SUSTAINABLE STORAGE OF GRAINS
BY IMPLEMENTING A NOVEL PROTECTANT
AND A VERSATILE APPLICATION TECHNOLOGY

D4.5. Co-Creation Workshops – September - November 2023 novIGRain

Co-Creation Workshops – 1st Session	
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Dissemination Level	
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1 Introduction

The focus of the novIGRain project is on the development of 3 innovations in the field of grain storage management:

- The development of a novel product that can be applied as a ULV (ultra-low volume);
- The development of a novel application technology that should make it feasible to apply multiple insecticides at the same time;
- The development of tools and manuals for doing proper grain storage management taking into account the possible resistance of insects to substances applied. These will be based on research on insect resistance done within the novIGRain project (in combination with literature studies).

Within the novIGRain project "co-creation workshops" were included to assure that the innovation will be developed according to the stakeholders' needs to assure a good market uptake when the project will be over. Throughout the project, a number of different Co-Creation workshops organised in 3 regions (being: France, Germany and Hungary). The provisioned timing of the workshops is:

- March-May 2021
- September-November 2023
- Summer-Autumn 2024 (exact timing and format TBD)
- Winter-Spring 2025 (exact timing and format TBD)

The participation in the workshops is not open, but only on invitation to assure that the overall stakeholders reached is a good mixture of the stakeholders involved. The output of the co-creation workshops will be used throughout the project.

1.1 Goal of Co-Creation Workshops in 2023

Following the feedback from first sessions of the workshops in 2021, the second set of workshops was decided to be focussed on users' perceptions and feedback, therefore the workshops in 2023 have 2 main goals:

(i) Sharing the progress done in the project with the interested stakeholders
(ii) Gathering feedback and data on preferences and perceptions of the potential users of the new ULV larvicide and its application technology

For 2023, co-creation workshops were initially planned in each of the three target regions (France, Germany, and Hungary) at the beginning of the year. However, firstly, due to limited sectoral availabilities in the beginning of the year and during summer period, in the consortium, the timing was rescheduled to the autumn of 2023 to ensure the presence of relevant partners and make it more convenient for participants. This change is reflected in the amendments to the Grant Agreement (GA). Secondly, due to a lack of interest in participating on-site, the workshops in Paris and Berlin were replaced by two separate online workshops. The workshop in Budapest proceeded in person at the Babolna Bio office.

2 Participating companies / organisations

The Participants were recruited with the help of the network of all the different partners in the consortium. Once the dates and locations of the workshops were established, invitation emails were sent to stakeholders from the target regions and other EU countries. Additionally, two emails were

sent providing more detailed information regarding the timing and agenda of the workshops. Interested stakeholders had the option to register through a sign-up form or via email.

However, it became evident relatively quickly that there wasn't much interest. Consequently, desk research was employed to actively invite and recruit potentially interested stakeholders, including pest control operators, grain storage managers, representatives of relevant associations, researchers, and policymakers. It is important to note that while policymakers and researchers were approached, they were not the primary focus of the recruitment process. These workshops were specifically designed to target actual consumers, and as such, efforts were directed towards engaging those directly involved in grain storage management. Additionally, it was decided to promote the workshops through LinkedIn and Wikifarmer.

These efforts resulted in additional registrations from stakeholders not initially connected to the consortium partners' network. In total, 22 external stakeholders participated in the workshops:

- First online workshop: 4 external participants
- Second online workshop: 4 external participants, with 2 persons registered but not present
- Budapest workshop: 14 external participants

Following organisations have participated to the different workshops, the "invited interested stakeholders" are marked in bold in the list below:

Online Workshop 1:

- **COCERAL**
- **Groupe Carré**
- **Mylva S.A.**
- **Sanus-M**
- Maxiline
- Sojam
- CRI
- Babolna-Bio
- United Experts

Online Workshop 2:

- **Arvalis**
- **Cargill**
- **German Farmers Association (DBV)**
- **Newpharm**
- Babolna-Bio
- CRI
- Maxiline
- United Experts

Workshop in Hungary:

- **ABER Gabonatechnika**
- **BEKES Pesticid**
- **BLS-TRIO**
- **Horváthné Borvári Ildikó**
- **Minőségi Vetőmag**

- **Rágcsávók**
- **Other**[1]
- Babolna-Bio
- CRI
- Maxiline
- United Experts

For some organisations multiple people participated to the workshop, assuring to have a good overview of the overall involved valorisation chain.

