ChemSkills

Enabling the green and digital skills transformation of the chemical industry.

Report on ChemSkills Survey Results

1st iteration in the Fertilizer sector

January 2025

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Executive Summary

The report is part of the ChemSkills project, which aims to assess trends in different parts of the chemical industry ecosystem and their impact on skills and workforce requirements. The survey was conducted by WP7 project members between January and October 2024, targeting key stakeholders to gain insights on trends in the fertilizer sector such as digitalization, environmental sustainability and value chain resilience.

The findings show that organizations in the fertiliser sector are evaluating these trends. In terms of impact on their own operations, they consider the transition to a green economy as the biggest challenge. They are aware of readiness gaps in the digitalization process, especially in areas such as artificial intelligence and data analytics. The growing demand for green transformation experts and professional technicians and engineers is proving crucial. Sustainability and circular economy, specific requirements for environmental safety of fertilizers and increased demands on production economics and application efficiency are changing the business environment, creating the need for new job roles.

The report reflects these changes in the need to upskill and reskill the workforce and the expected demand for key roles. As the fertilizer sector undergoes a digital and green transformation, providing the necessary training in all relevant areas will be essential to bridge the gap between current skills and future needs.

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1. Identification of Respondents

This section provides an overview of the respondents who completed the questionnaire, totalling 16 participants. The collected data offer insights into key characteristics of these respondents, including the size of their organizations, the number of employees, the country in which they operate, and their specific areas of activity. This information serves as a foundational reference for analyzing the survey results in the context of different organizational structures, geographical distribution, and operational focus.

1.1. Type of organization

As illustrated in the table and graphs (Fig. 1 and Tab 1) below, the majority of responses (56.25%) were submitted by representatives from the "Industry & SMEs / Industry Associations" category. The remaining three categories—"Social Partners," "Public Institutions/Authorities," and "Others" (identified as Contract Research Organisations and non-specific end-users of fertilisers)—each accounted for an equal share of 12.5%. The category of "Education and Training Providers / VET & Associations" had the lowest representation, contributing 6.25% of the total responses.

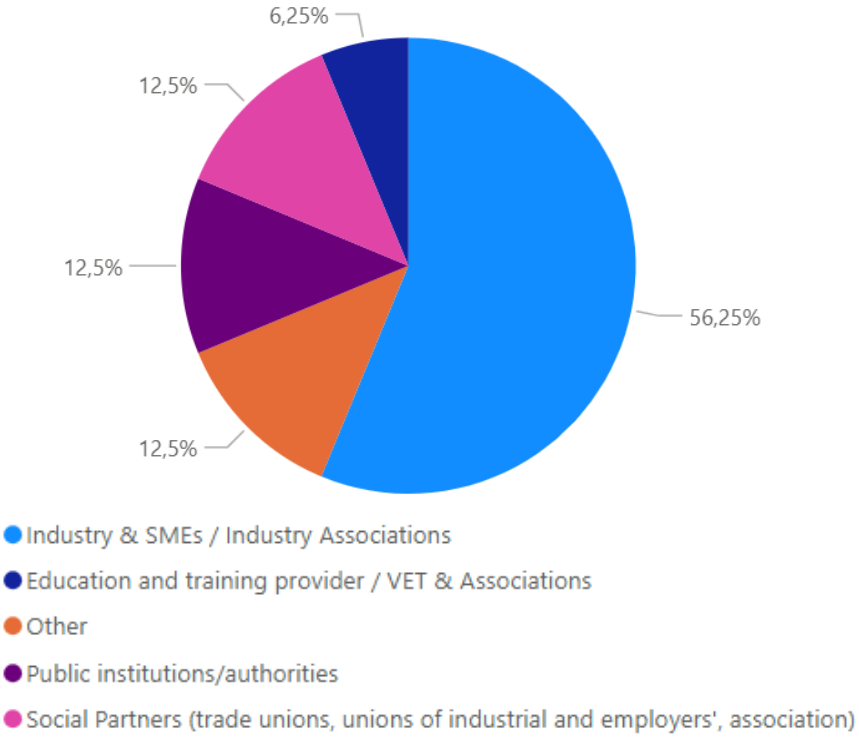

Figure 1: Type of organisation

Type of organisation	Answers	Ratio
Industry & SMEs / Industry Associations	9	56,25 %
Education and training provider / VET & Associations	1	6,25 %
Social Partners (trade unions, unions of industrial and employers', association)	2	12,50 %
Public institutions/authorities	2	12,50 %
Regions and municipalities	0	0 %
Other	2	12,50 %

Table 1: Type of organisation

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1.2. Size and country of operation

Regarding the size of enterprises based on the number of employees, the bar chart below illustrates that the highest proportion of responses (37.50%) came from small enterprises (up to 49 employees). Large companies (250+ employees) represented the second largest group, accounting for 31.25% of responses. Micro enterprises (1–9 employees) contributed 12.5% of the responses, while medium-sized enterprises (50–249 employees) accounted for 18.75%.

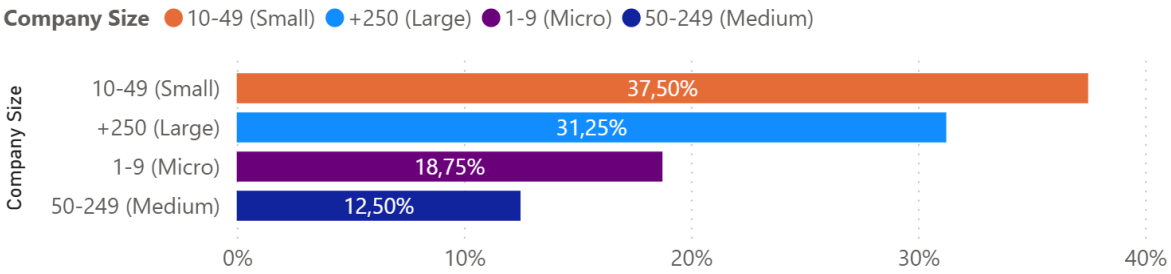

Figure 2: Size of organisations

Respondents were asked to specify the geographical scope of their organization's activities within the EU and beyond. The vast majority (87.5%) indicated that their primary area of business is within the European Union, while only 12.5% reported operations outside the EU. Among those active in the EU, respondents provided details on the specific countries in which they operate.

The data on geographical distribution highlight that most respondents represent multinational companies and associations with operations spanning multiple countries. A significant proportion reported activity in the Czech Republic (43.75%), Belgium (37.5%), France (31.25%), and Germany (25%). These were followed by Italy, the Netherlands, and Spain, each accounting for 18.75% of responses.

