TECHNICAL REPORT

Enterprise Development Index

A Multidimensional Tool for Characterizing Business Development in Agricultural Small and Medium Enterprises

Juan Taborda, Jorge Bouchot, and Miranda Hansen
245 Main Street, 2nd Floor,
Cambridge, MA 02142
United States
(617) 661-5792
jtaborda@rootcapital.org

Root Capital

CONTENTS

EXECUTIVE SUMMARY

Organizations financing and supporting small and medium agricultural enterprises (agri-SMEs) in emerging markets routinely collect monitoring data but rarely leverage it for strategic decision-making. This paper introduces the Enterprise Development Index (EDI), a multidimensional tool developed by Root Capital to evaluate client growth. By transforming routine monitoring data into actionable insights, the EDI demonstrates how organizations can move beyond simple reporting to drive strategic impact. Drawing on the methodological tradition of the Human Development Index (HDI), the Multidimensional Poverty Index (MPI), and the *tipologías* approach to territorial classification, the EDI synthesizes 25 indicators across six dimensions: Size and Reach, Financial Capacity, Operational and Sector Capacity, ESG Strength, Business Resilience, and Local Context. Each indicator is normalized on a 0–1 scale using goalpost values, aggregated through equally weighted arithmetic means, and classified into development categories using Jenks Natural Breaks. The paper explains the rationale for the index, presents the conceptual framework and methodology, describes the operationalization of each dimension, and discusses the intended uses and limitations of the tool. We offer the EDI as a practical, replicable framework that other practitioners serving agri-SMEs might adapt to their own portfolios and data environments.

INTRODUCTION[1]

The question of how to measure the development of an enterprise is deceptively simple. A single financial metric, such as annual revenue or profitability, captures only a fraction of what makes a business viable over time. For small and medium agricultural enterprises (agri-SMEs) operating in low- and middle- income countries, the challenge is compounded by factors that sit outside the enterprise itself: volatile commodity prices, weak rule of law, climate exposure, and limited access to formal financial services. Any tool that attempts to characterize business development must therefore grapple with multiple dimensions simultaneously, much as the field of development economics has done for decades when measuring poverty or human well-being.

Root Capital has financed and strengthened the capacity of agri-SMEs for over twenty-five years, operating across 13 countries in Latin America, Sub-Saharan Africa, and Southeast Asia. Throughout that history, the organization has invested in monitoring systems that produce standardized data on its clients' business performance, environmental practices, and social impact. However, until recently, no single tool existed within the organization that could synthesize those data into a coherent, multidimensional picture of where each client stands in its business development trajectory.

This paper introduces the Enterprise Development Index (EDI), a composite indicator designed to fill that gap. The EDI evaluates Root Capital's clients across six dimensions of business development, using 25 indicators drawn from existing monitoring and administrative data. Its methodological lineage traces back to the Human Development Index (UNDP, 1992) and the Multidimensional Poverty Index (Alkire and Santos, 2014), and it borrows directly from the *tipologías* approach to multidimensional territorial classification developed at the National Planning Department of Colombia (Aguilar et al., 2015). Our original contribution is the adaptation of these well-tested methods to the specific context of agri-SME assessment in a global lender and advisory services provider, relying only on the use of pre-existing monitoring or administrative data.

The objectives of the EDI are twofold. Internally, the index provides a data-driven basis for segmenting Root Capital's portfolio, guiding service eligibility, and informing resource allocation.

[1] Drafting, grammar, and clarity of this document were supported by AI-assisted tools. No proprietary or confidential client data was shared with or uploaded to any AI tool in the preparation of this document. All analytical content, recommendations, and judgements reflect the authors' own work and were verified prior to publication.

Externally, it enables the organization to articulate a nuanced narrative about the development trajectories of its clients over time and importantly it allows for peers in the sector to see how monitoring data can be used beyond reporting purposes. This paper is not intended as a journal submission or a purely academic effort. It is, rather, a methodology paper written for practitioners, donors, investors, and peer organizations who may benefit from understanding how the EDI was conceived, estimated, and deployed, and who may wish to adapt the approach to their own contexts.

The remainder of this paper is organized as follows. Section 2 reviews the literature on composite and multidimensional indices, with particular attention to the MPI and the *tipologías* framework. Section 3 describes Root Capital's institutional context and the limitations of prior assessment tools. Section 4 lays out the conceptual framework and the six dimensions of the EDI. Section 5 details the methodology, including normalization, aggregation, and classification. Section 6 discusses the operationalization of each dimension. Section 7 describes the intended uses and clarifies what the EDI is not designed to do. Section 8 acknowledges the limitations and charts a path forward. The document concludes by situating the EDI's value in its capacity to structure a consistent, data-informed conversation about enterprise development, and by offering the framework as a replicable model for peer organizations.

LITERATURE REVIEW: COMPOSITE INDICES AND MULTIDIMENSIONAL MEASUREMENT

The Rise of Composite Indices

The proliferation of composite indicators over the past four decades reflects a practical need. Policymakers, funders, and program managers require tools that simplify complex phenomena into interpretable metrics, without reducing them to the point of triviality. Nardo et al. (2008) attribute this trend to the demand for instruments that synthesize and communicate the dynamics of multifaceted environments. Paruolo et al. (2013) and Singh et al. (2009) identify two advantages of composite indicators over the analysis of individual metrics: they provide an intuitive overview of the phenomenon being measured, and they exhibit superior interpretive power when the objective is to identify broad patterns rather than trace the contribution of isolated variables.

