

Original Article

# Proposal for the Development of a Web Platform to Improve the Attention of Specialized Consultations on Agricultural Practices, 2023

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**Abstract** - The objective of this research is to propose the development of a web platform for specialized consultations to improve the attention to agricultural practices presented by many farmers in our country. The research proposes to use the Java programming language under the object-oriented programming (OOP) paradigm following the Model-View-Controller (MVC) software architecture style. Finally, all the information entered by the web platform is stored in the MySQL database manager. For the project's development, it was decided to use an agile methodology such as Scrum, which was divided in an optimal way in 4 Sprints. All the user stories that were obtained according to the needs presented were captured and covered during the development of the project, which allowed obtaining the best guidelines for the proposal of the web platform; finally, to guarantee the final proposal, surveys were conducted and the consistency was measured for its degree of reliability by applying Cronbach's Alpha, which provided a result of 0.924 reliability; thus, the proposal is validated in a satisfactory manner for the benefit of agriculture.

**Keywords** - Agricultural practices, Agriculture, Web platform, Java, Scrum.

## 1. Introduction

At present, farmers find it difficult to obtain specialized advice directly to correct their inadequate agricultural practices because they have little professional training to improve their crops and perceive the Peruvian government's abandonment of their needs, according to a study by the National Agrarian Confederation (CNA) [1]. Farmers in Peru do not feel sufficiently trained and perceive that they do not have the support from the State to improve their empirical practices in their crops.

Thus, it is necessary to consider that farmers should not only be trained to produce quality products suitable for human consumption; also, conservation and the surrounding environment must be considered. In Colombia, according to Gutiérrez, Serra and Dussan [2], among the critical aspects they consider to implement good agricultural practices is environmental awareness because this allows them to prevent the contamination of their crops and the soils where they work. Therefore, it is important to know the correct way to work the land according to the different crops.

The aforementioned problem is caused by the fact that farmers do not have a place where they can get professional

advice to alleviate their doubts and improve their cultivation methods. In addition, professional agronomists do not visit the country's interior very often because they are not very accessible. Likewise, there are not many channels for direct contact and interaction between farmers and agronomists, which makes it difficult to obtain specialized advice.

In this sense, it is necessary and urgent for farmers to have better knowledge of good agricultural practices that allow them to improve the quality of their crops. According to González and Rodríguez [3], in Argentina, the application of quality agricultural practices is scarce, which conditions and puts at high risk the good quality that their products should have.

Likewise, Somoza, Vazquez and Zulaica [4] indicate that good agricultural practices are essential to achieve responsible agriculture with control over all the processes involved. Therefore, it is necessary to give it the priority it deserves and provide tools to mitigate or minimize the consequences that can be generated by bad practices in crops.

According to Peris, Roselló and Añó [5], the consequences of not addressing this problem are reflected in the continuity of



inefficient cultivation practices that generate the improper use of chemicals, resulting in possible environmental alterations that can affect the products and the soil that is cultivated.

Therefore, the objective of this research is to develop a proposal for the development of a web platform for specialized consultations to improve the attention on agricultural practices that provide those involved, farmers and agronomists, with a tool where they can consult their doubts and obtain advice and tips on best practices.

## 2. Literature Review

This research describes farmers' difficulties in obtaining specialized advice to guide them on the best practices for their crops and the importance of having a means that facilitates them to meet this need. For this reason, the research proposes the importance of developing a specialized web platform to serve as a connection between farmers and agronomists since agronomist specialists do not frequently visit the interior sectors of our country due to the fact that they are not very accessible. In addition, it is considered of great importance the need to have training on the use of technologies such as web platforms in the various areas of the rural sector located in the country's most remote areas. Likewise, according to Ramirez and Blanco [6], it is important to mention that younger age groups take advantage of the intuitive designs of programs and applications to quickly adopt the use of digital technologies, which will speed up the learning process of using web platforms and help train their older relatives who may have difficulties in the use of these platforms.

In order to delimit the research topic, the methodologies used in previous research by various authors on the subject are analyzed. In the beginning, a descriptive methodology was found that uses statistical sources from a governmental entity in order to collect relevant information which highlights the percentage of the population that benefits from the positive impact of good agricultural labor productivity in the family economy of farmers thanks to the training they receive, this according to the author Tello [7].

This type of research is carried out to obtain statistical data that allow the evaluation of different aspects of the topic, from which significant criteria can be used to reinforce the research topic. In this sense, Tello [7] refers to his methodology in the importance of statistics to be able to divide the topics and statistical data into different sections that allow focusing on each point of the research analysis so that the structure and message are clear.

Likewise, three authors coincide in using descriptive methodologies based on the use of questionnaires with a quantitative perspective that allows measuring in quantities certain criteria, such as the size of the population in favor or against the training proposal to be received Lizzoni, Feiden and Feiden [8], the use of direct interviews with those

involved to obtain real information, objective and first source information that allows a better understanding of the topics of analysis in order to give importance to the opinions of the people directly involved in the research study AgroEnfoque [9] and the combined use of these two techniques that allowed, first, to have a clearer approach to the situation, and second, to conduct interviews based on all the answers that were collected in order to deepen those critical aspects for the research, this according to the authors Bedoya, Aramburú and Burneo [10].

The methodologies described in the previous paragraph are carried out with the aim of establishing a direct connection with the people involved to obtain accurate information proper to the reality faced by these actors, who are part of the research in which the difficulties they present with the training are revealed. On the one hand, the authors Lizzoni, Feiden and Feiden [8] propose questionnaires with a series of questions relevant to the research that will allow them to obtain quantitatively the details they want for later analysis.

On the other hand, the journal AgroEnfoque [9] uses a more direct method by conducting personal interviews in which they not only obtain statistical data but also obtain the experience and real situation of the place and the perspective they give in their answers to carry out a better analysis on aspects of feelings generated by the problems of the research topic. Likewise, the authors Bedoya, Aramburú and Burneo [10] combine these two techniques to have a greater scope and reinforce their statistical data obtained in the survey with the points of view and perspectives according to the appreciation of the interviewees to encompass their analysis criteria.

Also, methods focused on the authors' own empirical knowledge were found, which is based on the explanation of the problems that arose during all the periods of the agricultural sector in Peru and their own experiences that allowed them to analyze and compare the relevance of a specific aspect in the agricultural sector, such as the correct use of pesticides. These three agricultural stages presented good and bad moments that marked the importance of knowledge and training on the correct use of agricultural tools to have a better management and performance of the procedures carried out and not to generate a negative impact on the cultivated land, according to Cueva [11].

Following this approach, the importance that should be given to agronomic specialists is also discussed since they play a fundamental role in good cultivation practices and training that farmers should receive, which is why the author Calderón [12] considers it necessary to have a college of agronomists that enhances the commitment of specialists to provide better training in this sector so that farmers can receive advice and be better prepared in the use of different cultivation methods to improve their productions.