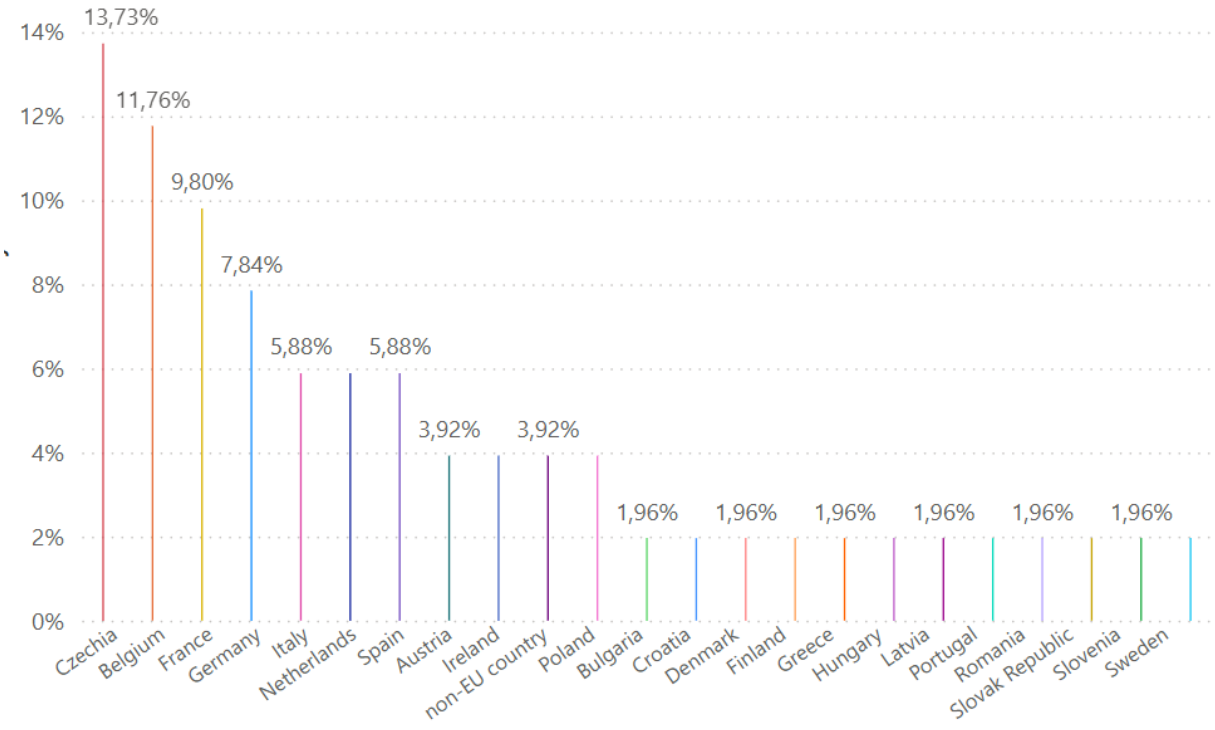

Figure 3: Geographical Coverage

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Country	Answers	Ratio
Austria	2	12,5 %
Belgium	6	37,5 %
Bulgaria	1	6,25 %
Croatia	1	6,25 %
Czechia	7	43,75 %
Denmark	1	6,25%
Finland	1	6,25 %
France	5	31,25 %
Germany	4	25 %
Greece	1	6,25 %
Hungary	1	6,25 %
Ireland	2	12,5 %
Italy	3	18,75 %
Latvia	1	6,25 %
Netherlands	3	18,75 %
Poland	2	12,5 %
Portugal	1	6,25 %
Romania	1	6,25 %
Slovak republic	1	6,25 %
Slovenia	1	6,25 %
Spain	3	18,75 %
Sweden	1	6,25 %
Non-EU country	2	12,5 %

Table 2: Geographical Coverage

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2. Sectoral Needs to Meet Green & Digital Transition

This section examines respondents' perspectives on the key trends shaping the fertiliser sector, as identified within the project framework.

According to the survey results, the most significant drivers of change impacting the market were "Growing emphasis on sustainability and the circular economy" (30.95%) and "Increased adoption of digital technologies" (28.57%). These were followed by "Regulatory changes impacting industry practices" (26.19%) and "Shift towards automation and robotics" (14.29%). Notably, none of the respondents identified "Rising demand for personalised and customised products" as a relevant factor influencing the sector.

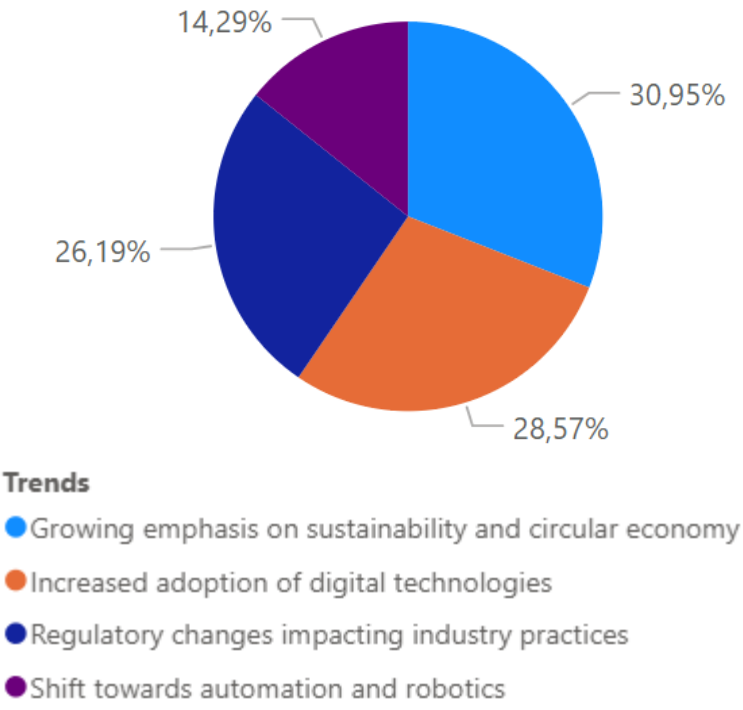

Figure 4: Current trends/drivers of change that the respondents experience in the current market

Trends	Answers	Ratio
Increased adoption of digital technologies	12	28,57 %
Growing emphasis on sustainability and circular economy	13	30,95 %
Shift towards automation and robotics	6	14,29 %
Rising demand for personalised and customized products	0	0 %
Regulatory changes impacting industry practices	11	26,19 %
Other	0	0 %

Table 3: Current trends/drivers of change

At the same time, the sector is actively addressing the challenges associated with the transition to a digital and green economy. All respondents anticipate that these shifts will have a

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fundamental impact on their operations and provided insights into the perceived likelihood of these trends affecting their activities.

