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Making the case for financial inclusion: A b_verify based solution to promote agriculture credit in Peru

Authors: Eric Peña (MIT Sloan)

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Making the case for financial inclusion: A b_verify based solution to promote agriculture credit in Peru

Name: Eric Peña

1. Executive Summary:

Since the inception of the Bitcoin blockchain in 2009, a plethora of potential use cases that use a distributed ledger at its core have been explored. At the same time, the potential of this technology to provide value in sectors where existing solutions do not cover all potential consumers, such as financial inclusion, is high. Public sector institutions and multilateral organizations seeking to improve conditions of less favored populations around the globe can capitalize on the opportunities that this new paradigm provides. Nevertheless, building a case for the exploration of a use case in this arena faces completely different challenges than those that come up in the commercial space.

This report aims to document the process of use case assessment, business case development and pilot planning of a blockchain-based protocol application for a public sector organization. More specifically, the team focused on building a pilot of the b_verify protocol for a financial inclusion solution on the agricultural credit sector in Peru.

Agrobanco is a public financial institution oversaw by the Ministry of Agriculture that up until late 2018 held one of the highest delinquency rates of the whole financial sector in Peru. The organization underwent a restructuration process that included an injection of PEN100M in new capital and policies oriented to drastically reducing delinquency rates. Additionally, it is pivotal for the bank to improve their product offering with an alternative that capitalizes on the use of production in warehouse as credit collateral. Accomplishing this goal involves reducing the possibility of crime and irregularities in the granting of loans and execution of collaterals while promoting better opportunities for farmers at the same time. However, existing products and procedures supported by the bank are not properly tailored to fulfill this objective.

The opportunity to use a blockchain based solution in the context of Agrobanco's situation is clear, however, developing the underlying software infrastructure also involves a non-trivial investment of resources. B_verify provides an opportunity to tackle the challenge of providing Agrobanco with a blockchain based solution without the need to jumpstart a whole network. The effort necessary to create the product is closer to a regular centralized implementation than developing an independent blockchain solution.

Driving innovation initiatives in bureaucratic organizations, however, is no easy task. As is the case in the Peruvian public sector, many government institutions develop high resistance to change. This can be the consequence of many factors, such as labor regimes, existing political agendas or even corruption. This report elaborates on the stakeholder mapping process that allowed the project team to generate enough internal advocacy to obtain much needed information regarding internal existing process flows for the planning stage of the project.

Based on the workflow information obtained from the bank, we defined the solution design components that must be put in place to orchestrate the information flow and generation of reliable and auditable records for the digital warehouse receipts that are to be used as collaterals. The modules necessary to accomplish this are described below:

1. Production Registration module: This module is an optional functionality to be provided to small farmers to control their production loads reserved for credit collateralization.
2. Warehouse Receipt Generator: This module can be a desktop or mobile module for the warehouse administrative staff. It consolidates the production loads brought by individual farmers to generate a warehouse receipt record to be used as collateral.
3. Commitment Server: As described in the b_verify specification, this component is in charge of packing the warehouse receipt records for commitment in the bitcoin blockchain.
4. Financial Institution client: The module on the side of the financial institution that is in charge of matching the records of digital warehouse receipts to the corresponding credit instruments they guarantee.

Additionally, we discuss the question of the need for a blockchain-based solution as opposed to a traditional centralized database solution by acknowledging that:

- The reliability of public sector institutions in their internal systems and controls has been frequently questioned so it is valuable to add this extra layer of reliability based on the immutable nature of the blockchain to provide confidence and avoid fraud; and that,
- Distributed databases and the APIs that allow integration among multiple organizations exist for decades, however, the collective action necessary to bring multiple parties and enable integration of dataflows has been hard to accomplish. Proposing a blockchain solution, even if it basically does the same of a centralized database with additional security, has proved to have the value of driving this collective action and keeping momentum.

Finally, we discuss that the introduction of b_verify for warehouse receipt collateralization creates additional opportunities in the space of financial inclusion. There is abundant research that deals with the limitations of existing credit rating mechanisms. Innovative ways to improve the quality of creditworthiness assessment take into account the possibility of using additional data such as operational information derived from customer ratings [17]. In this domain, the use of a b_verify based solution opens the possibility of creating a data source that can be used to complement existing, and frequently limited, credit rating algorithms.

2. Introduction:

Satoshi Nakamoto's breakthrough innovation, a purely peer-to-peer version of electronic cash that would allow online payments to be sent directly from one party to another without a centralized clearinghouse entity [1], became the genesis of the revival of the decentralized computing paradigm. As a result, since the inception of the Bitcoin blockchain in 2009, a plethora of potential use cases that use a distributed ledger at its core have been explored.

However, many argue that given the specific design choices of the blockchain architecture, innovators seeking to tackle real life problems using distributed ledger technologies (DLT) have not been successful in providing a "killer application" yet [2]. This doesn't mean companies are not investing in the space. A reported 61% of major global digital firms are investing in blockchain applications [3] with a big majority of them exploring private, permissioned blockchain solutions.

At the same time, the potential of this technology to provide value in sectors where existing solutions do not cover all potential consumers, such as financial inclusion, is high. Public sector institutions and multilateral organizations seeking to improve conditions of less favored populations around the globe can capitalize on the opportunities that this new paradigm provides. Nevertheless, building a case for the exploration of a use case in this arena faces completely different challenges than those that come up in the commercial space. This report aims to document the process of use case assessment, business case development and pilot planning of a blockchain-based protocol application for a public sector organization. More specifically, the team focused on building a pilot of the b_verify protocol for a financial inclusion solution on the agricultural credit sector in Peru. The overall goal of this effort is to provide a reference to all innovators and advocates of blockchain technology solutions that are set to build cases for piloting proposals in non-profit organizations. The report also concludes with a roadmap for the actual pilot execution in Peru.

3. The problem:

Despite the wide diversity of products, a result of the country's differing climatic and geographical zones, Peru's agricultural sector still lags in productivity and competitiveness when compared to more developed nations [4] . With a total output value of PEN33.44bn ($10.3bn),

growing by approximately 2% per year and land ownership highly atomized, one of the biggest challenges of Peruvian farmers is technology access through credit. To fill that gap the government created in 2001, a public financial institution that has the mandate of providing subsidized access to credit to small farmers: Agrobanco.

By early 2018, however, the bank was struggling with very high delinquency rates and a need for capital injection [5]. In march of the same year, a focus was made not only on providing accessible credit but also on enabling small farmers to improve their chances to move from survival production to bigger scale through association and access to technology and better processes, thus improving their chances to avoid defaulting on their loans. The reorganization plan included an additional fund "Agroperu" (later renamed "Mi Agro") to allow for the restructuring of the bank [6].

The main product of Agrobanco is "Crédito Agrícola" (which translates to Agricultural Credit), a loan that is issued against a collateral. Since most of the customers of the bank are small farmers, most of their production is sold immediately for subsistence and if possible loan repayment. This makes it impossible for farmers to use part of their production as collateral for production scaling or technology-based yield improvement. As a result most of the loans are backed with their land.

