**Deciphering the Constraints Faced by Cotton Growers in the Using Indigenous Technical Knowledge**

**ABSTRACT**

The study was conducted to delineate the constraints being faced by the cotton growers in the use of indigenous technical knowledge. The irrigated north western plain zone (Ib) of the state of Rajasthan was the locale of the study. Selected zone covered *viz.* Hanumangarh and Sri Ganganagar districts. Both the districts were selected purposely for the research study on the basis of largest area and production of cotton crop. Further, two tehsils were selected purposely on the basis of largest area and production of cotton from each selected district. Consequently, a total of four tehsils were chosen from the two selected districts. Furthermore, five villages from each selected tehsil were selected by simple random sampling method for the investigation. For the objective the research, twenty villages were therefore deliberately chosen from four tehsils in the Hanumangarh and Sri Ganganagar districts. Thus, a total of 300 cotton growers were chosen from both the selected districts and 15 cotton growers from each village were included in the proportional random sample used to choose the respondents. The results revealed that the major constraints being faced by the cotton growers in the use of ITKs practices were “ITK has not been scientifically evaluated (81.78MPS)”, “farmers were more dependent on ready-to-use (RTU) products (78.78 MPS)”, “ignorance of the young generation towards ITK in cotton cultivation (76.33 MPS )”, “no channel to share ITK in cotton cultivation (75.33 MPS )”, “lack of availability of financial assistance offered by credit institutions (74.44 MPS)” and “lack of availability of professional guidance to improve ITK practices (69.00 MPS)”.

**Keywords:** Constraints, Cotton Growers, Indigenous Technical Knowledge, Cotton Cultivation

**INTRODUCTION**

Indian agriculture grapples with two primary issues *i.e.,* boosting farmer income by reducing costs of production and promoting the sustainability of natural resources by utilising various knowledge systems already in place in the nation. Knowledge is a powerful tactical asset, facilitating the developmental process. Knowledge has been described as information that is intertwined with context, interpretation and experience (Davenport *et al.*, 1998). ITK is the actual knowledge of a given population that reflects the experiences based on tradition and includes more recent experiences with modern technologies (Haverkort, 1995). Indigenous knowledge is at significant risk of being lost and with-it valuable insights into sustainable ways of living are also endangered. Leveraging this traditional knowledge effectively can help stabilize farmers' livelihoods by reducing the costs associated with cotton cultivation. This paper is based on the premise that indigenous cotton farmers in Rajasthan's irrigated northwestern plain zone (Ib) face numerous challenges in adopting indigenous technical knowledge. The study aims to explore these constraints and gain a deeper understanding of the issues faced by cotton growers in this region.

**MATERIAL AND METHODS**

The Department of Agriculture, Government of Rajasthan has divided the state into ten agro-climatic zones. The irrigated north western plain zone (Ib) was chosen for the research study out of the ten agro-climatic zones in the state of Rajasthan. Two districts Hanumangarh and Sri Ganganagar were included in the zone Ib that was chosen for the present investigation. Both the districts were selected purposely for the research study on the basis of largest area and production of cotton crop in the zone. Two tehsils from each selected district were selected purposely for the research study on the basis of largest area and production of cotton. As a result, four tehsils from the selected two districts were chosen. Thereafter, five villages from each selected tehsil were selected by simple random sampling method for the investigation. Thus, from four carefully chosen tehsils in the Hanumangarh and Sri Ganganagar districts, twenty villages were specifically chosen for the study. For the selection of respondents, complete list of all cotton growers from the chosen villages having at least 5 years or more experience in cotton cultivation was compiled with the help of Deputy Director Agriculture (Ext.), Zila Parishad, Sri Ganganagar and Hanumangarh, who are referred to as respondents’. Out of these, 15 cotton growers were selected randomly from each selected village. Hence, a total of 300 cotton were selected for the present investigation. Subsequently, a semi-structured interview schedule was designed and used to collect data and then the data was analyzed by employing several statistical measures such as mean percent score, rank correlation, t-test *etc.*