Regarding the transition to a **digital economy**, 25% of respondents consider its impact on their operations to be highly likely, while 6.25% view it as very likely. A slightly larger share, 56.25%, expects the digital transformation to have a moderate impact on their business. In contrast, 12.5% of respondents foresee a lower likelihood of digitalisation significantly influencing their company.

Likelihood	Answers	Ratio
1	0	0 %
2	2	12,50 %
3	9	56,25 %
4	1	6,25 %
5	4	25 %

Table 4 Impact of the transition to the digital economy

With regard to the transition to a **green economy**, respondents anticipate an even greater impact compared to digitalisation. The majority (56.25%) consider the likelihood of this transition affecting their daily operations to be very high. Additionally, 31.25% of respondents perceive the impact as very likely, while 12.5% regard it as likely. These findings underscore the strong awareness within the sector of the profound changes that sustainability-driven transformations are expected to bring.

Likelyhood	Answers	Ratio
1	0	0 %
2	0	0 %
3	2	12,50 %
4	5	31,25 %
5	9	56,25 %

Table 5 Impact of the transition to the digital economy

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3. Competencies needed in the Fertilizer sector

This section provides an analysis on skills and knowledge needed in the sector. A range of competence categories was given, and respondents rated the specified competences. In the category "Other" the respondents could express their skills and knowledge not included in the range.

3.1. Sectoral

In assessing the relevance of competencies in terms of skills and knowledge defined for the chemical sector, respondents evaluated their specific importance for the fertiliser industry. The highest-rated competencies were "Quality Control and Assurance" (4.25 out of 5) and "Safety Awareness" (4.00), highlighting their critical role within the sector.

These were followed by "Safety and Risk Management" (3.88) and "Instrumentation and Process Control" (3.63), as well as "Chemical Processes Control and Monitoring" (3.50), "Chemical Process Design" (3.13), and "Material Science" (3.06).

Competencies deemed less critical included "Reaction Engineering" (2.50), "Thermodynamics and Heat Transfer" (2.31), and "Metallurgy" (1.94), indicating a comparatively lower perceived relevance of these areas within the fertiliser sector.

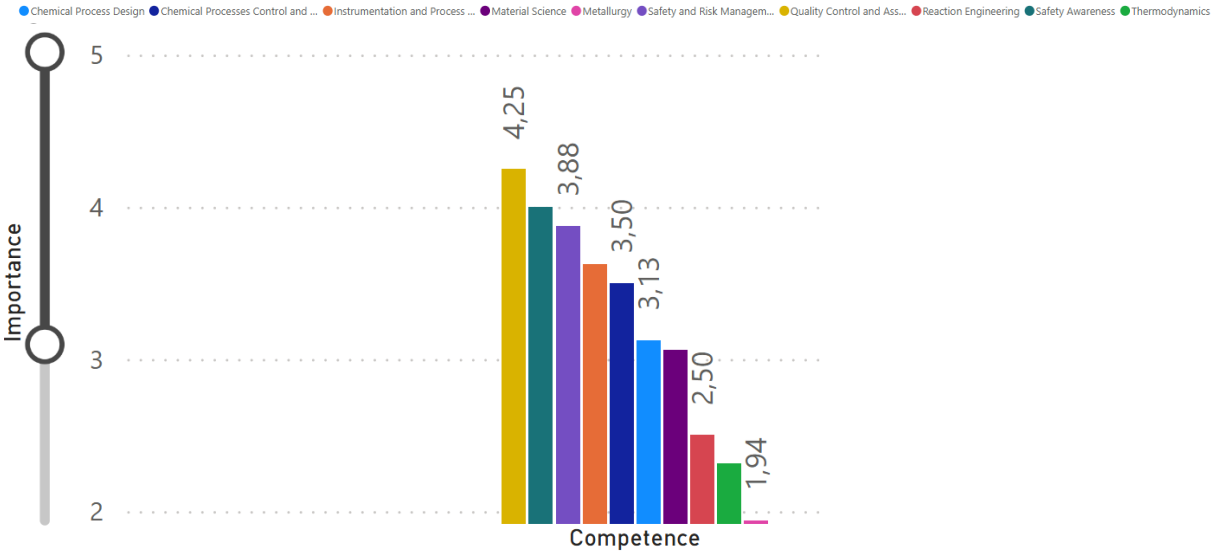

Figure 5: Sectoral Competence Needed

3.2. Digital

the DigComp Framework, in addressing the challenges associated with digitalisation trends. The most highly rated competencies were "Data Analytics" (4.19 out of 5) and "Sustainability and Circular Economy Expertise" (4.06), underscoring their critical role in the sector's transformation.

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Other key digital skills identified as highly relevant included “Cybersecurity and Network Security” (3.56), “Automation and Robotics Programming” (3.31), “Supply Chain Digitization and Logistics” (3.19), and “Internet of Things” (3.13), all of which reflect the increasing integration of digital technologies into industrial operations.

By contrast, respondents indicated a medium to lower level of need for “Digital Twin Modelling and Simulation” (2.50) and “3D Printing and Manufacturing” (2.00), suggesting that these technologies currently play a less prominent role in the fertiliser sector.

