
**IMPACT ASSESSMENT** REPORT

# Brazil (Federative Republic of Brazil)

Gente de Valor – Rural Communities Development Project in the Poorest Areas of the State of Bahia

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Investing in rural people

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# Executive summary

This report provides the results of the impact assessment of the Rural Communities Development Project in the Poorest Areas of the State of Bahia (PRODECAR), popularly referred to as Gente de Valor (GDV), a community driven development (CDD) project implemented in the State of Bahia, Brazil between 2007 and 2013. The purpose of GDV was to address the multitude of basic service gaps, empowerment deficit, and productive capacity needs experienced by residents of Brazil's Northeast region. Beneficiaries were drawn from the local population of *sertanejos*; a regional population named in reference to the dryland, *sertão* agro-climatic zone and among the poorest people in Brazil. As a CDD-style project, GDV's objective was to address their needs through a participatory process that would provide access to water-harvesting cisterns (primarily for household consumption), training on ecologically appropriate agricultural practices, technical assistance and technical inputs, as well as community capacitation to identify and address future development needs.

The timing of this study allowed for the assessment of beneficiary capacity to withstand shocks compared to non-beneficiaries. Brazil suffered one of the most extreme droughts of the century that overlapped with the conclusion of the project, as well as the years that followed. In addition, during approximately the same time-frame, Brazil was affected by an economic recession (2014-2017) which the government responded to with a sharp reduction in public policies[1] towards family agriculture following the implementation of fiscal discipline policies at the federal level.

The impact assessment employed quasi-experimental methods and found that GDV did succeed in increasing access to cisterns for household consumption, increasing agricultural production, and promoting gender empowerment compared to non-beneficiaries.[2] However, the impact assessment also found that beneficiaries were not more likely to earn more income, potentially due to their limited participation in off-farm work. It was found that a substantial portion of beneficiary income was directly attributed to transfers, such as Bolsa Familia, indicating that beneficiaries still have far to go before being fully autonomous under the duress of persistent shocks.

Based on these findings, the authors of this study recommend that future projects intending to incorporate elements similar to GDV increase their attention towards facilitating the pathway between productive capacity and income generation. In the case of GDV, it was not found that increases agricultural production lead to increases in agricultural income. While GDV was successful in achieving critical intermediary outcomes such as empowerment, access to water, and productive efficiency, these successes did not translate into larger welfare benefits as understood through the lens of total household income. As always however, the overall impact of the project must be interpreted through the economic typology of beneficiaries selected for inclusion, immediate needs, and realistic expectations in outcomes resulting from project interventions.

[1] Examples of programs that were negatively impacted include public purchase programs (PAA and PNAE), the cash transfer program targeted at the ultra poor (Bolsa Familia), as well as an access to credit program for farmers (PRONAF).

[2] In addition to participation in GDV, the government also instituted a number of infrastructure development programs, as well as the famous cash transfer program, Bolsa Familia. Some non-beneficiaries did obtain benefits from similar projects that provided access to household cisterns.

# 1. Introduction

In recent decades, the Brazilian economy has transformed into a global economic power, but remains marked by persistent inequality. This is particularly true for the Northeast region of the country, once referred to as the nexus of poverty in both Brazil and even the greater western hemisphere. As the Western and Southern regions advance in export-oriented agricultural commodities, industry, and services, many in the Northeast struggle to achieve access to basic services.

Government neglect and lack of investment is rooted in the Northeast's history – from the colonial-era that enriched foreign plantation owners, to the military governments of the 70s and 80s that took a centralized approach to economic development. In the stark absence of equitable access to an enabling economic environment, rural residents were historically characterized as subsistence farmers in a region largely irrelevant to the country's economic priorities.

Following the transition towards democracy in 1985 and increased pressure from grassroots mobilization, great emphasis has since been placed on rectifying the extreme gaps in economic opportunity. In an effort to increase social welfare for rural residents, who often had access to little more than small tracts of degraded land, the Government of Brazil has financed a number of projects and initiatives to develop the Northeast region.

Efforts throughout the 20th century to develop the Northeast have not been particularly successful. Two notable challenges stood out, namely access to fertile land and capacity to co-exist in the drought-prone semiarid environment. During colonization, sugar and cattle production were an early form of agricultural investment that created the *fazenda* plantation system whereby a small number of elites owned large tracts of productive land while laypeople were relegated to the non-secure and unproductive residuals as squatters and sharecroppers. This phenomenon particularly affected *quilombola* communities, which were settled by former slaves and indigenous peoples.

Recurring drought has also further hindered capacity to derive a secure livelihood from the agricultural sector. Given the absence of alternative income-generating mechanisms, drought is responsible for extreme hardship over time. The history of the expansive *sertão*[3] hinterlands is one of shock-induced mass-migration (Hastenrath & Heller, 1977; Namias, 1972) due to severe agricultural-loss, livestock death, and as recently as 1980s, the loss of human life. The relationship between the environment and local life is so deeply intertwined, that inhabitants of the Northeast are also referred to as *sertanejos*. With the impacts of climate change being increasingly felt, the Northeast region of Brazil has been identified as one that will be the most affected (Barbieri et al., 2010; Brabo Alves et al., 2009; Burney et al., 2014; Gateau-Rey et al., 2018; Lemos et al., 2002).

In response to these challenges, past government initiatives focused on keeping *flagelados* (drought-victims) from migrating to southern cities by offering short-term relief through public employment

[3] Also known locally as the the *poligono da seca* or polygon of drought. The sertão is an agro-ecological zone in the Northeast characterized by low precipitation and high evaporation rates along with the prevalence of *caatinga* vegetation.

schemes and *carros pipas* (water trucks).[4] These efforts did little to improve welfare beyond averting total crisis and contributed to a de facto "drought-industry." Large scale programs such as PROTERRA (1971) and POLONORDESTE (1974) advertised land reform and access to credit, but primarily served established farmers with the second-order expectation of generating agricultural employment opportunities for those with limited access to productive resources. After accounting for implementation issues such as corruption, fund leakages to other state activities, and politicization of assistance, little was ultimately done to directly address the capacities of rural residents to thrive in their agro-ecological environment with strategies targeting their specific needs.

Against the backdrop of transition from a military government to democracy, a drastically new approach, commonly referred to as community driven development (CDD), was introduced in the mid-1980s.[5] CDD endeavors to facilitate direct participation by project beneficiaries to set priorities and directly engage with the implementation process. For some CDD projects, decision-making can extend to administration such as the direct oversight of funds or selection of contractors. In the case of Brazil, the popularization of CDD radically reoriented targeting from the most to least productive residents (i.e. alternatively, the least to most marginalized). Motivated by the argument that CDD lead to substantial success in the provision of social infrastructure such as water and electricity, in the 20 years between 1985 and 2004, 24 CDD projects were funded by the World Bank alone in Northeast Brazil. It was claimed that the incorporation of CDD approaches succeeded where former efforts had failed to provide basic services such as access to water and electricity, and at a substantial cost savings (Roumani, 2004).[6]

IFAD has historically employed CDD in a number of projects througout the world, particularly in Latin America, with the intent to promote community ownership of development planning while simultaneously reducing poverty and promoting sustainable development. Using this framework, community organization is not simply a means to an end, but also its own worthy goal in order to facilitate the empowerment of marginalized communities through their own actions. The ultimate objective was to increase the capacity of historically marginalized rural residents to sustainably thrive in the drought-prone environment, while enabling communities to articulate needs and engage with local governments and economic systems.

As part of its greater portfolio in Northeast Brazil, IFAD supported the Brazilian government and State of Bahia to implement *Gente de Valor* (GDV) between 2007 and 2013.[7] GDV is a CDD-style project, focusing on two major components: community empowerment and enhacing productive capacities. Emphasis was placed on improving the capacity of beneficiaries to thrive in the semi-arid environment, augment agricultural capacities, and promote resilience through the provision of water-harvesting infrastructure such as cisterns.[8]

[4] These initatives are considered as hallmarks of political dependence by the local population on the government to satisfy their basic needs.

[5] The CDD movement in Brazil is also influenced by the work of Brazilian educator and activist, Paulo Freire, who promoted the direct engagement of poor societies to uplift themselves and influence their economic conditions (Freire, 1970).

[6] Roumani (2004) observes that under past projects, less than one-third of funds reached beneficiaries.

[7] GDV (Gente de Valor) is a commonly-used nickname for the official project name, *Rural Communities Development Project in the Poorest Areas of the State of Bahia.* It was also previously referred to as Terra de Valor.

[8] Cisterns are oriented towards household-consumption and productive activities. While GDV did implement cisterns for agriculture and livestock, the primary object was to harvest water for household-consumption.

A unique element of IFAD's approach in implementing GDV and similar CDD projects, is the intentional targeting of the most vulernable communities. This approach to beneficiary inclusion has been emphasized by project design teams as critical to appreciating CDD as an implementation strategy.[9]

Support for CDD style projects is mixed (White et al., 2018), with disagreement even regarding the purported benefits of the approach. Original practitioners focus on the potential to effectively provide small-scale infrastructure, while detractors largely focus on the failures of more recently presumed benefits such as increased local governance and social empowerment. Even when the focus is on the provision of quality infrastructure, it is extremely relevant to consider the current political climate, and specifically political will to provide resources, when assessing the advantages of community driven development. In the case of GDV, it is critically important to note that the project was one of many government initiatives in the region to provide access to electricity, water, and roads, albeit without the CDD component.

When IFAD was first developing its Brazil program, a scoping missing was undertaken in 1989, shortly after the devastating 1983 drought, to identify ways in which the institution could effectively collaborate with the country. The recommendations of this mission were emphatically opposed to CDD style projects, claiming that "the growing emphasis upon community organization and assistance is somewhat ambiguous. If [CDD] provides a starting point for greater integration of the poor into the process of directing activities, it also has embodied a 'welfarist' approach – in the form of a relative concentration on social infrastructure and grant transfers. **[CDD] suggests a desire to indicate to the poor that they have not been isolated from the process of distribution of social wealth, even if little is offered in the way to them as producers**" (Howe & Goodman, 1992, p. 131).

The same IFAD mission members would likely have found the productive component of GDV problematic, given their assertion: **"[I]t is not evident that there is any agricultural solution to the misery of the mass of the rural poor [in Brazil's Northeast], given their minimal access to the basic productive resource, land**. … Modern agricultural development has not provided an adequate alternative/supplementary income … and very large numbers … persist in their attempts to gain income from small and untitled holdings (Howe & Goodman, 1992, pp. 130–131). Furthermore, "any intervention oriented to income enhancement must address not only increasing returns to their current occupations, but also their future insertion into large scale production processes" (1992, p. xvi).

Similar to the expressed concern of over-emphasizing agriculture, is that of over-emphasizing the role of drought resilience in achieving poverty alleviation. Echoing the above sentiments, World Bank economists Kutcher and Sandizzo note that the Northeast *problem* "was not so much a climatic consequence as a result of political and administrative incompetence and inefficiency" (1981). There is little doubt that water storage schemes have the potential to reduce the hardships of drought and generally dry conditions, but critiques still contend that **drought exacerbates existing conditions that induce poverty, rather than cause them** (Hall, 1978). In sum, the argument is that drought makes poor

[9] By investing in the capacitation of community groups among extremely marginalized peoples, there are, by design, expected and natural tradeoffs for other investments such as income-generating activities.

subsistence communities even more poor, but the cause of their original poverty are underlying historic economic institutions.

Overtime however, the rural environment in Bahia is changing due to intensive initiatives such as *Bolsa Famila* (cash transfers for families with vaccinated children attending school), *Luz para Todos* (electrification), several projects that provide household cisterns (*Agua para Todos*, *Um Milhão de Cisternas*), construction of rural roads, and many others aimed directly at rural transformation. With GDV representing a type of project that is popular with the Brazilian government and IFAD, it is critical to understand its *relative impacts* against the backdrop of other development efforts and a rapidly changing rural environment.

GDV was selected to be part of the IFAD10 Impact Assessment Agenda that consists of a broader set of impact assessments across the world. The aim is to generate evidence and provide lessons for better rural poverty reduction programs and to measure the impact of IFAD-supported programmes on enhancing rural people's economic mobility, increased agricultural productive capacity, improved market participation and increased resilience. As almost six years having past since the project closed, the analysis evaluates the sustainable impacts of GDV under the realm of access to infrastructure, agricultural productivity, poverty impacts, and empowerment of both women, youth and the community at large. Given the role that drought plays in affecting the economic opportunities of sertanejos, it is also relevant that this project evaluates outcomes following the recent multi-year drought. From the years 2010 to 2016, Bahia experienced a drought characterized as one of the worst of the century; affecting 33.4 million people and resulting in an estimated damage of approximately 30 billion USD (Marengo et al., 2017).

The objective of this report is to present and discuss results from the *ex-post* impact assessment of the GDV project in Bahia, Brazil. The evaluation follows a mixed-methods approach whereby a qualitative study was undertaken to help inform later quantitative analysis and validate results. Given that this evaluation is ex-post, the methodology employs non-experimental designs to construct the counterfactual.

The rest of this report is structured as follows: the next section documents the theory of change and main research questions that the ex-post impact assessments sought to answer. In the third section, the data and methodology for the impact assessments are described, with an emphasis on the identification strategy employed to measure impact. The fourth section presents the results of the GDV ex-post IA results while the fifth and final section concludes with a summary and a set of key lessons learned.

# 2. Theory of change and main research questions

## 2.1 GDV theory of change

The GDV development goal was to significantly reduce poverty and improve social welfare among the population of semi-arid communities in low-income and marginalized sub-regions in the Northeast Brazilian state of Bahia. Broad-based development, gender equity, and greater participation of youth was promoted, in addition to overarching poverty alleviation objectives. Through CDD mechanisms, GDV intended for beneficiaries to strengthen their long-term capacity to participate in local development processes (i.e. both during the project and following its conclusion) and improve their income generating capacitates by transforming existing subsistence economic activities into profitable rural businesses (IFAD, 2007).

As a means to achieving this overarching goal, GDV inputs and activities were organized around two main components: (1) Human and social capital development, and (2) Productive and market development. These two components worked synergistically to promote community and household capacity to adapt to the conditions of the sertão and participate in productive activities while simultaneously empowering beneficiaries. Figure 1 outlines the key elements of the GDV theory of change, highlighting these two components.

**Component 1 (Human and Social Capital Investment)** initially focused on actions aimed at strengthening local organizations to promote buy-in by community groups and their engagement towards development initiatives that would be delivered as part of the project. