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# Effectiveness of certificate course on integrated nutrient management: Kirkpatrick's model

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**Abstract**
Assessment of the effectiveness of training programs holds significant importance as it enables the determination of the level of learning achieved and offers valuable insights for enhancement. The certificate course on Integrated Nutrient Management aims to enhance professional competence, enrich knowledge and cultivate technical skills among fertilizer dealers. Additionally, it fosters an environment for sharing experiences, resolving issues, and facilitating interactions between experts and dealers. This analysis focuses on assessing the effectiveness of the certificate course on Integrated Nutrient Management for fertilizer dealers and also it is essential to identify areas for improvement. Utilizing Kirkpatrick's four level training evaluation model, this evaluation aimed to measure the course's success in enhancing professional competence, knowledge enrichment and technical skill development. By analyzing trainee satisfaction, learning outcomes and the overall effectiveness of the training program, this evaluation provided valuable insights for optimizing future iterations of the course. The results implied a significant success for the certificate course, highlighting high levels of trainee satisfaction and effective learning across all four levels of training effectiveness.

**Keywords:** Evaluation, certificate course, fertilizer dealers and Kirkpatrick's' evaluation criteria.

## Introduction

The fertilizer dealers are the prime source of agricultural information to the farming community along with timely supply of quality inputs. Nearly 90 per cent of these agri-input dealers operated within India (Mayekar *et al.* 2021) [8]. However, majority of the fertilizer dealers didn't have a formal degree in agriculture or much knowledge of scientific practices related to Integrated Nutrient Management (INM). Realizing the importance of equipping fertilizer dealers and enhancing their professional competency of fertilizer dealers, in 1985, the Ministry of Agriculture and Farmers' Welfare issued an (control) amendment to the Fertilizers (Inorganic, Organic or Mixed) regulations. It is mandatory for all the state's fertilizer dealers to undergo a formal agricultural education, to obtain and retain their license for fertilizer dealerships. It is to make the fertilizer dealers more aware of the available natural resources, balanced use of inputs and to improve their professional competency and in turn offer best advisory services to the farming community. The certificate course on Integrated Nutrient Management had been organized continuously for 15 working days as residential programme. The course was conducted under the self-finance mode. In Kerala, Central Training Institute, Mannuthy under the Directorate of Extension, Kerala Agricultural University (KAU) along with the Krishi Vigyan Kendras (KVKs) functioned as Nodal Training Institute and conducted the certification course on INM. Because of the COVID-19 pandemic the certificate course was started in 2020 with 2 hours of online theory classes for 15 days and offline practical classes for 3 days were conducted in the KVKs of the respective districts in the state. When the restrictions related to the COVID-19 pandemic were relaxed, offline certificate courses on INM were started in three centers of KAU. The Central Training Institute conducted 15 online batches and 10 offline batches with 30 participants in each batch. In total, 1,719 fertilizer dealers secured certificates through the active involvement of KVKs undertaken under the overall guidance and supervision of the Central Training Institute, Mannuthy under the Directorate of Extension, KAU.

The comparative evaluation research measured the effectiveness of both online and offline certificate courses and identified areas that need improvement, especially in terms of providing knowledge and upskilling fertilizer dealers. Findings from this evaluation study will help to verify whether the certificate course achieved the desired results. The study will allow all stakeholders to understand multiple dimensions of benefits attained and to determine strengths and weaknesses. Assessment of the effectiveness

of the course by the selected participants will form a scientific base on which further required upgradation can be made.

**Objective**

To compare the effectiveness of online and offline certificate course on Integrated Nutrient Management (INM) as perceived by fertilizer dealers.

## Materials and Methods

**Selection of study area**

The sample represents the fertilizer dealers of all fourteen districts of Kerala. Out of fourteen districts seven districts *viz.,* Kannur, Kozhikode, Malappuram, Thrissur, Palakkad, Alappuzha and Kollam were selected purposively for the study by considering the maximum number of fertilizer dealers participated in the certificate course on Integrated Nutrient Management.

**Selection of respondents**

For the selection of fertilizer dealers, a comprehensive list of registered fertilizer dealers who had been trained under the certificate course on Integrated Nutrient Management for fertilizer dealers' program from the year 2018 to 2023 up to 25 batches was prepared with the help of the Central Training Institute (CTI), Mannuthy under the Directorate of Extension, Kerala Agricultural University (KAU). The list of the number of trainees participated in the 25 batches were prepared separately as online and offline trainees. Based on the list, a representative sample of 150 respondents each from online and offline certificate courses were selected by applying a proportionate random sampling technique, thus making the total sample size of 300 respondents.