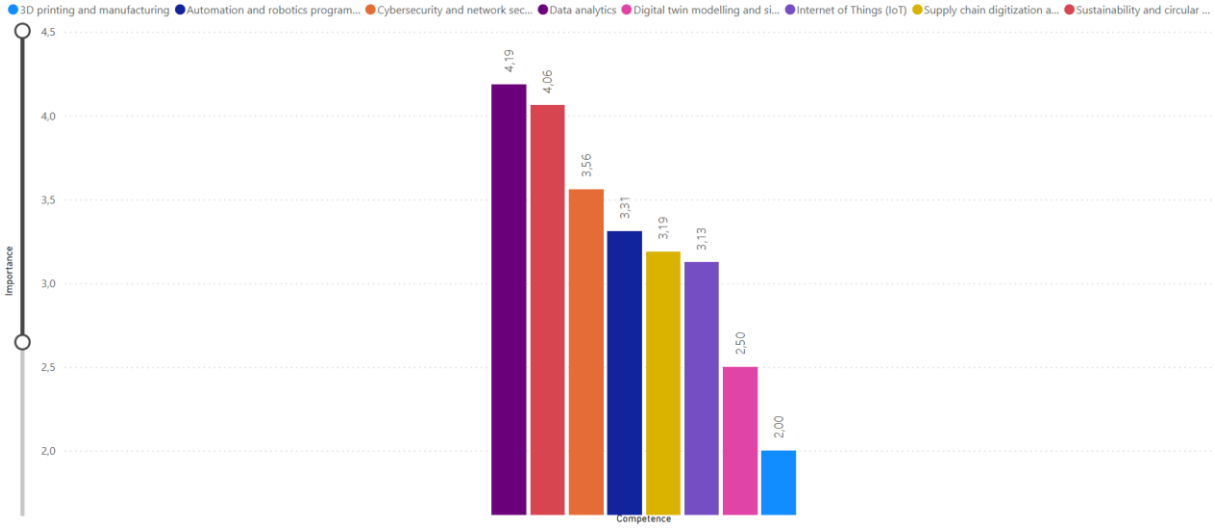

Figure 6: Digital Competence Needed

3.3. Soft

In this section, respondents were asked to assess the current need for soft skills in the fertiliser and agriculture sector. The most highly valued competencies were “Communication” (4.31 out of 5), “Cognitive Skills” (4.25), “Problem-Solving” (4.25), and “Critical Thinking” (4.06), highlighting their essential role in navigating industry challenges and fostering innovation.

Other important soft skills, though rated slightly lower, included “Social and Emotional Skills” (3.94), “Safety and Ethics” (3.88), and “Content Creation” (3.25), all of which contribute to effective teamwork, responsible decision-making, and professional adaptability.

Additionally, in open-ended responses, one participant emphasized the relevance of other mobilizing soft skills, such as language proficiency and negotiation abilities, further reinforcing the need for a well-rounded skill set in the evolving industry landscape.

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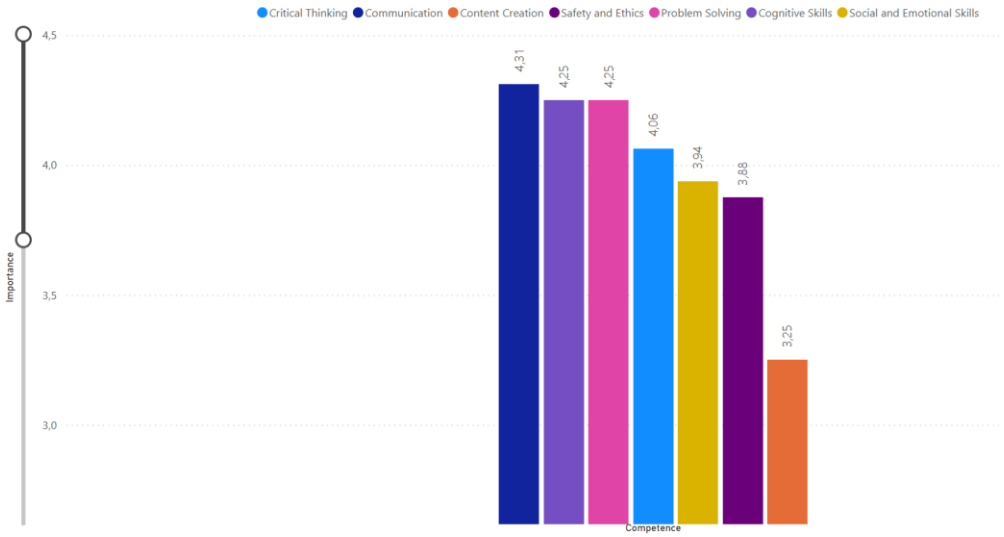

Figure 7: Soft Competence Needed

3.4. Green

This section presents the survey results on the current demand for green skills within the sector. The skill definitions are based on the JRC Science for Policy report GreenComp, and respondents were asked to assess their relevance on a scale from 1 to 5.

The highest-rated green competencies were "Monitoring and Predicting Environmental Impact" and "Embodying Sustainability Values", both receiving a score of 4.25 out of 5, highlighting their critical importance in the transition towards sustainable practices. These were followed by "Acting for Sustainability" (4.13) and "Envisioning Sustainable Futures" (4.06), reflecting the need for proactive engagement in sustainability initiatives.

Additionally, "Energy Efficiency Focus" (3.56) was also recognized as an important area, indicating its growing significance in improving resource efficiency and reducing environmental impact within the sector.

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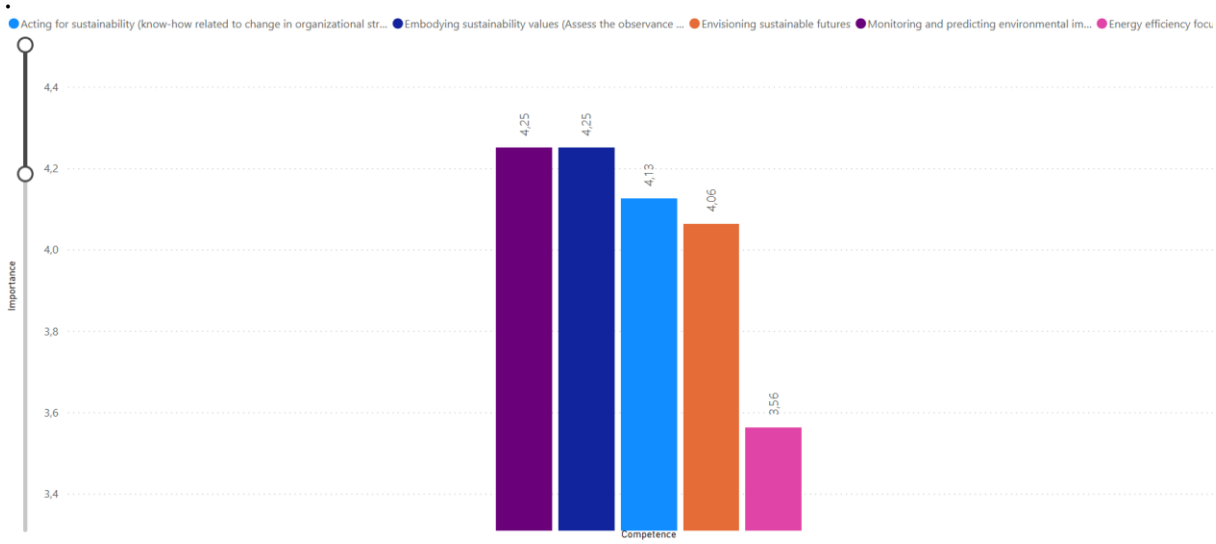

Figure 8: Green Competence Needed

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Following the assessment of current green skills needs, respondents were asked to identify the key corporate and sector-wide challenges anticipated over the next two years.

