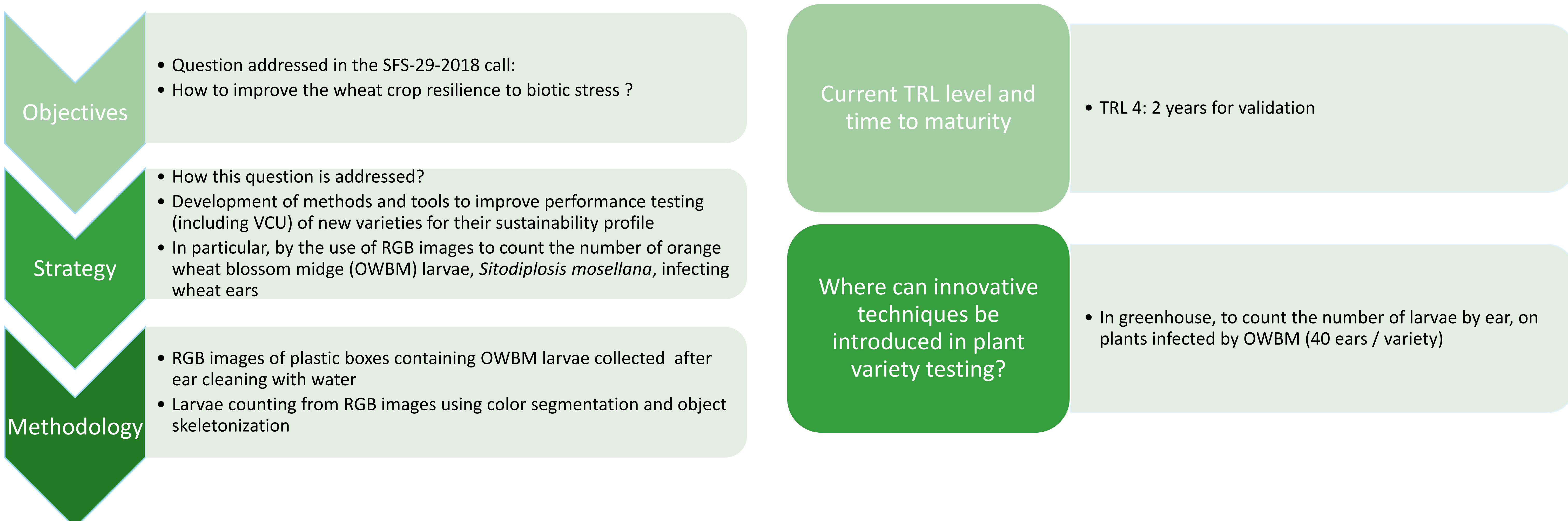


## Counting the number of orange wheat blossom midge (OWBM) larvae on wheat ears using RGB images

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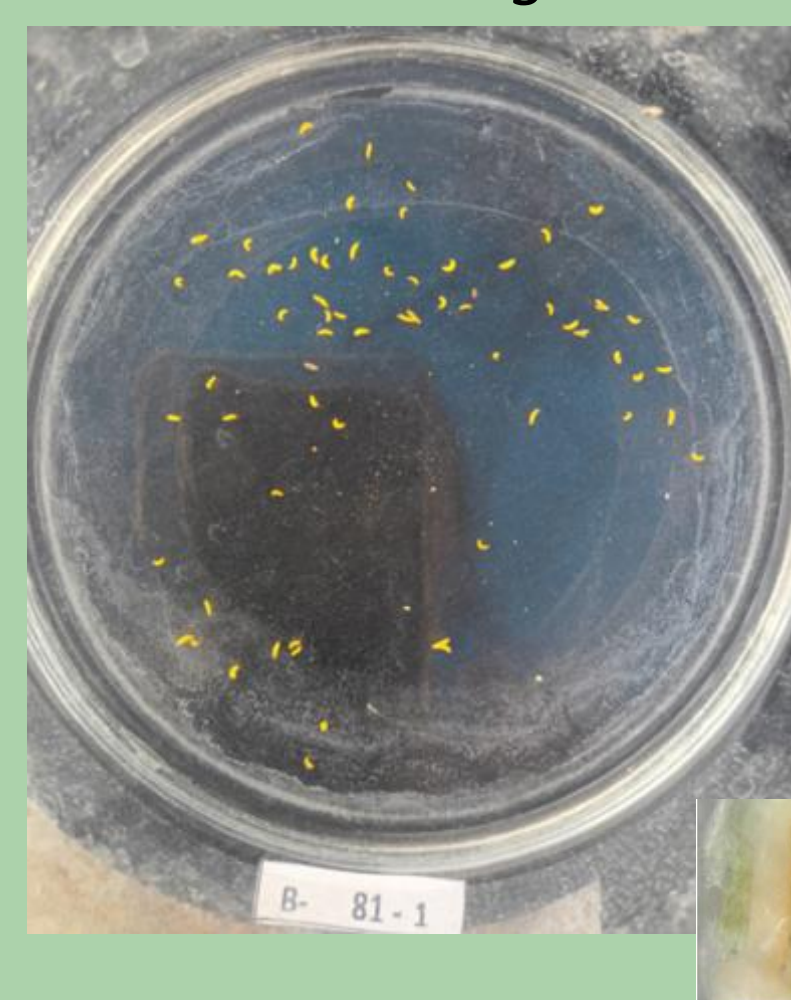