The bank's reorganization effort is focused on reducing the levels of loan default by adding an additional layer of farmer empowerment to the existing service offering. The organization's C-suite, as indicated in the conversations they had with the project team, outlined their plans to include a campaign to promote farmer's associativity. Associations would enable farmer's to have better negotiation power when acquiring equipment and production inputs, as well as reduce the risk of default by the introduction of better processes. Some associations already in existence are consolidating production and managing excess stored produce for later trade. The collateralization of production in a warehouse, however, is not supported by any bank product.

By early 2019 the reorganization effort of Agrobanco is already producing positive results, with Ministry of Agriculture officials projecting the bank to stop posting losses for the first time in years [7]. This context constitutes a huge opportunity for the bank, with an optimistic outlook

on its balance sheet and a stable political environment, the organization needs to guarantee it keeps the level of delinquency as low as possible to make a sustainable transition to profitability. To accomplish this, it is pivotal to improve their product offering with an alternative that capitalizes on the use of production in warehouse as credit collateral. Accomplishing this goal involves reducing the possibility of crime and irregularities in the granting of loans and execution of collaterals while promoting better opportunities for farmers at the same time. However, existing products and procedures supported by the bank are not properly tailored to fulfill this objective. Moreover, the land collateral loan process flow is slow and involves manual processing and interaction with external Notary Services and the Ownership Registry Authority (SUNARP), with credit issuance times going up to 45 days.

4. The tool:

Bitcoin became the concrete example of the potential of blockchain technology to both reduce the cost of verification of transaction attributes and the costs of networking. In the case of the latter, the role of early adopters and the economic incentives that form the basis of its consensus mechanism (proof of work and the mining process) made Bitcoin, the first digital platform to be bootstrapped in a decentralized fashion without resorting to investments by an intermediary or planner [8]. However, this is not the case for all blockchain projects. The high proliferation of projects that intend to tackle different applications of distributed ledger technologies, some even competing with the same value proposition, increase the amount of effort necessary to generate a critical mass of early adopters. Developing the underlying software infrastructure also involves a non-trivial investment of resources. It is reasonable to affirm that, it is becoming harder and harder to replicate the ease with which the Bitcoin network was built. Current approaches to network creation involve funding options like Initial Coin Offers (ICO), however, the widespread occurrence of scams, which the Satis Group estimated to be close to 80% of all ICOs in 2017 [9], has increased the level of scrutiny and therefore raised the demand for quality in all aspects of a project, from the whitepaper that describes the value proposition and solution to the prestige of the team involved in the project.

Given this context, one question that is worth trying to resolve is if it is possible to reap the benefits of using an decentralized and immutable append-only log without the big amount of collective action that a new blockchain demands today.

Attempts to piggyback on existing blockchain infrastructure date back to the very beginnings of Bitcoin. Even Satoshi Nakamoto himself got involved in the debate about using the bitcoin blockchain for additional purposes other than electronic payments, such as a fully decentralized domain naming system [10]. However, it is not until 2016, when Bitcoin Improvement Proposal 74 (or BIP74) [11] was introduced that a formal way to commit information to the Bitcoin blockchain was available. The introduction of zero-value OP_RETURN transaction outputs opens the possibility of using the existing Bitcoin blockchain to witness information to the blockchain, thus creating a log of immutable and auditable records that can be used for several purposes that range from digital notary services to fully decentralized key management systems. A first approach to support a service for witnessing log statements avoiding equivocation in a fully decentralized trustless environment was introduced with the “Catena” protocol [12].

B_verify, builds on its predecessor, Catena, to create a more scalable way to generate a log of verifiable records using the Bitcoin blockchain as an immutable repository. The protocol uses the Catena service to generate OP_RETURN un-spendable transactions that record a data payload in the blockchain [13]. On top, the protocol uses a commitment server that bundles multiple statements using a merkle prefix trie to improve scalability, thus allowing multiple thin clients to register information.

Additional research also explored the application of b_verify protocol to reduce the inefficiencies of financial services to small and medium enterprises (SMEs) by introducing the concept of a blockchain witnessing enabled inventory-based lending platform [14] that provides a streamlined workflow for the use of warehouse receipts as collateral for loans. This use case has very powerful implications and potential upsides, that include reducing the possibility of fraud in the use of warehouse-stored production as collateral and innovating creditworthiness assessment through the use of information on production storage and trade.

5. The proposal:

Having established the context, it is evident that b_verify is a great fit to tackle the issues of Agrobanco, however, this is not a straightforward task. The challenge of carrying out a pilot implementation of a product based on the protocol involves 1) building a case that is attractive enough to generate advocacy from within the organization, 2) designing the process flow of the new product and 3) executing the pilot on the field with the appropriate balance of detail so as to guarantee that the team both avoids disturbing everyday operations of the bank and makes sure that useful information is drawn from the whole process.

Scope:

The initial draft of the project's scope included the three stages described in the previous paragraph. Unfortunately, two things made it impossible for the project team to accomplish the goal of completing the last stage. The first had to do with the sharing of existing process information. Delays on the Agrobanco team side had an impact on the time available to prepare the software application that was going to be used for the pilot on the field. The second was the availability of resources for the modification of the code base already available. The existing pilot kit was originally coded in Java, once the team leader was able to locate and get the involvement of a Java developer (it was a Peruvian developer highly proficient in the tool who has previously worked with the project team leader before) the team was informed that the Java code base was not stable and that a version in Go was in the making.

After an honest evaluation of the timeframe available, the project team leader in coordination with the project advisor decided to proceed with only the first two stages of the project, which are described below:

Building a case and gaining internal advocacy:

Driving innovation initiatives in bureaucratic organizations is no easy task. As is the case in the Peruvian public sector, many government institutions develop high resistance to change. This can be the consequence of many factors, such as labor regimes, existing political agendas or even corruption. Fortunately, this is not the case, at least to a great extent, for the stakeholders in Peru. The previous professional experience of the project team leader in the Peruvian public

sector was also useful in assessing the stakeholder network and establishing a roadmap to generate internal advocacy for the project.

There were several context facts that affected the project (some positively and some negatively), which are described below:

- Since early 2018 the Peruvian Government established the promotion of Digital Government as a policy priority for the year [15].
- The Secretary General for the Ministry of Agriculture (organization that oversees the organizations in the Agriculture sector, including Agrobanco) has a background in technology and a track record of promoting innovation projects in the public sector.
- Half way through the process flow information collection phase, a change of Minister caused a change in the Secretary General position, debilitating support for the project.
- After several meetings with the project team and project leader, Agrobanco's Chairman became a champion of the project.

A summary of the main stakeholders' positions towards the project is shown below:

Key Players	**Keep it from happening**	**Let it happen**	**Help it Happen**	**Make it happen**
Ministry of Agriculture Secretary General				ox
Agrobanco Chairman		o		x
Agrobanco CEO		o	x	
Vice President of Risk		o		x
Vice President of IT	o		x	
Vice President of Credit		o		x
Notary Service Providers	ox			
Central Government Digital Secretariat			o	x

o ➔ Initial Position

x ➔ Final Position

Generating momentum for the project, especially when the team was advocating for an innovation based on a technology very much unknown (and hard to explain), was accomplished by portraying a compelling vision based on the needs of the organization and the assumed stakeholder's personal interests. At the end, the team was able to secure active collaboration from the organization's team and their commitment for the following stages of the project.

Process flow design:

The initial scope contemplated the possibility to modify the b_verify pilot kit to allow for the streamlining of the land collateral credit process. To design the modifications necessary to use the code base of the existing pilot kit the team needed to review the existing , and manual, process flow for this product. The original (Spanish) version of the process flow is included in the Appendices of this report, however for discussion purposes, diagram 1 below depicts a simplified version of the part of the process that deals with the collateral constitution.

As can be seen, there are several issues that render the application of b_verify very difficult in this context, namely:

- The data that is the basis for records that b_verify would need to commit to the blockchain are located in a database that is not the property of Agrobanco. It is the Property Registry Authority (SUNARP) that owns that information.
- Updating the records of land ownership is a heavily regulated process. Even generating parallel copies of changes in the status of this information would need modifications in the law to render them useful in the context of credit contracts.
- Modifying the underlying laws require legislative initiatives with timeframes that are prohibitive in the context of the project.
- There is a strong incentive on the side of Physical Notary services to maintain the status quo. A big part of the business of these stakeholders comes from the fees accrued from the process of land ownership collateralization.
- Gaining the collaboration of SUNARP in the pilot was a big challenge, based on previous experience.

Diagram 1: Existing Collateral constitution process

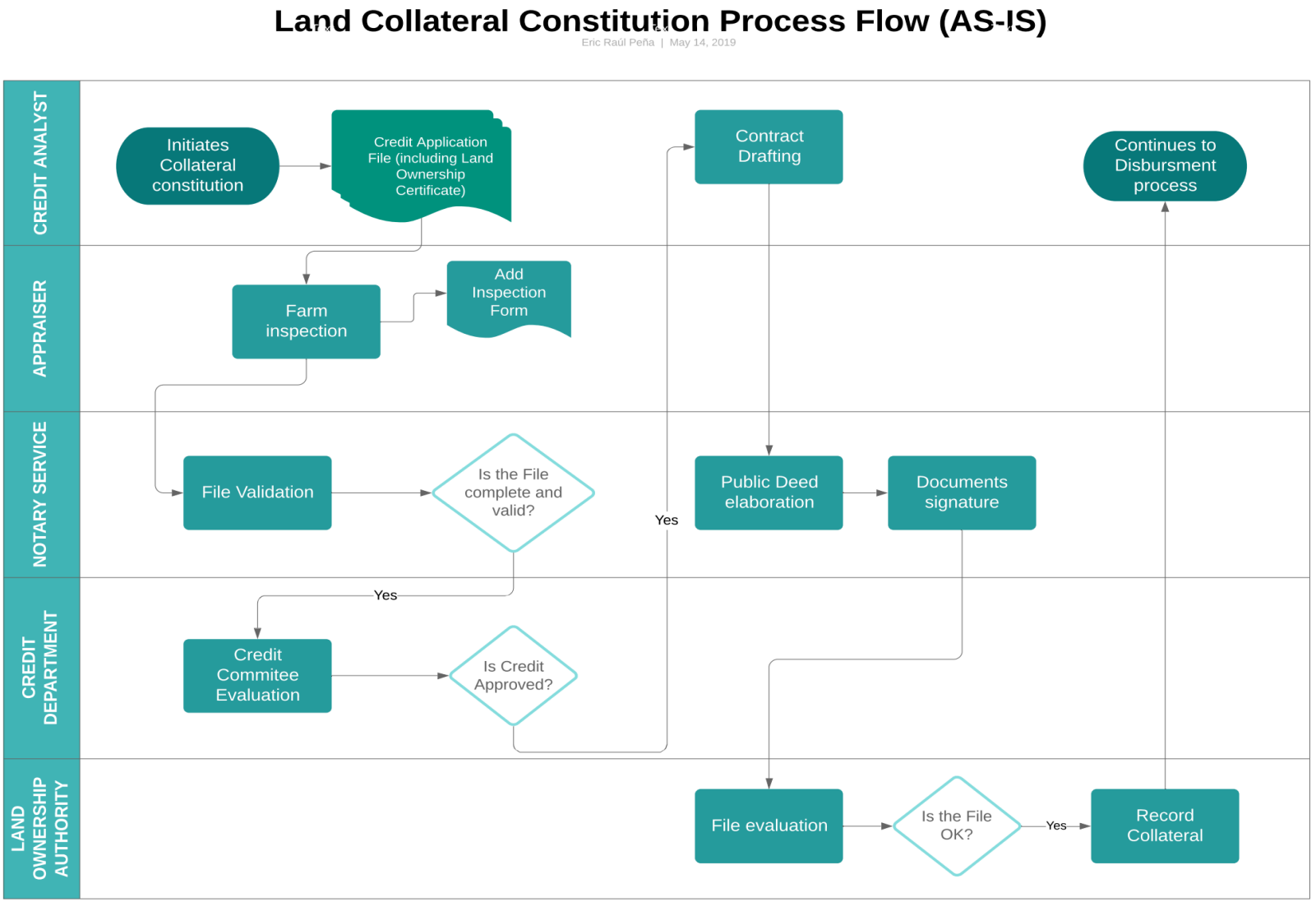
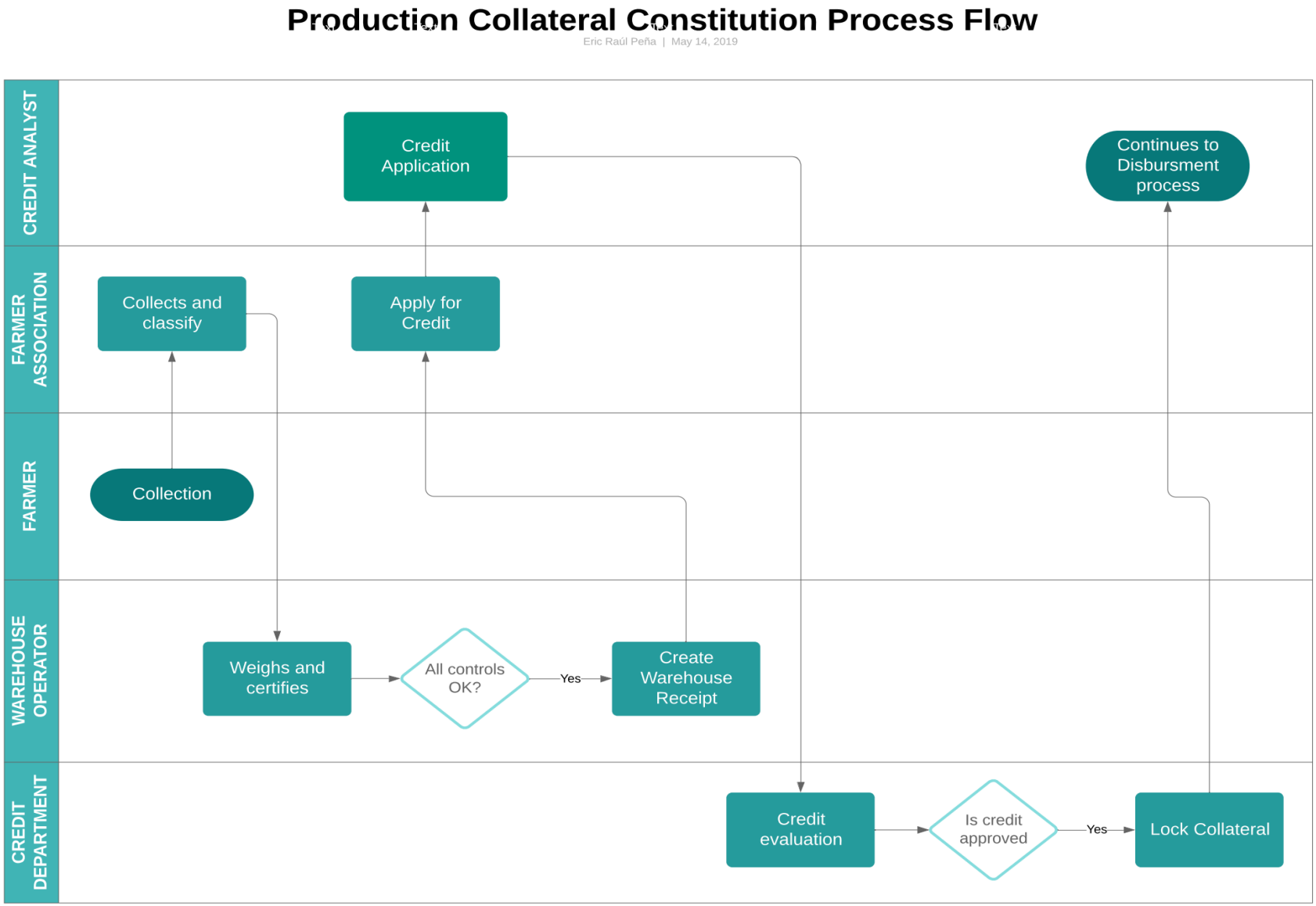


Diagram 2: Proposed basic process workflow:



After a thorough discussion with the Agrobanco team, it was decided that a pilot with a newly designed product that involved collateralization of production in warehouse would make more sense. This, however, would involve the use of assumptions in the design, since these type of credits are not available directly to small farmers (as mentioned before, almost all sell their production immediately or store very small quantities on their land). The project team agreed to work on this product as a projection of an integral campaign of empowerment by promoting associativity.

A simplified version of the new production in warehouse collateral constitution process flow was drafted by the project team (Agrobanco + MIT) and the resulting diagram is depicted in Diagram 2.

The diagram shows the workflow for the newly design process. Based on the arrangement of responsibilities in the process, there are several ways that the service can be delivered. This configurations have implications in the characteristics and functionality available as well as the scope of its outreach. These alternatives are discussed in the following section.

6. Research findings:

Based on the workflow outlined in the previous section, it is necessary to define the solution design components that must be put in place to orchestrate the information flow and generation of reliable and auditable records for the digital warehouse receipts that are to be used as collaterals. The modules necessary to accomplish this are described below:

5. Production Registration module: This module is an optional functionality to be provided to small farmers. Based on a mobile device it will allow farmers to register the amount, type and quality of the production they are going to take to the Association's warehouse (or the warehouse they contract for that matter). The module is an optional module because the registration of production can be performed at the warehouse, but it gives the possibility of streamlining the registration process.
6. Warehouse Receipt Generator: This module can be a desktop or mobile module for the warehouse administrative staff. It consolidates the production loads brought by individual farmers to generate a warehouse receipt record to be used as collateral. On the farmers

association's side it will allow the control of ownership of the different farmers and their contribution to the total collateralized inventory. Finally, the module will make the calls to the commitment server in charge of committing the warehouse receipt records to the blockchain.

7. Commitment Server: As described in the b_verify specification, this component is in charge of packing the warehouse receipt records for commitment in the bitcoin blockchain.
8. Financial Institution client: The module on the side of the financial institution that is in charge of matching the records of digital warehouse receipts to the corresponding credit instruments they guarantee. Explicit functionality must be put in place to govern the privileges management to ensure that access to the warehouse receipts records are only granted to their corresponding creditor agency in the case of multiple financial institutions participating in the ecosystem.

Depending on who takes charge of what piece of the solution design, there are three possible configurations for a final product. In other words, based on which parts of the process flow fall under the responsibility of either Agrobanco, third party providers and the Ministry of Agriculture, we can have a different final solution design. Let's examine these three possible configurations below:

Agrobanco fully integrated product:

One option is to let Agrobanco integrate the whole process from the collateral constitution initiation (by a credit request) until the commitment of the corresponding record in the blockchain, which implies governance over the commitment server. This approach has the following advantages and disadvantages:

Advantages:

- Ease of implementation from a project management standpoint.
- Easy integration with credit application databases and farmers associations records.
- Seamless workflow and non-fragmented user experience on the farmers side.

- Support for the necessary legal framework to make the solution work has good possibilities.

Disadvantages:

- Agrobanco would be the only provider of the solution, which eliminates the possibility of integrating other financial institutions.

Thrid-Party Service:

Another configuration would have a third-party service provider to provide the commitment server functionality as well as appropriate Application Programming Interfaces to allow integration from multiple credit providers.

Advantages:

- The model allows for integration of any financial institution interested in providing inventory based credit.

Disadvantages:

- The solution would require creating a business model that ensures sustainability which is an effort not included in this report.
- Getting support to create the legal framework necessary for the solution to work becomes challenging since it is a for-profit institution that benefits from the.

Ministry of Agriculture sponsored service:

The final configuration option has the Ministry of Agriculture as the first node of the network of commitment servers. The tiered solution would allow multiple financial services providers to join the network and participate in the generation of inventory-based collateral records.

Advantages:

- This arrangement provides an easy way to generate support for the legal framework to be put in place since it would be enforced as one Agriculture Sector Policy (the legal instrument that can be used in this context is a Supreme Decree, which doesn't need to go through Congress).
- It can support third-party financial services providers to join the validation scheme.

Disadvantages:

- Mobilizing the support within the Ministry of Agriculture would require a remapping of stakeholders and additional effort in generating advocacy for the project.

A decision of which choice of configuration to choose would be deferred until after the completion of the pilot to incorporate the insights that will emerge from its execution.

Finally, it is possible to question whether this can also be accomplished with a traditional centralized database solution. There are two main arguments that help understand why this decentralized solution is justified:

- The reliability of public sector institutions in their internal systems and controls has been frequently questioned. The Financial sector Comptroller Office (Superintendencia de Banca y Seguros in Spanish) has reported about this weaknesses of Agrobanco before [16]. So it is valuable to add this extra layer of reliability based on the immutable nature of the blockchain to provide confidence and avoid fraud.
- Distributed databases and the APIs that allow integration among multiple organizations exist for decades, however, the collective action necessary to bring multiple parties and enable integration of dataflow has been hard to accomplish. Proposing a blockchain solution, even if it basically does the same of a centralized database with additional security, has the value of driving this collective action and keeping momentum. This is a benefit that cannot be denied.

7. Further work:

Having developed the necessary design elements and internal advocacy for the project the next steps involve the following steps:

1. Create a fully functional pilot kit: Based on the process flow outline developed in coordination with the Agrobanco team, the appropriate modules should be developed. This involves not only the backend server software modules, but also the user interfaces in the modules described in the previous section. According to what has been established

with MIT DCI advisory team, this would be possible after the back-end commitment server functionality is operational.

2. Perform a credit simulation pilot: Once all pilot modules are available and tested, an on-the-field credit cycle simulation will inform the project team about specific issues that rise on a real life implementation. The Agrobanco team agreed to facilitate all the necessary elements to guarantee that the simulation takes place on existing farmers association premises to gain access to real feedback from all stakeholders.

Beyond warehouse receipts:

The introduction of b_verify for warehouse receipt collateralization creates additional opportunities in the space of financial inclusion. There is abundant research that deals with the limitations of existing credit rating mechanisms. Innovative ways to improve the quality of creditworthiness assessment take into account the possibility of using additional data such as operational information derived from customer ratings [17]. In this domain, the use of a b_verify based solution opens the possibility of creating a data source that can be used to complement existing, and frequently limited credit rating. Further work on this project should include the implications and necessary framework (bot technical and legal) to use the information on collateralized warehouse receipts as complementary information for credit rating of farmers associations.

8. References:

[1] S. Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System,” *2008*, p. 9.

[2] J. Young, “Blockchain is Solution Looking for Problem, Says Software Giant CEO,” *Cointelegraph*, 02-Nov-2016. [Online]. Available: https://cointelegraph.com/news/blockchain-is-solution-looking-for-problem-says-software-giant-ceo. [Accessed: 11-May-2019].

[3] H. Partz, “61% of Major Global Digital Firms Invest in Blockchain, Report Finds,” *Cointelegraph*, 03-Apr-2019. [Online]. Available: https://cointelegraph.com/news/61-of-major-global-digital-firms-invest-in-blockchain-report-finds. [Accessed: 11-May-2019].

[4] “Peru agricultural production rising though regional disparities persist,” *Oxford Business Group*, 24-Aug-2018. [Online]. Available: https://oxfordbusinessgroup.com/overview/output-growth-productivity-rise-disparities-persist-between-different-regions-country. [Accessed: 11-May-2019].

[5] “BNamericas - Burdened by bad loans, wobbling Agrobanco seeks US$140mn inj.” [Online]. Available: https://www.bnamericas.com/en/news/burdened-by-bad-loans-wobbling-agrobanco-seeks-us140mn-injection. [Accessed: 11-May-2019].

[6] “Peru to strengthen Agroperú fund as Agrobanco faces uncertain fate.” [Online]. Available: https://www.spglobal.com/marketintelligence/en/news-insights/trending/gprjkmbhpufee7ztbm-h0g2. [Accessed: 11-May-2019].

[7] “Peru agriculture chief expects troubled Agrobanco to swing to profit in 2019.” [Online]. Available: https://www.spglobal.com/marketintelligence/en/news-insights/trending/YXcbh3HStd1-ob3hBlQpZw2. [Accessed: 11-May-2019].

[8] C. Catalini and J. S. Gans, “Some Simple Economics of the Blockchain,” p. 33.

[9] S. Dowlat, “Cryptoasset Market Coverage Initiation: Network Creation,” p. 30, 2018.

[10] “BitDNS and Generalizing Bitcoin.” [Online]. Available: https://bitcointalk.org/index.php?topic=1790.msg28696#msg28696. [Accessed: 12-May-2019].

[11] *Bitcoin Improvement Proposals. Contribute to bitcoin/bips development by creating an account on GitHub*. Bitcoin, 2019.

[12] A. Tomescu and S. Devadas, “Catena: Efficient Non-equivocation via Bitcoin,” in *2017 IEEE Symposium on Security and Privacy (SP)*, San Jose, CA, USA, 2017, pp. 393–409.

[13] H. Aspegren, “b_verify: Scalable Non-Equivocation for Verifiable Management of Data,” p. 63.

[14] M. Weber and H. Aspegren, “SME Finance: Prototyping Blockchain Solutions For Inventory-Based Lending To Farmers,” p. 2.

[15] “Lineamientos del Líder de Gobierno Digital,” p. 6.

[16] R. EC, “SBS: Situación de Agrobanco debe ser resuelta a la brevedad,” *El Comercio*, 07-Feb-2018. [Online]. Available: https://elcomercio.pe/economia/peru/sbs-situacion-agrobanco-debe-resuelta-brevedad-noticia-495420. [Accessed: 14-May-2019].

[17] A. Moretto, L. Grassi, F. Caniato, M. Giorgino, and S. Ronchi, “Supply chain finance: From traditional to supply chain credit rating,” *Journal of Purchasing and Supply Management*, vol. 25, no. 2, pp. 197–217, Mar. 2019.

Appendix 1: Original process flows from Agrobanco (documents are not classified)

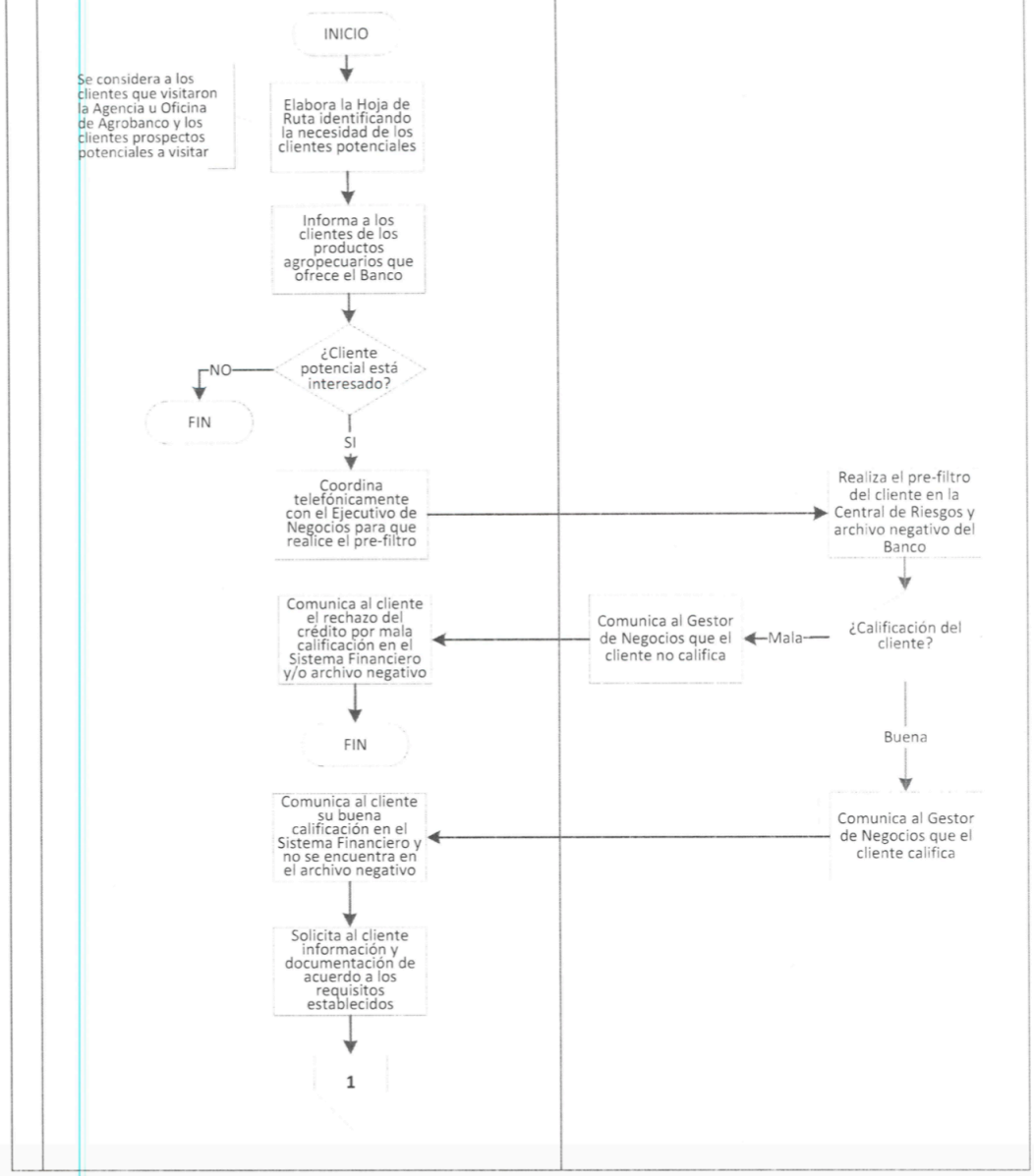
Agro Servicios Financieros para el Perú Rural	MANUAL DE PROCEDIMIENTOS DEL PROCESO CREDITICIO	Código	MDP-006-01
		Versión	01
		F. Aprob.	16/08/2017
		Página 26 de 32	

IX. DIAGRAMAS DE FLUJO

9.1. PROSPECCIÓN DE CRÉDITOS

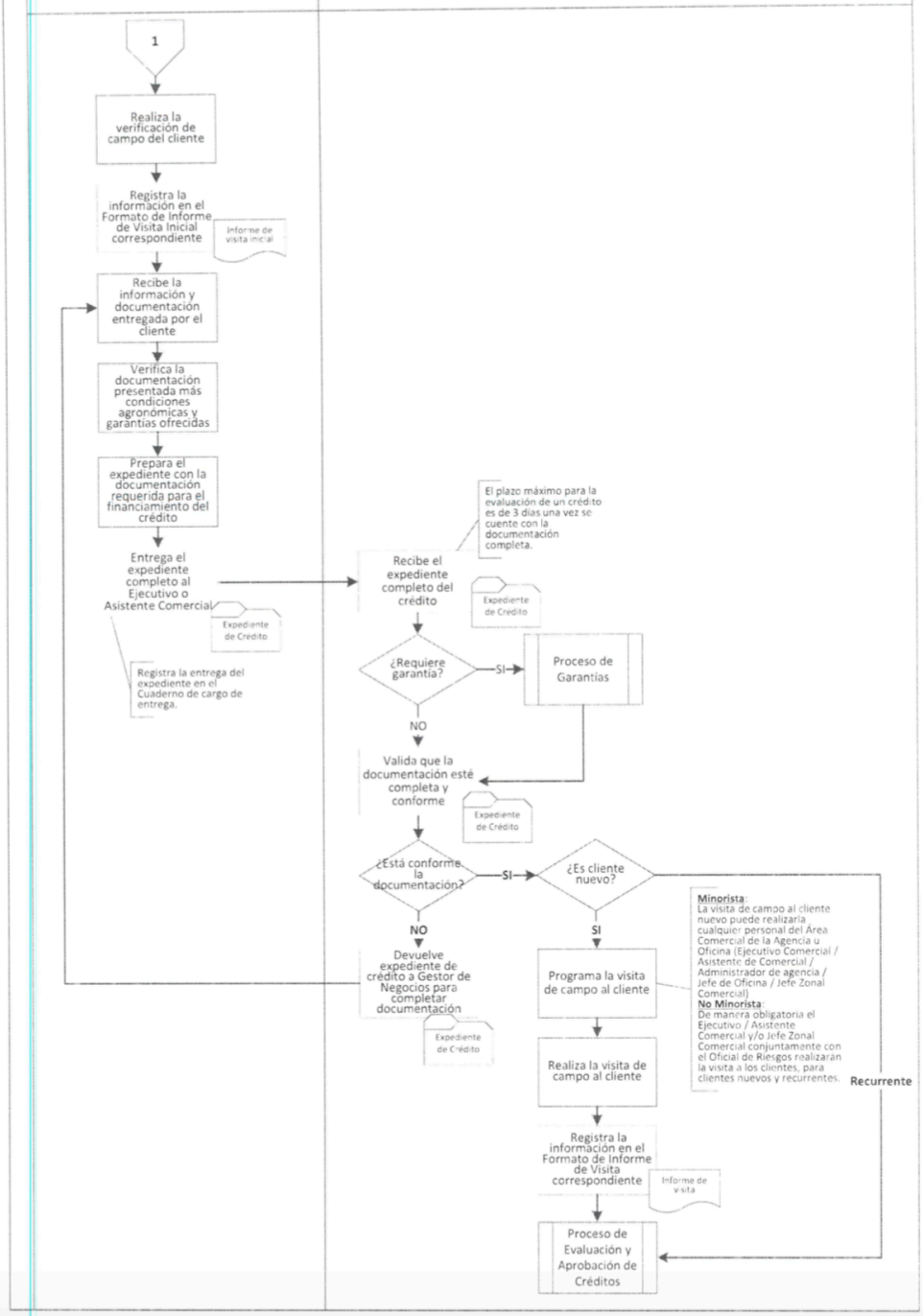
PROCEDIMIENTO DE PROSPECCIÓN DE CRÉDITOS