The most pressing concern highlighted was the "Availability of a workforce with the adequate skill sets", which received the highest importance rating (4.6 out of 5), underscoring the critical need for skilled professionals to support industry transitions. Additionally, respondents identified "Initial investment costs" (3.75) as a significant barrier, reflecting concerns about the financial requirements for adopting sustainable and digital technologies.

Another key challenge was ensuring the "Availability of training programs for the existing workforce to re-skill and up-skill" (3.63), emphasizing the need for continuous learning and workforce adaptation. Lastly, "Integration issues with existing systems" (3.50) were also recognized as a relevant concern, highlighting the complexities associated with implementing new technologies and sustainability initiatives within established operational frameworks.

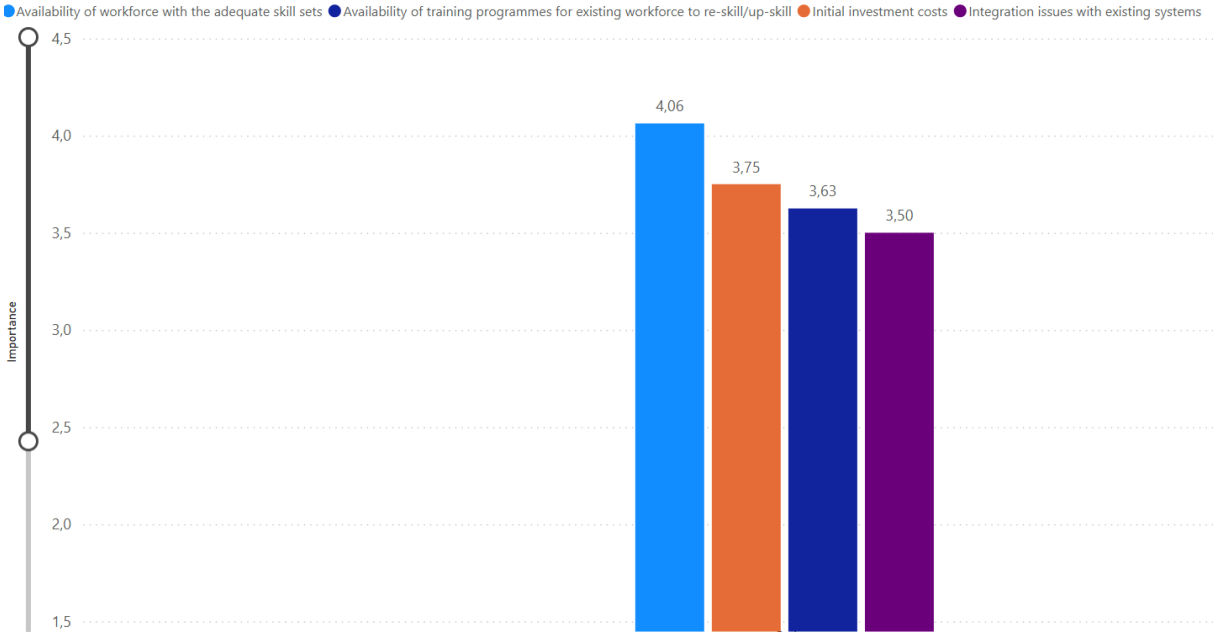

Figure 9: The Immediate (1-2 years) Need/Challenge

This section of the survey also examined the longer-term needs of organisations and the sector as a whole. Respondents were asked to assess the same challenges and requirements, but with a focus on a 5- to 10-year horizon.

The results highlighted a continued emphasis on the "Availability of a workforce with adequate skill sets", which remained the most critical factor, receiving an importance rating of 4.19 out of 5. Over time, the need to ensure the "Availability of training programmes for the existing workforce to re-skill and up-skill" also gained increasing significance, scoring 3.75.

In contrast, the perceived importance of "Initial investment costs" (3.38) and challenges related to "Integration issues with existing systems" (3.31) appeared to diminish in the long term. These findings suggest that while financial and technical barriers may become less critical over time, workforce skills and continuous training will remain key priorities for the sector's sustainable development. workforce skills and continuous training will remain key priorities for the sector's sustainable development.

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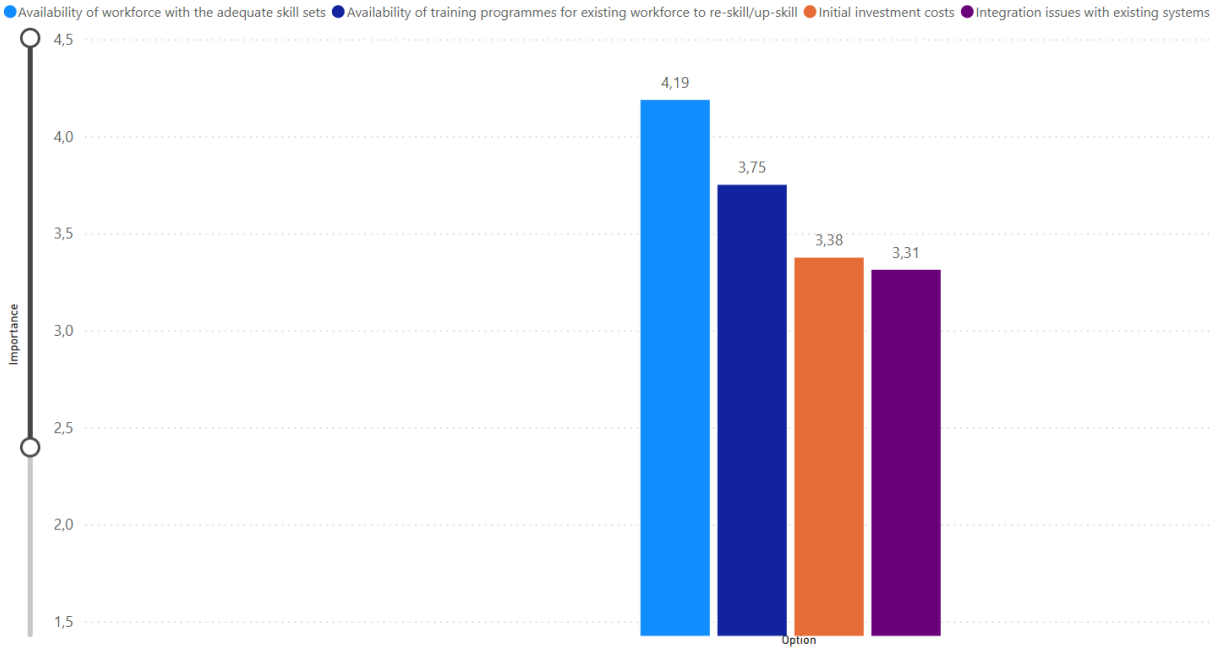

Figure 10: The Long Term (5-10 years) Need/Challenge

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4. Workforce needed in the Fertilizer sector

After identifying both short- and long-term sectoral skills needs, the next section examines workforce requirements in terms of job roles. Respondents were asked to indicate the most critical job positions needed both in the present and over the next 5 to 10 years.

