3. MAPPING THE VALUE CHAIN – MARKET INTELLIGENCE

- **What are the primary participant types involved in the value chain approach?**
- **What is exchanged between participants?**
- **Are certain relationships stronger than others?**
  - Though the exact structure and organization varies considerably from value chain to value chain, we can identify four key participant types in each: input suppliers, producers, aggregators, and retailers/consumers.
  - Mapping the interactions and relationships of these participants can provide a wealth of knowledge and confidence for a financial institution.
  - Mapping of a value chain implies an understanding of the flows of products, finance, information, and services.
  - This chapter explores the process of mapping and provides key insights from current case studies of how mapping knowledge can inform decision-making.

Once the target value chain has been identified, an in-depth analysis that goes beyond the concepts included in a traditional credit application becomes imperative for evaluating credit worthiness and risk profile. The financial institution should "map" the value chain, identifying the participants, the links among them (both strong and weak), as well as the key players operating in the value chain. At the same time, the evaluation should identify those relationships that impact both product and credit flows. This takes on particular significance given that value chain finance facilitates the extension of formal banking operations to large numbers of small producers building upon existing internal linkages in the value chain.

It is important to recognize that the relationships can be both formal and informal. Formal relationships are those that are grounded in a contract, spelling out obligations of the parties to the agreement. Formal agreements imply legal recourse for non-compliance.

Informal agreements are built on an understanding between the participants of their obligations and responsibilities, which may or may not be in writing, and that typically has no formal recourse in case of non-compliance. These informal pacts are usually the result of an ongoing interaction and confidence between the participants in the value chain. This tends to be the way local moneylenders and first stage intermediaries or rural collectors operate. Established value chains rely on both formal contractual agreements and informal agreements among participants in the value chain. When engaging with small farmers, buyers may depend on informal relationships or, as is the case with the Indian hybrid seed value chain, companies will work through an intermediary (in that case, a seed production organizer) whose interaction with producers is largely based on informal relationships.

Determining relations of resource controls (negotiating power) is another key objective in mapping the value

chain. Agricultural financing is often provided in-kind; buyers will supply inputs into the production process with the expectation that reimbursement will occur only upon delivery of production from farmers. Additionally, buyers will set production requirements and standards, which determine the type and levels of technology used in production. Understanding how information moves through the value chain is a key determinant of both the chain's competitive position and inherent risk profile, as well as an indicator of power within the chain. This understanding must include the consumer market to reduce the credit risk from downstream market adjustments.[12]

The value chain is about market-focused collaboration among participants, hence mapping focuses primarily on the participants and their inter-relationships. This recognizes the importance for effective risk management that the relationships between participants represent; particularly in environments where formal contracts are not the norm or where contract enforcement is weak.

These concepts within the mapping stage should be understood as a supplement, rather than substitute, to the traditional analysis involved in credit decisions. These would include, among others, the competitive position (e.g. cost of production, competitors, etc.), potential risks and mitigation, and the chain's product position in reference to the end consumer market. The mapping of the value chain not only strengthens the traditional analysis, but also supports the financial institution's evaluation of the entry points in the value chain, as well as the potential financial products that can be offered to the participants along the value chain.

Participants in the value chain – real flows (inputs and product)

From the general categories of participants enunciated in the introductory chapter, four key participant types can be identified for mapping purposes along the value chains: 1) input suppliers; 2) producers; 3) aggregators; and 4) retailers and consumers.