**Data analysis**

Data were collected from respondents by using the interview schedule developed for the study based on the set objectives. A well-structured and pre-tested interview schedule used for collecting data underwent thorough processing and analysis using relevant software tools, including SPSS 27 and Microsoft Excel 2021.

**Table 1:** Measurement of perceived effectiveness of certificate course

| SI. No | Responses | Code | Score | Interval | Effectiveness |
|---|---|---|---|---|---|
| 1 | Most Relevant | MOR | 5 | 4.45-5.0 | Most Effective (MOE) |
| 2 | More Relevant | MR | 4 | 3.45-4.44 | More Effective (ME) |
| 3 | Relevant | R | 3 | 2.45-3.44 | Effective (E) |
| 4 | Least Relevant | LR | 2 | 1.45-2.44 | Least Effective (LE) |
| 5 | Not Relevant | NR | 1 | 1.0-1.44 | Not Effective (NE) |

**Table 2:** Perception of fertilizer dealers towards the effectiveness of online and offline certificate course, (N=300)

| SI. No. | Levels of effectiveness and parameters | Online trained fertilizer dealers ($n_1$=150) | | | | Offline trained fertilizer dealers ($N_2$=150) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean score | SD* | Effectiveness | Rank | Mean score | SD* | Effectiveness | Rank |
| **I** | **Reaction** | | | | | | | | |
| 1 | Quality | 4.03 | 0.92 | More effective | I | 4.40 | 0.72 | More effective | II |
| 2 | Course content | 3.59 | 1.26 | More effective | IV | 4.20 | 0.90 | More effective | IV |
| 3 | Teaching methods | 3.70 | 1.26 | More effective | III | 4.49 | 0.67 | Most effective | I |
| 4 | Duration and time of training | 3.81 | 1.13 | More effective | II | 4.35 | 0.80 | More effective | III |
| **II** | **Learning** | | | | | | | | |
| 1 | Utility | 3.93 | 0.97 | More effective | I | 4.33 | 0.73 | More effective | I |
| 2 | Coverage | 3.82 | 0.99 | More effective | III | 4.20 | 0.85 | More effective | III |
| 3 | Knowledge gained | 3.89 | 1.04 | More effective | II | 4.31 | 0.72 | More effective | II |
| 4 | Skill development | 3.69 | 1.08 | More effective | IV | 4.15 | 0.87 | More effective | IV |
| **III** | **Behaviour** | | | | | | | | |
| 1 | Job performance | 3.87 | 1.05 | More effective | I | 4.28 | 0.79 | More effective | I |
| **2** | **Change in behaviour** | | | | | | | | |
| | i) Self confidence | 3.77 | 1.18 | More effective | II | 4.26 | 0.82 | More effective | II |
| | ii)Management skills | 3.66 | 1.21 | More effective | III | 4.10 | 0.86 | More effective | III |
| **IV** | **Results** | | | | | | | | |
| 1 | Professional competency | 3.74 | 1.20 | More effective | IV | 4.23 | 0.74 | More effective | II |
| 2 | Management of fertilizer dealership | 3.84 | 1.10 | More effective | III | 4.17 | 0.87 | More effective | III |
| 3 | Transfer of technology | 3.87 | 0.99 | More effective | II | 4.23 | 0.87 | More effective | II |
| 4 | Overall satisfaction | 4.01 | 1.02 | More effective | I | 4.39 | 0.84 | More effective | I |

*SD – Standard Deviation

## Results and Discussion

**Perceived effectiveness of certificate course using Kirkpatrick's training evaluation model**

An attempt was made in this study to analyse the fertilizer dealers' perception towards the effectiveness of online and offline certificate course on Integrated Nutrient Management (INM). The perception of the respondents were collected on four levels of Kirkpatrick's evaluation model. The data was collected through a Likert-type interview schedule to find out the perception of respondents based on the following four levels:

1. **Reaction:** How did the participants react to the training?
2. **Learning:** What information and skills were gained from the training?
3. **Behaviour:** How participants transferred knowledge and skills to their jobs?
4. **Results:** What was the effect of the certificate course

on the trainees and achievement of the objectives of the certificate course?