In this context, farmers need to be able to receive training from specialists in the field to resolve any doubts they may have in the management of their crops in order to improve their production and care for the environment. In this regard, Bedoya, Aramburú and Burneo [10], in their article on the unsustainability of agriculture, indicate that farmers living in the interior of the VRAE (Apurímac and Ene River Valley) have shown that the excessive use of soils, uncontrolled management of agrochemicals with advanced technology in these plantations and poor crop control associated with empirical practices are the cause of the great abundance of ferns and unfavorable plantations in crops that increase over the years. The article shows that training is a necessary and urgent issue to improve farmers' knowledge in these issues of interest, not only to improve their crops but also to minimize the side effects that compromise the soil they work.

In addition, the authors Gurrionero and Mallqui [13] mention that the lack of knowledge and training of farmers related to the improvement of their crops and production have led many farmers to sink into poverty and underdevelopment because they continue to use obsolete and ineffective techniques for the productivity of their crops. In other words, farmers need to have knowledge of effective cultivation techniques. This shows how important it is to have a means that allows farmers to obtain training or at least clear up any doubts they may have about improving their crops, not only for their own benefit but also for the benefit of the region.

On the other hand, it should be noted that adopting new techniques and skills due to the training received has a positive influence on new opportunities and alternative solutions to the difficulties that farmers may face in the

agricultural sector. They also positively impact the development of their family life since better training enables them to apply better techniques to their crops and therefore have better products in greater market demand.

Finally, in terms of training and advice, according to the research, it is urgent to propose a solution based on the design and development of a web platform that facilitates specialized attention to farmers, especially in the San Martin region, because this region has a percentage of 55% of the economically active population that is dedicated to OGEIEE agriculture [14].

It should be mentioned that some entities schedule any training they receive. Still, these are carried out infrequently and according to their availability, which leaves a gap between the technical limitations of farmers with the lack of knowledge to manage some difficulties they face in their crops, such as pests or more effective methods. Therefore, in view of the research highlighting the importance of training, it is necessary to have the means to obtain these advisories at any time and from anywhere.

### 3. Methodology

Ruiz [15] mentions that Scrum is a process which adapts to a set of good practices to work in teams and achieve the best result. It is based on implementing products/services through an incremental and iterative process involving customer validation of the value achieved with the changes made [30]. In other words, it is an agile framework that works in small teams with the objective of delivering products with value in a short period of time.

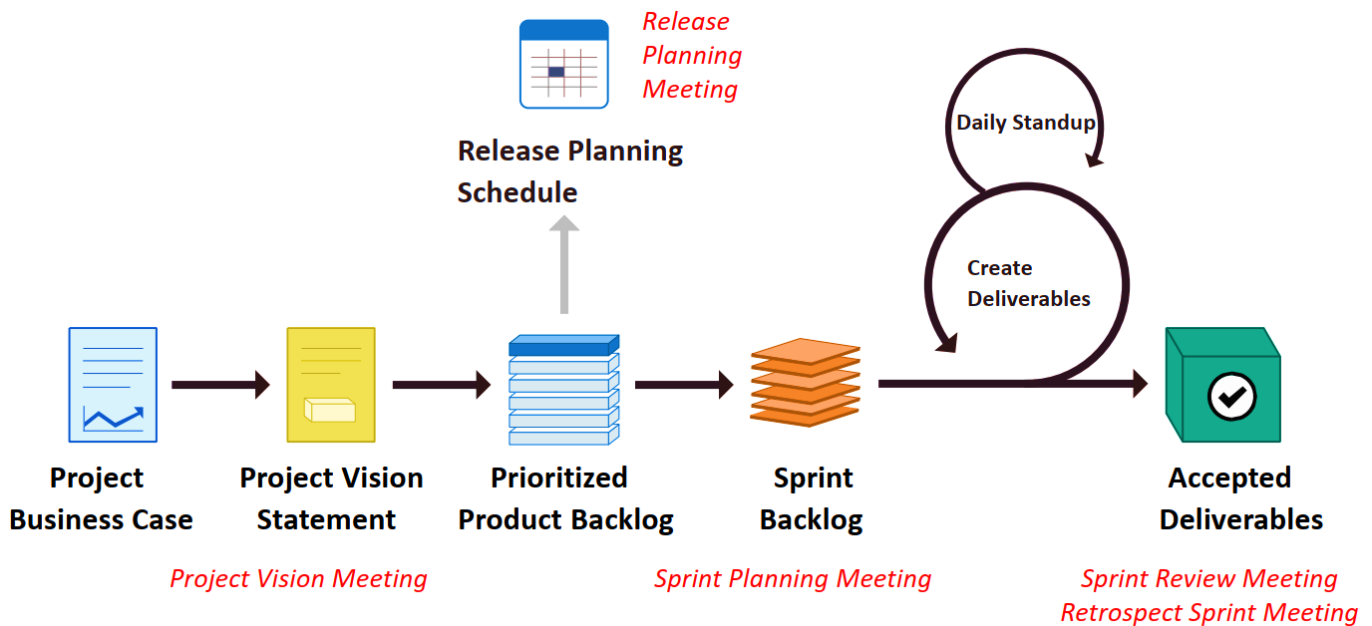


Fig. 1 Scrum's elements

### 3.1. Scrum

#### 3.1.1. Scrum Principles

According to the SBOK guide [17] mentions that the principles are 6 and are non-negotiable since they must be applied as described in the framework presented because they will help to have a better guide during the development of the projects.

The principles that Scrum establishes are the following:  
*Empirical Process Control*

It is focused on three important points. In the first place, there is transparency that is transmitted through the scrum instruments or within the sessions that are carried out with the team. On the other hand, we have the inspection, which is given at the time of collecting the necessary information for the development of epics, as well as in the review and approval of deliverables with stakeholders. Finally, we have the adaptation which occurs as we work with transparency and inspection; we can analyze improvements to be made.

#### *Self-organization*

Aimed especially at workers, since it is intended, they can have greater participation with the team, which will allow them to have the motivation and shared commitment.

#### *Collaboration*

Focused on three important points related to collaborative work, these are represented in awareness, articulation and ownership. Likewise, working under these dimensions will help mitigate project risks, increase efficiency and generate continuous improvement.

#### *Value-based Priorization*

The objective of this principle is to deliver to the customer a product or service with value in a continuous and timely manner, taking into account factors such as value, risk and dependencies.

#### *Time-boxing*

Describes the time to be considered for each deliverable, so team members should estimate times well. This will allow them to reduce overhead and have an efficient development process.

#### *Iterative Development*

It allows the creation of products that meet customers' needs so that customer requirements are written in user stories to develop them since the aim is to offer the maximum commercial value of the product requested by the customer in the shortest possible time.

#### 3.1.2. Scrum Artifacts

Scrum artifacts, according to authors A. Navarro, J. Fernandez and J. Morales [18], are by-products that are broken down from the activities performed in the framework that allows transparency during the project duration.

Likewise, K. Schwaber and J. Sutherland [19] add that artifacts are designed to maximize information transparency so that all personnel have the same understanding of the information.

The artifacts, according to The SBOK Guide [17], are:

#### *Product Backlog*

It is a list of what is needed in order to improve the product that defines the product objective.