3 Workshop Programme

Each workshop started with presentations on resistance research delivered by Vaclav Stesjskal from CRI and the development of the new product and application method delivered by Anna Kosa-Tass from Babolna Bio. Both presentations are added as attachments to this report. After this, participants engaged in the interactive part of the workshop. Various types of questions (see further) were posed using the Mentimeter application. After each question, the answers were discussed within the group.

Since the current workshops were focused on users' perspectives, a combination of different types of questions was used, including word clouds, 2x2 matrices, and 5-point Likert scale agree/disagree questions.

Below is the summary of the agenda utilised for the current workshop sessions:

1. Introduction of NovIGRain
2. Tour de table
3. Presentation of Vaclav Stejskal (CRI) - Resistance and management of stored product pests
4. Interactive Questionnaire Part 1 (Word Clouds)
5. Presentation of Anna Kosa-Tass (Babolna Bio) - Resistance and management of stored product pests
6. Interactive Questionnaire Part 1 (Word Clouds)
7. Interactive Questionnaire Part 2 (2x2 Matrix)
8. Interactive Questionnaire Part 3 (Agree/disagree questions)

3.1 Word Clouds

To capture users' expectations of a grain protection product and their impressions of the newly developed larvicide, two questions were asked: (1) 'Use 3 adjectives to describe desired properties in a grain protection product,' (2) 'Use 3 adjectives to describe your impressions of the new product.'

3.2 2x2 Matrix

To understand the competitive position of various available grain protection solutions, a 2x2 matrix was employed. In this assessment, three currently available products (phosphine, deltamethrin, pirimiphos-methyl) were considered, along with the newly developed S-methoprene-based product in the project. The matrix comprises two axes, each representing a question: the X-axis signifies users' ranking of suitability for their needs, and the Y-axis represents users' ranking of the likelihood of them using the product.

[1] To learn about other participating organisations, please refer to the attachment containing the minutes of the workshop.

3.3 Agree/Disagree Questions

Finally, to explore more specific psychological aspects involved in users' decision-making, the Theory of Planned Behaviour was utilised. The Theory of Planned Behaviour is a widely used methodology in the field of psychology and consumer studies. In essence, the theory suggests that the psychological constructs of Attitudes, Subjective Norms, and Perceived Behavioural Control affect users' intention to use a new product. Therefore, for the purposes of the co-creation workshops, the Theory of Planned Behaviour was used as the guiding framework.

For each of the psychological constructs mentioned above, a set of four agree/disagree questions was developed, where each respondent needed to express their view on the 5-point Likert scale. Table 1 summarises the questions that were addressed to the participants per psychological construct from theory of planned behaviour.

Table 1. Agree/disagree questions

Construct/Question
Intentions
I am satisfied with the currently available grain protection products
I expect that treating grain will be more challenging with currently available products in the coming years
I would participate in a trial program for the new grain protection product
I am interested and ready to try a novel grain protection product belonging to the larvicide family
Attitudes
If proven to be effective I would recommend the new product (larvicide) to others over the fumigation
I feel that the new product can reduce the overall cost of protecting the grain
I believe that the new product will improve health and safety of workers when treating grain
I prefer to have the ability to simultaneously apply both larvicide and adulticide
Subjective Norms
I feel pressure to use more sustainable / safer solutions for treating grain than my current ones
I take into the account the opinions of the experts on the new possibilities for grain protection
If key stakeholders in grain protection industry showed enthusiasm for the new product, I would be more inclined to use it
Authorities encourage the use of new more sustainable/safer solutions for grain protection
Perceived Behavioural Control
I receive sufficient information on the options available for grain protection
I understand well what equipment is needed for the effective application of the new product
I have reasonable options to choose from for the grain protection
I am familiar with application of ultra-low volumes of grain protection product

4 Collected Data and Outcomes of Co-Creation Workshops

4.1 Online Workshop 1 (28/09/2023)

Figures 1 and 2 summarise the results to the word cloud questions from Online Workshop 1. Notably, in terms of desired properties for a grain protection product the participants most commonly pointed out effectiveness, ease of use and low cost. Regarding the impressions to the newly developed

product the answers were less aligned, yet the overall impression among the participants was positive and optimistic.