Overall perceived effectiveness was calculated by summing up the scores obtained for all the fourteen parameters under four levels of evaluation as mentioned in Table 2. Each fourteen parameter was measured with selected items. The responses for each item were quantified by allotting scores of 5, 4, 3, 2, and 1 as 'Most Relevant' (MOR), 'More Relevant' (MR), 'Relevant' (R), 'Least Relevant' (LR) and 'Not Relevant' (NR) respectively. It is made into five categories of effectiveness based on the arbitrary method by fixing interval of scores as given in Table 1. The categories made were most effective, more effective, effective, least effective and not effective. The respondents were categorized as stated below:

**Perception of fertilizer dealers towards the effectiveness of online and offline certificate course**

**I. Reaction**

Table 2 revealed that most of the online trained fertilizer dealers perceived that course quality which was ranked as I with the mean score (4.03) followed by duration and time of training which was ranked as II with the mean score (3.81), teaching methods which was ranked as III with the mean score (3.70) and course content which was ranked as IV with the mean score (3.59). In the case of offline trained fertilizer dealers perceived that teaching methods which was ranked as I with the mean score (4.49) followed by course quality which was ranked as II with the mean score (4.40), duration and time of training which was ranked as III with the mean score (4.35) and course content which was ranked as IV with the mean score (4.20) is depicted in Fig. 1.

It can be concluded that the reaction under online and offline certificate course was more focused on course quality and teaching methods. Whereas, the course content was ranked fourth under the reaction level of their effectiveness. The probable reasons might be that the course was developed based on the specific needs and interests of the fertilizer dealers. Using the local language during training likely aided their comprehension. The training institute ensured experienced and knowledgeable faculties for lectures without bias. Field and lab visits fostered relationships with experts and the fertilizer dealers, which made them to gain first hand knowledge about the subject. However, uncertainties about the course content, such as the absence of a handbook, late material supply and excessive theoretical lectures with limited practical exposure, may have caused to rank the course content as lowest consent among trainees, especially with limited practical exposure due to the training center's first-time online training format. This result is in agreement with the findings of Shankara *et al.* (2014) [11], Krishnaveni (2015) [5], Balasubramani (2017) [2] and Kaur (2017) [4].

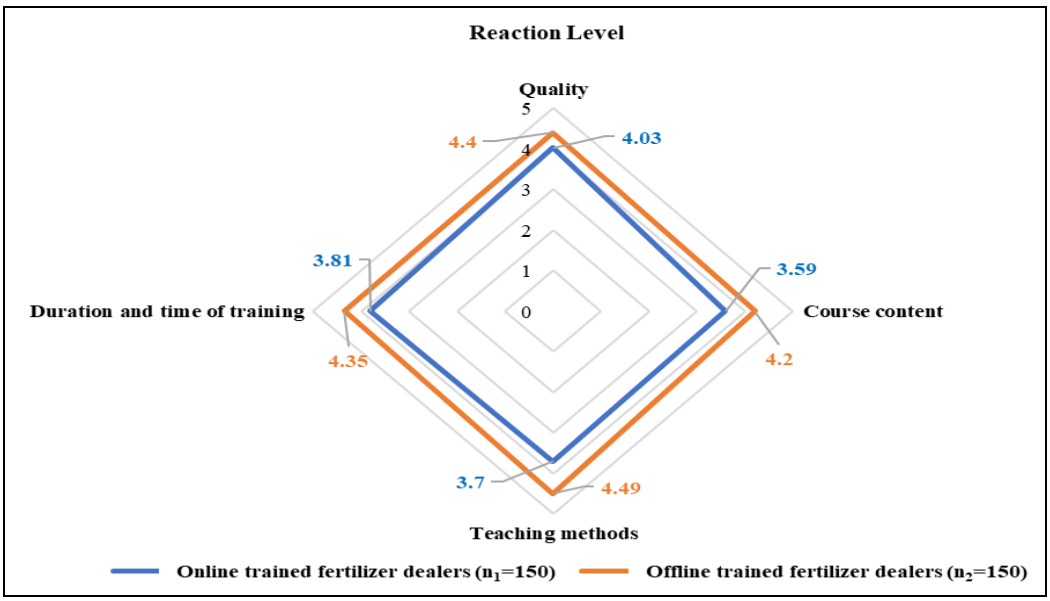


**Fig 1:** Perception of fertilizer dealers according to their reaction level towards the effectiveness of online and offline certificate course

**II. Learning**

It could also be inferred from the Table 2 that majority of the online trained fertilizer dealers perceived utility which was ranked as the first with the mean score (3.93) followed by knowledge gained which was ranked as II with the mean score (3.89), coverage which was ranked as III with the mean score (3.82) and skill development which was ranked as IV with the mean score (3.69). In the case of offline trained fertilizer dealers perceived that utility which was ranked as I with the mean score (4.33) followed by knowledge gained which was ranked as II with the mean score (4.31), coverage which was ranked as III with the mean score (4.20) and skill development which was ranked as IV with the mean score (4.15) is depicted in Fig. 2.