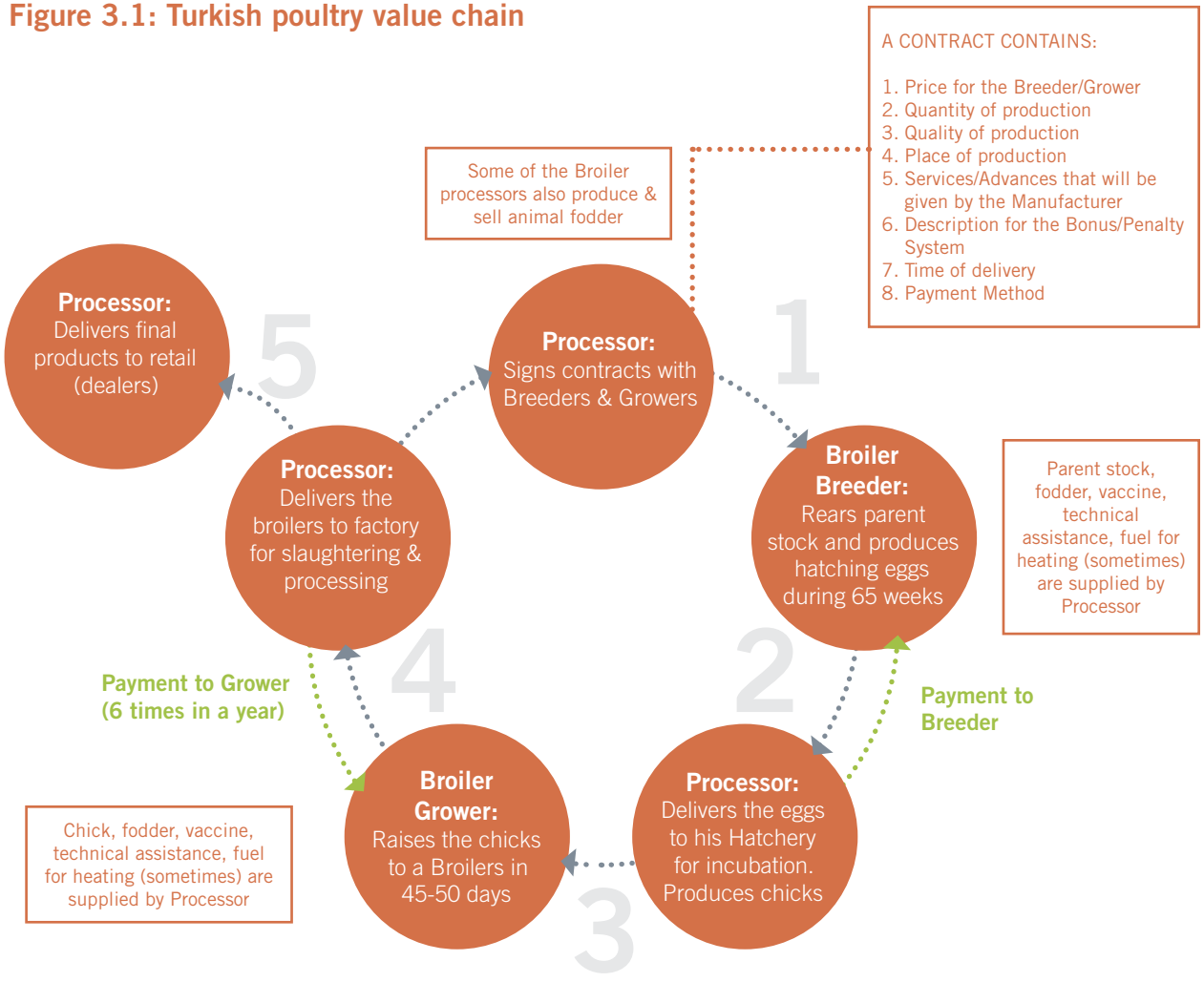
Input suppliers. Traditionally, inputs into the production process have been sourced from separate, identifiable suppliers. For crop agriculture these often include, seed, fertilizer, and agrochemicals. As for animal agriculture, key inputs in the production process are feed ingredients, feeder stock, and medicine. The types of technology and their availability depend on the relations, including financing, between the supplier and producer. Often this does not ensure the most up-to-date technology or the lowest cost of credit. The result is higher input costs with the ensuing negative impact on margins and competitiveness. Furthermore, these relations are not focusing on or promoting aggregation of the financial process.