Figure 1. Word Cloud – Desired Properties in Grain Protection Product Online Workshop 1



Figure 2. Word Cloud – Impressions of new Grain Protection Product Online Workshop 1



In the second part of the interactive questionnaire, participants expressed their perceptions of existing grain protection solutions and a newly developed product. Figure 3 summarises the results for 2x2 matrix questions, it illustrates the centre points as averages of workshop participants' responses for each of the analysed products along with individual responses of each participant represented by the smaller dots.

Figure 3. 2x2 Matrix – Online Workshop 1



Although the sample size is too small to provide statistically significant results, it offers interesting, directionally correct insights. For example, Phosphine elicited varied responses, spanning from quadrant 1 to 3, with the resulting average closely situated to the centre of the diagram. Deltamethrin and S-methoprene also exhibited a wide range, but their averages notably leaned towards the upper right corner, suggesting a more favourable competitive position compared to phosphine.

Pirimiphos-methyl, on the other hand, demonstrated a relatively narrow range and an overall low average rating, indicating a less competitive position. This is likely attributed to legal restrictions on pirimiphos-methyl in the countries of the participants.

Finally, the participants responded to the agree/disagree questions. Notably the overall answers were rather uniform without much variation, which provide a good summary of trend in stakeholders perceptions. Figure 4 summarises the answers.

Figure 4. Agree/Disagree questions from Online Workshop 1



Interestingly, the results clearly indicate that participants expressed a below-average level of satisfaction with currently available grain protection solutions. Furthermore, they seem to perceive little to no viable alternatives to the products currently in use.

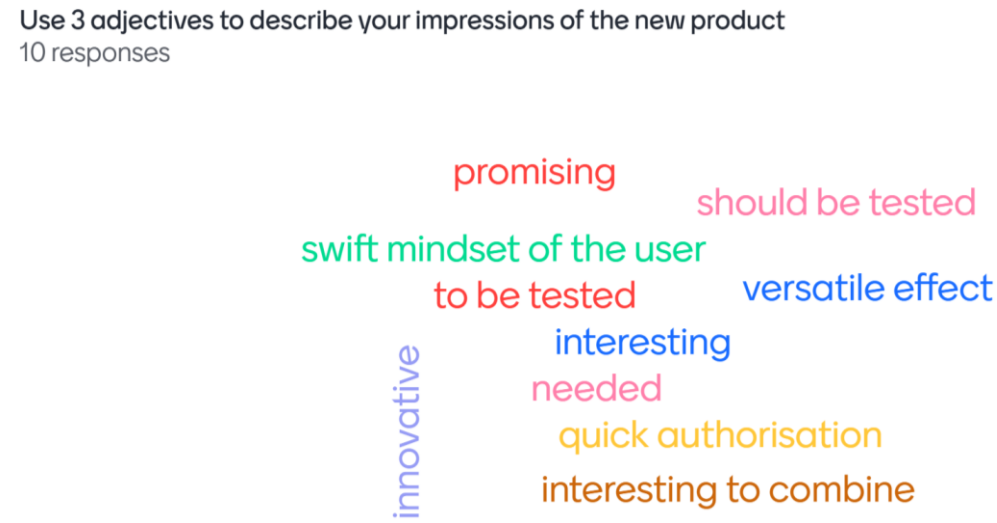
4.2 Online Workshop 2 (18/10/2023)

Figures 5 and 6 summarise the results to the word cloud questions from Online Workshop 2. Similarly, to the participants in the first session, the guests at the second workshop noted ease of use and effectiveness as key qualities, but also additionally mentioned sustainability as an important aspect. The impressions of the newly developed product also have been positive, although underlining the importance of testing to ensure efficacy.