However, composite indicators carry well-documented methodological risks. The selection of component indicators is inherently subjective, and choices about normalization, weighting, and

aggregation can each alter the final ranking or categorization of units. El Gibari et al. (2019) provide a thorough review of multicriteria methods for constructing composite indicators, noting that no single aggregation technique is universally optimal. Decancq and Lugo (2013) offer a systematic overview of weighting approaches, from equal weights to data-driven methods such as principal component analysis (PCA), and caution that the choice of weights embeds normative assumptions about the relative importance of each dimension. These concerns are not reasons to avoid composite indicators altogether, but they demand transparency about the decisions made at each step of the construction process.

Multidimensional Indices in Development Economics

Among the most influential composite indicators in development economics are the Human Development Index (HDI) and the Multidimensional Poverty Index (MPI). The HDI, introduced by the United Nations Development Program in 1992, combines indicators of health, education, and income into a single value between zero and one, using min-max normalization and geometric means (UNDP, 1992; Anand and Sen, 2000). Its enduring contribution is methodological: the use of "goalpost values" (predetermined minima and maxima) to standardize indicators and make them comparable across contexts. The Technical Notes of the Human Development Report 2023–24 describe these goalposts as "natural zeros" and "aspirational targets" that anchor the scale independently of the distribution of the data (UNDP, 2024).

The MPI, developed by Alkire and Foster (2011) and refined by Alkire and Santos (2014), extended this approach by introducing a counting methodology that identifies the proportion of the population that is simultaneously deprived across multiple dimensions, adjusted by the intensity of those deprivations. The MPI's contribution to our work is less about its specific counting method (which is designed for household-level poverty measurement) and more about the principle that single-dimension assessments are misleading. An enterprise might show strong financial performance while operating in a context of weak governance and high climate vulnerability, and a unidimensional measure would miss that the context might be pulling down its assessment.

The *Tipologías* Approach to Multidimensional Classification

Tipologías, or typologies, refers to a methodological approach for classifying territorial entities according to their multidimensional development profiles. The approach was formalized in Colombia as part of Law 1551 of 2012, which mandated the creation of municipal typologies to guide differentiated public investment. Aguilar et al. (2015) describe the methodology in detail: six dimensions of territorial development (urban-regional functionality, economic dynamism, quality of life, environment, security, and institutional capacity) are each operationalized through

multiple indicators, reduced to a synthetic variable using principal component analysis, and then combined into a single index using equally weighted averages.

The *tipologías* approach shares the HDI's commitment to equal weighting across dimensions, the MPI's insistence on multidimensionality, and a practical concern with classification. Its final step uses Jenks Natural Breaks to partition the distribution into groups that minimize within-group variance and maximize between-group variance, avoiding the imposition of arbitrary thresholds. For this reason, the resulting typologies reflect the structure of the data rather than the preferences of the analyst.

The *tipologías* framework was a direct inspiration for the EDI. While the units of analysis differ (municipalities in the Colombian case, agri-SMEs in ours), the methodological architecture is analogous: multiple dimensions, normalization to a common scale, equal weighting, arithmetic aggregation, and classification through natural breaks. The EDI departs from the *tipologías* approach in its weighting strategy for indicators within dimensions. Where the *tipologías* methodology uses PCA to derive data-driven weights, the EDI uses equal weights within dimensions, replicating the HDI's approach. This choice prioritizes interpretability and stability over statistical fit. Because the EDI is designed to be recalculated annually with updated data, a weighting scheme that shifts with each estimation would complicate year-over-year comparisons.

Enterprise Development Metrics for Agri-SMEs

Beyond the macro-level indices discussed above, a growing body of work addresses the measurement of enterprise development, particularly for small and medium enterprises in the agricultural sector. The National Federal of Independent Business (NFIB) Small Business Optimism Index, the US Chamber of Commerce Small Business Index, and the Federal Reserve's Small Business Credit Survey (Federal Reserve Banks, 2024) each capture aspects of business health, though they are designed for the U.S. context and focus primarily on sentiment or access to credit rather than multidimensional development.

More relevant to our context are frameworks from the international development sector. DuBois et al. (2015) developed the Pact's Organizational Performance Index (OPI), which assesses organizational capacity across governance, financial management, and program delivery. The GIIN's IRIS+ Catalog of Metrics (2025) provides standardized indicators for impact investors, including metrics for reach, financial performance, and environmental sustainability. USAID's Standard Indicators (2024) offer a government-facing equivalent. SAFIN's Agri-SME Taxonomy (2021) and the Council on Smallholder Agricultural Finance (CSAF) segmentation proposal represent sector-specific attempts to classify agricultural enterprises by type and development stage.

The EDI builds on these efforts but diverges in important ways. Unlike single-sector indices, the EDI incorporates a Local Context dimension that situates the enterprise within its country-level operating environment. Unlike purely financial assessments, it captures ESG strength and business resilience. And unlike static taxonomies, it produces a continuous score that can be tracked over time. All these were methodological and design decisions, aimed to provide a framework that is both methodologically grounded in the tradition of multidimensional indices and practically useful for organizations that serve agri-SMEs across diverse geographies and value chains.

INSTITUTIONAL CONTEXT: ROOT CAPITAL AND THE NEED FOR A NEW TOOL

Root Capital operates at the intersection of impact investing and capacity building for agri-SMEs. Its “credit plus capacity” model pairs financing with advisory services, reaching over 250 agri-SMEs per year that collectively connect more than 500,000 smallholder farmers to markets. The organization works across 13 countries and three regions (Latin America, Sub-Saharan Africa, and Southeast Asia), spanning value chains that include coffee, cocoa, macadamia, and other agricultural commodities.

Central to Root Capital’s operations is a globally standardized monitoring system. The Social and Environmental Metrics (SEMs) capture approximately 60 key business indicators, including annual revenue, payments to producers, volume of crop purchased, and employment figures disaggregated by gender and age. SEMs are embedded into client-facing processes: a loan cannot close until the requisite environmental, social, and governance data have been collected, reviewed, and approved. This tight integration of data collection with service delivery ensures high compliance and provides the foundation for any index that relies on existing data.

