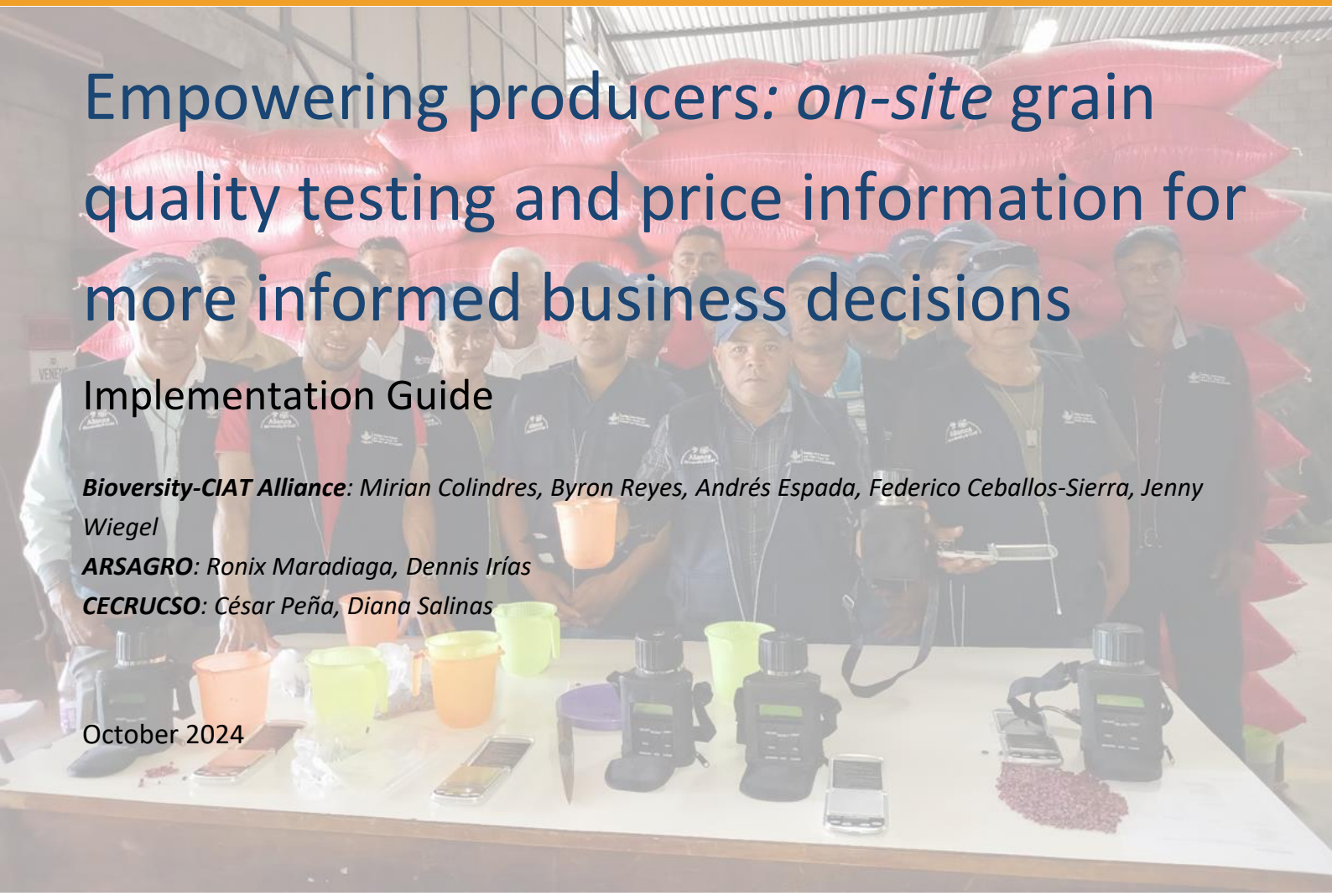


Empowering producers: *on-site* grain quality testing and price information for more informed business decisions

Implementation Guide

***Bioversity-CIAT Alliance**: Mirian Colindres, Byron Reyes, Andrés Espada, Federico Ceballos-Sierra, Jenny Wiegel*
***ARSAGRO**: Ronix Maradiaga, Dennis Irías*
***CECRUCSO**: César Peña, Diana Salinas*

October 2024

Context

The CGIAR Initiative "Transforming Markets and Value Chains for Inclusion and Sustainability" (Transformando Mercados), together with the Asociación Regional de Servicios Agropecuarios de Oriente (ARSAGRO) and the Central de Cajas Rurales de Ahorro y Crédito Comunidades Solidarias de Oriente (CECRUCSO) are conducting an evaluation of the impact of jointly conducting *in situ* quality tests (in producers' homes) and providing market price information, on producers' commercial decisions, i.e., to whom to sell and how much to sell. This innovation is part of a pilot study evaluating another innovation (detailed by Colindres et al., 2024), the design of which is presented in Reyes et al. (2023). The study is being implemented in the department of El Paraíso, Honduras. Bean producers receiving support and technical assistance from ARSAGRO and CECRUCSO participate in group training, where they acquire knowledge on bean management, post-harvest practices, and bean marketing. *On-site* quality tests together with price information were identified as strategies that together help producers (i) learn about the factors that are evaluated when a buyer (the associations in this case) tests the quality of the bean, thus making the process transparent; (ii) identify which of these factors are affecting the quality of their grain (and thus what practices they could adopt to positively affect quality) and the effect this has on possible discounts they can receive; and (iii) make more informed commercial decisions about who to sell to and how much to sell. This resulted from a consultative process conducted in two stages. In the first stage, sector stakeholders identified a number of challenges in the bean value chain, including the difficulty for producers to meet established quality

standards, which limits their access to differentiated markets. In the second stage, aforementioned associations determined that conducting *on-site* quality tests (i.e., where the producer has his bean ready to store or sell, which is usually at home), which determine weight discounts that producers can receive for low quality if they choose to sell to the association, along with providing market price information were appropriate and complementary practices to help overcome some of these challenges

The context in which these *on-site* quality tests were carried out on producers has two dimensions. The first relates to the profile of the associations responsible for organizing and executing these tests. ARSAGRO is a second-tier organization with close to 600 active members (in 2023) in five municipalities in the department of El Paraíso. ARSAGRO has offices and a bean processing plant located in the city of Danlí, with a monthly processing capacity of 9,600 quintals of beans. This association has experience in selling quality beans to differentiated markets through public-private partnerships, exporting beans, and carrying out research and development projects. Its main commercial activity is the purchase and sale of beans and corn, although it has other sources of income. Services provided to its members include technical assistance and credit (in cash or in kind). In 2023, this association had 25 para-technicians, who are lead farmers trained by the association to provide some of its services, mainly technical assistance using the farmer field school methodology.

CECRUCSO was founded to consolidate different legally established groups, including the Cajas Rurales de Ahorro y Crédito (CRACs). In 2023 it had 31 affiliated CRACs, totaling more than 360 farmers in three municipalities in the department of El Paraíso. CECRUCSO has infrastructure and equipment used for coffee and beans (wet milling, solar dryers, processing and drying plant, threshing and roasting equipment, and a grinder). It has experience in supplying coffee to local and international markets, selling quality beans to differentiated markets, and executing development projects. CECRUCSO's main activity is to allocate credit to the different CRACs so that they can support their members in the production of coffee, beans and, to a lesser extent, livestock. CECRUCSO provides drying services for coffee and beans, threshing and roasting for coffee, and technical assistance to the farmers they work with, focusing on good agricultural and processing practices. In 2023, CECRUCSO had three field technicians providing technical assistance to farmers.

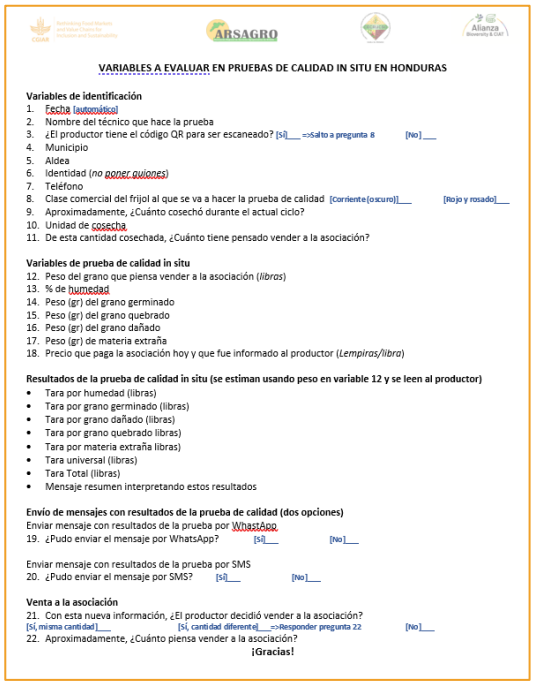
The second dimension is related to the characteristics of the farmers served by the associations. Seventy-six percent of them were men, with an average age of 49 years, 23 years of experience growing beans, and an average of just over 5 years of formal education. In addition, each household consisted of an average of 4.4 people. The majority (92%) owned their homes, and 67% of households had electricity. In addition, 94% of farmers owned a cell phone, and 74% owned a smartphone for communication. On average, farmers grew 1.7 manzanas (1 mz = 7,000 m²) of beans, 89% used fertilizer, and 61% sold beans; all were part of one of two associations.

This note was developed to organize the knowledge gained from the experience of conducting *on-site* quality tests with and providing price information to associated bean producers. It is anticipated that stakeholders interested in replicating these practices with producers in other regions of the country, or in other countries with a similar context, may have detailed information to facilitate their implementation.

Implementation of quality tests and transmission of prices and results.

The quality tests were possible thanks to the existing human capacity, availability of equipment, and previous experience of the associations and their technicians in the implementation of this practice, both in the collection/processing plant and in the field (one of the associations does similar practices for corn). This practice contributes to strengthening the knowledge that producers acquire in group training on grain quality and marketing. The implementation of this process is detailed below.

Step 1: Co-identification of the parameters to be assessed *on*



VARIABLES A EVALUAR EN PRUEBAS DE CALIDAD IN SITU EN HONDURAS

Variables de identificación

1. Fecha [automático]
2. Nombre del técnico que hace la prueba
3. ¿El productor tiene el código QR para ser escaneado? [Sí]___ =>Salto a pregunta 8 [No] ___
4. Municipio
5. Aldea
6. Identidad (*no poner guiones*)
7. Teléfono
8. Clase comercial del frijol al que se va a hacer la prueba de calidad [Corriente(oscuro)]___ [Rojo y rosado]___
9. Aproximadamente, ¿Cuánto cosechó durante el actual ciclo?
10. Unidad de cosecha
11. De esta cantidad cosechada, ¿Cuánto tiene pensado vender a la asociación?

Variables de prueba de calidad in situ

12. Peso del grano que piensa vender a la asociación (*libras*)
13. % de humedad
14. Peso (gr) del grano germinado
15. Peso (gr) del grano quebrado
16. Peso (gr) del grano dañado
17. Peso (gr) de materia extraña
18. Precio que paga la asociación hoy y que fue informado al productor (*Lempiras/libra*)

Resultados de la prueba de calidad in situ (se estiman usando peso en variable 12 y se leen al productor)

- Tara por humedad (libras)
- Tara por grano germinado (libras)
- Tara por grano dañado (libras)
- Tara por grano quebrado libras)
- Tara por materia extraña libras)
- Tara universal (libras)
- Tara Total (libras)
- Mensaje resumen interpretando estos resultados

Envío de mensajes con resultados de la prueba de calidad (dos opciones)

Enviar mensaje con resultados de la prueba por WhastApp

19. ¿Pudo enviar el mensaje por WhatsApp? [Sí]___ [No]___

Enviar mensaje con resultados de la prueba por SMS

20. ¿Pudo enviar el mensaje por SMS? [Sí]___ [No]___

Venta a la asociación

21. Con esta nueva información, ¿El productor decidió vender a la asociación?
[Sí, misma cantidad]___ [Sí, cantidad diferente]___=>Responder pregunta 22 [No]___
22. Aproximadamente, ¿Cuánto piensa vender a la asociación?

¡Gracias!

The first step in implementing on-site quality testing was to determine the parameters to be evaluated, which had to meet the following criteria: that they can be evaluated outside a laboratory or processing plant, that they can be evaluated quickly and practically, and that the results of the analysis capture the main factors that influence grain quality and directly affect the discounts (by weight) that the associations apply to the grain they purchase.

To guide this selection, we first identified the parameters included in the requirements of the Honduran Bean Standard, which details which parameters should be measured, how they should be measured, and the reference values, among other information. From this list, parameters that the associations already evaluate were selected to exclude parameters of low relevance to the associations. Then, from this reduced list, five parameters were identified to evaluate in situ, since they met the defined criteria: moisture, germinated grain, broken grain, damaged grain, and foreign matter. Moisture is the amount of water contained in the bean grain, expressed as a percentage of water mass in relation to the mass of dry matter. Sprouted grain refers to grain that shows the hypocotyl outside the outer layer of the bean. Broken grain includes grain that has lost part of its original constitution. Damaged grain refers to any whole bean or piece of bean grain that is obviously altered in color, odor, or appearance. Foreign matter (or impurities) is any material other than bean kernels (such as leaves, stems, pods, stones, etc.) These last four parameters are expressed in grams.

In addition to the defined quality parameters of interest, information was obtained to identify the producer, the commercial class of bean, the quantity harvested, and the intention to sell to the association before and after the quality test. It was also recorded whether the results of the quality test could be transmitted to the producer. A total of 22 variables were recorded. Together, the quality parameters and additional variables constituted the 'evaluation form' of the on-site quality tests (image left, above).

Step 2: Determination of equipment and supplies

With the quality parameters defined, the equipment and supplies needed to implement this activity were determined, including: a plastic container to place the grain sample, a sampler (a hollow metal tool with a tip that allows a grain sample to be extracted from the sacks), a precision scale, a moisture meter, plastic bags, a vest, a cap and a backpack. In addition, a booklet (laminated sheet) was included to separate the grains according to quality parameters, which facilitated the work of the technicians and reduced the possibility of errors in the measurement and recording of results. This constituted the 'field equipment', which was provided by the project (purchased if necessary) or the associations. For recording results, the technicians used their own cell phones

Step 3: Programming the on-site evaluation form into a tool

Bioversity-CIAT Alliance staff programmed the evaluation form to use Kobo Collect to record the results of the quality tests. The quality parameters were used as input to estimate the discounts (tare) in grain weight that would apply if producers decided to sell to the association, and the tentative income. For this, the programming included the following formulas to automatically report this information:

- Moisture tare (pounds): following the national standard, the associations accept grain with 14% moisture, and if the moisture is higher, discounts are applied. For each percentage point above 14%, two pounds are deducted from the weight, since this weight is lost when the grain is dried. For example, if the producer had 100 pounds to sell to the association, and the moisture test result was 16%, the discount applied is 4.0 pounds [2 x (16%-14%)=4 lb]. To measure moisture, a sample of 250 grams of grain is used.
- Tare per sprouted grain (pounds): the established protocol defined that first a sample of 250 grams of grain should be extracted, and from this sample, the sprouted grains should be separated and weighed. This weight was recorded in grams. The programmed formula took the sprouted bean weight and divided it by 250. This value was multiplied by the total beans intended to be sold to the association to determine the tare (discount) due to sprouted beans.
- Tare for each of the other quality parameters (broken grain, damaged grain, and foreign matter): the same formula was used as described for the tare per sprouted grain.
- Universal tare (pounds): a universal tare was applied to all producers, equivalent to 1% of the weight, as this is a discount applied at the commercial level by any grain buyer. This discount reflects weight loss due to external factors such as grain transportation from one area to another, grain damage, poor scale calibration, among others. This value was multiplied by the total amount of beans intended to be sold to the association to determine the universal tare.
- Total tare (pounds): sum of all tare or discounts to be applied.
- Net weight: weight of grain intended to be sold to the association minus the total tare

The programming also included the automatic preparation of a message summarizing the results, identifying which parameters were the most influential in the discounts (tare) applied, and the tentative income (the final income was determined with an additional quality test at the processing plant, on the day of delivery of the grain) to be received, if the producer decided to sell his grain to the association. This message was also programmed to be sent automatically to the producer's cell phone, as described below.

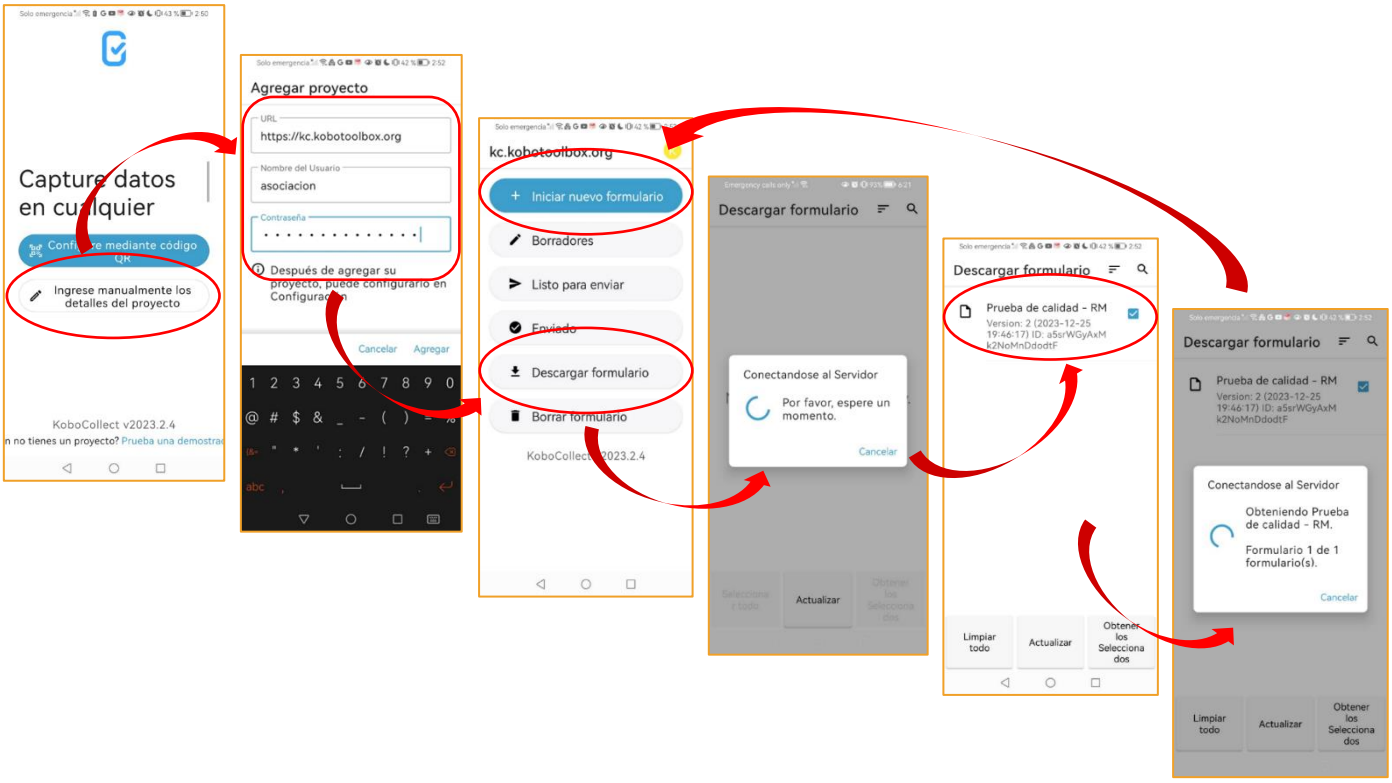
Step 4: Hands-on training of technicians and para-technicians on how to perform *on-site* quality tests

The technicians (from ARSAGRO and CECRUCSO) and para-technicians (from ARSAGRO) carried out the quality tests in situ. The technicians are employees of the associations, and the para-technicians are leading producers who support ARSAGRO in various activities, and have experience in different areas (production, group training, etc.) The work of the para-technicians was supervised by technicians of this association.

To minimize errors in the evaluation of quality parameters, technicians and para-technicians received theoretical and practical training, in which they were familiarized with the correct use of field equipment and the evaluation protocol to be followed. This protocol included the correct way to take grain samples from different bags to prepare a representative composite sample, homogenization of the composite sample, moisture measurement, grain classification according to the quality parameters to be evaluated, and grain weighing. They were also familiarized with the use of the data recording application.

Step 5: Training in the use of the digital tool for recording quality test results *on site*

For proper recording, technicians and para-technicians practiced recording the quality test results in the KoboCollect application. This also included the transmission of these results to the producer. First, the application was downloaded to the cell phones of the technicians/para-technicians. Then, following the prepared instructions, the application was configured for use with the form designed for this activity, and data recording was practiced. The diagram below illustrates this process. A key point is that, if any changes are made to the programming of the form, it must be ensured that the technicians update the form in the application to this new version, so that these changes are reflected.



Step 6: Scheduling of producer visits and implementation of *on-site* quality testing

The implementation of on-site quality tests, where technicians or para-technicians perform these tests in the presence of the producers, in the place where the producer has his grain stored, required scheduling the visit in advance. This is because, after harvesting, producers do some practices before storing or selling the grain, and the evaluation of quality parameters should be done when the grain is ready to be marketed or stored. The technicians/para-technicians coordinated with the producers a date when the grain was ready, to arrive to do the quality test.

The quality tests involved the following:

a) **Registration of the producer's data in Kobo Collect:** the technicians/para-technicians entered the producer's identification data in the application to begin recording the information. Initially, this was done manually, and a unique identifier (code) was entered for each producer member of the association. However, in some cases, the producer was not present and delegated the supervision of the test to another person, and that person was registered. This caused problems because this information was analyzed together with socioeconomic information collected in a survey, and in these cases, it was required to match the information from both databases manually. To minimize this problem, we proceeded to digitize this process by generating QR codes and printing them on plastic cards, along with basic

information on the producer. In this way, the technicians/para-technicians only scanned the QR code from the application, and the identification information was automatically uploaded

b) **Representative bean sampling:** to ensure that the bean sample is representative, a sampler (traditionally known as a 'chuzo'; photo right) was used to extract beans from different parts of the sacks and from different sacks. The weight of this sample was approximately two kilograms.

c) **Homogenization of the grain sample:** the sample was placed in a transparent plastic bag and mixed in a circular motion for one minute to ensure uniformity.

d) **Sub-sample weighing:** from the homogenized grain sample, a 250-gram sub-sample was weighed using a precision balance, placed on a flat surface to ensure accurate measurement.

e) **Moisture measurement:** the 250-gram subsample was placed in the portable moisture meter (photo right), level with the cap, and the test key was pressed, and the result was displayed on a screen. This result was recorded in the Kobo Collect application.

f) **Classification and weighing of kernels according to the quality parameters to be evaluated:** from the subsample, kernels were classified according to the type of damage (photo on the right): damaged kernels, which included physical damage, fungal damage, and insect damage (recorded as damaged kernels); sprouted kernels; broken kernels; and foreign matter. The damaged kernels were then weighed (grams) and the data were recorded in Kobo Collect.

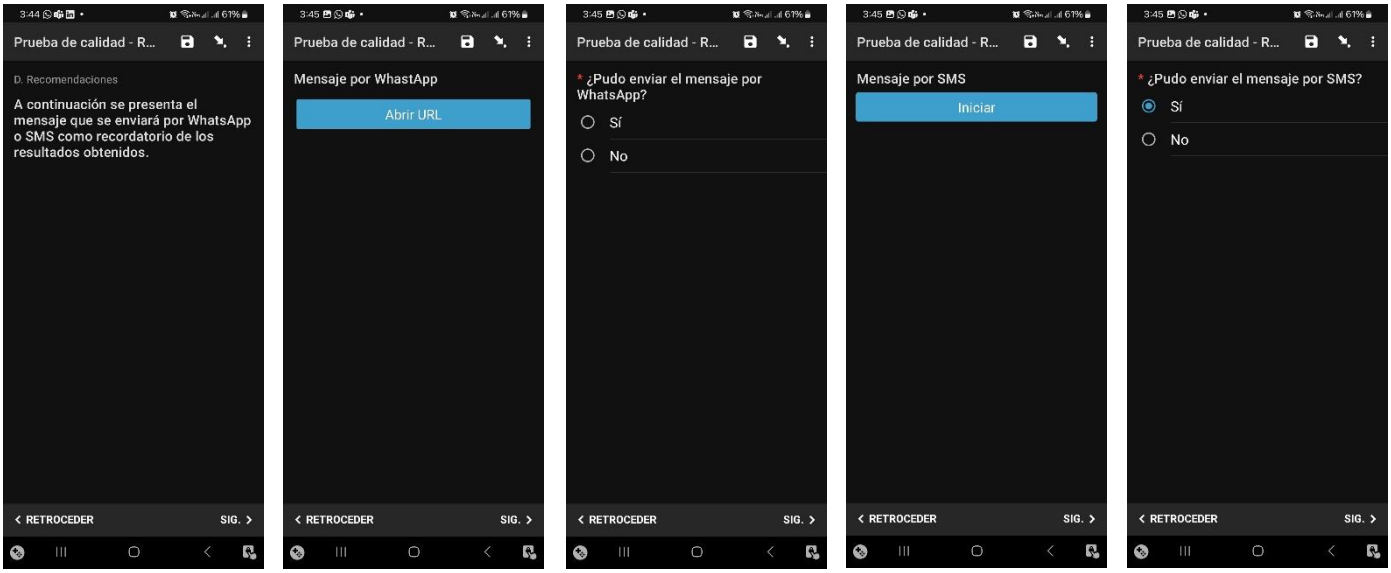
g) **Estimation and reading of quality test results:** as detailed above, the application used was programmed to automatically estimate the discounts in the weight of the grain, related to its quality, according to the defined parameters. In addition, a text was generated summarizing these results and, using the purchase price of the day, the approximate total income that could be obtained if it decided to sell to the association. This income could vary because, at the time of delivery of the grain to the association's processing plant, an additional quality test is performed (which is normally done by the association), and these results are what finally determine the discounts to be applied and the total income. Finally, a message was also generated highlighting which factor affected quality the most (i.e. caused the highest discounts) and providing a recommendation to the producer as to what he can do to improve the quality of his grain

Step 7: Price information and its relation to quality test results

The price reported to the producer was the price at which the association was buying the grain on the day of the on-site quality test. The results of the quality test were used to determine the total weight discount (total tare) and the net weight of the grain. This net weight was multiplied by the price of the day to inform the producer of the income he could receive if he decided to sell his grain to the association. As discussed above, this income was indicative because, if the producer decided to sell his grain to the association, an additional, more detailed quality test at the association's processing plant determined the final discount (tare) to be applied.