4.1 Immediate need/challenge

The results for current workforce needs highlighted "Professionals" as the most in-demand job category, receiving an importance rating of 4.00 out of 5, followed closely by "Technicians" (3.94). "Managers" and "Workers" were assigned equal importance (3.50), while "Operators" (3.06) were rated slightly lower. The "Elementary workforce" (2.50) and "Assemblers" (2.13) were identified as having the lowest current demand.

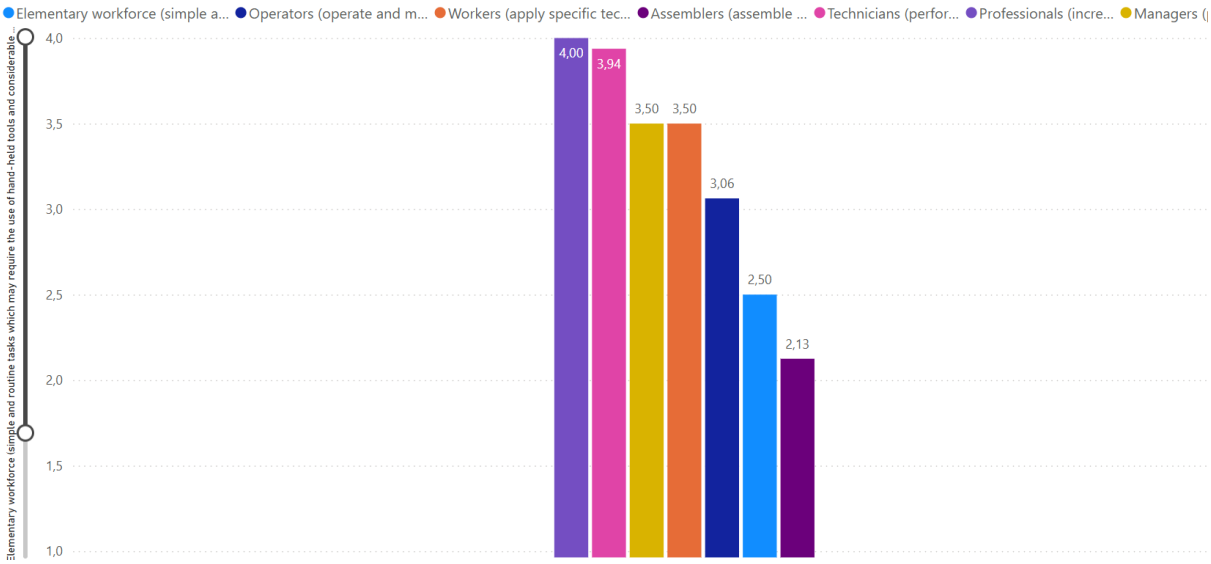

Figure 11: Immediate Need/Challenge for the Department/Organisation/Sector

4.2 Long-term need/challenge

As illustrated in Figure 12, the long-term labour requirements in terms of job positions do not differ significantly from the current needs, according to respondents.

The highest importance was again assigned to the "Professionals" and "Technicians" categories, both receiving a rating of 3.94 out of 5. The demand for "Managers" and "Workers" remained stable at 3.56, indicating a continued need for leadership and operational roles.

Compared to the current workforce needs, the importance of "Operators" has increased to 3.25, suggesting a growing recognition of their role in future industry operations. In contrast, the demand for the "Elementary workforce" has slightly declined to 2.38, while the demand for "Assemblers" (2.13) remained unchanged.

These findings suggest that while core professional and technical roles will remain a priority in the long term, there may be shifts in the demand for operational and lower-skilled positions.

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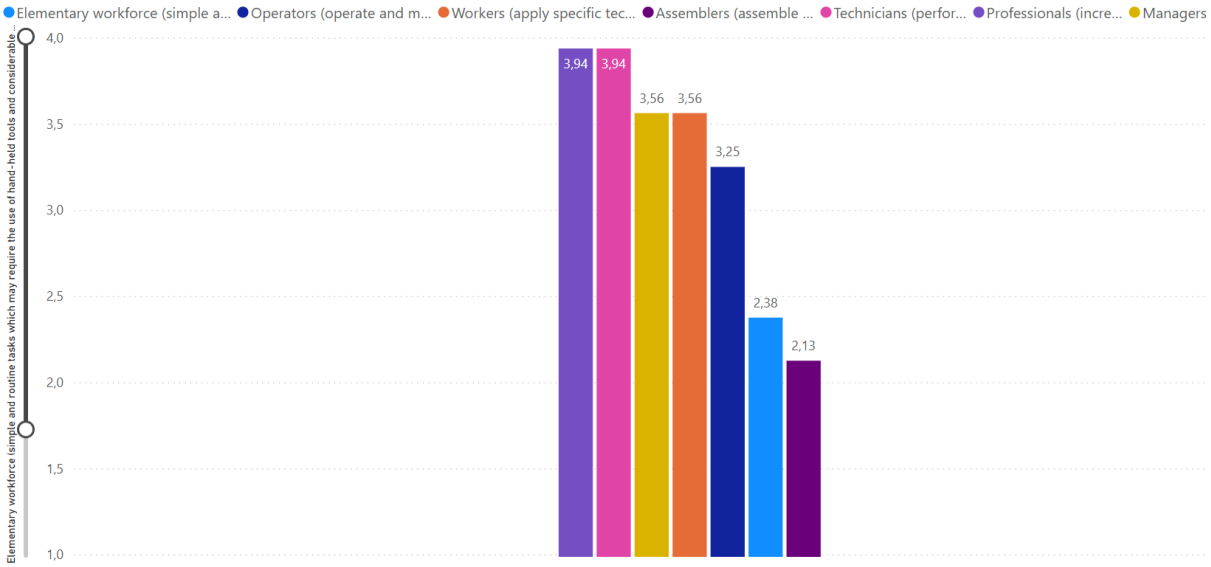

Figure 12: Long-term Need/Challenge for the Department/Organisation/Sector

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5. Training Need in the Transition in the Fertilizer sector

This section of the report presents respondents' insights on the use of training courses, as well as their awareness of and access to educational programmes essential for supporting the ongoing transformation within the industrial sector. The findings provide an overview of the current training landscape and highlight potential gaps in workforce development needed to meet evolving industry demands.