Prior to the EDI, Root Capital employed two multidimensional tools for client assessment. In 2020, in collaboration with Bain and Company we constructed the Resilience Quotient (RQ), a framework spanning five dimensions (financial, social, human, natural, and physical) with up to 68 indicators scored on a 1–5 scale. The RQ offered both a resilience capacity assessment and a diagnostic categorization. However, its adoption was limited by the fragmented nature of the underlying data, which was stored in separate data assets without an integrated organizational database.

In parallel, our advisory services designed and implemented the Enterprise Progression Framework (EPF), a tool originally conceived to measure the business progression of Root Capital's advisory clients but that proved more useful for mapping advisory services to client

needs. However, a review by the Impact MEL team noted opportunities to strengthen the EPF's design. The EPF relied on a single metric, the overall DGX score (Root Capital's agribusiness diagnostic tool), and its categorization methodology was heavily dependent on just two of the DGX's five dimensions: financial-economic management and commercial capacity.

The EDI was designed to address these shortcomings. It retains the multidimensional structure of both the RQ and the EPF but reduces the number of indicators to 25 across six dimensions, streamlining the assessment while maintaining analytical rigor. Critically, it draws from a master dataset compiled by merging more than nine data assets, covering services, diagnostics, advisory sessions, impact and risk ratings, and financial spreads, among others, into a panel dataset organized by client account number and year. This consolidation, covering 802 clients and 2,169 client-year observations between 2020 and 2024, was itself a prerequisite for making the EDI possible.

CONCEPTUAL FRAMEWORK

The EDI evaluates enterprise development by considering multiple dimensions of business sophistication and operating environment. The core premise is straightforward: understanding business development in a single measure requires capturing distinct aspects that reflect both the enterprise's internal capacity and the external conditions under which it operates. As Booysen (2002) observes, multidimensional indices are aggregate measures of complex development phenomena, and the decision about which dimensions to include is inherently normative

We selected the EDI's dimensions by triangulating three sources of guidance. First, Root Capital's theory of change, which articulates how lending and advisory services contribute to enterprise growth, rural prosperity, and system-level change, determined which aspects of business development are strategically relevant. Second, the literature review offered reference points on dimensions commonly used by other institutions serving agri-SMEs. Third, the practical constraint of data availability shaped which dimensions could be operationalized with existing monitoring and administrative records. Drawing from these analyses, we identified six dimensions.

Size and Reach

This dimension captures the enterprise's capacity to expand its base of affiliated farmers, employees, or geographic coverage. From Root Capital's perspective, it reflects not the economic size of the business but the potential reach the enterprise has within its community,

which is directly relevant to the organization's system-change objectives. Similar indicators have been used as proxies for reach in frameworks developed by USAID, PACT, and the GIIN IRIS+ framework (DuBois et al., 2015; GIIN, 2025; USAID, 2024).

Financial Capacity

Financial Capacity focuses on the enterprise's ability to manage its financial resources effectively and maintain financial health. It encompasses indicators that serve as proxies for traditional financial ratios assessing organizational profitability, productivity, access to credit, and risk. Additionally, it includes Root Capital's own metric of the client's business management capabilities, ensuring that the dimension reflects not only outputs but the organizational capacity to produce them.

Operational and Sector Capacity

This dimension evaluates the enterprise's maturity and its position within its industry. It incorporates indicators of operational experience (years in operation), productivity within its industry (sales per employee), governance practices (whether the enterprise produces audited financial statements), market position (a within-sector sales ranking), and the breadth of its sustainability certifications. The dimension is designed to capture the enterprise's competitive capacity relative to peers in its country and industry.

ESG Strength

Environmental, Social, and Governance (ESG) Strength assesses the extent to which the enterprise invests in and demonstrates commitment to responsible practices. This dimension builds on the assumption that engagement with Root Capital's advisory services contributes to ESG improvements over time, which is why we include it as a variable. We also include information on the ratio of agronomists to producers per industry per country and two certifications that, in our portfolio, highly correlate with the adoption of environmental practices. The literature supports the link between gender inclusivity and stronger governance (Banahan and Hasson, 2018; Wahid, 2019; Schwartz-Ziv, 2017), and we use Root Capital's standard definition of a gender-inclusive client as one component of ESG strength.

Business Resilience

Business Resilience measures the enterprise's capacity to adapt to, recover from, and mitigate shocks. The dimension operationalizes resilience through two mechanisms (access to emergency resources and diversification of credit sources) and two measures of capability (the

DGX diagnostic score and provision of extension services). The conceptual foundation draws on validated instruments for assessing financial health: the core argument is that access to emergency funds mitigates vulnerabilities, enables the absorption of financial shocks, and reduces the likelihood of resorting to coping mechanisms that could jeopardize long-term financial stability. This, coupled with the organizational capabilities captured by the diagnostic and extension variables, allows us to assess both the enterprise's perceived capacity to weather shocks and its realized ability to do so.

Local Context

The Local Context dimension situates the enterprise within the macro-level environment in which it operates. It considers country-level factors including agricultural export performance, multidimensional poverty (MPI), climate vulnerability (ND-GAIN Exposure Score), and governance quality (World Bank Rule of Law Index). The inclusion of this dimension reflects a conviction that enterprise development cannot be understood in isolation from the structural conditions of the operating environment. A coffee cooperative in Honduras and a macadamia processor in Kenya may have similar internal capacities but face fundamentally different contextual constraints.