#### *Sprint Backlog*

It is a plan developed for the Development team that shows the progress in real-time of what is planned to be done and the activities already performed. The Sprint Backlog is updated throughout the project sprint.

#### *Increment*

These are the functional technical deliverables obtained in each sprint that meet the minimum acceptance criteria, which allows obtaining initial versions of the general requirement, which are complemented during each sprint.

#### 3.1.3. Scrum Events

Scrum Events allow to organize and minimize the needs of meetings that have not been defined [20].

The SBOK Guide [17] indicates 5 events:

#### *Sprint*

These are events that have a fixed duration, usually one month.

#### *Sprint Planning*

It is the meeting that takes place at the beginning of each sprint in which it is made known why this sprint is important, what activities will be performed and how they will be performed.

#### *Daily Scrum*

These are 15-minute meetings in which progress is reviewed, and further developments are coordinated.

#### *Sprint Review*

A meeting between the Scrum Team and the project stakeholders normally takes 4 hours for one-month Sprints in which the Sprint results are presented and analyzed by the stakeholders.

#### *Sprint Retrospective*

These are meetings that take place at the end of a Sprint and have a duration of approximately 3 hours for Sprints of one month. In these meetings, the whole Scrum team meets and analyzes the problems that may have existed and the successful ways that were given to correct or maintain in the next Sprints.

#### 3.1.4. Scrum Roles

**Product Owner:** He is responsible for achieving the maximum business value for the project and communicating the customer's requirements. In addition, he/she is the one who indicates the priorities of the to-do list, provides the acceptance criteria and reviews the deliverables.

#### *Scrum Master*

Is the one who ensures that the Scrum Team has all the means to carry out the Sprints, coordinating activities and resolving possible impediments that may arise. He also ensures that everyone involved follows the Scrum methodology guidelines.

#### *Scrum Team*

They are formed by a team of 6 to 10 members in a multifunctional and self-organized way with the autonomy of development during the sprint that is in charge of taking forward the technical and functional part of the project.

#### 3.1.5. Scrum Phases and Processes

Scrum processes define the activities to be performed during a Project. The following authors [21] describe the following processes:

#### *Initiate*

The initial phase of this methodology consists of defining the vision of the project to be implemented. Also, the scrum master and other interested people are identified, and then, with the support of the scrum master, the scrum team is formed, which will carry out the project's development. In addition, the epics are identified, taking into account the user's requirements. Likewise, the backlog is developed where priority is given to the epics to be developed. Finally, a planning schedule of versions and stages to be delivered to the interested parties is developed.

#### *Plan & Estimate*

This phase contemplates as the first point the description of User Stories and acceptance criteria that each epic will contain. Secondly, with the support of the scrum master, the team performs the estimation of each user story. In addition, a commitment is made to delivering user stories approved by the product owner for Sprint. Also, the tasks to be performed in each User Story committed for delivery are identified; after identifying these tasks, the estimate for each is performed. Finally, the Sprint backlog must be updated.

#### *Implement*

The scrum team starts with developing the tasks of each committed user story to complete the deliverables in the established time. This phase is done through sprint in which they create deliverables according to the established priorities. These advances are monitored through Daily Meetings in which advances and problems are identified, and each scrum team member expresses what they did, what they planned to

do and the problems they had. In this way, the team generates value for the product during each sprint.

#### *Review & Retrospect*

This phase is performed at the end of each sprint since the deliverable generated during the sprint must be presented to the Product Owner to validate the product based on the established acceptance criteria. In addition, a retrospective meeting is held to analyze the difficulties encountered during the sprint and the ways to deal with them in the next sprint.

#### *Release*

This phase is based on delivering the final product to the client with all the functionalities based on the user stories. It also involves the delivery of functional, technical and product acceptance documentation. On the other hand, a meeting is held between the scrum team called Project Retrospective. The strengths and weaknesses are analyzed throughout the project to seek continuous improvements that can generate best practices.

### 3.2. Software Development Tools

#### 3.2.1. Netbeans

Netbeans is an OpenSource development environment that is used free of charge by the general public so that they can develop different web applications or desktop applications on different operating systems and with different programming languages, the most popular being Java and Html [22].

#### 3.2.2. MySql Workbench

MySql is one of the free visual tools for programmers and database administrators to perform design, development, and object management of the entire database [23].

#### 3.2.3. Java

According to the official Java website, Java is a computer programming language platform that allows the creation of desktop and web services and applications. Likewise, Barrón and Stansifer [31] indicate that Java is the most widely used programming language in the world by developers due to the power of its language and reliability.

#### 3.2.4. Html

According to Endredy and Novak [25], it is a set of various tags that serve to determine the form and design of the presentation of text, page divisions and other elements of the page. He also mentions that this type of "language" is used so that browsers can display web pages to users.

#### 3.2.5. CSS (Cascade Style Sheets)

It is a language that allows the styling of web page presentations. In addition, according to the authors [26] it is pointed out that CSS is used to format and style almost all elements within a web page, such as tables, letters, images,

and buttons with different colors, sizes, and layouts, among other styles.

3.2.6. JavaScript

Citing Sprimont and Ricci [27], JavaScript is a language that allows the creation of dynamism in web pages since they are embedded within HTML pages. It is also claimed to be one of the most powerful, widespread and flexible programming languages currently available.

3.3. Software Architecture

This project works under a 3-layer architecture, which will allow us to organize our components in 3 independent levels such as user layer, application layer and database layer.

3.4. BD Physical Model

The diagram below shows the database objects, specifically the tables, and the relationships between each one of them, in order to show the relationships that exist based on their primary and secondary keys.

3.5. Solution Development

3.5.1. Definition of the Scrum Team

The following table details the people that make up the Scrum Team, Scrum Master and Product Owner.

Table 1. Scrum Team

Role	Abbreviation	Names and Lastnames
Scrum Master	SM	Laberiano Matias Andrade Arenas
Product Owner	PO	Miguel Angel Cano Lengua
Quality Analyst	QA	Mirian Medali Castañeda Berrú
Developer	DEV	Anthony Carlos Montañez Ayala

3.5.2. Requirement's Identification

The following table shows all the prioritized requirements.