**RESULTS AND DISCUSSION**

Constraints are limitations or barriers that restrict the achievement of objectives. They can involve resources, time or external factors that hinder progress. In various fields, such as agriculture or project management, constraints define the challenges that need to be overcome for success. To assess the constraints hindering the adoption of indigenous technical knowledge by respondents, a schedule was developed. This section aimed to identify the challenges faced by respondents in adopting indigenous technical knowledge. For the present study, all the possible constraints being faced by the cotton growers were grouped into six major categories *viz*. socio-psychological, technological, documentation, financial, extension-related and policy-related constraints. In order to study various types of constraints, the cotton growers were asked to give the response on three-point continuum. Based on the scores in each constraint category, the Mean Percent Score (MPS) was calculated. The constraints were then ranked accordingly and rank correlation was determined for each dimension.

**Socio-psychological Constraints**

The data in Table 1 shows that socio-psychological constraints *viz*. “ignorance of the young generation towards ITK in cotton cultivation” was ranked first by cotton growers of Hanumangarh district with 80.44 MPS, followed by “young farmers have little knowledge and awareness about ITK practices” (70.00 MPS), “area-to-area changes In indigenous technical knowledge” (66.67 MPS), “lack of motivation among farmers towards ITK often arises due to the gap between traditional practices and modern farming methods” (65.11 MPS), “farmers find it challenging to identify indigenous ingredients” (62.00 MPS) and “farmers have negative attitude towards ITK” (55.11 MPS) were ranked second, third, fourth, fifth and sixth, respectively.

**Table 1: Ranking of Items under Socio-psychological Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Socio-psychological Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | Ignorance of the young generation towards ITK in cotton cultivation | 80.44 | I | 72.22 | II | 76.33 | I |
|  | Lack of motivation among farmers towards ITK often arises due to the gap between traditional practices and modern farming methods | 65.11 | IV | 71.78 | III | 68.44 | III |
|  | Farmers have negative attitude towards ITK | 55.11 | VI | 64.22 | V | 59.67 | VI |
|  | Farmers find it challenging to identify indigenous ingredients | 62.00 | V | 70.67 | IV | 66.33 | IV |
|  | Area-to-area changes In Indigenous technical knowledge | 66.67 | III | 63.78 | VI | 65.22 | V |
|  | Young farmers have little knowledge and awareness about ITK practices | 70.00 | II | 78.44 | I | 74.22 | II |
| **Pooled** | | **66.56** |  | **70.19** |  | **68.37** |  |

rs= Rank Correlation

MPS = Mean Percent Score

NS= Non Significant

rs=0.60

t = 1.50NS

Whereas, in Sri Ganganagar district, cotton growers given the first rank to the constraint “young farmers have little knowledge and awareness about ITK practices” with 78.44 MPS, followed by “ignorance of the young generation towards ITK in cotton cultivation” (72.22 MPS), “lack of motivation among farmers towards ITK often arises due to the gap between traditional practices and modern farming methods” (71.78 MPS), ‘‘farmers find it challenging to identify indigenous ingredients” (70.67 MPS), “farmers have negative attitude towards ITK” (64.22 MPS) and “area-to-area changes in indigenous technical knowledge” (63.78 MPS) which were ranked second, third, fourth, fifth and sixth, respectively.