Código : MDP-006-01 Pág.1/2 Versión: 01

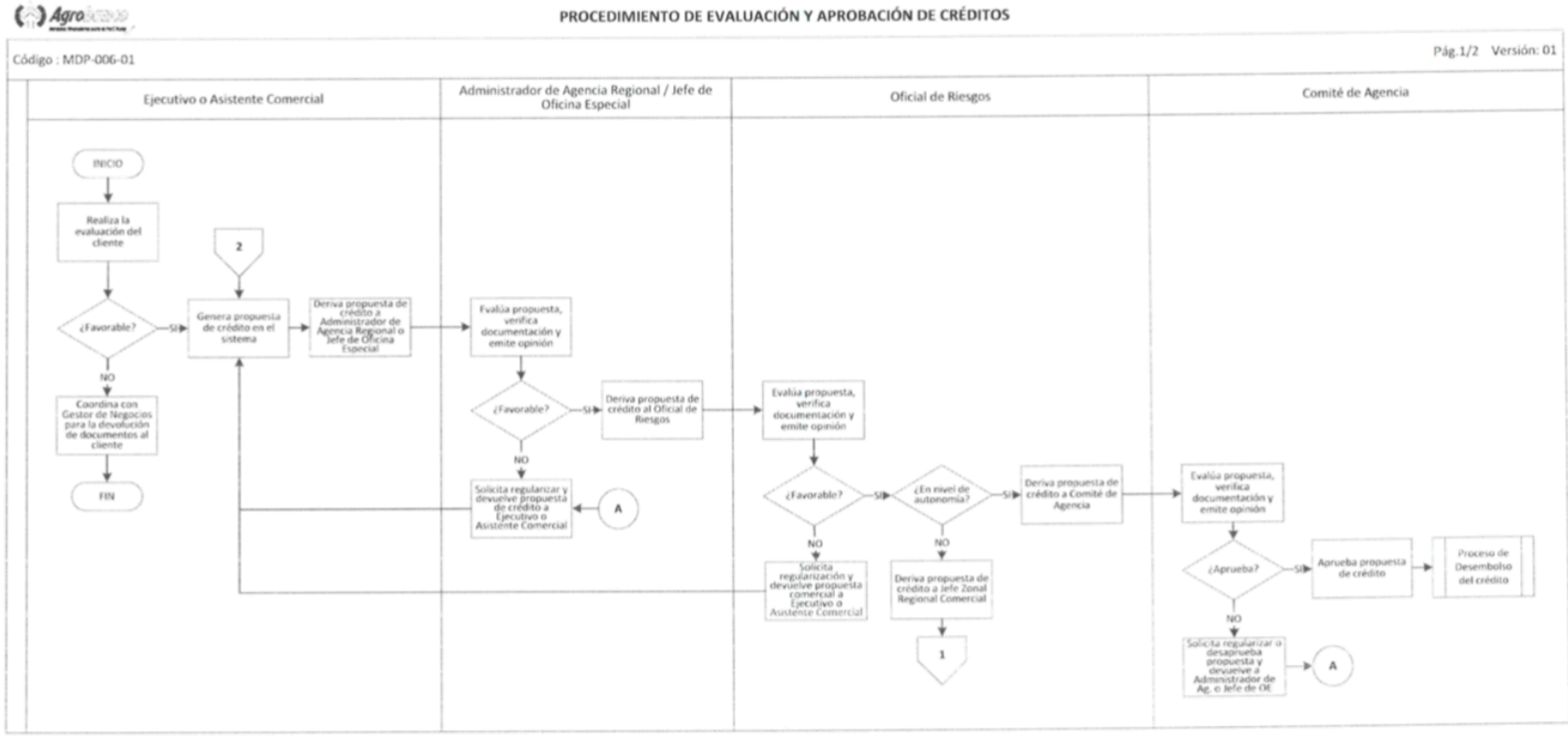


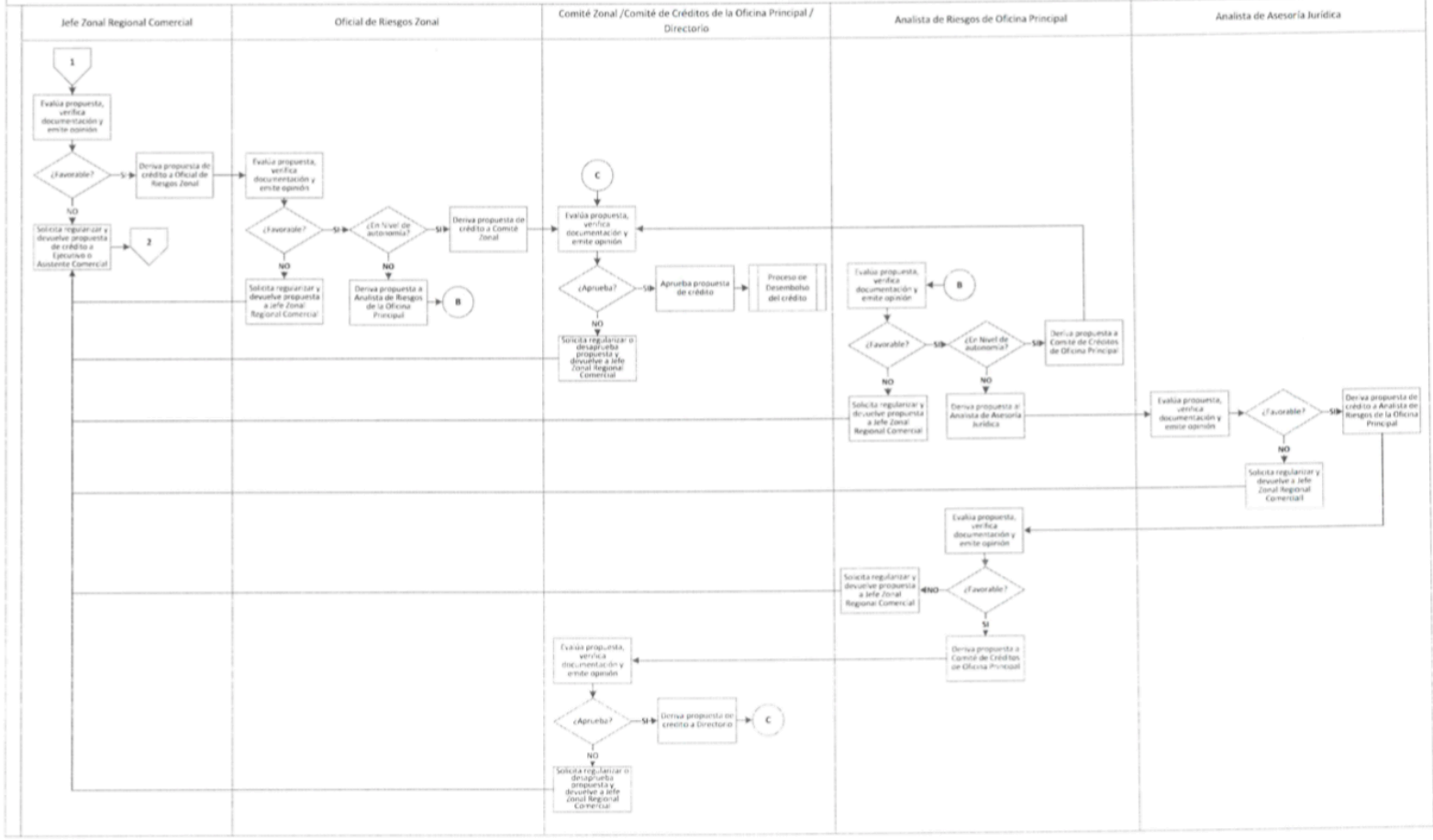
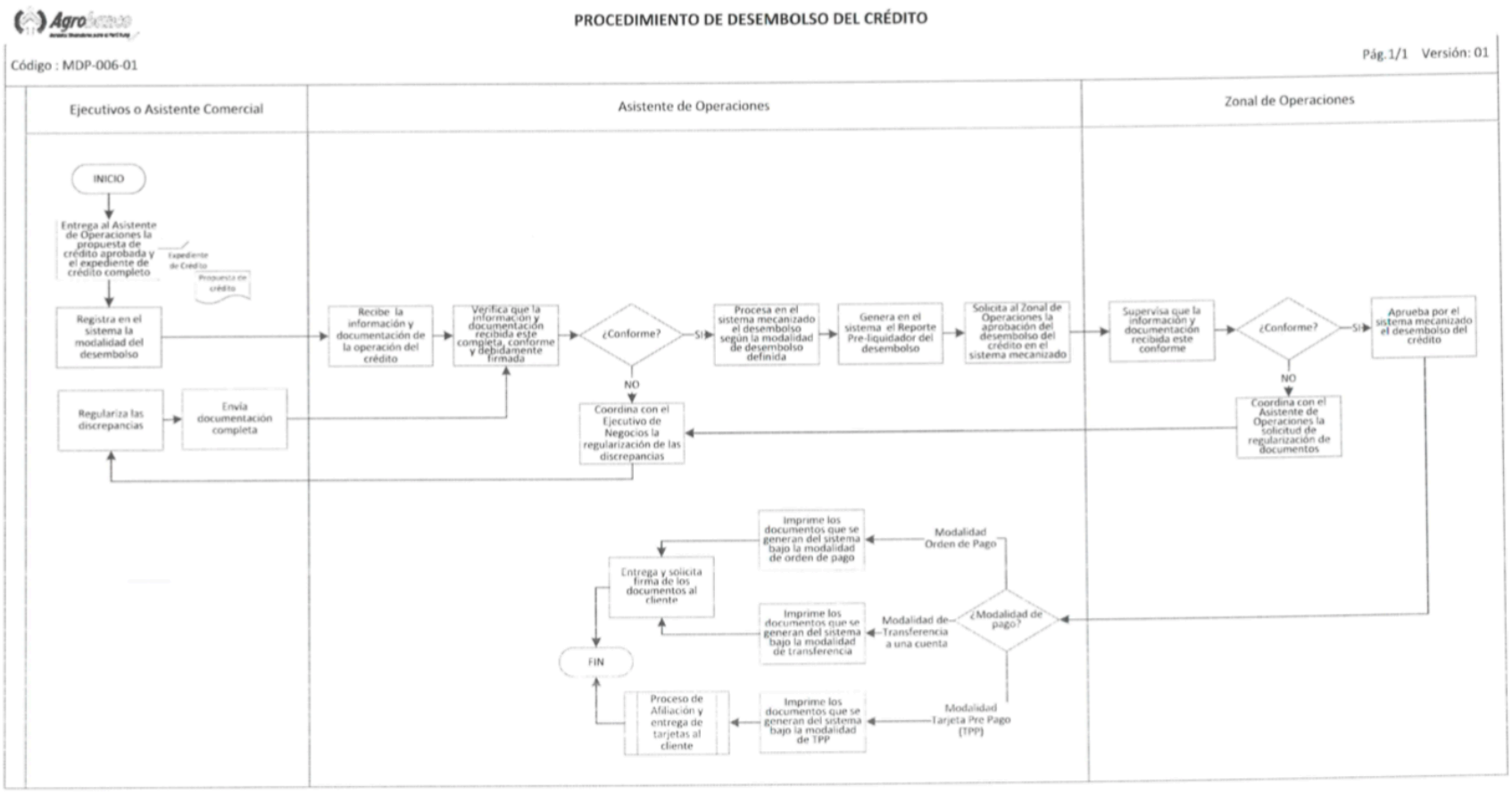
PROCEDIMIENTO DE PROSPECCIÓN DE CRÉDITOS

Código : MDP-006-01 Pág.2/2 Versión: 01



9.2. EVALUACIÓN Y APROBACIÓN DE CRÉDITOS




Jefe Zonal Regional Comercial
Oficial de Riesgos Zonal
Comité Zonal /Comité de Créditos de la Oficina Principal / Directorio
Analista de Riesgos de Oficina Principal
Analista de Asesoría Jurídica
1
Evalúa propuesta, verifica documentación y emite opinión
¿Favorable?
Si
Deriva propuesta de crédito a Oficial de Riesgos Zonal
NO
Solicita regularizar y devuelve propuesta de crédito a Ejecutivo o Asistente Comercial
2
Evalúa propuesta, verifica documentación y emite opinión
¿Favorable?
Si
¿En Nivel de autonomía?
Si
Deriva propuesta de crédito a Comité Zonal
NO
Solicita regularizar y devuelve propuesta a Jefe Zonal Regional Comercial
NO
Deriva propuesta a Analista de Riesgos de la Oficina Principal
B
C
Evalúa propuesta, verifica documentación y emite opinión
¿Aprueba?
Si