METHODOLOGY

The EDI follows a three-step methodology: normalization, aggregation, and classification. Each step is designed to balance methodological rigor with practical interpretability, following the approach used by the Human Development Index (UNDP, 2024) and adapted from the *tipologías* framework (Aguilar et al., 2015).

Data Infrastructure

The EDI draws from a master dataset merging more than nine data assets, covering services, diagnostics, advisory sessions, impact and risk ratings, and financial spreads, among others. The data were organized into a panel structure indexed by the client's Root Capital account number and year, yielding a comprehensive view of 802 clients across 2,169 client-year observations.

A significant challenge is data completeness. For the period 2020 to 2023, only 170 client-year observations have complete data across all 25 indicators. When the estimation ignores missing values (calculating dimension scores from available indicators only), the dataset yields 2,175

estimated EDI scores for the same period. This gap is not trivial: complete-data observations for 2020 number only 23, compared to 357 when missing values are ignored.

To further mitigate the challenge of data incompleteness, we apply a "shelf-life" logic to our internal indicators. This approach rests on the operational principle that the most recently verified data remains a reliable proxy for an enterprise's reality for a limited period. Specifically, for intermediate missing values, we extend the validity of 30 key indicators—including producer counts, financial spreads, and DGX scores—by carrying forward the most recent observation for up to two years. By allowing this two-year shelf-life, we ensure the index captures the longitudinal trajectory of our clients without losing observations to minor reporting lags. This adjustment significantly improves the density of the panel structure while maintaining the integrity of the enterprise's profile between formal monitoring cycles.

The expectation is that this challenge will reduce as we are now more intentionally tracking the core indicators used for EDI estimation across our portfolio, but the limitation section discusses these challenges in detail.

Normalization

All indicators are normalized to a 0–1 scale using min-max scaling with predetermined goalpost values. The formula, consistent with the HDI methodology, is:

$$Dimension\ Index\ = \frac{(Actual\ Value\ -\ Minimum\ Value)}{(Maximum\ Value\ -\ Minimum\ Value)}$$

The goalpost values serve as anchors that define the theoretical floor and ceiling of each indicator. Values that fall below the minimum are set to zero; values that exceed the maximum are set to one. This capping prevents outliers in any single indicator from distorting the index. The specific goalposts were determined through a combination of data inspection, consultation with regional teams, and alignment with Root Capital's operational definitions. For instance, the maximum for Number of Producers is set at 1,820, while the maximum for Total Sales uses the natural logarithm of $4,000,000 to compress the right tail of the distribution.

It is important to acknowledge that the choice of goalposts is subjective. A different set of minimum and maximum values would produce different index scores. Having said that, the subjectivity is applied uniformly across the entire portfolio, meaning that while absolute scores are sensitive to goalpost choices, relative rankings and the structure of the categories are more robust. We have validated the goalposts with regional teams, ensuring that to date they align with the empirical distribution of our portfolio. Were our portfolio to change significantly, we would proceed to revisit these goalposts to recognize that evolution, but we do not foresee needing to run any update until the end of our next strategy in 2028.

Table 1

EDI dimensions, indicators, and minimum and maximum bounds.

Dimension	Indicator	Minimum	Maximum
Size / Reach	Number of Producers	0	1603
	Full-time Equivalent Employees	0	58
	Total Hectares	75	1748
Financial Capacity	Total sales	$ln($133,000)	$ln($4,000,000)
	FF overall score	1	20
	Total sales - Payment to producers	$13,000	$630,000
	Access to credit	-1	6.5
	Risk Rating (worst in last 2y)	-10	-4
Operational & Sector capacity	Years in operation	0	18
	Total sales / Full-time employees	$3,900	$233,000
	Audited statements	0	1
	Percentile of ranking of sales per industry and country	1	5
	Certifications	1	3
ESG Strength	Percentile of ratio agronomists-producers per industry per country	1	5
	Years since client first reached	0	12
	Gender Inclusive	0	1
	Relevant social or environmental certification available	0	1
Business Resilience	Proxy access to emergency resources	0	1
	RC only lender	0	2
	DGX score	0	0.73
	Provision of agronomic extension services	0	1
Local Context	Exports of agricultural products	$ 170 M	$43,400 M
	Multidimensional poverty index (MPI)	0	0.28
	ND GAIN Exposure Score	0.44	0.52
	WB rule of law	-1.82	0.50

Aggregation

The aggregation follows a two-step arithmetic mean process. First, the normalized indicator values within each dimension are averaged to produce six dimension scores. Second, the scores of the six dimensions are averaged with equal weights to produce the overall EDI score. Equal weighting across both levels (within and between dimensions) replicates the approach used by the Human Development Index (Herre and Arriagada, 2023) and ensures that no single dimension disproportionately drives the composite score.

The choice of equal weights merits discussion. There are three main perspectives: i. data-driven approaches, such as principal component analysis, produce weights that better reflect the statistical structure of the data; ii. expert elicitation or participatory processes can capture the normative priorities of the intended users; and iii. equal weights represent a more transparent and defensible default in the absence of a compelling reason to weight dimensions differently. We adopt the third position. The EDI is intended to characterize the development profile of each client, not to explain the causal contribution of each dimension. In that context, equal weights maintain interpretability and facilitate communication with non-technical audiences.

It is worth noting that when the EDI is estimated for clients with incomplete data, the dimension score is calculated using only the available indicators within that dimension, if there are at least 12 indicators to estimate the score. For example, if a client lacks data on total hectares in the Size and Reach dimension, the dimension score is the mean of the two remaining indicators (total producers and full-time equivalent employees). This approach avoids penalizing clients for data gaps that are beyond their control, but it introduces the limitation that dimension scores for clients with missing values are not strictly comparable to those calculated from complete data.

Classification: Jenks Natural Breaks

The final step assigns each client-year observation to one of five development categories. The classification uses Jenks Natural Breaks, a method that identifies groupings within the data distribution by minimizing within-group variance and maximizing between-group variance. Natural Breaks was applied to each year's distribution separately, and the resulting ranges were then averaged to produce stable cutoff points that allow comparison across years.

Table 2

Cutoff points for each EDI category

Category	EDI Cutoff points
Category 1	Below 0.305
Category 2	0.305 – 0.432
Category 3	0.433 – 0.538
Category 4	0.539 – 0.652
Category 5	0.653 and above
Incomplete Category	12+ indicators missing

The choice of five categories is consistent with the *tipologías* approach, which uses seven categories for municipalities and five for departments. For Root Capital's operational purposes, the five categories were further collapsed into two portfolios: an Accelerator Portfolio (comprising early-stage agri-SMEs building bankability to secure their first loan) and a Growth Portfolio (comprising mature-stage agri-SMEs expanding their capacity to drive rural resilience). This binary segmentation responds to a concrete operational need: the organization's 2025–2028 strategy focuses on differentiating services for clients at different stages of development.

Adjustment for Loan Defaults and Operational Continuity

A critical refinement to the EDI emerged during the validation phase with Root Capital's regional field staff. A persistent observation regarding the initial index iterations was that enterprises experiencing significant credit distress or default did not always show a corresponding drop in their EDI scores. This discrepancy occurred because, per Root Capital's operational guidelines, we typically cease the collection of monitoring data once an enterprise enters default or stops receiving services. Consequently, the index would continue to reflect the enterprise's performance based on its last known "healthy" state, potentially overstating its current development.

To address this and ensure the EDI remains a faithful reflection of an enterprise's actual standing, we implemented a structural penalization for clients with a Risk Rating of 9 or higher. For these observations, the total scores for both the Financial Capacity and Operational Capacity dimensions are automatically set to zero. This adjustment reflects the reality that a default event is a systemic failure of both financial liquidity and operational governance. By

incorporating this rule, we ensure the index accurately captures the severe erosion of business strength that occurs during a default, maintaining the EDI's utility as a tool for both impact measurement and portfolio risk awareness.

OPERATIONALIZATION OF THE DIMENSIONS

This section describes how each of the six dimensions is operationalized, including the data sources, any transformations or imputations performed, and the rationale for including each indicator. A key challenge in constructing the EDI is operationalizing the dimensions using available and reliable data while ensuring that the essence of each dimension is accurately captured. This first iteration includes 25 indicators. By design, some degree of correlation exists among indicators, both within and across dimensions. The objective of the operationalization is not to explain the independent contribution of each variable to business development but to characterize it as comprehensively as existing data allow.

Given the iterative approach to index creation, future versions of the EDI will likely revise the operationalization of some or all dimensions as better data or indicators become available. However, the expectation is that the six dimensions will remain stable to allow comparison across the next three years as we implement our 2026-2028 strategy.

Size and Reach

This dimension is operationalized by three indicators drawn from SEMs data. Rather than measuring economic output, these indicators capture the enterprise's community footprint and its potential impact on the rural population. Following the normalization logic described previously, the maximum goalposts for these indicators are set at the 75th percentile of the 2020–2024 portfolio distribution.

- Total Producers: The number of farmers or producers supplying the enterprise. The maximum goalpost is 1,603 producers, with the minimum bound maintained at a natural zero.
- Full-Time Equivalent (FTE) Employees: The total number of staff employed by the organization. The maximum goalpost is 58 employees, with the minimum bound maintained at a natural zero.

- Total Hectares Managed: The total area under sustainable management, cultivated by producers or managed directly by the enterprise. The maximum goalpost is 1,748 hectares, while the minimum floor is set at 75 hectares.

No further transformations or imputations were required for the indicators within this dimension.

Financial Capacity

This dimension comprises five indicators that evaluate an enterprise's economic health, management maturity, and bankability. To ensure comparability across the portfolio, we establish minimum and maximum goalposts based on empirical distributions and internal benchmarks.

- Total Sales: To normalize a highly right-skewed distribution, sales figures are log-transformed. The minimum goalpost is set at the 5th percentile ln(\$133,000) and the maximum at the 75th percentile ln(\$4,000,000) of our 2020–2024 portfolio distribution.
- Gross Margin Proxy: Calculated as the difference between total sales and payments to producers, this metric follows the same distribution-based logic, with goalposts set at the 5th and 75th percentiles (\$13,000 and \$630,000, respectively).
- Financial Fundamentals (FF) Score: This proprietary metric assesses internal financial management capacity. While the FF tool utilizes a 1–24 scale, we set the maximum goalpost at 20, reflecting the 90th percentile of our 2020–2024 portfolio distribution.

  Data Imputation: For 198 lending-only observations lacking this metric, values were imputed based on the client's financial additionality—the gap between Root Capital's services and commercially available alternatives. Clients with low, medium, and high additionality received FF scores corresponding to the 90th, 50th, and 25th percentiles of the observed distribution, respectively. This reflects the empirical relationship where clients with the greatest need for our specialized services often possess the most room for growth in formal management capacity.
- Access to Credit: We operationalize this using a tiered proxy for financial additionality that measures a client's integration into formal capital markets. Clients with access to commercial banks are assigned a value of 6.5; those with other social lenders receive a 3; and clients for whom Root Capital is the sole lender receive a 0. For advisory-only clients without available credit data, we assign a baseline value of -1.
- Internal Risk Rating: We utilize our traditional 4–10 scale to assess credit risk. Because a higher risk rating indicates weaker financial capacity, the scale is inverted for the index

so that higher values correspond to more favorable outcomes. For clients where credit-specific risk data is unavailable, we assign a value of -8.5.