It can be concluded that learning under an online and offline certificate course was more focused on the utility of the course. Whereas, the skill development was ranked fourth under the learning level of their effectiveness. The probable reasons might be that the certificate course enhanced the knowledge and competencies of fertilizer dealers and also developed favourable attitude towards the job. However, the relatively moderate increase in skill level may be due to the less number of field visits and practical sessions. Not all skills can be effectively learned online, especially

considering the disruptions caused by the pandemic. This highlights the importance of prioritizing field visits, demonstrations and similar hands-on activities for skill development in INM certificate course. This result is in agreement with the findings of Singh (2014) and Kaur (2017) [4].

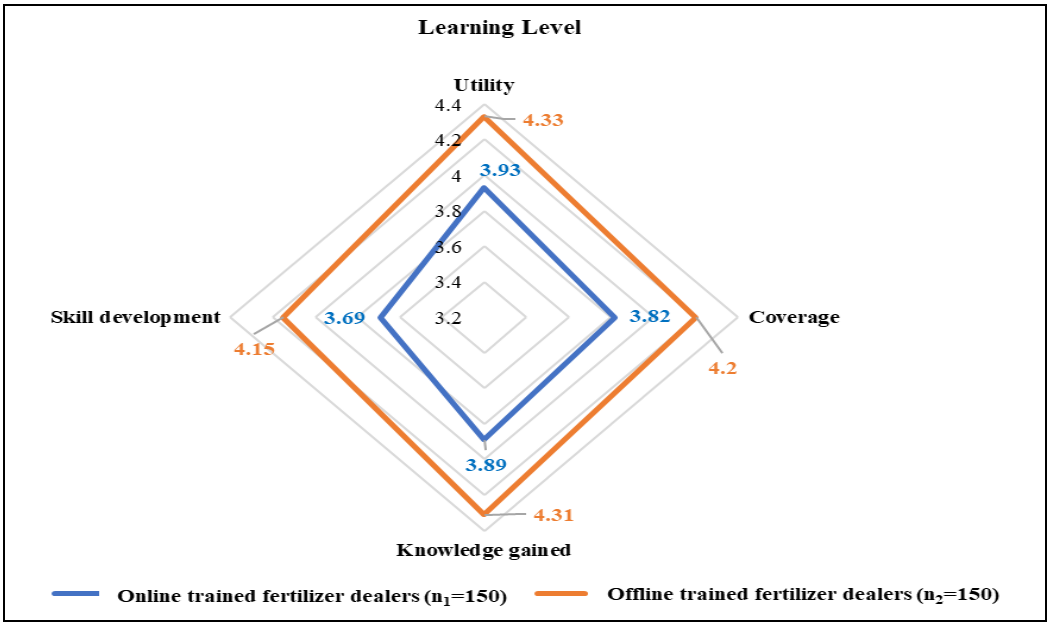


**Fig 2:** Perception of fertilizer dealers according to their learning level towards the effectiveness of online and offline certificate course

**III. Behaviour**

From the Table 2 it was seen that majority of the online trained fertilizer dealers perceived that job performance which was ranked as I with the mean score (3.87) followed by change in behaviour under self-confidence which was ranked as II with the mean score (3.77) and management skills which was ranked as III with the mean score (3.66). In the case of offline trained fertilizer dealers perceived that job performance which was ranked as I with the mean score (4.28) followed by change in behaviour under self-confidence which was ranked as II with the mean score (4.26) and management skills which was ranked as III with the mean score (4.10) is depicted in Fig. 3.

It can be concluded that behaviour under online and offline certificate course where the majority of the fertilizer dealers reported on the change in job performance. Whereas, the change in behaviour of the management skills was ranked third under the behaviour level of their effectiveness. The probable reasons might be fertilizer dealers exhibited a high awareness of the issues encountered by farmers and increased confidence in offering advice and guidance. This underscores the evolving role of fertilizer dealers as essential service providers to farmers, reflecting their growing importance within agricultural communities. However, concerning management skills, the substantial gap in financial management and relationship building within and beyond the dealership might hinder the effectiveness of the course. This result is in agreement with the findings of Natagall (2016) [9], Latha (2019) [6] and Latha *et al.* (2022) [7].