Figure 5. Word Cloud – Desired Properties in Grain Protection Product Online Workshop 2

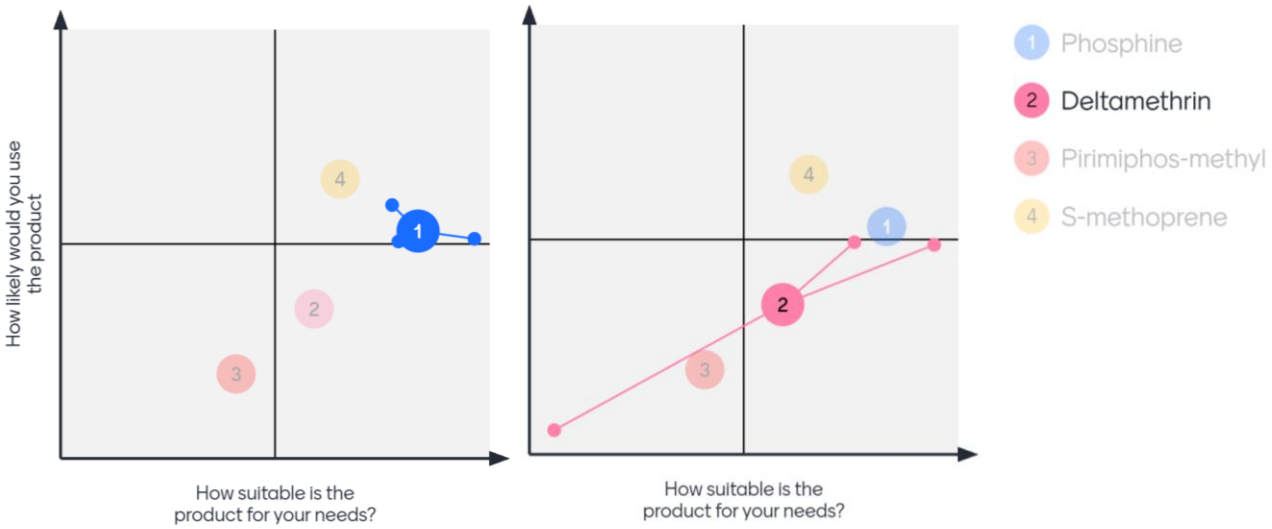


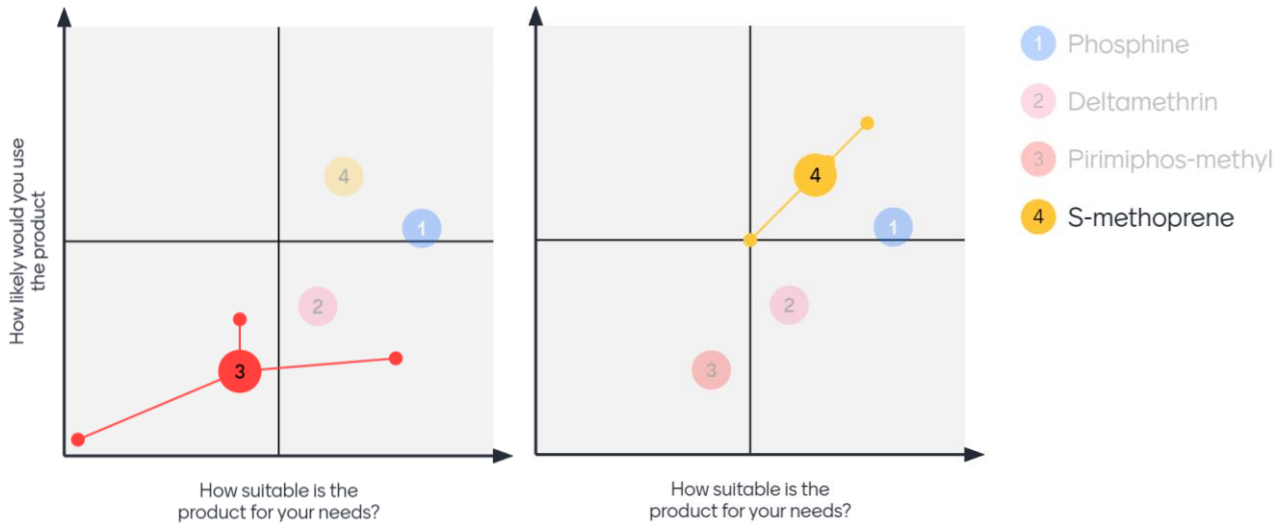
Figure 6. Word Cloud – Impressions of new Grain Protection Product Online Workshop 2



In the second part of the interactive questionnaire, participants expressed their perceptions of existing grain protection solutions and a newly developed product. Figure 7 summarises the results for 2x2 matrix questions, it illustrates the centre points as averages of workshop participants' responses for each of the analysed products along with individual responses of each participant represented by the smaller dots.

