acquired during FTI training.

FTI helps participants reorient towards science and innovation, becoming better entrepreneurs and focusing on knowledge acquisition. Education enables individuals to gather and apply knowledge. Extension contact helps farmers and women adopt research-based knowledge, broadening their perspectives and fostering new ideas. These findings highlight the importance of education and extension contact in enhancing knowledge acquisition. Effective extension contacts provide factual information about technology, while attitudes toward value addition are linked to participants' perceived knowledge levels. Fishbein and Ajzen (1975) indicated that attitude is viewed as a major determinant of the person’s intention to perform the behavior in question. The positive attitude towards value addition in entrepreneurship motivates FTI and KVK participants to gain knowledge through active participation in training. Entrepreneurship deals with significant issues, motivating KVK participants to gain knowledge on value addition. SHG membership also plays a significant role in providing education, training, and awareness-creating programs in agriculture, food, nutrition, leadership, and income-generating activities (Chan et al., 2018).

**Table 10. Contribution of independent variables to perceived Knowledge of the FTI participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **FTI participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 12.589 | 5.507 | 2.286\*\* |
| Age (years) | 0.035 | 0.082 | 0.421 |
| Education (number of years of schooling) | 0.735 | 0.260 | 2.824\*\*\* |
| Family size (number) | -0.071 | 0.454 | -0.156 |
| Land Holding (acre) | -1.140 | 0.816 | -1.397 |
| Family annual income (Rs.) | 0.000 | 0.000 | 0.956 |
| Training experience (score) | 0.027 | 0.230 | 0.118 |
| Post-harvest +Knowledge (score) | 0.829 | 0.445 | 1.951\* |
| Extension agent contact (score) | 0.670 | 0.350 | 1.916\* |
| Small Scale Entrepreneurship (score) | -0.403 | 0.444 | -0.906 |
| ICT Exposure (score) | -0.220 | 0.376 | -0.585 |
| SHGs membership (score) | 0.048 | 0.194 | 0.249 |
| Attitude toward Value Addition (score) | 0.288 | 0.112 | 2.570\*\* |
| *\*\*\* Significant at 1%, \*\* Significant at 5%, \* Significant at 10%*  *R2 = 0.472, F value- 2.753 \*\*\** | | | |

**Table 11. Contribution of independent variables to perceived knowledge of KVK participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **KVK participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 12.414 | 5.837 | 2.584\*\* |
| Age (years) | 0.022 | 0.128 | 0.165 |
| Education (number of years of schooling) | 0.649 | 0.300 | 2.713\*\* |
| Family size (number) | -0.694 | 0.706 | -0.984 |
| Land Holding (acre) | -0.777 | 0.858 | -0.905 |
| Family annual income (Rs.) | 0.000 | 0.000 | 1.567 |
| Training experience (score) | 0.386 | 0.333 | 1.158 |
| Post-harvest Knowledge (score) | 0.568 | 0.656 | 0.866 |
| Extension agent contact (score) | 0.359 | 0.404 | 0.887 |
| Small Scale Entrepreneurship (score) | 1.732 | 0.789 | 2.195\*\* |
| ICT Exposure (score) | -0.061 | 0.429 | -0.143 |
| SHGs membership (score) | 0.937 | 0.424 | 2.353\*\* |
| Attitude toward Value Addition (score) | 0.281 | 0.165 | 1.697\* |
| *\*\*\* Significant at 1% , \* \* Significant at 5% , \* Significant at 10%*  *R2 = 0.450, F-value- 2.37\*\** | | | |

**3.2.2** **Contribution of independent variables to skill acquisition**

Among the 12 independent variables only education, post-harvest knowledge, and attitude towards value addition have contributed significantly to the variation in the acquisition of skills of FTI participants (Table 12). Collectively, these 4 variables put together have explained 36.5% of the variation in the acquisition of skills on the value addition of FTI participants. Similarly, the three variables education, post-harvest knowledge, and attitude toward value addition contributed significantly to the 46.3% of variation in the acquisition of skills of KVK participants (Table 13). As individuals' educational levels increase, they tend to develop in various fields and learn skills faster. Post-harvest knowledge is crucial for becoming skilled in the agricultural field, as knowledge is necessary for success. Attitude plays a significant role in driving behavior and influencing an individual's orientation towards excelling in farm enterprises. A positive attitude generally leads to a higher orientation towards risks, scientific technology, and competition, which naturally influence an individual's skill acquisition. Therefore, attitude significantly contributes to the acquisition of skills in various fields.

**Table 12. Contribution of independent variables to skill acquisition of FTI participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **FTI participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 15.114 | 6.498 | 2.326\*\* |
| Age (years) | -0.086 | 0.097 | -0.889 |
| Education (number of years of schooling) | 0.661 | 0.307 | 2.153\*\* |
| Family size (number) | 0.500 | 0.535 | 0.934 |
| Land Holding (acre) | -0.216 | 0.963 | -0.224 |
| Family annual income (Rs.) | -6.76 | 0.000 | -0.544 |
| Training experience (score) | 0.337 | 0.271 | 1.244 |
| Post-harvest knowledge (score) | 0.981 | 0.526 | 1.865\* |
| Extension agent contact (score) | 0.350 | 0.413 | 0.848 |
| Small Scale Entrepreneurship (score) | 0.208 | 0.524 | 0.397 |
| ICT Exposure (score) | -0.153 | 0.444 | -0.344 |
| SHGs membership (score) | 0.328 | 0.229 | 1.436 |
| Attitude toward Value Addition (score) | 0.290 | 0.132 | 2.189\*\* |
| *\*\*\* Significant at 1%, \*\* Significant at 5%, \* Significant at 10%*  *R2 = 0.365, F value- 1.774* | | | |

**Table 13. Contribution of independent variables to skill acquisition of KVK participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **Skill of KVK participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 8.117 | 8.063 | 1.007 |
| Age (years) | 0.050 | 0.132 | 0.378 |
| Education (number of years of schooling) | 0.768 | 0.309 | 2.533\*\* |
| Family size (number) | -0.601 | 0.726 | -0.828 |
| Land Holding (acre) | 0.769 | 0.883 | 0.871 |
| Family annual income (Rs.) | -2.552 | 0.000 | -0.101 |
| Training experience (score) | 0.484 | 0.343 | 1.411 |
| Post-harvest Knowledge (score) | 1.546 | 0.675 | 2.291\*\* |
| Extension agent contact (score) | 0.027 | 0.416 | 0.066 |
| Small Scale Entrepreneurship (score) | 1.136 | 0.812 | 1.399 |
| ICT Exposure (score) | -0.281 | 0.441 | -0.636 |
| SHGs membership (score) | 0.618 | 0.437 | 1.417 |
| Attitude toward Value Addition (score) | 0.333 | 0.170 | 1.958\* |
| *\*\* Significant at 5%, \* Significant at 10%*  *R2 = 0.463, F value-2.659\*\** | | | |

**3.2.3** **Contribution of independent variables to adoption level**

64.5% of the variation in the level of adoption of value addition among FTI participants could be explained by five independent variables while education was significant in contribution at one percent level (Table 14). Besides, the results of three independent variables of KVK fitted together in the regression model contributed to 44.3% of the variation in the adoption of value-added practices. The education level of FTI and KVK participants might have helped to a greater extent in understanding and comprehension of modern technologies of value addition.

**Table 14. Contribution of independent variables to adoption level of FTI participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **FTI participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 15.327 | 5.344 | 2.868\*\*\* |
| Age (years) | 0.015 | 0.080 | 0.188 |
| Education (number of years of schooling) | 0.689 | 0.253 | 2.936\*\*\* |
| Family size (number) | -0.139 | 0.440 | -0.315 |
| Land Holding (acre) | 1.373 | 0.792 | 1.733\* |
| Family annual income (Rs.) | 1.277 | 0.000 | 0.125 |
| Training experience (score) | 0.046 | 0.223 | 0.205 |
| Post-harvest Knowledge (score) | 0.887 | 0.432 | 2.366\*\* |
| Extension agent contact (score) | 0.078 | 0.339 | 0.229 |
| Small Scale Entrepreneurship (score) | 0.918 | 0.431 | 2.130\*\* |
| ICT Exposure (score) | 0.046 | 0.365 | 0.127 |
| SHGs membership (score) | 0.449 | 0.188 | 2.568\*\* |
| Attitude toward Value Addition (score) | 0.001 | 0.109 | 0.008 |
| *\*\*\* Significant at 1%, \*\* Significant at 5%, \* Significant at 10%*  *R2 = 0.645, F value = 5.593\*\*\** | | | |

**Table 15. Contribution of independent variables to adoption level of KVK participants**

|  |  |  |  |
| --- | --- | --- | --- |
| **Independent variables** | **KVK participants** | | |
| **Regression coefficient (b)** | **Standard error (SEb)** | **‘t’ value** |
| Intercept | 7.803 | 7.130 | 1.094 |
| Age (years) | -0.070 | 0.116 | -0.603 |
| Education (number of years of schooling) | 0.651 | 0.273 | 2.349\*\* |
| Family size (number) | 0.831 | 0.642 | 1.295 |
| Land Holding (acre) | -0.539 | 0.781 | -0.690 |
| Family annual income (Rs.) | 1.433 | 0.000 | 0.064 |
| Training experience (score) | 0.002 | 0.303 | 0.005 |
| Post-harvest Knowledge (score) | 0.464 | 0.597 | 0.778 |
| Extension agent contact (score) | 0.590 | 0.368 | 1.604 |
| Small Scale Entrepreneurship (score) | 1.243 | 0.718 | 1.731\* |
| ICT Exposure (score) | 0.275 | 0.390 | 0.704 |
| SHGs membership (score) | 0.882 | 0.386 | 2.812\*\* |
| Attitude toward Value Addition (score) | 0.158 | 0.150 | 1.050 |
| *\*\*\*Significant at 1%, \*\*Significant at 5%, \*Significant at 10%*  *R2 =0.443, F value- 2.457\*\** | | | |

Education offers insight into how technology is enabling higher production, kindling the urge for higher adoption. Besides, entrepreneurs need a keen eye to understand the market, raw materials, and demand-supply realities. Hence, entrepreneurship (t-value=2.130) had a contribution to adoption (Table 15). Cent percent of KVK participants were women and SHGs for them became extraordinary tools for empowering, family welfare, functional literacy, increasing their assets, inoculating the habit of savings, and developing the economy. Moreover, SHGs provide credit for agricultural production, livestock farming, dairy farming, etc. for improving farmers’ economic development, which is related to the adoption of new technologies, varieties, and practices on value addition (Table 15).

**4. Conclusion**

The study results conclude that a comparatively higher number (75%) of KVK participants than FTI participants obtained a medium to high level of perceived knowledge of value addition while overall around 60% of the participants achieved perceived knowledge of value addition. Again, a higher percentage (52%) of KVK participants acquired high skills than FTI participants who achieved low to medium skills in value addition. However, no significant differences were found between the FTI and KVK participants on the adoption level of value-addition practices. Education and post-harvest knowledge were the most contributing variables to the knowledge, skill, and adoption of the FTI and KVK participants. Moreover, other variables such as entrepreneurship, self-help groups, and attitudes towards value addition also contributed significantly. Regarding perceived knowledge and skill acquisition, significant differences were found between the FTI and KVK participants. In particular, KVK participants achieved significantly more knowledge and skills than the FTI participants. However, regarding adoption level, similar findings were reported.

Based on the findings, this study recommends as follows:

* To educate the importance of value addition by creating awareness initiatives is recommended. Value addition is not only in cereal crops but also in horticultural crops, livestock products and fish and marine products should be given priority so that people can actualize the vast untapped growth potential of Indian agriculture.
* The status of post-harvest activities in rural areas should be critically reviewed to identify location-specific value-added products in terms of human resource development and institutional mechanisms for attaining the desired results in this vital sector to face the challenges arising from economic liberalization and globalization.
* Capacity building is another vital factor to adopt value addition. Simplified credit facilities should be provided to farmers and their cooperatives that wish to undertake value addition to their produce. Promoting contract farming would be another potential solution in this regard. State government should act as a facilitator for capacity building among the rural producers.
* The number and duration of the training program should be increased for those who are potential entrepreneurs for value addition. Besides, follow-up activities are highly recommended for evaluation to assess the ultimate usefulness of the training program.
* Extension service should be revamped to develop high-value agriculture and grassroots-level extension personnel should provide necessary post-harvest management training so that they can promote and educate farmers on value addition.
* KVK and FTI should set up value-addition centers or processing units in rural areas. They should also promote rural processing and value-addition groups to increase the active participation of farmers, sharing information and services that ultimately develop effective backward linkages with farmers, to procure quality raw material.
* A favorable policy and strategy should be formulated at the state and national levels to oversee the needs of micro-level producers, while encouraging highly enthusiastic participants with financial and institutional support to start value addition entrepreneurship.

**COMPETING INTERESTS**

**The authors have declared that no competing interests exist.**

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**REFERENCES**

Born, H., & Bachmann, J. (2006). Adding value to farm products: an overview. *National Sustainable Agriculture Information Service,* 1-12.

Chan, N. W., Roy, R., Lai, C.H. & Tan, M. L. (2018): Social capital as a vital resource in flood disaster recovery in Malaysia, International Journal of Water Resources Development, DOI: 10.1080/07900627.2018.1467312

CII-McKinsey & Co. (1997). *Food and Agriculture Integrated Development and Action (FAIDA) Report*. Confederation of Indian Industry (CII) and McKinsey & Company.