Table 2. System requirements

Requirement	Description	Priority
RQ001	Login with username and password.	12
RQ002	Password recovery.	6
RQ003	Unlock the user account.	6
RQ004	Register as a Farmer or Agronomist.	12
RQ005	Access the modules according to the role.	12
RQ006	List Registered Agronomists.	12
RQ007	Contact an agronomist internally.	8
RQ008	Posting in the forum.	10
RQ009	Make comments in the forum.	10
RQ010	Receive alerts when the publication has a response.	5
RQ011	View links to news related to agriculture.	3
RQ012	Perform platform maintenance (Administrator).	4

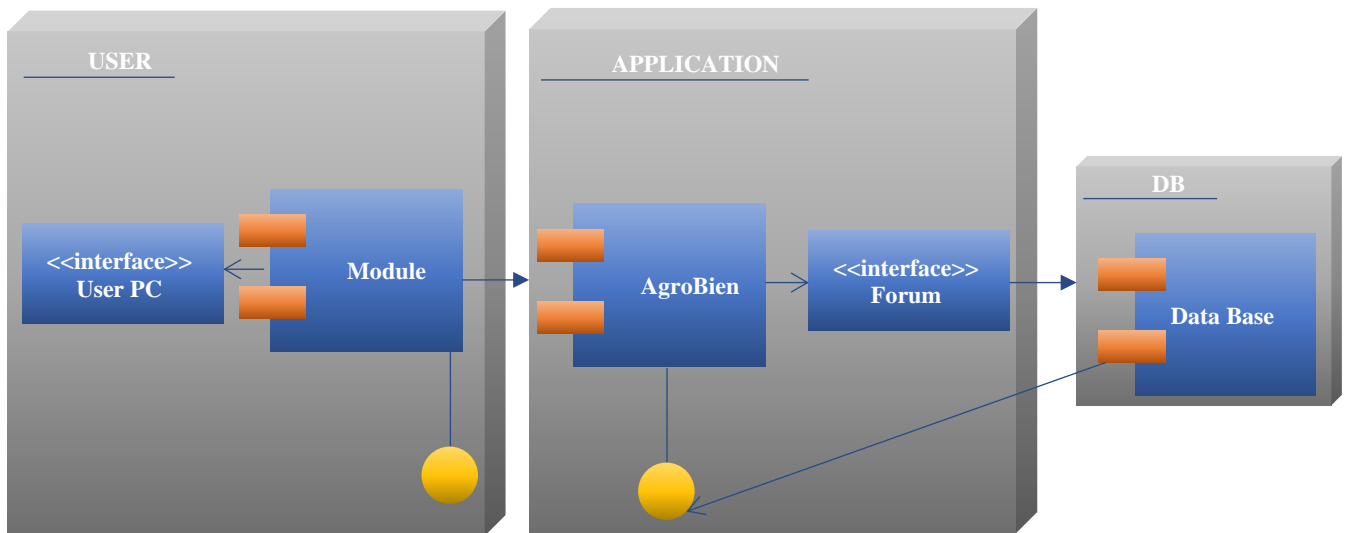


Fig. 2 Software architecture

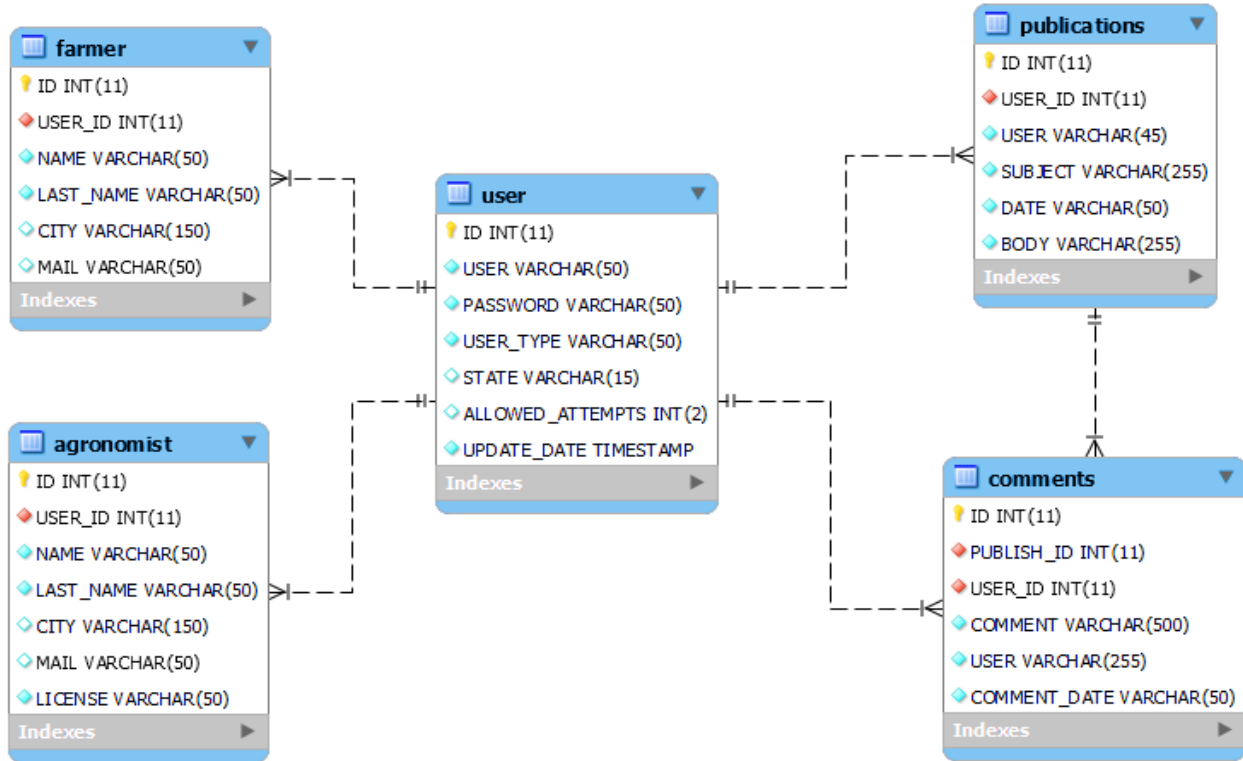


Fig. 3 Physical database model

3.5.3. Sprint Planning (User Stories)

Based on the requirements identified, we start with the

definition of the user stories so that they can be prioritized and structured in the project's sprint.

Table 3. User stories

Code	User Stories	Priority
HU001	As a user, I can enter the Registration module to register as a user with the role of the farmer.	5
HU002	As a user, I can enter the Registration module to register as a user with the role of an agronomist.	5
HU003	As a Farmer or Agronomist user, I can enter the Login of the web platform to log in.	4
HU004	As a farmer user, I can access the platform with my username and password to view the forum, news and agronomists modules.	3
HU005	As an agronomist user, I can access the platform with my username and password to view the forum and news modules.	3
HU006	As a farmer user, I can see a list of registered agronomists so that I can contact them directly.	2
HU007	As a Farmer or Agronomist user, I can log in to display the Forum module.	2
HU008	As a Farmer or Agronomist user, I can enter the Forum module to make publications.	5
HU009	As a Farmer or Agronomist user, I can enter the Forum module to make comments on publications.	5
HU010	As a Farmer or Agronomist user, I can enter the password recovery option to send a link to the email and reset the password.	3
HU011	As a Farmer or Agronomist user, I can enter the option to unlock an account by sending a link to the email and unlocking the password.	3
HU012	As a Farmer user, I can enter the agronomist module and select an available agronomist to contact via email.	5
HU013	As a Farmer or Agronomist user, I can log in to the Forum posts to receive notifications when my posts have comments.	3
HU014	As a Farmer or Agronomist user, I can log in to display the News module.	3
HU015	As a Farmer or Agronomist user, I can log in to the News module to view current news related to agriculture.	3
HU016	As an Administrator user, I can log in to perform maintenance on the platform.	5

3.5.4. Sprints

The Sprints considered for this project and each User Stories they include are detailed below. Likewise, the duration for each of the Sprints is identified.