Figure 7. 2x2 Matrix – Online Workshop 2





Overall, the participants in the second workshop reaffirmed the trends identified in the first workshop. However, in this session, phosphine was ranked higher than deltamethrin, and the overall spread of responses was lower, particularly for phosphine. It is important to note that participants in the second session explicitly mentioned that they should be regarded as indirect stakeholders, and they possess limited knowledge and expertise on grain protection products. Therefore, the results presented for this session should be considered with this limitation in mind.

As mentioned earlier, the limitation regarding respondents' expertise also applies to agree/disagree questions. Consequently, the section covering the psychological construct of Intention was omitted, as the questions were deemed irrelevant for the participants. Nonetheless, these questions served as a solid foundation for in-session discussions, and the results are summarised in Figure 8.

Figure 8. Agree/Disagree questions from Online Workshop 2



4.3 Workshop in Hungary (16/11/2023)

In contrast to the previous online session, the workshop in Hungary took the form of a physical meeting involving actual users of grain protection products, providing a highly practical perspective. Additionally, the results obtained from this session are deemed the most representative compared to others, attributed to the higher number of participants. Important to note that the workshop was done in Hungarian, therefore the results presented below are the translation of the inputs from participants.

Figures 9 and 10 summarise the results to the word cloud questions from the workshop in Hungary. Participants identified three key desired properties, notably efficiency, low cost, and safety. Consistent with participants in other sessions, they conveyed positive impressions of the newly developed product, using key words such as promising, innovative, and interesting.

Figure 9. Word Cloud – Desired Properties in Grain Protection Product Workshop in Hungary

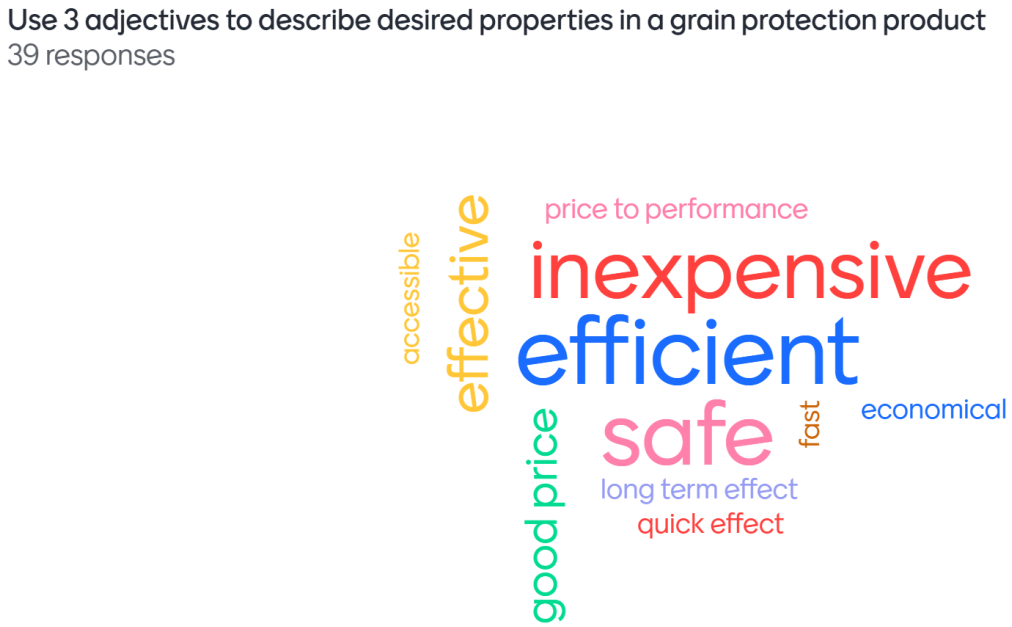


Figure 10. Word Cloud – Impressions of new Grain Protection Product Workshop in Hungary