## Results

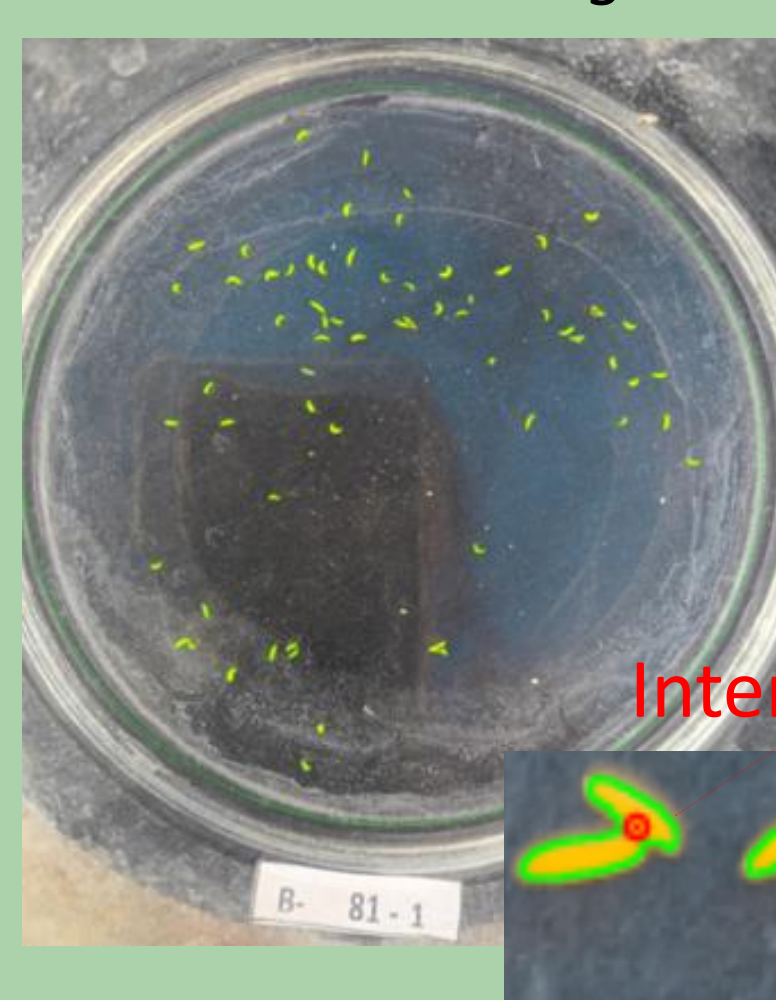
### RGB images

- Collection of larvae by ear cleaning with water, in a plastic box, for 40 ears by variety
- RGB image acquisition for each plastic box
- Larvae counting based on color segmentation and object skeletonization (to identify intersections between larvae touching each other)