Within the more structured value chains, the input supply function is changing from direct in-kind provision of inputs by aggregators (to reduce diversion), to aggregators entering into agreements with input suppliers to supply these to producers. Production parameters are also commonly specified in these aggregator-producer agreements. Depending on the role of the input in the production process, the aggregator may actually produce the input and/or enter into an alliance with a specialized firm to produce and supply it. This is the case in the Turkish poultry value chain, which is typical of many poultry value chains (Figure 3.1). The processor enters into formal agreements with breeders and growers. The breeder produces hatching eggs for the processor. In this portion of the value chain, the breeder is the input supplier. The transaction is commercial, i.e. the processor pays the breeder for the hatching eggs. In the next stage in the value chain, the processor will supply the inputs – day-old chicks – to the grower, as well as other inputs, such as vaccine and feed. The grower will deliver the grown chick – a broiler – to the processor in 45 to 50 days.

The supply of inputs may itself be a context specific value chain, especially when it involves research and development (R&D), and biotechnology. The India case study is a good example of this evolution (Box 3.1).

12. For example, in the cut flower market for roses the dominant color for the end market changes practically from year to year. This means that the producer's financial success is dependent on Information about the changing market dynamics. And the buyer power is partially based on the knowledge of what the market is demanding in terms of the colors of the flowers.

Figure 3.1: Turkish poultry value chain



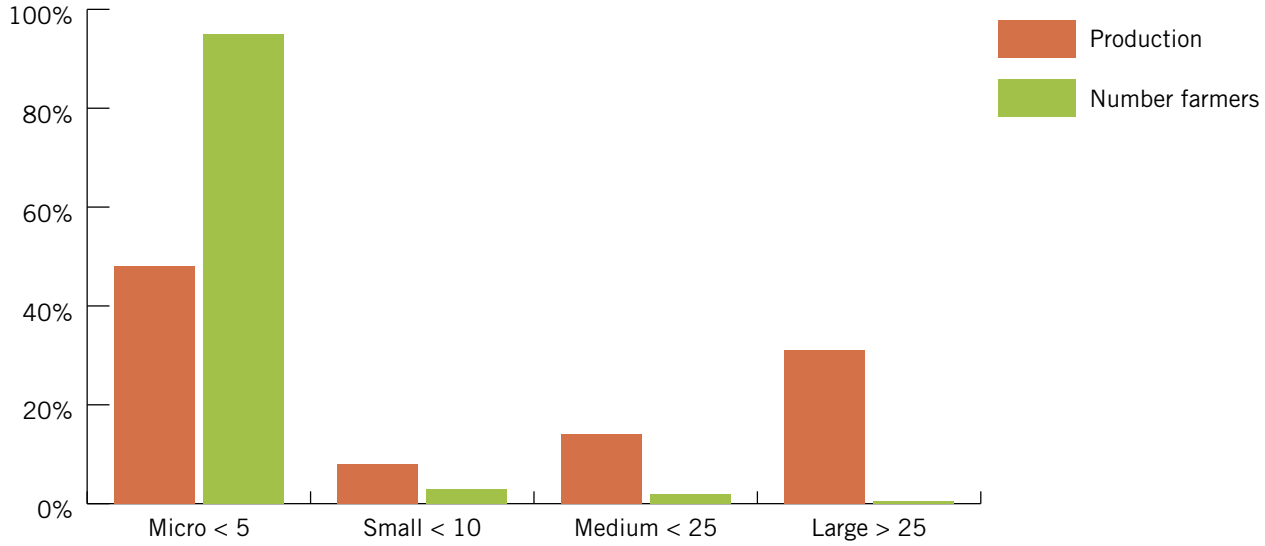
Source: Yapi Kredi. AgriFin VCF Bootcamp.

Box 3.1 Research and development and biotechnology in input supply

The India case study focused on the seed industry value chain. The case study found that, "the private sector seed industry underwent a transition following the Indian government's focus on biotechnology research as a means of increasing agricultural production and was driven by trends in the domestic and world seed market. Intensifying international competition, increasing R&D costs, and the complexity of biotechnology have led to increased consolidation of the Indian seed industry with several of the large and medium companies merging or being taken over by multinational seed companies. India's varied agro climatic conditions, abundant skilled and unskilled labor, are attracting several multination hybrid seed companies to India. Several large seed producers with deep pockets, both domestic and multinational, are hoping to buy financially strained or 'technologically rich' smaller firms with sizeable geographical reach and distinct product portfolio."