Table 4. Sprints

Sprint	User Stories	Duration
Sprint 1	HU001, HU002, HU003, HU004, HU005, HU006	15 days
Sprint 2	HU007, HU008, HU009	15 days
Sprint 3	HU010, HU011, HU012, HU013	15 days
Sprint 4	HU014, HU015, HU016	15 days

3.5.5. Development of each Sprint

Sprint 1

During Sprint 1, the registration module, the Login module, module visualization by roles and the list of registered agronomists will be developed.

Table 5. User stories sprint 1

User Stories	Score
HU001 - As a user, I can enter the Registration module to register as a user with the role of the farmer.	5
HU002 - As a user, I can enter the Registration module to register as a user with the role of an agronomist.	5
HU003 - As a Farmer or Agronomist user, I can enter the Login of the web platform to log in.	4
HU004 - As a farmer user, I can access the platform with my username and password to view the forum, news and agronomists modules.	3
HU005 - As an agronomist user, I can access the platform with my username and password to view the forum and news modules.	3
HU006 - As a farmer user, I can see a list of registered agronomists so that I can contact them directly.	2

Sprint 2

In the development of Sprint 2, the development of the Forum module is contemplated. Likewise, the development of the functionality for the publication of forums and comments to published forums is also contemplated.

Table 6. User stories sprint 2

User Stories	Score
HU007- As a Farmer or Agronomist user, I can log in to display the Forum module.	2
HU008 - As a Farmer or Agronomist user, I can enter the Forum module to make publications.	5
HU009 - As a Farmer or Agronomist user, I can enter the Forum module to make comments on publications.	5

Sprint 3

For the development of Sprint 3, the functionalities of password recovery, account unlocking, contact agronomist and notifications are contemplated.

Sprint 4

In the development of Sprint 4, the functionalities of the News module, external links and the administrator module are developed.

Table 7. User stories sprint 3

User Stories	Score
HU010 - As a Farmer or Agronomist user, I can enter the password recovery option to send a link to the email and reset the password.	3
HU011- As a Farmer or Agronomist user, I can enter the option to unlock an account by sending a link to the email and unlocking the password.	3
HU012 - As a Farmer user, I can enter the Agronomist Listing module to contact an agronomist directly.	5
HU013 - As a Farmer user, I can receive notifications when my post has been commented on so I can read suggestions in time.	3

Table 8. User stories sprint 4

User Stories	Score
HU014 - As a Farmer or Agronomist user, I can log in to display the News module.	3
HU015 - As a Farmer or Agronomist user, I can log in to the News module to view current news and organizations related to agriculture.	3
HU016 - As an Administrator user, I can log in to perform platform maintenance.	5

4. Results

4.1. Results by Sprint

The main activities for each sprint and the most important deliverables obtained in each of the Sprints are detailed.

Sprint 1

Figure 4 shows the screen that users who wish to register with the role of Farmer or Agronomist will be able to see, which will allow them to enter the required information in each field and then register and save it in the database.

The screenshot shows a registration form with the following fields: Name (Leonardo), Type (Farmer), Last Name (Carranza), Username (leonardo.carranza), Mail (leonardo@gmail.com), Password (masked with dots), and City (Lima). A 'Register' button is located at the bottom right. The form is titled 'Register' and has a notification icon in the top right corner.

Fig. 4 - Registration Form



Log in with your username and password.

User  
Username

Password  
Password

Log in

[Forgot your password?](#)

**Fig. 5 Login Form**

Figure 5 shows the Login screen, which has 2 fields, username and password. It also has a login button which validates the credentials entered. It also has an additional option to recover the password.

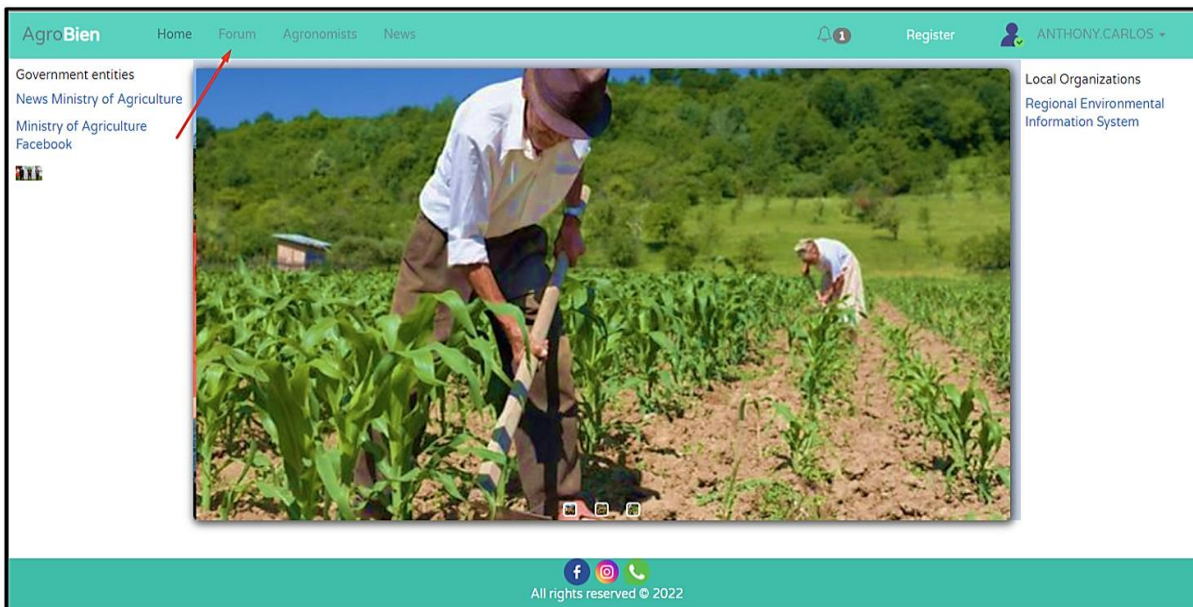
Figure 6 shows the list of agronomists that have registered so far on the platform. It shows the main data and an option to contact you via email.

*Sprint 2*

Figure 7 shows the screen with the Forum option enabled. This option is visible to registered and unregistered users, but only registered users can post.