Aprueba propuesta de crédito
Proceso de Desembolso del crédito
NO
Solicita regularizar o desaprueba propuesta y devuelve a Jefe Zonal Regional Comercial
B
Evalúa propuesta, verifica documentación y emite opinión
¿Favorable?
Si
¿En Nivel de autonomía?
Si
Deriva propuesta a Comité de Créditos de Oficina Principal
NO
Solicita regularizar y devuelve propuesta a Jefe Zonal Regional Comercial
NO
Deriva propuesta al Analista de Asesoría Jurídica
Evalúa propuesta, verifica documentación y emite opinión
¿Favorable?
Si
Deriva propuesta de crédito a Analista de Riesgos de la Oficina Principal
NO
Solicita regularizar y devuelve a Jefe Zonal Regional Comercial
Evalúa propuesta, verifica documentación y emite opinión
Solicita regularizar y devuelve propuesta a Jefe Zonal Regional Comercial
NO
¿Favorable?
Si
Deriva propuesta a Comité de Créditos de Oficina Principal
Evalúa propuesta, verifica documentación y emite opinión
¿Aprueba?
Si
Deriva propuesta de crédito a Directorio
C
NO
Solicita regularizar o desaprueba propuesta y devuelve a Jefe Zonal Regional Comercial

9.3. DESEMBOLSO DEL CRÉDITO