By aligning these indicators toward a uniform direction, the Financial Capacity dimension provides a standardized, robust snapshot of an enterprise's ability to manage capital and its progress toward financial "graduation" into commercial markets.

Operational and Sector Capacity

This dimension evaluates the internal maturity, efficiency, and market positioning of the enterprise through five key indicators capturing a holistic view of a client's operational sophistication.

- Years in Operation: This serves as a primary proxy for organizational maturity. To standardize this metric, we set the maximum goalpost at the 75th percentile of the portfolio distribution (2020-2024), ensuring the index distinguishes between early-stage and established enterprises.
- Labor Productivity (Sales per full-time employee): We measure efficiency as the ratio of total sales to full-time equivalent employees. Consistent with our other economic metrics, we establish a floor at the 5th percentile and a ceiling at the 75th percentile to prevent outliers from distorting the results.
- Governance (Audited Financial Statements): The presence of audited statements serves as a binary indicator of governance sophistication. For advisory-only clients or those lacking direct credit data, we utilize a proxy from the DGX diagnostic. Specifically, we assign a "1" (presence of audit) to clients scoring 0.75 or higher on the DGX Financial and Economic Management (FEM) accounting sub-score, while those scoring below this threshold are assigned a "0."
- Market Position (Sales Percentile): To account for varying economic contexts, we rank each client within its specific industry and country. This distribution is divided into quintiles (1–5), where a score of 5 represents the top 20% of the local market, offering a relative measure of competitive standing.
- Certifications: This indicator captures the enterprise's commitment to externally verified social and environmental standards. We aggregate the total number of certifications held and standardize them into a 1–3 scale:
    - **1:** Zero certifications.
    - **2:** One certification.

- **3:** Two or more certifications.

ESG Strength

This dimension measures, through four indicators, the enterprise's commitment to social and environmental governance through four strategic indicators. These metrics capture the depth of the enterprise's internal technical support, its long-term commitment to professional growth, and its inclusivity.

- Technical Extension Capacity (Agronomist-to-Producer Ratio): Organizations that provide robust agronomic extension services typically demonstrate higher ESG capacity. Because these ratios vary significantly by crop and geography, we rank each client relative to its country-level peers. Following our standardization methodology, the minimum goalpost is set at the 5^{th} percentile and the maximum at the 75^{th} percentile of the local distribution for the period 2020-2024.
- Partnership Tenure (Years with Root Capital): We assume that sustained engagement with Root Capital's financing and advisory services contributes to organizational ESG capacity over time. This indicator is capped at a maximum goalpost set at the 90^{th} percentile of our portfolio's tenure distribution (2020-2024), rewarding long-term institutional growth.
- Gender Inclusivity: This binary indicator identifies enterprises that meet Root Capital's formal definition of gender inclusiveness. A client qualifies if women comprise more than 30% of its farmer suppliers and employees, or if the enterprise is women-led with women comprising more than 20% of its suppliers and employees. Our operational data suggests a strong correlation between gender-inclusive leadership and overall ESG performance.
- High-Standard Certifications: We use the attainment of specific, high-bar certifications as a proxy for social and environmental governance. Specifically, this indicator tracks whether a client holds Fair Trade (USA or International) or Rainforest Alliance certification. These standards are recognized by our client-facing teams as particularly rigorous benchmarks for improved social and environmental outcomes.

No further transformations or imputations were required for the second, third, or fourth indicators in this dimension.

Business Resilience

This dimension captures an enterprise's ability to navigate shocks and maintain operations under stress. It is operationalized through four indicators that assess financial liquidity, credit diversification, organizational strength, and supply chain support.

- Access to Emergency Cash: We define an enterprise as having adequate emergency resources if 5% of its annual sales exceeds its operational margin (the difference between total sales and payments to producers). This proxy identifies businesses with sufficient liquidity to cover immediate cash needs without compromising payments to their farmer-suppliers.
- Credit Diversification: To measure financial resilience, we track whether a client has successfully diversified its funding sources. Using a tiered scale, we assign a 2 to clients with established relationships with other social lenders or commercial banks. Clients for whom Root Capital is the sole lender receive a 1, while those with no active credit history or loan data are assigned a 0. This reflects the risk reduction inherent in having multiple windows of credit.
- Diagnostic of Business Capacity (DGX) Score: The DGX is our comprehensive assessment of an enterprise's operational and strategic strength. To standardize this metric, we set the maximum goalpost at the 90^{th} percentile of the adjusted DGX score distribution for the period 2020-2024.

  Imputation: For lending clients without a current score, we apply the additionality-based imputation used for the FF score: assigning values corresponding to the 90^{th}, 50^{th}, and 25^{th} percentiles for low, medium, and high additionality clients, respectively.
- Agronomic Extension Services: We include a dummy variable to capture whether the enterprise provides technical assistance to its farmers. Our evaluations consistently show that extension services strengthen realized resilience throughout the supply chain. Data is primarily sourced from SEMS; where SEMS data is unavailable, we utilize DGX diagnostic data to verify the provision of these services.

Local Context

This dimension accounts for the external environment in which our clients operate, utilizing four country-level indicators sourced from publicly available datasets. These metrics are selected for their alignment with Root Capital's standard ESG due diligence practices. To ensure the index reflects the most current reality, we utilize the latest available value for all four indicators; for example, if the most recent data point for a country was recorded in 2023, that value is carried forward for the 2023, 2024 and 2025 analysis.