N°	NAME	LAST NAME	CITY	MAIL	CONTACT
1	MIRIAN	CASTAÑEDA	LIMA	MIRIANCASTAXEDA.2014@GMAIL.COM	
2	JUAN	HUAMAN	LIMA	JUAN@GMAIL.COM	
3	MIGUEL	ANGEL	LIMA	MIGUEL@GMAIL.COM	
4	LUIS	ORTIZ	LIMA	LUIS@GMAIL.COM	
5	CARLOS	MILLA	LIMA	MILLA@GMAIL.COM	

**Fig. 6 Agronomist Listing Screen**



**Fig. 7 Screen showing the Forum option**

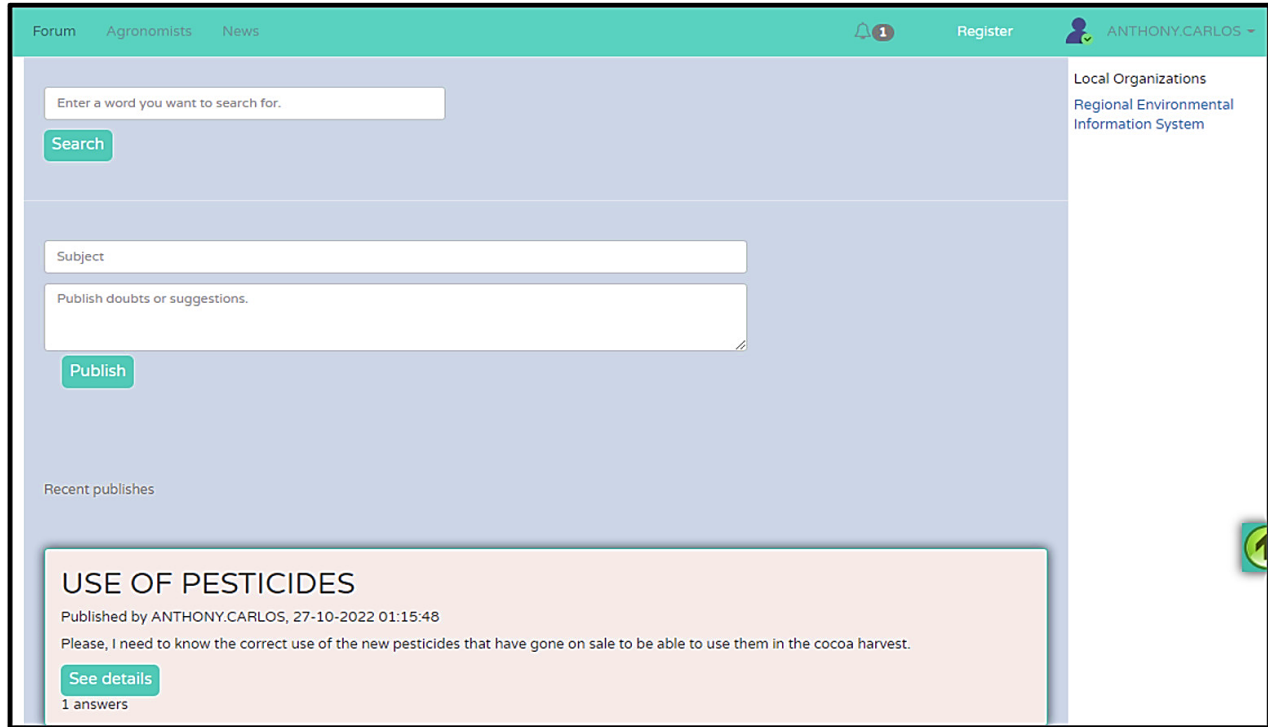


Fig. 8 Forum screen for posting

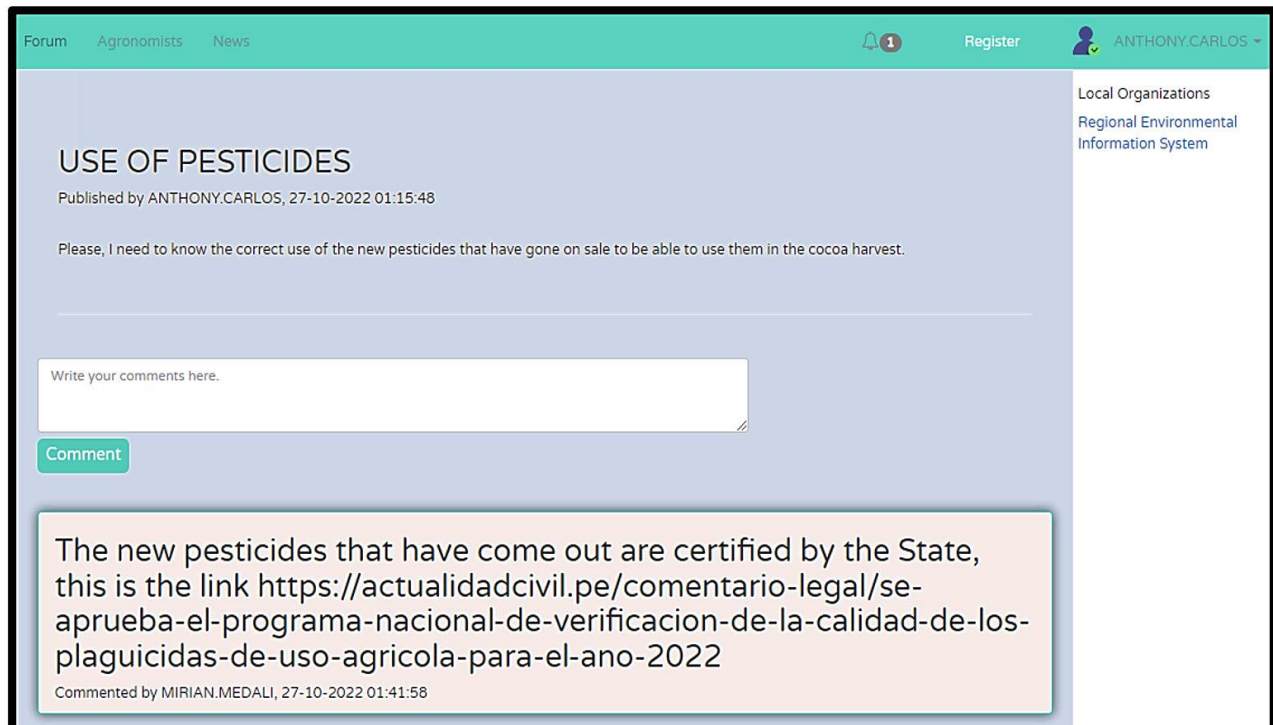


Fig. 9 Forum commenting screen

Figure 8 shows the Forum screen for users to make posts. It also shows the details of the user who published it and the date of publication where the main subject and the detail can be seen.

Figure 9 shows the Forum screen for users to comment on posts. It also shows the user making the comment and the date of the comment.