RGB image



Predicted image

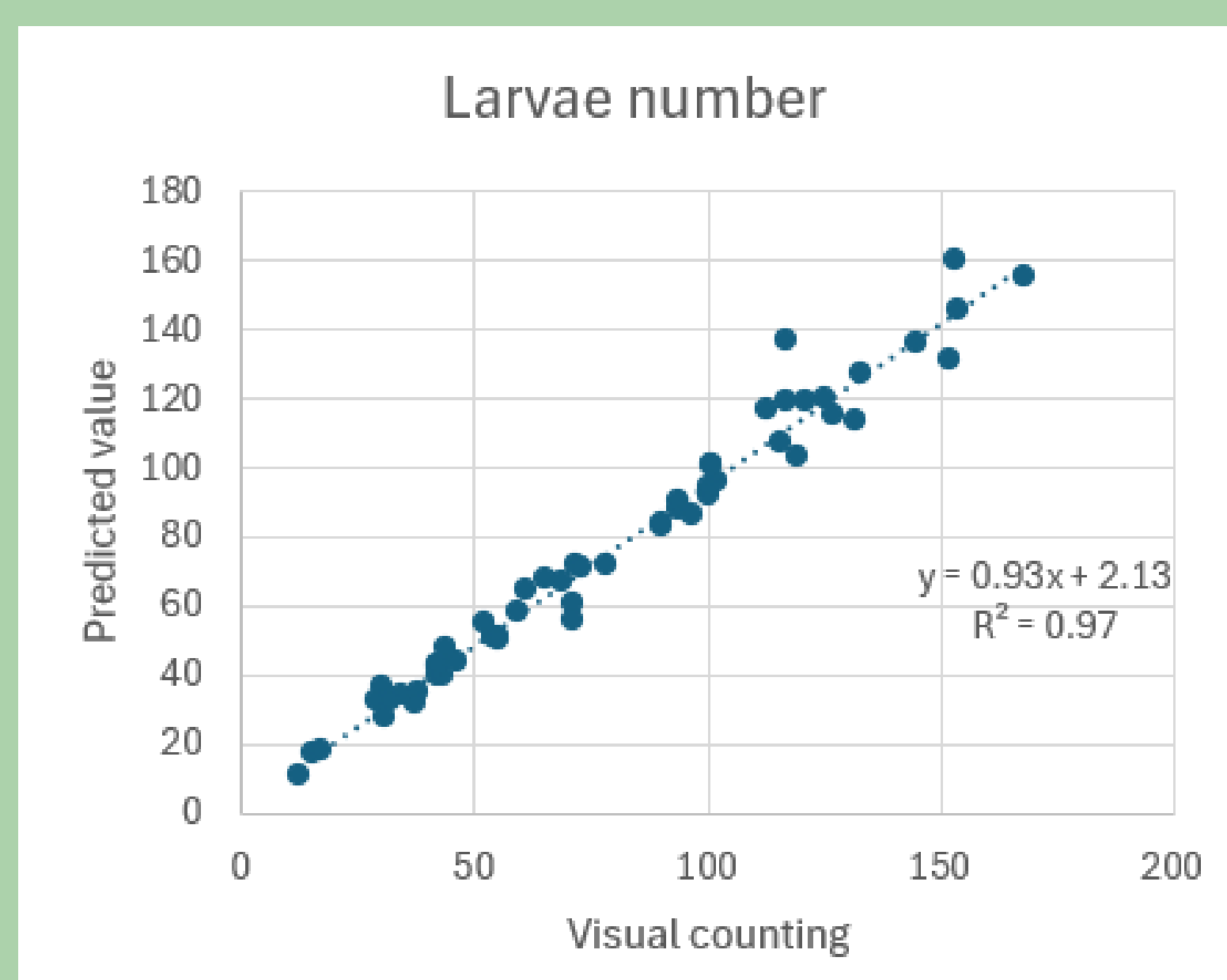


Intersections



### Prediction results

#### Validation on 54 samples



Good correlation between visual and predicted counting from RGB image

#### Classification on 7 varieties (210 samples)

	Larvae/ear for each variety			
	Visual counting	Rank	Pred value	Rank
Var 1	5	1	5	1
Var 2	13	2	14	2
Var 3	24	3	23	3
Var 4	28	4	27	4
Var 5	28	5	28	5
Var 6	31	6	28	6
Var 7	40	7	38	7

Same classification using visual counting or predicted counting from RGB image

## Next steps for an application by OEs or PROs

- Development of deep learning model to solve the counting in a much more robust way
- Validation on a full trial in greenhouse in 2025 and 2026
- Exploration of resistance assessment from NIR hyperspectral images on ears to avoid the ear cleaning process

Annotated image for training a neural network



## Conclusions

- Proof of concept for the use of RGB imaging to replace visual counting has been established for classifying varietal resistance to OWBM larvae;
- A study on wheat plants in greenhouse give similar results using visual counting or predicted counting from RGB image;
- Counting time highly reduced, and counting error risk also reduced, in particular for the susceptible varieties with high number of larvae;
- Storage of RGB images useful when doubtful results.