Further, the data in Table 1 also illustrates that “ignorance of the young generation towards ITK in cotton cultivation” (76.33 MPS) was ranked first by majority of the overall cotton growers, followed by “farmers have little knowledge and awareness about ITK practices” (74.22 MPS) ranked second, “lack of motivation among farmers towards ITK often arises due to the gap between traditional practices and modern farming methods” (68.44 MPS) ranked third, “farmers find it challenging to identify indigenous ingredients” (66.33 MPS) ranked fourth, “area-to-area changes in indigenous technical knowledge” (65.22 MPS) ranked fifth and “farmers have negative attitude towards ITK” (59.67 MPS) was ranked sixth under socio-psychological constraints category. The value of rank correlation between Hanumangarh district and Sri Ganganagar district cotton growers (rs) was 0.60. The calculated value of ‘t’ (1.50NS) was lower than its tabulated value. This shows non-significance, which leads to conclusion that there was no similarity in rank assignment pattern of socio-psychological constraints among cotton growers of Hanumangarh and Sri Ganganagar districts. The findings are supported by the results of Hathila (2013), Khatri (2014) and Kumar *et al.* (2017) who found extinct due to non-practice by the younger generation; young farmers were not interested in adoption of ITKs.

**Technological Constraints**

The data in Table 2 indicates that in Hanumangarh district, the major technological constraints faced y the farmers were “farmers are more dependent on ready-to-use (RTU) products” with 80.44 MPS which was ranked first, followed by “use of ITKs practices gives late results as compared to modern technology” (66.67 MPS) ranked second, “cotton cultivation requires a lot of time and labour using ITK techniques” (64.00 MPS), “low cotton production potential when using techniques based on ITK” (57.78 MPS), “farmers excessive reliance on outside inputs” (55.78 MPS), “lack of technical inputs in the ITK preparation” (51.56 MPS), “cotton farmers are more inclined towards new technology to increase production” (47.78 MPS) and “ITK knowledge is not as beneficial as to the compared modern technology” (44.44 MPS) ranked third, fourth, fifth, sixth, seventh and eighth, respectively.

The results in Table 2 further demonstrates that in Sri Ganganagar district, the main constraints perceived by the farmers were “farmers are more dependent on ready-to-use (RTU) products” with 77.11 MPS which was ranked first, followed by “low cotton production potential when using techniques based on ITK” (67.78 MPS) ranked second, “use of ITKs practices gives late results as compared to modern technology” (63.56 MPS), “cotton cultivation requires a lot of time and labour using ITK techniques” (62.22 MPS), “cotton farmers are more inclined towards new technology to increase production” (58.22 MPS), “ITK knowledge is not as beneficial as to the compared modern technology” (54.67 MPS), “farmers excessive reliance on outside inputs” (54.00 MPS) and “lack of technical inputs in the ITK preparation” (46.00 MPS) ranked third, fourth, fifth, sixth, seventh and eighth, respectively.

Further, Table 2 also depicts that technological constraints faced by overall cotton growers were “farmers are more dependent on ready-to-use (RTU) products” with 78.78 MPS which was assigned rank first, followed by “use of ITKs practices gives late results as compared to modern technology” (65.11 MPS) ranked second, “cotton cultivation requires a lot of time and labour using ITK techniques” (63.11 MPS), “low cotton production potential when using techniques based on ITK” (62.78 MPS), “farmers excessive reliance on outside inputs” (54.89 MPS), “cotton farmers are more inclined towards new technology to increase production” (53.00 MPS), “ITK knowledge is not as beneficial as to the compared modern technology” (49.56 MPS) and “lack of technical inputs in the ITK preparation” (48.78 MPS) which were ranked third, fourth, fifth, sixth, seventh and eighth, respectively in both Hanumangarh and Sri Ganganagar districts.