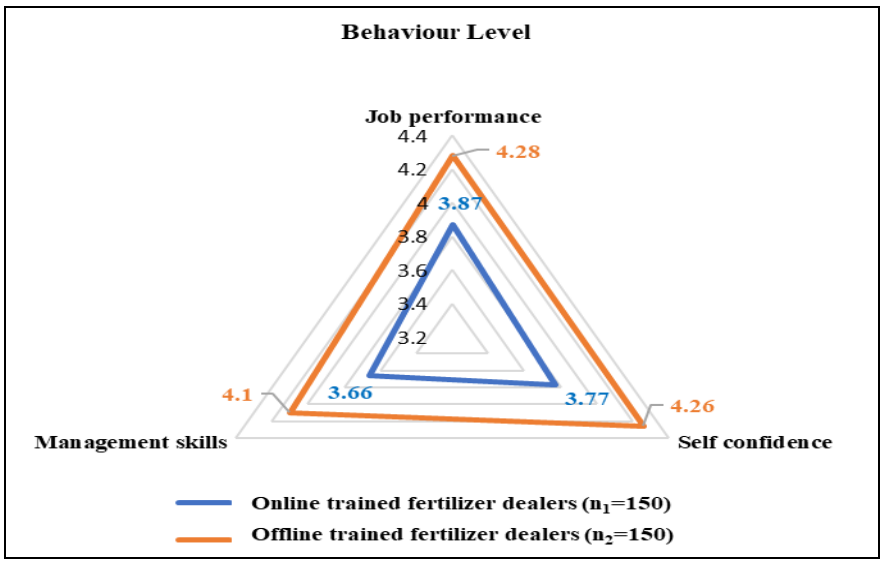


**Fig 3:** Perception of fertilizer dealers according to their behaviour level towards the effectiveness of online and offline certificate course.

## IV. Results

It was corrugated from the Table 2 that majority of the online trained fertilizer dealers perceived that overall satisfaction which was ranked as I with the mean score (4.01) followed by transfer of technology which was ranked as II with the mean score (3.87), management of fertilizer dealership which was ranked as III with the mean score (3.84) and professional competency which was ranked as IV with the mean score (3.74). In the case of offline trained fertilizer dealers perceived that overall satisfaction which was ranked as I with the mean score (4.39) followed by transfer of technology and professional competency which was ranked as II with the mean score (4.23), and management of fertilizer dealership which was ranked as III with the mean score (4.17) is depicted in Fig. 4.

It can be concluded that results under online and offline certificate course where the majority of the fertilizer dealers reported on overall satisfaction of course. Whereas, the professional competency was ranked fourth under the results level of their effectiveness. The probable reasons might be fertilizer dealers expressed satisfaction with various aspects of their training, including well-structured lectures by experts, ample time for each topic, convenient scheduling, interactive sessions, engaging presentations, use of local language and visits to model farms and agricultural institutions. They also praised the pleasant learning environment provided by the Central Training Institute and found the course relevant and well organized. However, regarding professional competency, the probable reason for any shortcomings could be that while courses provided valuable theoretical knowledge, they often lack sufficient focus on real-world application. Without ample resources, support systems, and regulatory incentives, dealers may struggle to effectively implement INM practices in their work situation. This result is in agreement with the findings of Natagall (2016) [9] and Gajbhiye (2020) [3].