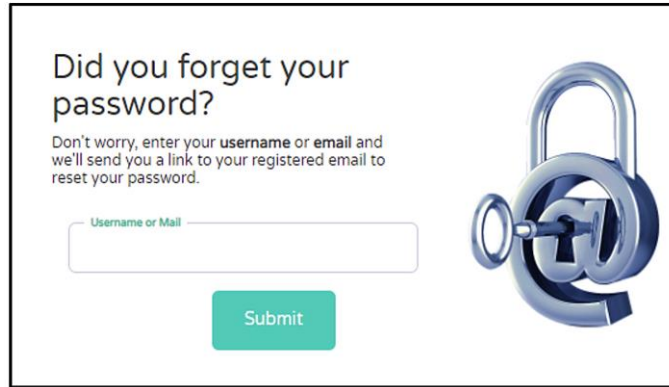


Fig. 10 Password recovery screen

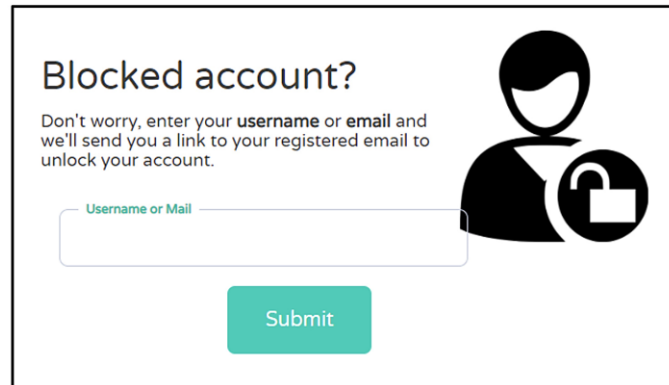


Fig. 11 Account unlock screen

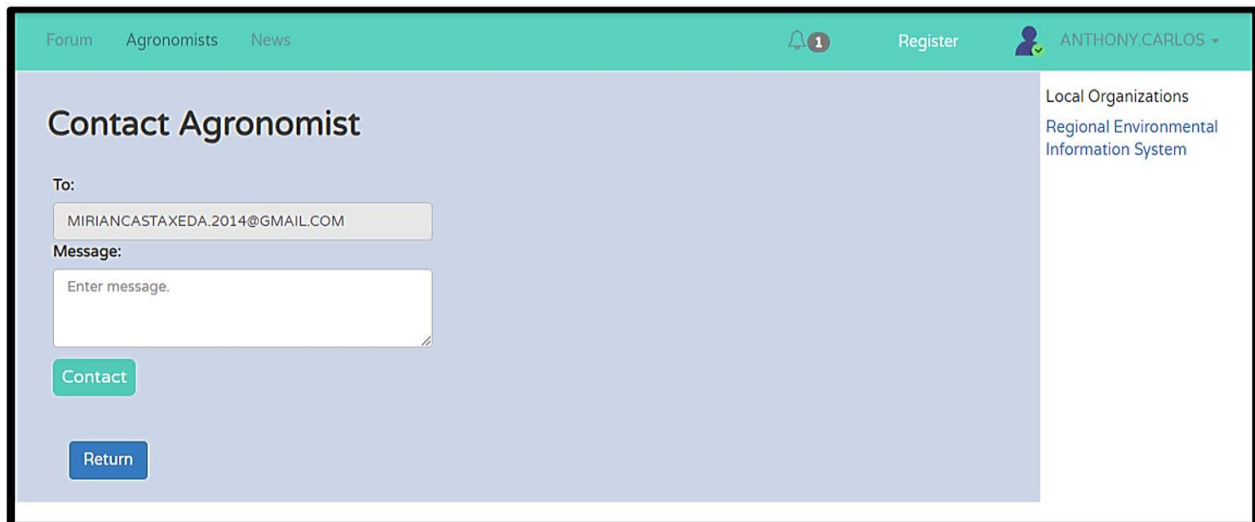


Fig. 12 Screen to contact an agronomist

### Sprint 3

Figure 10 shows the screen that allows an email to be sent to the user with a link to reset their password.

Figure 11 shows the screen that allows an email to be sent to the user with a link to unlock their account.

Figure 12 shows the screen in which the agronomist is contacted directly through his registered email address.

### Sprint 4

Figure 13 shows the News module screen and external links related to agricultural issues.

Figure 14 shows the display of the web pages that are opened from the images or external links found within the news module.