5.1. Training and courses in the fertilizers industry

The majority of respondents (56.25%) confirmed that their companies regularly implement specific training courses. However, 31.25% indicated that such courses are not currently in place within their organisations. Additionally, 6.25% of respondents stated that training programmes are planned for future implementation, while an equal proportion (6.25%) reported no interest in offering training courses and no plans to introduce them.

Among respondents who specified the types of courses provided, the main focus areas included digitalisation, precision farming, fertiliser application (including compliance with the Nitrate Directive), and the green economy, particularly carbon sequestration. These topics reflect the sector's ongoing adaptation to digital and sustainable practices.

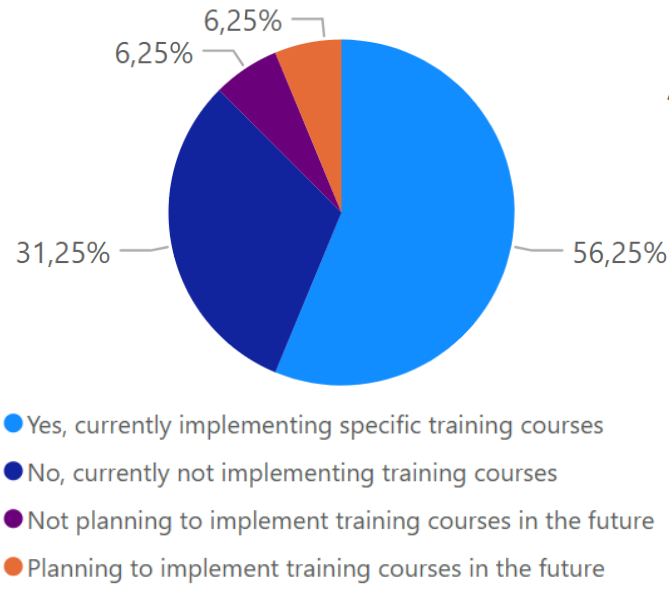

Figure 13: Training and courses already implemented in the department/sector/organisation

5.2 Investment in personal learning and development

The next set of questions aimed to assess the extent to which organisations invest in personal development and training for their workforce.

A significant proportion of respondents (37.50%) indicated that they were unaware of the exact amount of time allocated to personal learning and development within their organisations.

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Among those who provided specific estimates, 25% reported investing less than 20 hours per person per year, while 18.75% indicated a training commitment of 20 to 80 hours per person per year. An equal proportion (18.75%) stated that their organisations dedicate more than 80 hours per person per year to personal development and training.

These findings highlight the varying levels of investment in workforce upskilling and suggest potential disparities in training priorities across different organisations.

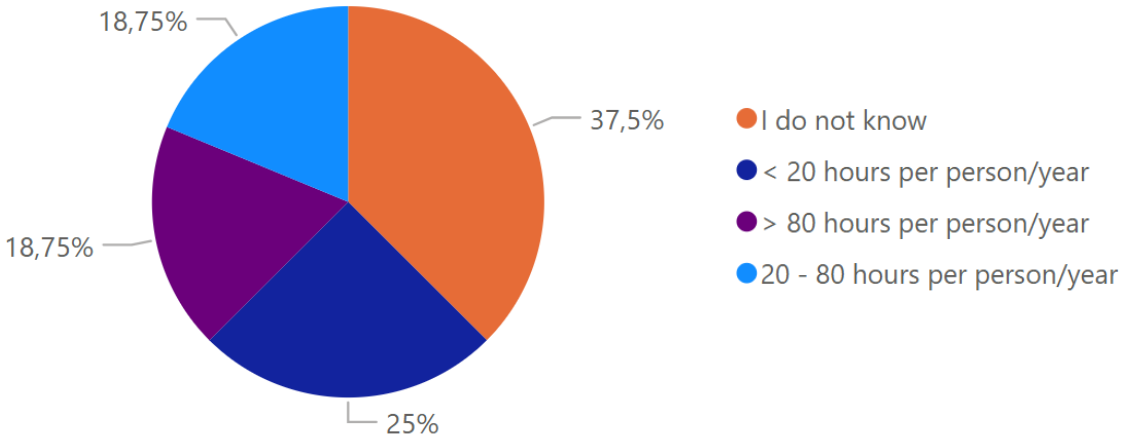

Figure 14: Average investment into personal learning & development in terms of time

In monetary terms, the proportion of investment in learning and development within the overall employee development budget varies significantly among respondents.

A high level of investment (more than 40% of the total employee development budget) was reported by 6.25% of respondents, while 12.5% indicated a medium level of investment (approximately 30% of the total budget). A low level of investment (less than 20%) was reported by 25% of respondents.

Notably, 50% of respondents stated that they do not have information regarding the share of investments allocated to learning and development within their organisations. This suggests that in many cases, financial allocation for employee training may not be systematically tracked or prioritised at the organisational level.

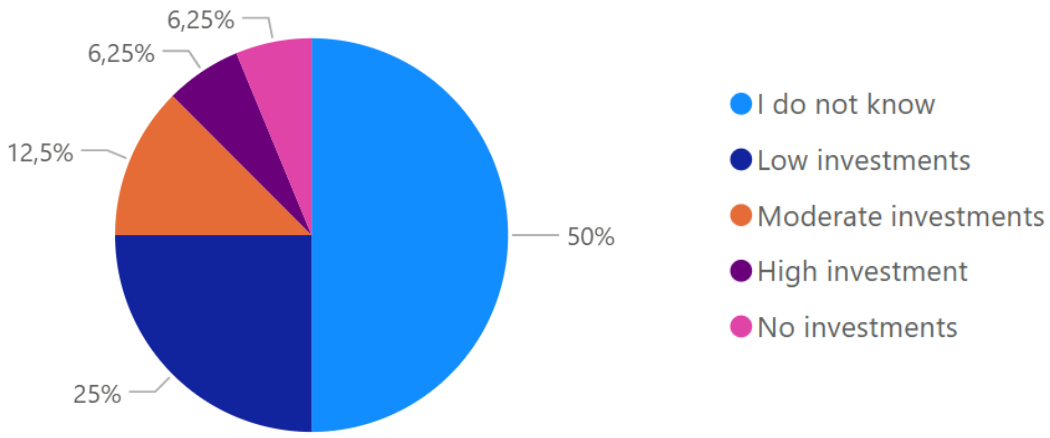

Figure 15: Average investment into personal learning & development in terms of money

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In response to the question regarding the existence of strategic documents related to the new skills required in the fertiliser and agriculture sector, only 12.5% of respondents confirmed that such documents exist within their organisations.