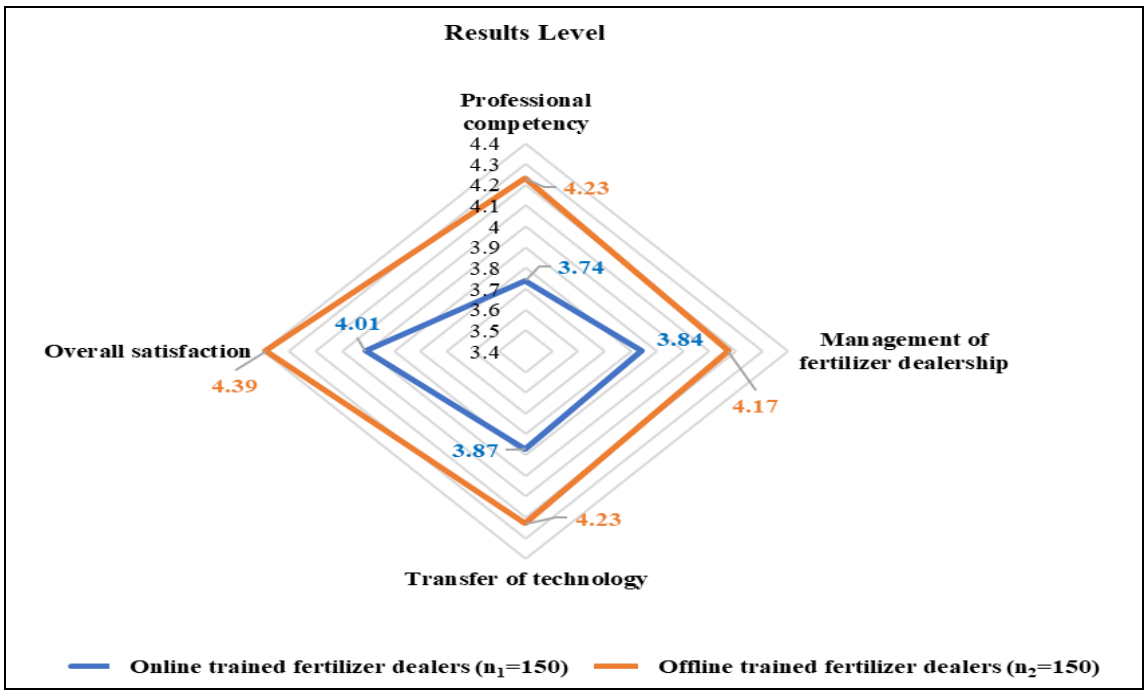


**Fig 4:** Perception of fertilizer dealers according to their results level towards the effectiveness of online and offline certificate course

**Table 3:** Comparison of perceived effectiveness of online and offline certificate course at the 4-levels of Kirkpatrick's training evaluation model, (N=300)

| Kirkpatrick's levels | Online trained fertilizer dealers ($n_1$=150) | | | Offline trained fertilizer dealers ($n_2$=150) | | |
|---|---|---|---|---|---|---|
| | Mean score | SD* | Effectiveness | Mean score | SD* | Effectiveness |
| 1. Reaction | 3.78 | 1.14 | More effective | 4.36 | 0.77 | More effective |
| 2. Learning | 3.83 | 1.02 | More effective | 4.24 | 0.79 | More effective |
| 3. Behaviour | 3.76 | 1.14 | More effective | 4.21 | 0.82 | More effective |
| 4. Results | 3.86 | 1.07 | More effective | 4.25 | 0.83 | More effective |

*SD – Standard Deviation

### Comparison of effectiveness of online and offline certificate course at the 4-levels of Kirkpatrick's training evaluation model

### I. Reaction

Table 3 revealed that the 'reaction' level of the certificate course on INM composed of the following reactions from the respondents such as quality, course content, teaching methods and duration and time of training. It shows that the mean score (4.36) of offline trained fertilizer dealers was higher compared to the mean score (3.78) of online trained fertilizer dealers (Figure 5).

Hence it inferred that the offline trained fertilizer dealers had a higher level of reaction or response to the certificate course compared to the online trained fertilizer dealers. Besides, the standard deviation (1.14<0.77) of offline trained fertilizer dealers was less and hence they were less

varied in their perception.

**II. Learning**

It could also be inferred from Table 3 that the 'learning' level of the certificate course on INM constituted the components such as utility, coverage, knowledge gained and skill development. Table 3 and Fig. 5, reveals that the mean score learning level of the offline trained fertilizer dealers (4.24) was higher in comparison to online trained fertilizer dealers (3.83).

It is understood by the fertilizer dealers that the learning from the offline certificate course was higher compared to the learning of online trained fertilizer dealers. The standard deviation of learning reported by offline trained fertilizer dealers was 0.79 while the standard deviation for online trained fertilizer dealers was 1.02. Hence it is inferred that the perception of offline fertilizer dealers were less varied in terms of learning level of Kirkpatrick's model when compared to the perception of online trained fertilizer dealers.

**III. Behaviour**

It could also be inferred from Table 3 that the change in behaviour of the respondents mainly consisted the components such as job performance, self confidence and management skills.