**Table 2: Ranking of Items under Technological Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Technological Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | Cotton cultivation requires a lot of time and labour using ITK techniques | 64.00 | III | 62.22 | IV | 63.11 | III |
|  | Cotton farmers are more inclined towards new technology to increase production | 47.78 | VII | 58.22 | V | 53.00 | VI |
|  | Farmers excessive reliance on outside inputs | 55.78 | V | 54.00 | VII | 54.89 | V |
|  | Lack of technical inputs in the ITK preparation | 51.56 | VI | 46.00 | VIII | 48.78 | VIII |
|  | ITK Knowledge is not as beneficial as to the compared modern technology | 44.44 | VIII | 54.67 | VI | 49.56 | VII |
|  | Low cotton production potential when using techniques based on ITK | 57.78 | IV | 67.78 | II | 62.78 | IV |
|  | Farmers are more dependent on ready-to-use (RTU) products | 80.44 | I | 77.11 | I | 78.78 | I |
|  | Use of ITKs Practices gives late results as compared to modern technology | 66.67 | II | 63.56 | III | 65.11 | II |
| **Pooled** | | **58.56** |  | **60.44** |  | **59.53** |  |

rs= Rank Correlation

MPS = Mean Percent Score rs= 0.74

\*\*= Significant at 0.01 Level of Probability t=2.68\*\*

The rank correlation (rs) between cotton growers in Hanumangarh and Sri Ganganagar districts was 0.74. Since the calculated 't' value (2.68\*\*) exceeded the tabulated value, it was found to be positive and significant at the one per cent level of significance. This indicates a significant similarity in the way cotton growers in both districts ranked technology-related constraints concerning indigenous technical knowledge. The findings are in line with the findings of Rawat (2010), Khateeb *et al.* (2017), Madhukar (2017) and Jadhav (2020) who found that “ITK in cotton cultivation was labour and time consuming”, “knowledge of ITK was not beneficial as compared to modern technology and low production possibility of cotton through use of ITK”, “lot of time and labour using ITK techniques” etc. were the major constraints faced by the farmers.

**Documentation Constraints**

The data in Table 3 reveals that major documentation constraints faced by the cotton growers in Hanumangarh district were “ITK has not been scientifically evaluated, modified or refined” with 83.78 MPS which was given rank first, followed by “lack of interest of government and non-government organizations towards ITK practices” (78.89 MPS) ranked second, “lack of coverage of regional innovations in news publications and magazines” (74.89 MPS), “the work carried out by ITK users is not recognised” (72.44 MPS), “no connection between ITK users and other institutions related to cotton cultivation” (69.78 MPS),“the ITK system lacks any written documentation, relying solely on oral tradition for its operation and maintenance” (69.11 MPS) and “there is no platform available where ITK users can impart their knowledge to others” (66.89 MPS) which were ranked third, fourth, fifth, sixth and seventh, respectively.

**Table 3: Ranking of Items under Documentation Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Documentation Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | ITK has not been scientifically evaluated, modified or refined | 83.78 | I | 79.78 | II | 81.78 | I |
|  | Lack of interest of government and non-government organizations towards ITK practices | 78.89 | II | 82.00 | I | 80.44 | II |
|  | No connection between ITK users and other institutions related to cotton cultivation | 69.78 | V | 74.44 | IV | 72.11 | IV |
|  | The work carried out by ITK users is not recognised | 72.44 | IV | 70.00 | V | 71.22 | V |
|  | Lack of coverage of regional innovations in news publications and magazines | 74.89 | III | 78.67 | III | 76.78 | III |
|  | There is no platform available where ITK users can impart their knowledge to others | 66.89 | VII | 69.78 | VI | 68.33 | VII |
|  | The ITK system lacks any written documentation, relying solely on oral tradition for its operation and maintenance | 69.11 | VI | 68.89 | VII | 69.00 | VI |
| **Pooled** | | **73.68** |  | **74.79** |  | **74.24** |  |