A quarter of respondents (25%) indicated that their organisations do not have any strategic documents addressing skill requirements. Additionally, the majority (62.5%) stated that they do not have information on whether such documents exist within their organisation, suggesting a potential lack of awareness or prioritisation of structured workforce development planning.

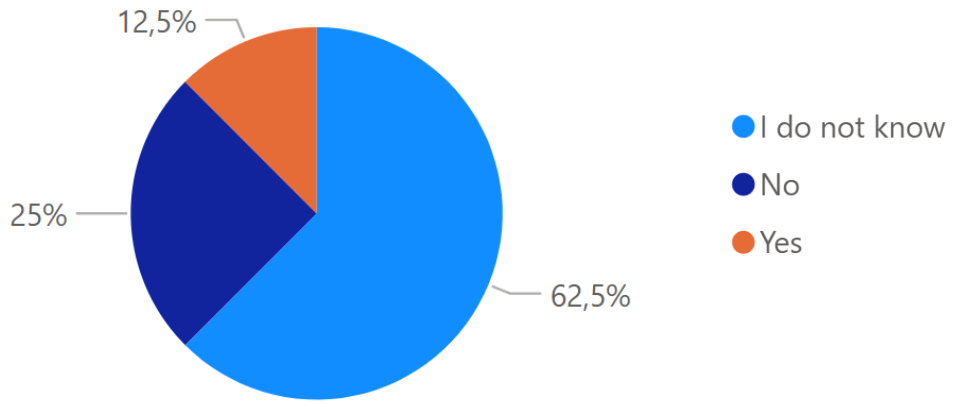

Figure 16: Availability of strategic documents related to required new skills in sector

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6. Generation and Gender Gaps

The survey also included a section addressing digital skills gaps, with a specific focus on differences related to age and gender. The following pie charts illustrate respondents' views on whether generational gaps and gender disparities in digital skills exist among employees within their organisations.

When asked about the existence of a generational gap in digital skills, 50% of respondents confirmed that a significant gap is present within their organisation, while 37.5% acknowledged a minor gap. In contrast, 12.5% of respondents reported that they do not observe any noticeable generational differences in digital skills among employees.

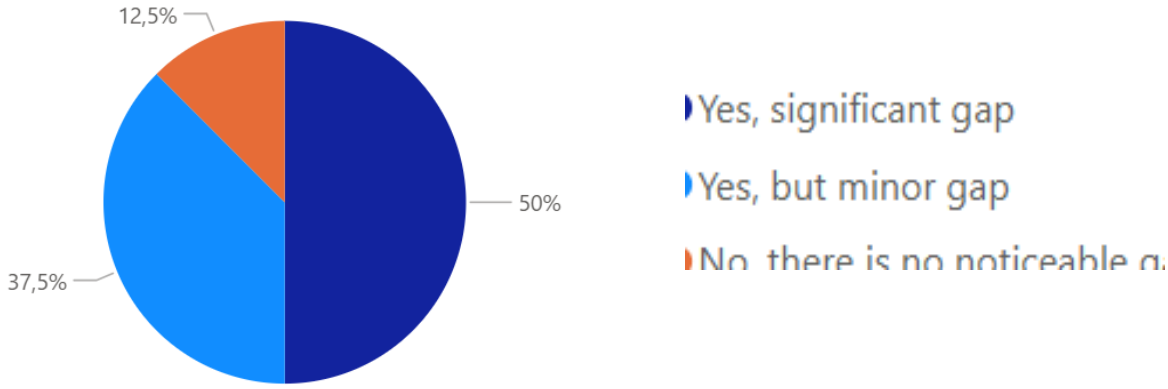

Figure 17: Generational gap in digital skills among employees in the organisations

With regard to gender disparities in digital skills, 12.5% of respondents identified a significant difference, while an equal proportion (12.5%) considered the gap to be minor. Notably, the majority of respondents (75%) indicated that they do not perceive any substantial gender-based differences in digital skills within their organisation.

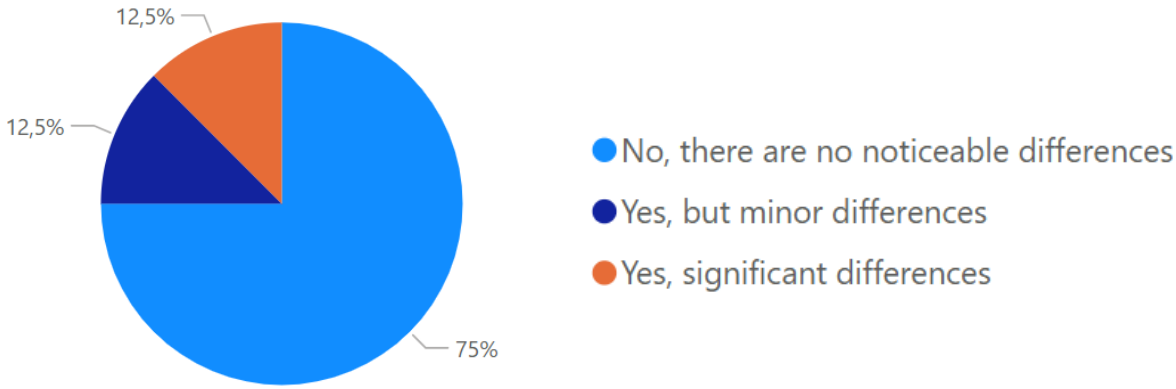

Figure 18: Gender-based differences in digital skills among employees in the organisations

These findings suggest that while generational differences in digital proficiency are widely recognised, gender-based disparities are perceived as less prominent in the sector.

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7. Conclusion

This report represents the first step in a series of surveys conducted as part of the ChemSkills project, focusing on the fertiliser and agriculture sector. Its objective is to provide a comprehensive analysis of current trends in skills needs and workforce training, which are shaping the evolving ecosystem of fertiliser production and use. The insights gained will support the quantification of the impact of digitalisation, the green economy, and emerging production and business models on workforce development and skills requirements.

The findings underscore the critical need for continuous skills development and the adaptation of training programmes to align with the sector's evolving demands, particularly in response to technological advancements and sustainability initiatives. The transition to a more digital and green economy necessitates proactive measures to upgrade and modernise skill sets, ensuring a resilient and future-ready workforce.

By identifying key areas for improvement and highlighting workforce challenges, this report provides a valuable foundation for future initiatives aimed at supporting skills transformation. The insights presented herein will serve as a starting point for targeted actions, ensuring that the sector is equipped to navigate the challenges and opportunities of an evolving industrial landscape.

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