Source: HDFC. 2015.

Figure 3.2 Mexico tomato production: percent of producers and production by farm size (hectares)



Source: Bankaool, 2015.

Producers. At the producers' level, mapping involves developing an understanding of their operations, and the first-level marketing structure, i.e., the producers' relationship with the immediate purchaser(s) of their products. Optimally, this would include collecting information on farm size, average production, yields, yearly production variations, production costs, and prices received. Existing relations with input suppliers and aggregators should be identified, including both formal and informal arrangements, particularly if they impact the prices farmers receive. Given that the agricultural industry operates in an information economy, it is also important to identify market and technology information flows. The results of the mapping exercise should allow the financial institution to estimate the changes in costs and returns that may be possible with improved access to formal credit. Additionally, due to the extent of governmental support to agriculture in many countries, it is important to identify the types of support to producers in the value chain, including impacts and limitations.

Markets throughout the developing world tend to be characterized by large numbers of small producers. In the Mexico horticultural case study, for example, practically 90 percent of the tomato producers operated on less than five hectares (Figure 3.2). Similarly, in the Mexican sugar industry practically 70 percent of cane growers cultivate less than five hectares. At the same time most of the farmers operate in an informal environment. In the Indian dairy industry, for example, 88 percent of the dairy producers are not part of a structured value chain, participating largely in the informal economy.

An important advantage of value chain financing is that it represents a strategy for aggregating or scaling-up the activities of smallholder farmers, bringing them more deeply into the formal financial system and offering them the chance to improve farm productivity and income levels and to help increase food production.[13] Scaling-up operations through value chain finance turns a money-losing proposition into a feasible business proposition. For example, HDFC in India estimated that it would take two years to reach break even financing medium-sized dairy operations through the value chain. For stand-alone, direct credit to the same producer, at the same interest rate, it would take four years to reach the break-even cost return ratio.

Aggregators. Understanding the aggregator and identifying "anchor companies" are important aspects of analyzing the value chain (Box 3.2). The aggregator is defined as an agent that acquires the farmer's production and is the primary vehicle for promoting small producer financing. Using this definition, the aggregator may be a farmer cooperative or farmer producer organization that receives and aggregates production from members for subsequent sale. In

13. HDFC, AgriFin. 2015. Creating Value Chain Finance for Smallholder Farmers - Summary of the Market Study Report of Indian Hybrid Seed Production Chains.

Box 3.2. What defines an anchor company?

What makes a firm an "anchor company" in a value chain? Anchor companies are the prominent companies in the value chain that drive the volume of production and value-added products. The value chain mapping should seek to highlight prominent companies in the value chain by a number of criteria:

1. Market share in final product
2. Market share in critical intermediate outputs
3. Number of suppliers as a proportion of total producers
4. Stability of supplier relationships (e.g., percent of repeat suppliers each season)
5. Financial performance and credit rating

Where there are several companies active in the area in which the bank operates, the mapping exercise should build a score for each company using all five criteria, to facilitate comparisons and to define negotiating approaches as needed. In the extreme case in which there is only one anchor firm present in the bank's field of operations, the criteria addressing stability of supply and financial performance/credit rating should be the key determinants of whether to engage in a formal partnership with the anchor firm.

this case, the aggregator takes possession but not ownership. The aggregator may be a distributor/trader or processor that will turn around and sell the production to another buyer or aggregator. The number of aggregators in the market may be significant. The Pakistan case study identified the number of milk collectors at an estimated 300,000 agents, sometimes collecting as little as a bucket full of milk.