rs= Rank Correlation

MPS = Mean Percent Score rs= 0.89

\*\*= Significant at 0.01 Level of Probability t= 4.43\*\*

In Sri Ganganagar district the major documentation constraints faced by the farmers were “lack of interest of government and non-government organizations towards ITK practices” (82.00 MPS), followed by “ITK has not been scientifically evaluated, modified or refined” (79.78 MPS), “lack of coverage of regional innovations in news publications and magazines” (78.67 MPS), “no connection between ITK users and other institutions related to cotton cultivation” (74.44 MPS ), “the work carried out by ITK users is not recognised” (70.00 MPS) and “there is no platform available where ITK users can impart their knowledge to others” (69.78 MPS) and “the ITK system lacks any written documentation, relying solely on oral tradition for its operation and maintenance” (68.89 MPS) were assigned rank second, third, fourth, fifth, sixth and seventh, respectively. Further, examination of the Table 3 shows that documentation constraints perceived by the overall cotton growers were “ITK has not been scientifically evaluated, modified or refined” with 81.78 MPS recorded first rank, followed by “lack of interest of government and non-government organizations towards ITK practices” (80.44 MPS) ranked second, “lack of coverage of regional innovations in news publications and magazines” (76.78 MPS), “no connection between ITK users and other institutions related to cotton cultivation” (72.11 MPS), “the work carried out by ITK users is not recognised” (71.22 MPS), “the ITK system lacks any written documentation, relying solely on oral tradition for its operation and maintenance” (69.00 MPS) and “there is no platform available where ITK users can impart their knowledge to others” (68.33 MPS), ranked third, fourth, fifth, sixth and seventh, respectively. The value of rank correlation between Hanumangarh district and Sri Ganganagar districts cotton growers (rs) was 0.89. The calculated value of ‘t’ (4.43\*\*) was higher than its tabulated value. This shows positive and significant association at one per cent level of significance, which leads to conclusion that there was a similarity in rank assignment pattern of documentation constraints by the cotton growers of both districts. The findings are supported by the results of Rawat (2010), Khateeb *et al.* (2017), Kumar *et al.* (2017), Madhukar (2017) and Naharki and Jaishi (2020) who found “no proper documentation of ITK”, “no scientific validation of ITK”, “lack of publication of local innovations in regional or other magazines and newspapers”, “lack of support from government authorities” etc. were the main constraints faced by the farmers.

**Financial Constraints**

The data in Table 4 illustrates that the farmers of Hanumangarh district’s faced major financial constraints such as “lack of availability of financial assistance offered by credit institutions” with 75.78 MPS which was ranked first, “use of ITK practices requires increased labour and financial resources” with 72.44 MPS, “use of ITK practices leads to lower returns on equity” with 71.78 MPS, “no financial support is given for the disclosure of indigenous knowledge” with 69.11 MPS and “expensive external input preferred over cheap ITK” with 68.22 MPS, ranked as second, third, fourth and fifth, respectively. In Sri Ganganagar district’s, the farmers reported the main financial constraints in cotton cultivation were “use of ITK practices leads to lower returns on equity” with 74.22 MPS, ranked first, followed by “lack of availability of financial assistance offered by credit institutions” with 73.11 MPS, “use of ITK practices requires increased labour and financial resources” with 69.78 MPS, “expensive external input preferred over cheap ITK” with 67.33 MPS and “no financial support is given for the disclosure of indigenous knowledge” with 62.44 MPS, ranked as second, third, fourth and fifth, respectively.

The data in Table 4 indicates that overall respondents reported “lack of availability of financial assistance offered by credit institutions” with 74.44 MPS, assigned first rank, followed by “use of ITK practices leads to lower returns on equity” with 73.00 MPS, “use of ITK practices requires increased labour and financial resources” with 71.11 MPS, “expensive external input preferred over cheap ITK” with 67.78 MPS and “no financial support is given for the disclosure of indigenous knowledge” with 65.78 MPS, which were ranked second, third, fourth and fifth, respectively were the major constraints faced by the farmers in cotton cultivation. The rank correlation (rs) between cotton growers in Hanumangarh and Sri Ganganagar districts was 0.60. Since the calculated 't' value (1.30NS) was lower than the tabulated value, the result was non-significant. This indicates that there was no similarity in the way cotton growers from both districts ranked financial constraints related to indigenous technical knowledge in cotton cultivation. These finding are supported by Kanagasabapathi & Sakthivel (2016) and Singh (2021) who found higher production cost as the major financial constraint faced by the farmers.