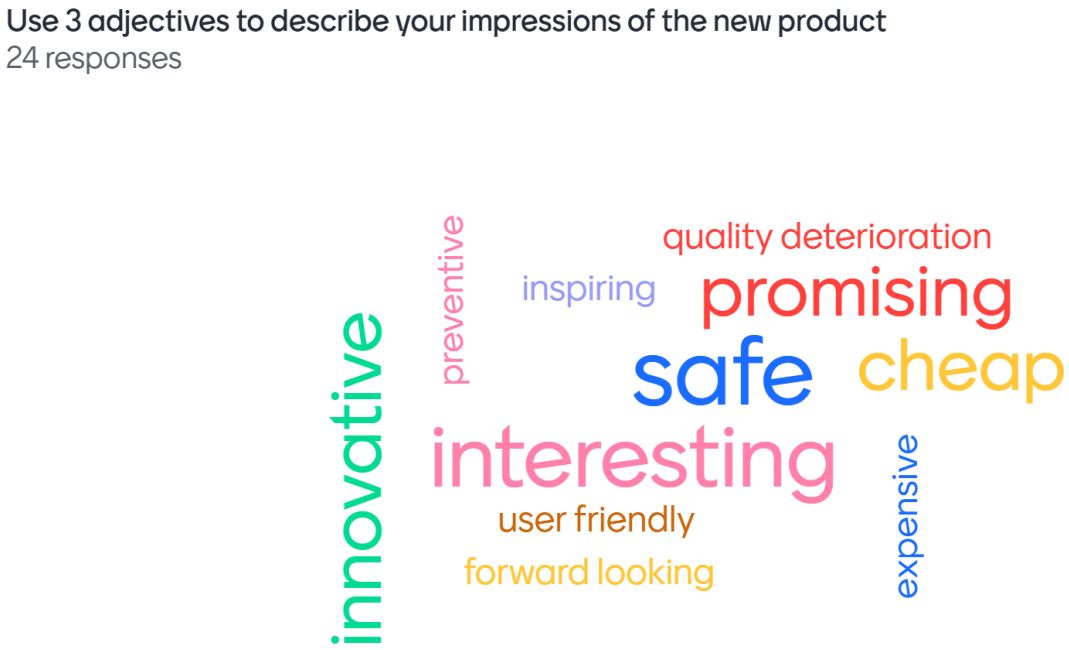
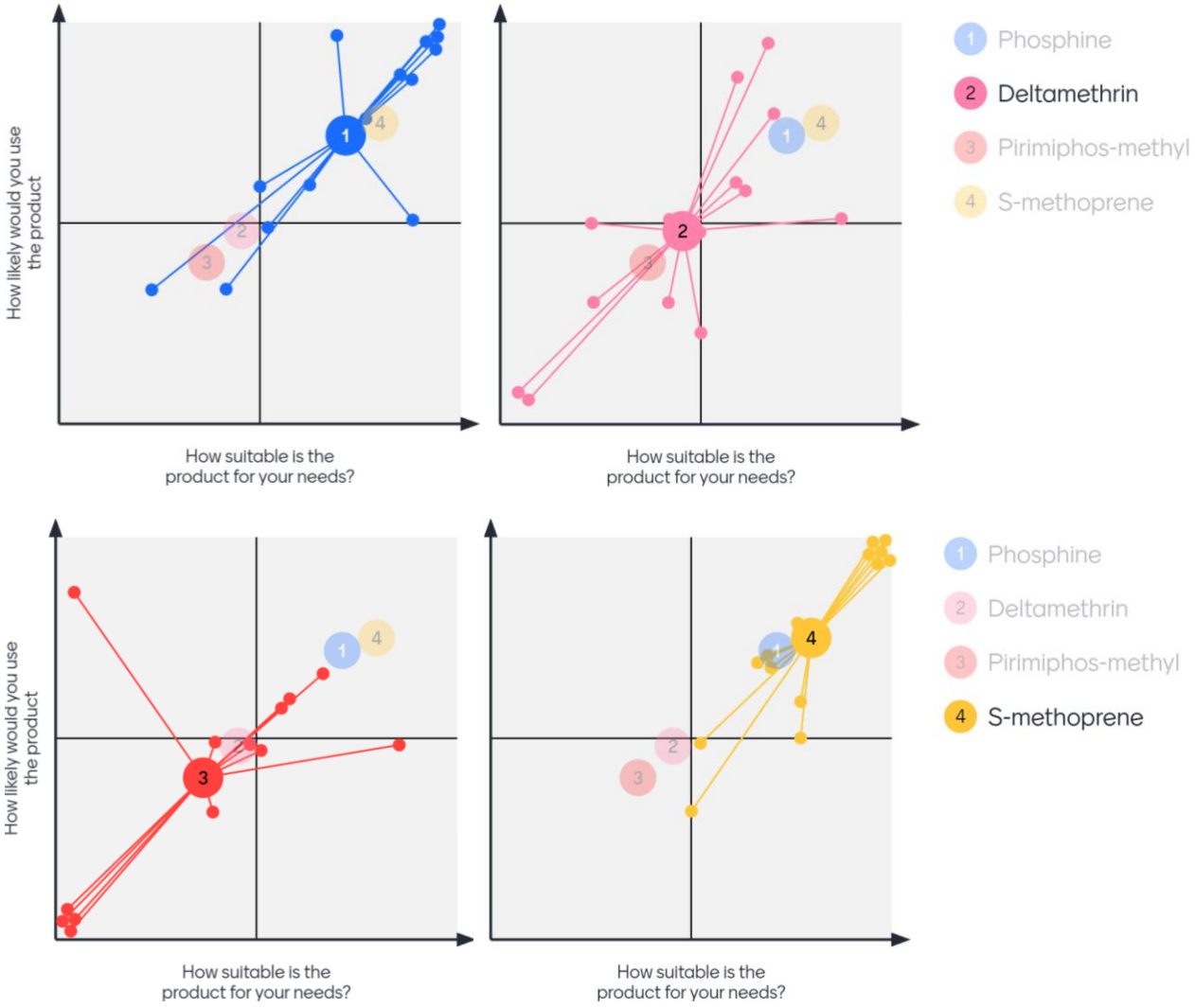