Alternatively, farmers may be the final seller, as is the case in Mexico's vegetable industry where retailers have established direct relationships with producers for delivery of their production. On the other hand, it is frequently the case that producers are "represented" by aggregators with regard to other downstream participants or a financial institution. The aggregator may be a company operating in the domestic market, or perhaps even in a foreign market.

The relationship between the aggregator and the producer plays an integral part in defining the risk profile for value chain financing. Ultimately, the producer's ability to repay a loan will, of course, depend on payment from the aggregator. The aggregator conversely depends on producers honoring their commitments to deliver their production. In many developing country markets, transactions are based on informal agreements. This was identified in the Pakistan case study on the dairy industry, which is characterized by unwritten, year-long agreements. The quality of the milk is based on trust, rather than laboratory analysis, with payments made on a monthly basis. Similarly, in the Mexican vegetable industry, trust based on long-term relationships is the operating norm since cross-border financing is used for harvesting and packing.[14]

In the India seed case study, the relationship is somewhat more complicated as seed companies depend on seed production organizers (SPO). The SPOs provide several services, including farmer selection, seed production management on behalf of the seed company, and technical and financial support to the farmers. The seed production process and the success of crops are heavily dependent on the technical inputs provided by the company and the organizer, as well as the financial assistance provided at the appropriate time. The SPO was found to be a nerve center in the value chain. The majority of payments made by the company to farmers are routed through the SPO, which often also fulfilled the role of a moneylender. The SPO is generally a local villager who is financially stable. From a banker's perspective, this is a relatively safe avenue for extending collateral-based agriculture credit, as the SPO is usually a landowner with diversified sources of income. The nature of the transactions between the SPOs and the seed farmers depend largely on informal relationships. With multinational seed companies, transactions are based on formal contracts whereas these are scarcer when considering regional and national Indian companies.

14. HBL/AgriFin. Structure and Performance of the Dairy Value Chain in Pakistan. Implications for Value Chain Finance. Draft June 2015.

Where the aggregator is an intermediary or trader, the credit risk exists not only between the producer and the aggregator but also between the aggregator and the client. In fact, the weak point in the value chain may actually lay in the transactions between the aggregator and its client. This is often overlooked in credit analysis, and when mapping the relationships in the value chain.

It is the aggregator that often performs the role as the anchor company. That is, they represent the point of contact, or entry point, between the financial institution and the value chain in general and, in particular, the farmers. Typically, the aggregator/anchor company or farmer organization has a preexisting relationship with the financial institution, which can be leveraged through a value chain financing strategy. This is of particular importance since the ongoing financial relationship helps to validate, at least partially, the financial viability of the value chain. At the same time, the aggregator can undertake the role of a financial agent for the financial institution and/or even provide a first loss guarantee (i.e., a secondary source of repayment), thereby partially sharing the risk involved in the financial operation.

End-market participants. A common mistake by financial institutions is to make a credit decision solely on the basis of production and productivity. An important part of reducing risk is that the mapping of the value chain should identify the participants and the role they play as well as what is happening at the consumer level. This is especially important when the market is situated partially or entirely outside the country. In the Mexico case study, for example, it is estimated that 45 percent of 2013 production was exported, up from 34 percent in 2000. Greenhouse production was a significant contributor to this growth, as the area in greenhouse production went from approximately 9,000 hectares to 30,000 hectares over the same period. A key driver for the growth in greenhouse area was an increase in consumer demand and premium prices for greenhouse produce in the U.S. market (which receives 90 percent of Mexico's vegetable exports).

The agri-food system has evolved from being production-oriented to one that is demand-focused. In the Mexican vegetable industry, for example, it is estimated that supermarkets account for 27 percent of the vegetables purchased by consumers. With the supermarket segment dominated by a relatively small number of retailers, this suggests that only a few retailers control almost a quarter of the Mexican domestic vegetable market.

The consumer market for food is rapidly changing, reflecting a greater focus on health and concerns about the impact of food production on the environment. Accordingly, profitability and credit risk hinge to far greater extent on the ability to meet changing market tastes and demands. For example, another factor stimulating the growth of greenhouse production in Mexico is its ability to ensure the quality (i.e., food safety) of produce. In the Turkish poultry industry, market demands directly influence the decision by the processor as to which breed of chickens to provide to the grower.