Choudhuri, N. C., Paul, G., Kundu, A., Kundssu, M. S., Chatterjee, R. N. and Chand, V. (2010). Training impact on poultry farmers of South Andaman Islands and comparative performance evaluation of pure and cross breeds of Nicobari fowl. *Livestock Research for Rural Development,* 22(8).

Coltrain, D., Barton, D., & Boland, M. (2000). Value added: opportunities and strategies. Arthur Capper Cooperative Center, Department of Agricultural Economics, Cooperative Extension Service, Kansas State University.

Davis, K., Nkonya, E., Kato, E., Mekonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. *World development,* 40(2), 402-413.

Deepti, S. R. and Varma, S.K. (2009). Impact of project training on knowledge of farm women for foods and nutrition practices, *Asian Journal of Home Science*, 4(2),337-339.

Dubey, A. K., & Srivastava, J. P. (2007). Effect of training programme on knowledge and adoption behaviour of farmers on wheat production technologies. *Indian Res. J. Ext. Edu,* 7(2&3), 41-43.

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An introduction to theory and research. Reading, MA: Addison-Wesley Pub.

Kumbhare, N. V., & Khonde, S. R. (2009). Impact of KVK training on farmers adoption behaviour and knowledge gain. *Indian Journal of Extension Education,* 45(3&4), 60-62.

Meena, B. S. and Bhati, D. S., 2010, Impact of Krishi Vigyan Kendra’s trainings on knowledge and adoption of cotton production technologies, *Indian J. of Extn. Edu.* 5(1 & 2), 92-95.

Meena, B. M. and Singh, B. (2010). Impact of training programmes imparted by Krishi Vigyan Kendras in Rajasthan, *International Journal of Agricultural Sciences,* 6(1), 213-215.

Narayanaswamy, B. K. Narayana G. and Nagaraj, G. N. (2007). Performance of Self Help Groups of Karnataka in Farm Activities, *Karnataka J. Agric. Sci.,*20(1), (85 – 88).

Negi, V., Kumar, V. and Rafique, S. (2009) Soyabean Crop Production and Value Addition for Enterprise Development: a case of Uttarakhand Livelihoods Improvement Project of the Himalayas, India, IFAD, India Country Office, Poorvi Marg, Vasant Vihar, New Delhi.

Noor, K. B. M. and Dola, K. (2010). A Study on the Impact of Government Initiated Training towards Farmers in Malaysia, *European Journal of Social Sciences,*14(2).

Parveen, S., Bushra, I., Humaira, K., Shazia, S., & Azhar, M. A. (2014). Value addition: A tool to minimize the post-harvest losses in horticultural crops. *Greener Journal of Agricultural Sciences,* 4(5), 195-198.

Pal, S. (2023). India's rural development and agricultural infrastructure. *PNR Journal*, 14(S01), 110. DOI: 10.47750/pnr.2023.14.S01.110

Remya, M., & George, A. (2015). Impact of training on adoption and knowledge gain in facilitators of People’s Rural Education Movement (PREM). *Journal of Extension Education,* 27(4).

Roy, R., Chan, N.W., Uemura, T., Imura, H., 2013. The vision of agri-environmental sustainability in Bangladesh: how the policies, strategies and institutions delivered? *J. Environ. Protect*. 4, 40–51. <http://doi:10.4236/jep.2013.48A2006>.

Roy, R., Chan, N. W., & Rainis, R. (2014). Rice farming sustainability assessment in Bangladesh. *Sustainability Science, 9*, 31–44.

Roy, R., Chan, N.W., Xenarios, S., 2015. Sustainability of rice production systems: an empirical evaluation to improve policy. *Environ. Dev. Sustain*. 18, 257–278. https:// doi.org/10.1007/s10668-015-9638-x.

Sunil, N.K. and Manjula, N., 2009, Role of Krishi Vigyan Kendra in Technology Transfer to create awareness on Vermi-Compost Technology, *Indian J. of Extn. Edu,* 4(1&2), 3-7.

Verma, T. and Rajesh A., 1994, Impact of Post Harvest Technology on Rural Women. *Maharastra J. Extn. Edu.,*13, 35-38.

World Bank. (2009). Gender in agriculture sourcebook. Washington, DC 20433, website: [www.worldbank.org](http://www.worldbank.org)

World Bank. (2008). World Development Report, Agriculture for Development Washington DC, USA