Figure 11 summarises the results for 2x2 matrix questions, it illustrates the centre points as averages of workshop participants' responses for each of the analysed products along with individual responses of each participant represented by the smaller dots.

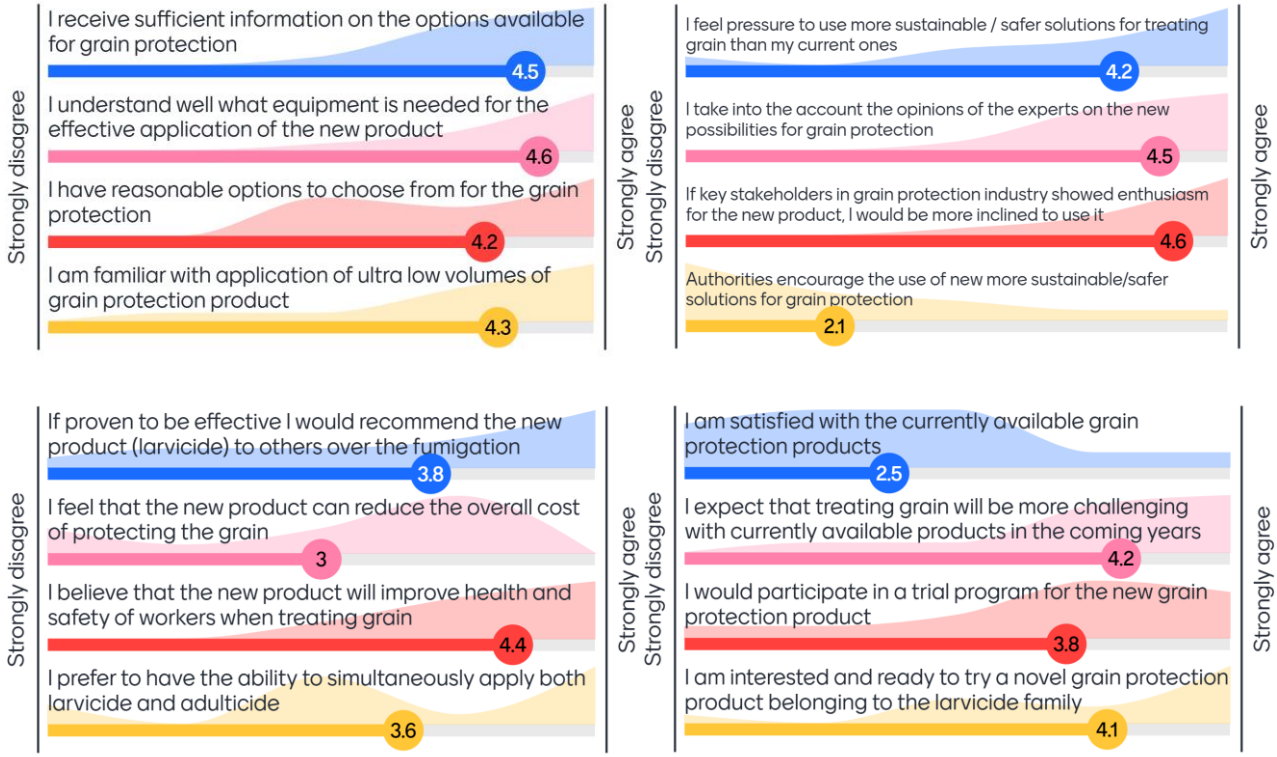
Figure 11. 2x2 Matrix – Workshop in Hungary