**Table 4: Ranking of Items under Financial Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Financial Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | Lack of availability of financial assistance offered by credit institutions | 75.78 | I | 73.11 | II | 74.44 | I |
|  | Use of ITK practices leads to lower returns on equity | 71.78 | III | 74.22 | I | 73.00 | II |
|  | Expensive external input preferred over cheap ITK | 68.22 | V | 67.33 | IV | 67.78 | IV |
|  | Use of ITK practices requires increased labour and financial resources | 72.44 | II | 69.78 | III | 71.11 | III |
|  | No financial support is given for the disclosure of indigenous knowledge | 69.11 | IV | 62.44 | V | 65.78 | V |
| **Pooled** | | **71.47** |  | **69.38** |  | **70.42** |  |

rs= Rank Correlation

MPS= = Mean Percent Score

NS= Non Significant

rs= 0.60

t= 1.30NS

**Extension- related Constraints**

The data in Table 5 depicts that major extension-related constraints perceived by the Hanumangarh district cotton growers were “lack of availability of professional guidance to improve ITK practices” (65.78 MPS) which was ranked first, followed by, “providing inadequate training to the farmers about ITKs practices” (60.89 MPS) ranked second, “lack of technological validation through participation” (52.89 MPS) ranked third and “absence of campaigns to encourage farmers about indigenous technical knowledge “(47.78 MPS) was ranked fourth, respectively. The data in Table 5 also shows that major extension-related constraints faced by the Sri Ganganagar district cotton growers were “lack of availability of professional guidance to improve ITK practices” (72.22 MPS) which was ranked first, followed by “absence of campaigns to encourage farmers about indigenous technical knowledge” (50.89 MPS) ranked second, “providing inadequate training to the farmers about ITKs practices” (48.44 MPS) ranked third and “lack of technological validation through participation” (43.33 MPS) was ranked fourth, respectively.

Further, Table 5 also illustrates that major extension-related constraints faced by overall cotton growers were “lack of availability of professional guidance to improve ITK practices” (69.00 MPS) which was ranked first, followed by “providing inadequate training to the farmers about ITKs practices” (54.67 MPS) ranked second, “absence of campaigns to encourage farmers about indigenous technical knowledge (49.33 MPS) ranked third and “lack of technological validation through participation” (48.11 MPS) was ranked fourth, respectively. The rank correlation (rs) between cotton growers in Hanumangarh and Sri Ganganagar districts was 0.60. As the calculated 't' value (0.76NS) was lower than the tabulated value, the result was non-significant. This indicates that there was no similarity found in the rank assignment pattern of financial constraints among the cotton growers from both districts. These finding are supported by Malhari (2015), Dhoke *et al.* (2021) and Khatri *et al.* (2021) who found “lack of training about indigenous knowledge”, “limited number of experts about indigenous knowledge” and “lack of expert guidance or extension support” *etc.* were the major constraints faced by the farmers.

**Table 5: Ranking of Items under Extension- related Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Extension- related Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | Lack of availability of professional guidance to improve ITK practices | 65.78 | I | 72.22 | I | 69.00 | I |
|  | Providing inadequate training to the farmers about ITKs practices | 60.89 | II | 48.44 | III | 54.67 | II |
|  | Absence of campaigns to encourage farmers about indigenous technical knowledge | 47.78 | IV | 50.89 | II | 49.33 | III |
|  | Lack of technological validation through participation | 52.89 | III | 43.33 | IV | 48.11 | IV |
| **Pooled** | | 56.83 |  | 53.72 |  | 55.28 |  |