Changes in the agri-food system has shifted power to those participants in the value chain that are closest to the final consumer. At the same time, many markets have seen consolidation at the retail, trader, and food service levels, further enhancing their power in the value chain. As highlighted above, retailers (particularly large retailers) will buy directly from producers to ensure that they have products that meet consumer demand. However, even when retailers buy directly from producers they will not typically provide financing or technical support. Instead, they often set standards that must be met for the products that they purchase. In the Mexican vegetable industry, where technical support and financing from retailers is uncommon, large retailers have begun to provide contracts to large suppliers. Notably, this type of arrangement has been limited to cross-border transactions between U.S. retailers and Mexican export producers.

Financial flows – intra- and extra-value chain transactions

Mapping of the value chain not only focuses on the participants and the product flow but also on the sources of financing inside and outside the value chain. As indicated, formal bank financing for smallholder farmers is frequently absent. In some cases, it is the input supplier or the aggregator that supplies credit to these producers, while local moneylenders are often the main source of financing. Mapping the financial flows, while pairing them with the product flows and participants in the value chain, represents an important tool for recognizing risks and identifying potential entry points for financial institutions.

During the field research associated with the value chain mapping, creating a profile (however approximate) of financial flows for each main participant in the value chain is crucial to understanding the potential demand for financial products a bank may be able to offer. These profiles could be based on field surveys of a sample of participants, as was done in India for the seed value chain, or on key-informant interviews, which were used in Pakistan and Mexico.

The weak links. As indicated throughout this chapter, mapping the value chain provides important insights into the risk points or weak links within an industry. The mapping not only looks at the relationship between the participants but the numbers of participants and their impact on the business proposition of the value chain. For example, an important criterion in successful value chain financing is the ability to dilute risk. As such, when working with an aggregator the number of farmers must be large enough so that non-repayment by a single or even a small number of farmers will not seriously damage the quality of the transaction.

Besides the nature of the transactions between the aggregator and its clients, the other areas of vulnerability are extra-value chain transactions in which the supplier fails to sell or deliver the product to the aggregator (known as side selling). This is a risk to the aggregators with clear implications for the recuperation of credit. In some cases, this risk can be addressed by having no other aggregators in the operating area and/or the setting of extremely high transportation costs, resulting in a cash loss to the producer. Supply contracts are not a particularly attractive option given the costs involved in establishing a large quantity of contracts with many small farmers who are outside the formal market system. Informal agreements among aggregators to respect the each other's suppliers in the Mexican vegetable industry have been reported. However, since these agreements are informal, and might be considered to be collusive, they are hardly enforceable. Once again, the quality and understanding of the relationship between the aggregator and the supplier becomes crucial for compliance and risk mitigation.

Risks across the value chain

The final piece in the mapping process involves identifying the risks inherent in the value chain and understanding their implications for the financial institution's value chain business opportunities. Among the more important risk categories that financial institutions should consider for selection of the target value chain, in addition to the political and structural risks discussed above, are: 1) production-level risks; 2) side-selling risk 3) aggregator risks; 4) downstream market-level risks; 5) client-level risks; and (6) reputation risks. [15]

Primary production level risks. Production-related risks include changes in both expected output and product prices. They typically stem from weather effects, disease or insects, food safety scares or changes in the international market environment. Many of these can be mitigated through risk management products, such as crop insurance. Understanding what steps a producer can take to mitigate price risk is important in selecting a value chain. Sophisticated instruments, such as derivatives, are usually beyond the reach of smallholder farmers (or most farmers, for that matter) but may be an option for large aggregators or processors downstream.

Side-selling risks. Side selling, in which suppliers fail to honor delivery commitments to the aggregator or the processor and therefore imperil loan repayment, is a significant risk. To the extent that there is a high level of competition (a large number of buyers), the risk of side selling increases. Given that formal contracts might not exist or might be unenforceable, past experience or track record with regard to honoring delivery commitments provides an indication of the extent of financial risk. Hence, gathering existing information on past transactions in a manageable, useable way is of high value for the stability of the value chain finance relationship.