Significantly, while the range of responses for all presented products is notably broad, the competitive positions of the different products are defined. Phosphine and S-methoprene are situated closer to the top right corner, indicating a more favourable competitive position compared to deltamethrin and pirimiphos-methyl.

Lastly, the participants responded to the agree/disagree questions. Similarly, to the online workshop 1, the overall answers were rather uniform without much variation and also the similar trends were exhibited. In particular, the participants expressed their dissatisfaction with currently available grain protection products and also highlighted that there is little support from authorities in finding the new solution. Figure 12 summarises the rest of the answers.

Figure 12. Agree/Disagree questions from Workshop in Hungary



4.4 General Conclusions and Outcomes

In summary, three workshops were conducted to gather insights on grain protection products. Key findings include:

1. Desired Properties for Grain Protection Products:
   Participants consistently highlighted effectiveness, ease of use, and low cost as crucial properties for a grain protection product.
2. Impressions of Newly Developed Product:
   Overall, participants had a positive and optimistic view of the newly developed product and its application technology, emphasising its promise.
3. Perceptions of Existing Grain Protection Solutions:
   Evaluation using a 2x2 matrix indicated varying perceptions. Depending on the workshop session, the competitive positions of currently available products were changing, with some participants preferring phosphine over deltamethrin and vice versa. Despite that, the new larvicide based on S-methoprene was ranked very highly, competing well with currently available solutions.
4. Agree/Disagree Questions:
   Participants consistently expressed overall dissatisfaction with current grain protection solutions and limited alternatives to the existing products. Also, participants are clearly looking forward to new products and are ready to be more involved in their development.
5. Comparison Between Workshops:
   Despite a quite diverse group of participants across all workshops, the overall trends and perceptions aligned with slight variation in perspectives. The differences present were regarding the perception of competitive positions of different grain protection products as well as slight variation in desired properties.
6. Limited participation:

The sample of the participants, although sufficient, was rather small, likely the result of busy schedules of potential participants as well as the rather conservative nature of the industry and limited attention to innovative developments.

5 Way forward

As noted before, recruitment and invitation of participants have proven challenging for these workshop sessions. Limited interest among stakeholders is primarily attributed to the product being in its early stages of development, coupled with expected lengthy legal approval procedures, resulting in a distant market availability. Addressing this recruitment challenge requires a strategic approach, potentially involving a shift in the co-creation workshop format, substituting them with either surveys or participation in thematic conferences where relevant stakeholders are already present. The optimal method to address this challenge will be further elaborated upon among members of the consortium, with a discussion scheduled for the consortium meeting in February 2024. This meeting will serve as a platform to explore and decide upon the most effective means to attract and involve participants given the circumstances.

6 Confidentiality / GDPR

During the workshops in 2023 no sensitive or company specific data was shared, only general comments. When registering for the workshops, participants were offered detailed information about the GDPR and the fact that the information shared during the workshop will only be used in light of project purposes. The participants were also informed on how they could object or let their personal data removed from the project's databases.

7 Attachments

- Minutes of each workshop session, including presentations used during the workshops and participant lists.
- Video recordings of the workshops can be requested at contact@novigrain.eu