rs= Rank Correlation

MPS= = Mean Percent Scorers rs= 0.60

NS= Non Significant t= 0.76NS

**Policy-related Constraints**

The data in Table 6 shows that major policy-related constraints perceived by the Hanumangarh district’s cotton growers were “no channel to share ITK in cotton cultivation”(77.11 MPS) which was ranked first, followed by “lack of interest of government agencies to promote ITK” (75.78 MPS) ranked second, “lack of Prior Informed Consent (PIC) provision for commercialization” (69.11 MPS) ranked third, “there is no subsidy or programme initiated by the government to promote ITK” (60.22 MPS) ranked fourth and “ITK work is not well recognized by the government and non- government agencies“(58.44 MPS) was ranked fifth, respectively. The data in Table 6 also indicates that major policy-related constraints perceived by the Sri Ganganagar’s cotton growers were “lack of interest of government agencies to promote ITK” (74.89 MPS) which was ranked first, followed by “there is no subsidy or programme initiated by the government to promote ITK” (70.22 MPS)” ranked second, “no channel to share ITK in cotton cultivation” (67.33 MPS) ranked third, “ITK work is not well recognized by the government and non-government agencies”(58.44 MPS) ranked fourth and “lack of Prior Informed Consent (PIC) provision for commercialization” (55.33 MPS) was ranked fifth, respectively.

Further, Table 6 depicts that major policy-related constraints faced by overall cotton growers were “lack of interest of government agencies to promote ITK” (75.33 MPS) which was ranked first, followed by “no channel to share ITK in cotton cultivation” (72.22 MPS) ranked second, “there is no subsidy or programme initiated by the government to promote ITK” (65.22 MPS) ranked third, “lack of Prior Informed Consent (PIC) provision for commercialization” (62.22 MPS) ranked fourth and “ITK work is not well recognized by the government and non-government agencies” (58.44 MPS) was ranked fifth, respectively. The value of rank correlation between Hanumangarh and Sri Ganganagar districts cotton growers (rs) was 0.30. The calculated value of ‘t’ (0.54NS) was lower than its tabulated value. This shows non-significance, which leads to conclusion that there was a no similarity in rank assignment pattern of policy-related constraints by the cotton growers of Hanumangarh and Sri Ganganagar. Similar findings were also reported by the Malhari (2015) who found that “lack of support from government authorities” and “weak linkages between government and farmers” were the major constraints faced by the farmers.

**Table 6: Ranking of Items under Policy-related Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Policy- related Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | No channel to share ITK in cotton cultivation | 77.11 | I | 67.33 | III | 72.22 | II |
|  | Lack of interest of government agencies to promote ITK | 75.78 | II | 74.89 | I | 75.33 | I |
|  | ITK work is not well recognized by the government and non- government agencies | 55.78 | V | 58.44 | IV | 57.11 | V |
|  | Lack of Prior Informed Consent (PIC) provision for commercialization | 69.11 | III | 55.33 | V | 62.22 | IV |
|  | There is no subsidy or programme initiated by the government to promote ITK | 60.22 | IV | 70.22 | II | 65.22 | III |
| **Pooled** | | **67.60** |  | **65.24** |  | **66.42** |  |

rs= Rank Correlation

MPS= = Mean Percent Score

NS= Non Significant

rs= 0.30

t = 0.54NS

**Overall Constraints being faced by the Farmers in the Use of Indigenous Technical Knowledge with Regard to Cotton Cultivation**

The data in Table 7 reveals that major overall constraints faced by the cotton growers in Hanumangarh district were “documentation constraints” with 73.68 MPS which was ranked first, followed by “financial constraints” (71.47 MPS) ranked second, “policy-related constraints” (67.60 MPS), “socio-psychological constraints” (66.56 MPS), “technological constraints” (58.56 MPS) and “extension-related constraints” (45.47 MPS), ranked third, fourth, fifth and sixth, respectively. The data in Table 7 also depicts that major overall constraints faced by the cotton growers in Sri Ganganagar district were “documentation constraints” with 74.79 MPS which was assigned first rank, followed by “socio-psychological constraints” (70.19 MPS), ranked second, “financial constraints” (69.38 MPS), “policy-related constraints” (65.24 MPS), “technological constraints” (60.44 MPS) and “extension-related constraints” (42.98 MPS) were ranked third, fourth, fifth and sixth, respectively.

**Table 7: Ranking of Items under Overall Constraints**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Constraints** | **Cotton Growers** | | | | | |
| **Hanumangarh**  **(n=150)** | | **Sri Ganganagar**  **(n=150)** | | **Overall (N=300)** | |
| **MPS** | **Rank** | **MPS** | **Rank** | **MPS** | **Rank** |
|  | Socio-psychological Constraints | 66.56 | IV | 70.19 | II | 68.37 | III |
|  | Technological Constraints | 58.56 | V | 60.44 | V | 59.50 | V |
|  | Documentation Constraints | 73.68 | I | 74.79 | I | 74.24 | I |
|  | Financial Constraints | 71.47 | II | 69.38 | III | 70.42 | II |
|  | Extension-related Constraints | 45.47 | VI | 42.98 | VI | 44.22 | VI |
|  | Policy-related Constraints | 67.60 | III | 65.24 | IV | 66.42 | IV |
| **Pooled** | | **63.89** |  | **63.84** |  | **63.86** |  |

rs= Rank Correlation

MPS = Mean Percent Score

\*\*= Significant at 0.01 Level of Probability rs= 0.83

t=2.96\*\*

Further, examination of the Table 7 elucidates that overall constraints perceived by the overall cotton growers were “documentation constraints” with 74.24 MPS, ranked first, followed by “financial constraints” (70.42 MPS) ranked second, “socio-psychological constraints” (68.37 MPS), “policy-related constraints” (66.42 MPS), “technological constraints” (59.50 MPS) and extension-related constraints” (44.22 MPS) ranked third, fourth, fifth and sixth, respectively. The value of rank correlation between Hanumangarh and Sri Ganganagar districts cotton growers (rs) was 0.83. The calculated value of ‘t’ (2.96\*\*) was higher than its tabulated value. This shows positive and significant association at one per cent level of significance, which leads to conclusion that there was a similarity in rank assignment pattern of overall constraints among cotton growers of both the districts in the use of indigenous technical knowledge with regard to cotton cultivation.

**CONCLUSION**

From the above findings, it is concluded that the major constraints being faced by the cotton growers in the use of ITKs practices were “ITK has not been scientifically evaluated (81.78MPS)”, “farmers were more dependent on ready-to-use (RTU) products (78.78 MPS)”, “ignorance of the young generation towards ITK in cotton cultivation (76.33 MPS )”, “no channel to share ITK in cotton cultivation (75.33 MPS )”, “lack of availability of financial assistance offered by credit institutions (74.44 MPS)” and “lack of availability of professional guidance to improve ITK practices (69.00 MPS)”. Thus, in order to mitigate these constraints ICAR, Government Department of Agriculture, KVKs and extension workers should focus on creating awareness among the younger generations through the digital platforms and e-learning modules may also be developed to highlight ITK's value and demonstrate its integration with precision farming tools and IoT-based solutions. To reduce farmers' reliance on ready-to-use (RTU) products, efforts should be made on developing and promoting ITK-based solutions that are user-friendly, standardized, and convenient to apply. Developing standardized, packaged ITK formulations in collaboration with agricultural experts, research institutions and local entrepreneurs can make these practices more appealing and practical. Establishing local production units or cooperatives to manufacture and distribute these ITK-based products can ensure affordability and availability. Scientific validation and refinement of ITK practices are critical, research institutions and state agricultural universities should prioritize documentation and evaluation of ITK to ensure its compatibility with modern farming techniques.

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Details of the AI usage are given below:

1.

2.

3.

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