Table 3 shows that the mean score (4.21) of the offline trained fertilizer dealers was higher compared to the mean score (3.76) of online trained fertilizer dealers related to the 'behavior' level of them after attending the certificate course (Fig. 5). It unveils that the perception of the behavioral change after attending the certificate course was more among the fertilizer dealers of offline learned than fertilizer dealers of online learned. The standard deviation was less among offline trained fertilizer dealers and hence they were less varied in their perception of behavioural change.

**IV. Results**

It was observed from Table 3 that the 'result' level of the certificate course on INM comprised of role of professional competency, management of fertilizer dealership, transfer of technology and overall satisfaction.

Table 3 shows that the mean score earned related to the results level of evaluation of offline trained fertilizer dealers was 4.25 and the standard deviation was 0.83 compared to the mean score (3.86) and standard deviation (1.07) of online trained fertilizer dealers (Fig. 5). It indicated that the perception of offline trained fertilizer dealers had higher results towards the certificate course and less varied when compared to online trained fertilizer dealers.

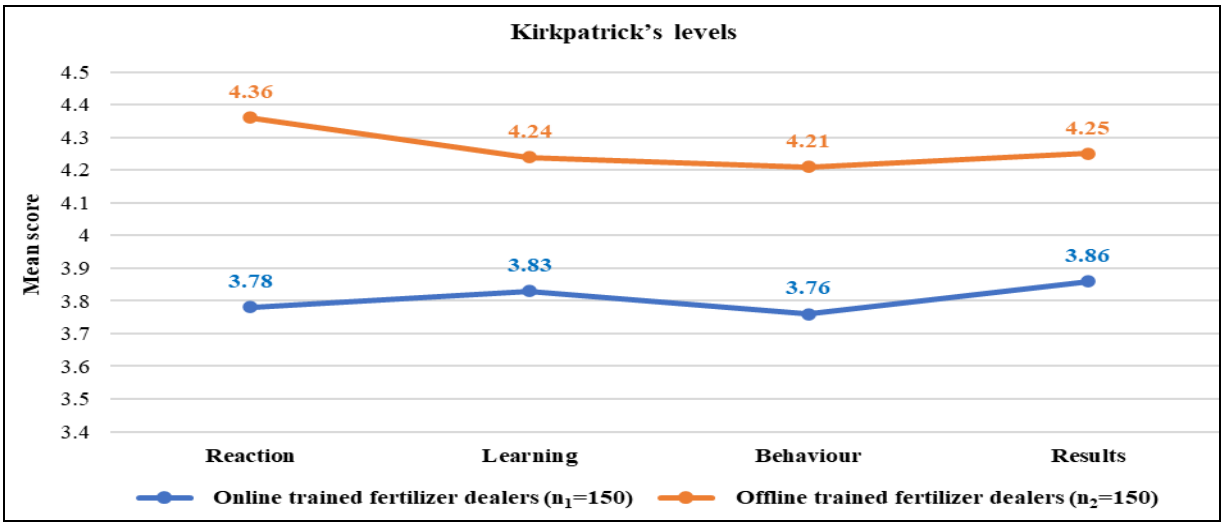


**Fig 5:** Comparison of effectiveness of online and offline certificate course based on the 4-levels of Kirkpatrick's training evaluation model

**Table 4:** Comparison of perception of trained fertilizer dealers towards the certificate course on Integrated Nutrient Management (INM) offline vs. online using independent 't' test

| Levels | Kirkpatrick's levels | Offline trained fertilizer dealers ($n_2$=150) | | Online trained fertilizer dealers ($n_1$=150) | | Mean score difference | 't' test value | P-Value |
|---|---|---|---|---|---|---|---|---|
| | | Mean | SD* | Mean | SD* | | | |
| Level 1 | Reaction | 69.68 | 09.07 | 59.21 | 15.23 | 10.47 | 7.235 | <0.001 |
| Level 2 | Learning | 67.95 | 10.66 | 60.06 | 16.36 | 7.890 | 4.946 | <0.001 |
| Level 3 | Behaviour | 36.89 | 14.71 | 30.21 | 15.88 | 6.673 | 3.777 | <0.001 |
| Level 4 | Results | 63.27 | 10.20 | 56.27 | 17.12 | 7.000 | 4.303 | <0.001 |

*SD – Standard Deviation

Table 4 above illustrates that the mean values related to the four levels of evaluation *viz;* reaction, learning, behaviour and results as perceived by offline trained fertilizer dealers were higher than the mean score earned by online trained fertilizer dealers. The calculated independent 't' test values at all the four levels was found to be statistically significant at $p$<0.001 level which clearly stated that there was a significant difference in the level of perception among fertilizer dealers towards online and offline learning. This result is in agreement with the findings of Rachmah (2020).

**Table 5:** Overall perception of fertilizer dealers towards the effectiveness of certificate course using Kirkpatrick's model, (N=300)

| Levels | Kirkpatrick's levels | Mean score | Inference |
|---|---|---|---|
| Level 1 | Reaction | 4.07 | More Effective |
| Level 2 | Learning | 4.03 | More Effective |
| Level 3 | Behaviour | 3.98 | More Effective |
| Level 4 | Results | 4.05 | More Effective |
| Weighted mean score ($\bar{x}_w$) | | 4.03 | More Effective |

Table 5 shows the mean score for all four levels of evaluation of the certificate course among the respondents of both online and offline certificate courses. The overall perceived effectiveness of the certificate course on INM as indicated by the weighted mean score (4.03), was 'More Effective' across all the four levels of Kirkpatrick's evaluation model (Fig. 6). It can be inferred that the respondents held a positive perception of the certificate course on Integrated Nutrient Management (INM), reporting that the certificate course on INM enhanced the competence of fertilizer dealers and developed them as para-extension professionals in the agricultural domain. The findings are in conformity with the findings of Afroz (2019) [1].

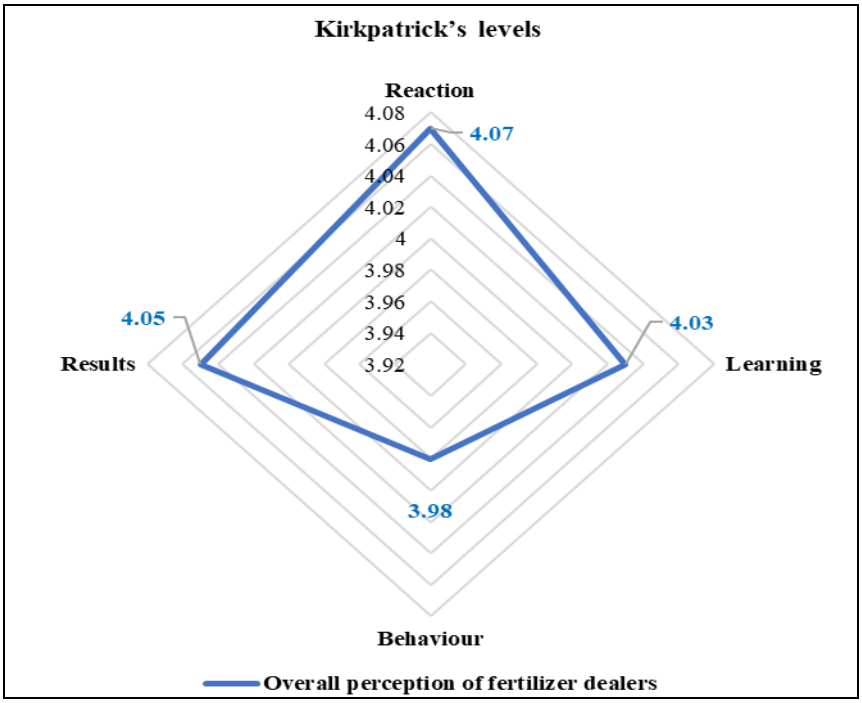


**Fig 6:** Overall perception of fertilizer dealers towards the effectiveness of certificate course using Kirkpatrick's model

## Conclusion

The adapted Kirkpatrick's model proved the effectiveness of the certificate course on Integrated Nutrient Management across all the four levels of evaluation *viz;* reaction, learning, behavior and results. The assessment of the effectiveness of a certificate course indicated that offline learning proved to be more effective when compared to online learning. This evaluation was rated by the trainees distinctly favoring offline learning due to various reasons such as citing better comprehension of materials, direct and personal communication with experts, heightened focus, active engagement, build personal relationship with fellow participants and overall enjoyment during sessions. The reasons for the less effectiveness of the online certificate course were: lack of direct interaction between trainees and trainers, difficulties in balancing work and study time and a general sense of difficulty in grasping course materials. In conclusion, the present research clearly identified a preference and higher demand for the offline certificate course compared to the online certificate course.

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