Aggregator risk. While primary production risks and producer creditworthiness are important, the weakest link in value chain finance may in fact be the aggregator. The financial institution's business model and the aggregator's primary interest and standard operating procedures should be aligned with the market. Similarly, when the aggregator has a commitment to provide inputs to producers, risks include not only failure to deliver but also delayed delivery. This is particularly important given that delayed delivery of inputs may result, for example, in extemporaneous planting by farmers, impacting negatively on productivity. Similarly, there is the risk that the aggregator may not comply

15. Standard credit risk assessment may also be modified when dealing with VCF lending. See Chapter 6.

with the agreement to acquire farm production in its entirety or in the agreed-upon proportion. At the same time, delay in payment to producers increases the financial risk, particularly when unsecured credit is provided to producers. When the aggregator assumes a commitment in the credit delivery or recovery process, credit risk relies to a large extent upon aggregator performance.

Downstream market-level risk. There are three types of downstream market risks: compliance risk; competitive risk; and management risk. Many of the risks that exist between aggregators and producers also arise as the aggregator sells or moves product downstream, be it processed or not. These include payment and contract compliance, among others. In fact, the true risk in the value chain may reside with the aggregator's buyer. The second source of risk has to do with competition in the market. The more sellers there are, the greater the competition and, subsequently, the greater the market risk related to the specific aggregator. Similarly, the existence of imports and/or similar-type products impacts the competitive environment. Finally, there is the ability of the participants to deal with market-related developments. For example, market risk is heightened where there is a marked seasonality of production and/or demand. Here, effective inventory management becomes important in controlling market risk.

Systemic risk/systemic default. Most value chains are by nature subject to covariance risks, usually associated with weather phenomena, or pests/diseases (e.g., coffee rust in Latin America) that affect the chain's base commodity. Market developments, such as price fluctuations may also create conditions for widespread/systemic failures that will result in systemic default. A common related aggravating factor is government intervention through debt relief or forgiveness, which, while alleviating the effects for farmers, makes the effects on financial service providers even more significant. An obvious mitigation for weather related systemic risk (drought, floods) is geographic diversification. Indeed, the two partner banks that had already selected a value chain had used geographic diversification of hybrid seed production (HDFC, India) and dairy production (HBL, Pakistan) as a risk-reducing criterion. Portfolio diversification and specific-crops lending caps are commonly used for the coffee-rust type risk, where disease damage occurs across different geographies. Price-related systemic default is usually more predictable, and its mitigation can take advantage of hedging and insurance instruments (if available), in addition to diversification to other value chains.

Client-level risks. At the client level (e.g., large aggregator or processor), typically the financial institution looks at the client's financial situation, concentrating on cash flow criteria. These include:

- Liquidity, which shows how the amount of assets that can be converted into cash compares to payables within the year, with a minimum ratio of 1;
- Leverage of cash flow, which considers how debt (bank, supplier, or land) compares to sales and to operating cash flow (using a conservative scenario of a maximum of 60 percent of net sales and debt less than three-times earnings before interest, taxes, depreciation, and amortization);
- Payment capacity, which evaluates the relationship between expected operating cash compared to debt service (interest plus installments), with a minimum of 1:2;
- Solvency, which reveals how total debt compares to total assets, looking for a maximum ratio of 40 percent. At the client level, the financial institution often fails to look at the adequacy of the financial operations.

Reputation risks. Reputation risk in value chain finance may emerge in different ways. If, for example, a bank is financing an aggregator who in turn exercises bad practices with the upstream customers (farmers), the bank will get negative publicity and, possibly, regulatory attention. As such, due diligence by the bank on the different partners it may have in the value chain is important. If, for example, the bank is extending non-lending services to value chain customers, compliance with "know your client" requirements – even for small farmers – will be important to protect the bank's reputation.