- Agricultural Product Exports (WTO): This proxies for macro-level trends affecting agricultural exporters, such as trade policy and exchange rate fluctuations. The maximum goalpost is set at the 90th percentile of the 2020–2024 country distribution.
- Multidimensional Poverty Index (MPI): This captures the intensity of deprivation in a country's population. Similar to exports, we set the maximum goalpost at the 90th percentile to reflect the high-need contexts where we operate.
- ND-GAIN Exposure Score: This assesses the extent to which a society is stressed by future climate conditions.
- World Bank Rule of Law Index: This aggregates six governance dimensions, including contract enforcement and property rights, to provide a snapshot of institutional stability.

By standardizing these indicators using the distribution-based goalposts detailed in Table 1, the EDI provides a context-adjusted view of enterprise development, acknowledging that a business's growth is inextricably linked to its national environment.

INTENDED USES AND CLARIFICATIONS

Internal Uses

Internally, the EDI serves three primary functions. First, it provides the metric and categorization framework for portfolio construction and segmentation. Root Capital's 2025–2028 strategy segments clients into Accelerator and Growth portfolios, each with differentiated services. The EDI provides the empirical basis for this segmentation, replacing ad hoc categorizations with a standardized, data-driven framework.

Second, the EDI informs the definition and monitoring of impact goals. By tracking the distribution of clients across EDI categories over time, the organization can set targets that are specific and measurable. For instance, the strategy might set a target for the share of Accelerator clients that transition to the Growth segment within a given period.

Third, the EDI delivers the framework for client engagement, including service eligibility. Advisory services, for example, can be matched to the client's EDI profile, ensuring that early-stage enterprises receive foundational capacity building while mature-stage enterprises receive specialized support for growth and resilience.

External Uses

Externally, the EDI provides the inputs for sharing a data-driven narrative about the development trajectories of Root Capital's clients. It enables the organization to track and communicate changes at both the individual client level and the aggregated portfolio level, whether globally or by region. For donors and investors, the EDI offers a transparent, replicable metric that situates Root Capital's portfolio within the broader landscape of agri-SME development. For peer organizations, it offers a methodology that can be adapted to different data environments.

What the EDI Is Not

Three clarifications are essential. First, the EDI is non-judgmental. It does not evaluate enterprises as good or bad, nor does it assign normative labels to different development stages. A higher EDI score does not indicate a superior enterprise; it indicates a different profile of development and capacity.

Second, the EDI is non-normative in a specific sense: Root Capital's services are not designed to increase EDI scores directly. The index captures dimensions that are partially or entirely beyond both Root Capital's interventions and the enterprise's direct scope of action (notably, the Local Context dimension).

Third, and perhaps most importantly, the EDI is not a long-term outcome impact measurement tool. By design, it is not possible to attribute changes in the EDI to Root Capital's services. The index is multidimensional and holistic; it includes factors that Root Capital does not directly influence. Any attempt to use the EDI as a before-and-after measure of intervention effectiveness would conflate the enterprise's internal development with changes in its operating environment, producing misleading conclusions. For rigorous impact evaluation, the organization relies on separate methods that can incorporate among others a subset of EDI indicators within an econometric framework capable of supporting attributional claims of impact.

LIMITATIONS AND FUTURE DIRECTIONS

We identify four categories of limitations in the current version of the EDI, along with the steps we plan to take to address them.

Data Completeness

The most immediate limitation is the availability of complete data. Even though Root Capital leads among peers in having a consolidated impact monitoring system, this initial version of the EDI is constrained by data availability. Only 170 client-year observations out of 2,175 have data across all 25 indicators, a completeness rate of roughly 8 percent. The gap is driven by the data generation process of Root Capital's monitoring data which depends on the client-led logic of our services, which implies that data collected for each individual client will depend on the services the client choose to take on each particular year. Furthermore, some of the most relevant indicators informing the EDI were not collected during the early years covered by our data (2020 through 2023). The practical consequence is that any external reporting restricting analysis to complete cases will cover a fraction of the portfolio, while internal analyses that tolerate missing values must accept some degree of measurement imprecision. We cannot conclude that EDI scores based on incomplete data are unbiased estimates of what the complete-data scores would have been, because the pattern of missingness is not random: it depends on the timing and type of services the client receives.

The practical steps we have taken at this stage follow three strategies: extending the temporal coverage of certain indicators by using the most recent available value for slowly changing metrics, developing data extrapolation protocols, and validating which indicators are most critical for dimension scores so that future data collection efforts can prioritize accordingly. In line with the third component of our strategy, we have adjusted our impact monitoring system to collect the minimum data required for EDI estimation for all clients beginning in 2026.

Temporality and Service Dependency

The EDI relies on internally generated data, which means it cannot be estimated for clients that have not yet received any service from Root Capital. This creates a potential selection bias: the universe of clients for whom the EDI can be estimated is, by definition, the universe of clients with whom Root Capital has already engaged. For prospective clients, a simplified version of the EDI can be applied using publicly available data and basic financial information gathered during the screening process, but this preliminary score requires validation once services commence. Initial tests conducted with our client-facing teams indicate that a local portfolio manager can estimate a provisional EDI score by focusing on only five key indicators, and that this provisional score is sufficient to assign a new client to one of the two portfolio segments prior to the full assessment required for definitive EDI classification.

CONCLUSION

The Enterprise Development Index represents an effort to translate Root Capital's accumulated monitoring data into a forward-looking, actionable tool for portfolio segmentation and client characterization. Its methodological roots in the Human Development Index, the Multidimensional Poverty Index, and the *tipologías* approach to territorial classification provide a tested foundation. Its practical implementation draws on over 25 years of institutional learning and a globally standardized monitoring system that few organizations of comparable size possess.

The EDI does not resolve the fundamental tensions inherent in composite indicators: the subjectivity of indicator selection, the arbitrariness of goalpost values, and the tradeoffs between completeness and coverage. We have been transparent about these tensions rather than minimizing them. We believe that the value of the EDI lies not in its precision as a point estimate but in its capacity to structure a conversation about enterprise development that is multidimensional, data-informed, and consistent across a diverse global portfolio.

For practitioners, the EDI offers a replicable model. Any organization with a standardized monitoring system can, in principle, identify dimensions of enterprise development that align with its theory of change, select indicators from existing data, normalize and aggregate them, and classify the results. The resource requirements are modest relative to the informational payoff: Root Capital developed, validated, and implemented the EDI across its entire portfolio in under a year, relying on existing monitoring data and administrative records rather than new data collection.

We hope the EDI will prove useful not only within Root Capital but as a contribution to the broader field of agri-SME assessment. We welcome feedback from peer organizations, investors, and researchers, and we commit to sharing updated methodological documentation as the index evolves through subsequent iterations.

REFERENCES

Aguilar, C., Osejo, I., Carmona, C., Supelano, D., & Taborda, J. C. (2015). Tipologías Municipales de Colombia: Herramienta para la consolidación de regiones desarrolladas. *Boletín Regional, Urbano y Ambiental. IPEA*, *1*(11).

Ahelegbey, D. F., & Giudici, P. (2024). Multidimensional Inequality Metrics for Sustainable Business Development. *Mathematics*, *12*(22), 3633. https://doi.org/10.3390/math12223633

Alkire, S., & Foster, J. (2011). Counting and multidimensional poverty measurement. *Journal of Public Economics*, *95*(7–8), 476–487. https://doi.org/10.1016/j.jpubeco.2010.11.006

Alkire, S., & Santos, M. E. (2014). Measuring acute poverty in the developing world: Robustness and scope of the multidimensional poverty index. *World Development*, *59*, 251-274.

Anand, S., & Sen, A. (2000). Human Development and Economic Sustainability. *World Development*, *28*(12), 2029–2049. https://doi.org/10.1016/S0305-750X(00)00071-1

Banahan, C., & Hasson, G. (2018, September 6). Across the Board Improvements: Gender Diversity and ESG Performance. *The Harvard Law School Forum on Corporate Governance*. https://corpgov.law.harvard.edu/2018/09/06/across-the-board-improvements-gender-diversity-and-esg-performance/

Booysen, F. (2002). An Overview and Evaluation of Composite Indices of Development. *Social Indicators Research*, *59*(2), 115–151. http://www.jstor.org/stable/27527024

Catalyst. (2020). *Quick Take: Why Diversity and Inclusion Matter*. Catalyst. https://www.catalyst.org/insights/2020/why-diversity-and-inclusion-matter

Decancq, K., & Lugo, M. A. (2013). Weights in Multidimensional Indices of Wellbeing: An Overview. *Econometric Reviews*, *32*(1), 7–34. https://doi.org/10.1080/07474938.2012.690641

DuBois, R., Reeves, M., & Yakimakho, O. (2015). *Organizational Performance Index (OPI) Handbook* (p. 38) [Handbook]. PACT.

El Gibari, S., Gómez, T., & Ruiz, F. (2019). Building composite indicators using multicriteria methods: a review. *Journal of Business Economics*, *89*(1), 1-24.

Federal Reserve Banks (2024). *2024 Report on Employer Firms: Findings from the 2023 Small Business Credit Survey*. Small Business Credit Survey. https://doi.org/10.55350/sbcs-20240307

Herre, B. & Arriagada, P. (2023) - *State Capacity*. https://ourworldindata.org/state-capacity'

Madera, J. M., Ng, L., Sundermann, J. M., & Hebl, M. (2019). Top management gender diversity and organizational attraction: When and why it matters. *Archives of Scientific Psychology*, *7*(1), 90–101. https://doi.org/10.1037/arc0000060

Nardo M, Saisana M, Saltelli A, Tarantola S, Giovannini E, Hofman A (2008). *Handbook on constructing composite indicators. Methodology and user guide*. Technical report, OECD, Paris.

Paruolo P, Saisana M, Saltelli A (2013). Ratings and rankings: voodoo or science. *J R Stat Soc* 176:609–634.

Robeyns, I. (2005). The capability approach: a theoretical survey. *Journal of human development*, *6*(1), 93-117.

SAFIN. (2021). *Agri-SME taxonomy*. Learning brief. https://safinetwork.org/wp-content/uploads/2023/03/e03597_6cc65702918e4bdeae734f54b3585b32.pdf

Schwartz-Ziv, M. (2017). Gender and Board Activeness: The Role of a Critical Mass. *Journal of Financial and Quantitative Analysis*, *52*(2), 751–780. https://doi.org/10.1017/S0022109017000059

Singh RK, Murty HT, Gupta SK, Dikshit AK (2009) An overview of sustainability assessment methodologies. *Ecol Indic* 9:189–212.

Technical Notes Human Development Report 2023-24. (2024). In UNDP (Ed.), *Human Development Reports*. United Nations Development Programme (UNDP). https://hdr.undp.org/data-center/documentation-and-downloads

The GIIN. (2025). *IRIS Catalog of Metrics | IRIS+ System*. https://iris.thegiin.org/metrics/

UNDP (Ed.). (2024). *Breaking the gridlock: Reimagining cooperation in a polarized world*. United Nations Development Programme (UNDP).

UNDP. *Human development report 1992*. UN, 1992.

USAID. (2024, July 12). *Standard Indicators | Project Starter*. U.S. Agency for International Development. https://www.usaid.gov/standard-indicators

Wahid, A. S. (2019). The Effects and the Mechanisms of Board Gender Diversity: Evidence from Financial Manipulation. *Journal of Business Ethics*, *159*(3), 705–725. https://doi.org/10.1007/s10551-018-3785-6