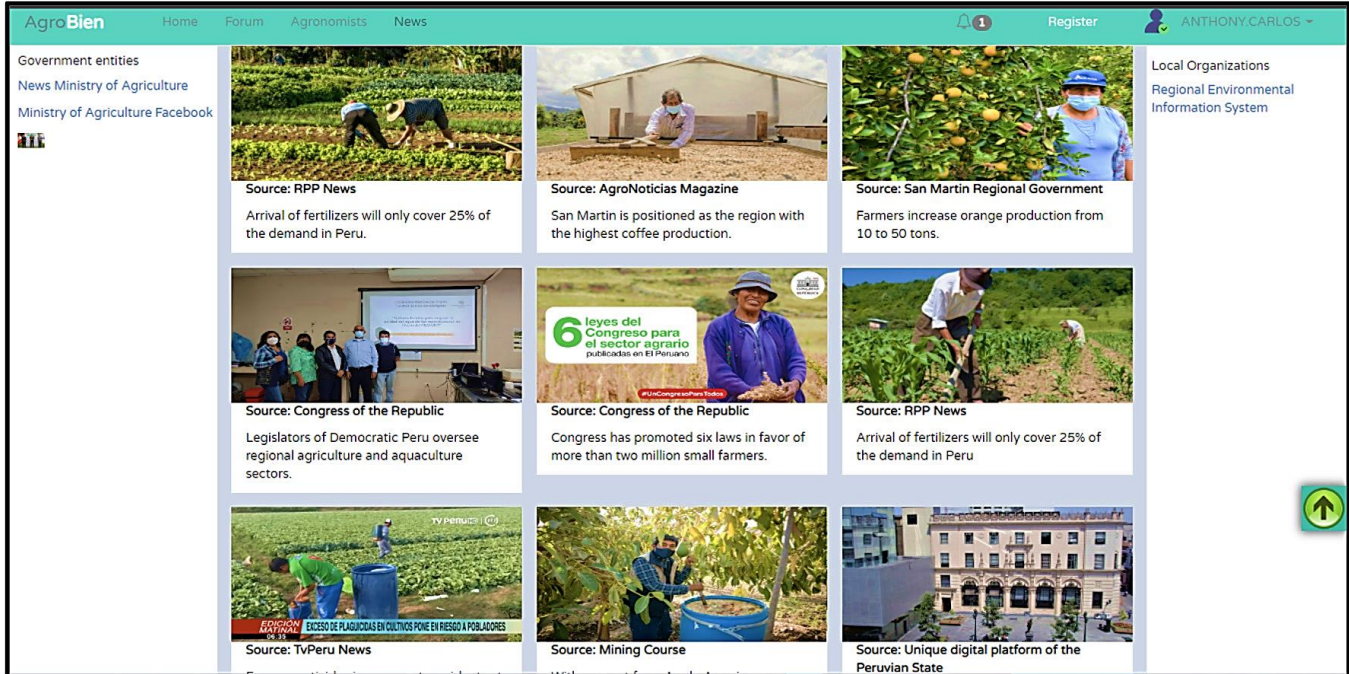


Fig. 13 News screen and external links

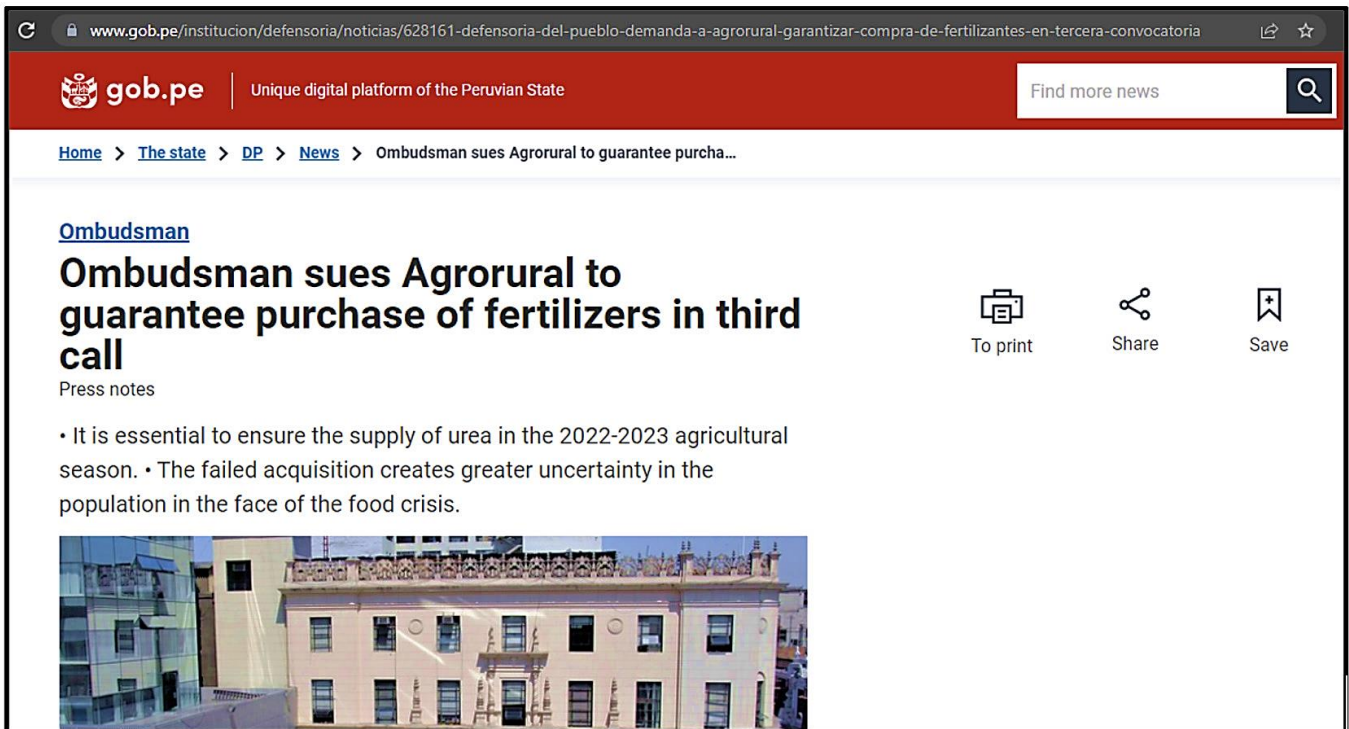


Fig. 14 External page that opens from the news module

#### 4.2. Validation by Expert Judgment

In order to evaluate user satisfaction regarding the use of the web platform, a virtual survey was carried out among 42 people, including farmers and agronomists. Eleven questions were asked, with answers ranging from 1 to 5, where 1 is the least valued and 5 is the most valued.

Below are a couple of the most salient results of the survey:

In the figure 15, it can be seen that 42.9%, representing 18 people, frequently seek information on help or advice on topics related to agricultural processes, which indicates that 42.9% will find the proposed platform very useful.

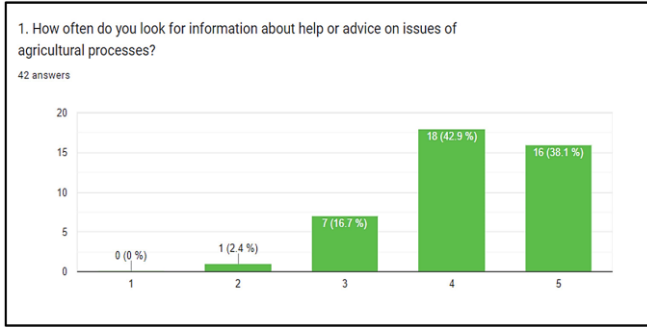


Fig. 15 Survey question 1

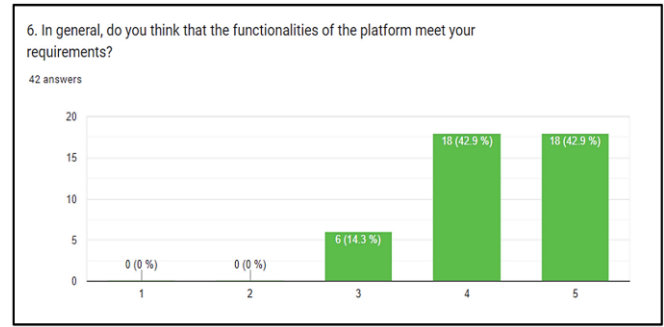


Fig. 16 Survey question 6

In the figure 16, it can be seen that in ranks 4 and 5, which corresponds to probable and very probable, 42.9 % representing 18 people in both ranks 4 and 5, consider that the functionalities presented by the platform satisfy the need of their requirements in their agricultural processes.

Likewise, according to Donato and Perez [28], Cronbach's alpha was used to add value to the questionnaire and to demonstrate its reliability. All the questionnaire answers were validated, giving 100% of valid cases without excluding any questions.

The reliability analysis using Cronbach's Alpha provides a value of 0.924, which indicates that our questionnaire has a high degree of reliability since if the value is greater than 0.7, it has an acceptable internal consistency. While the value is close to unity, it represents greater reliability.

As described above, the expert judgments have reviewed the prototypes, validating the functionalities and guaranteeing the satisfaction of the web platform users.

## 5. Conclusion and Future Work

According to all the points mentioned in this research work, we can conclude that the proposal for the development of a web platform to improve the attention of specialized consultations on agricultural practices is very viable because this platform will allow direct contact between the farmer and agronomist, thus helping the farmer to solve his doubts that he may have in the process of his crops or other activities related to agriculture. In addition, the professional agronomist

will be able to make his work known. Likewise, since agriculture is a very broad branch, if improvements are required to this proposal, other cases can be studied with the support of other specialists knowledgeable on the subject.

On the other hand, the Scrum methodology will be used to develop this web platform, since it is a process that adapts to a set of good practices to work in teams and achieve the best result. In addition, there are important results such as those seen in [29]. Being an agile framework, we work in small teams with the objective of delivering products with value in a short time, which is reflected in the prototypes that are delivered at the end of each sprint.

Finally, according to the results of the system validation survey, it is clear that many users, especially farmers, are interested in using this platform to facilitate contact with an agronomist professional and help solve their doubts about their agricultural processes.

## 6. Recommendations or Suggestions

It is recommended that further research on these issues be carried out to improve the functionalities offered in this platform and thus provide better solutions and greater facilities to farmers on issues that may be pending.

It is also suggested that more institutions related to agriculture be involved, with direct knowledge of the reality experienced in the different regions of the country, in order to enrich and add more functionalities to meet the additional requirements of users.

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