Step 8: Transmission of results

Although the results of the on-site quality test were read to the producer, two mechanisms were also used to transmit the summary of the results to his cell phone. First, WhatsApp was used, and it recorded whether or not the message could be sent. Since we anticipated that in some communities with limited access to the cellular network the use of WhatsApp could be limited, SMS was also used to transmit the message with the results of the test, and it was recorded whether the message could be sent. It was determined to have these two alternatives to ensure that producers received a copy of their results. The images below illustrate this process. In addition, the associations received all the information automatically, once it was uploaded to the cloud.



Lessons learned and recommendations

Positive aspects

- The implementation of these in situ tests was easy to operationalize because the associations' personnel had experience doing quality tests in the processing plant and, in the case of ARSAGRO, in the field, with another crop. This, complemented with training, ensured the correct implementation of this activity.
- The knowledge that the associations have about their associates made it possible to identify whether there would be resistance on the part of the producers to this activity, and the establishment of mechanisms (socialization of the activity, inclusion of quality issues in group trainings, improvements in communication) to facilitate openness to in situ testing.
- On-site quality testing has fostered greater producer outreach to the associations, as producers have gained a better understanding of the factors that affect the quality of their beans and how this influences the discounts (in weight) and income received.
- The digitization of this activity (i.e., creation and use of QR codes and the use of an application for recording results) facilitated the transmission of information and its use in a short time.

Opportunities for improvement

- In some cases, it was not possible to carry out an in-situ test visit because the producers sold their grain without notifying the technicians/para-technicians in advance, which reduced the information collected. This was improved over time, but if it had been anticipated, it could have been avoided.
- Explore new digital technologies to expand the information contained in producer identification cards. Although the use of NFC cards (which store various information) to identify producers was contemplated, this was not feasible because they could not be imported in time. Because of this, PVC cards (which do not store information) printed with a QR code and basic producer information were used.
- For producers without a cell phone, a mechanism must be identified to transmit the results of these tests (most likely by filling out a printed form with the result).

Recommendations for implementers

- To prevent producers from selling their beans before the on-site quality test is conducted, it is recommended not to rely on the producer's initiative to advise when the beans are ready; rather, a proactive and coordinated system should be established to plan these tests (from the side of the associations).

- Consider the use of digital technologies to facilitate the recording of information. This may require strengthening the capacity of the associations, so that they can carry out these activities independently. In addition, this would allow for improved traceability of the grain, if doing so is an objective of the association (or its buyers).
- Assess the associations' capacities and needs to operationalize this activity. For example, it is important to know what experience the associations have, what equipment they have available (or if it is feasible to acquire it), and how the information will be managed to facilitate the associations' decisions.

Quote:

Bioversity-CIAT Alliance; ARSAGRO; CECRUCSO. 2024. Empowering producers: on-site grain quality testing and price information for more informed business decisions. Implementation guide. 9p.

CGIAR is a global research partnership for a food-secure future. CGIAR science is dedicated to transforming food, land, and water systems in a climate crisis. Its research is carried out by 13 CGIAR Centers/Alliances in close collaboration with hundreds of partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector. www.cgiar.org

We would like to thank all funders who support this research through their contributions to the CGIAR Trust Fund: .www.cgiar.org/funders

To learn more about this Initiative, please visit this webpage.

To learn more about this and other Initiatives in the CGIAR Research Portfolio, please visitwww.cgiar.org/cgiar-portfolio

INITIATIVE ON
Rethinking Food Markets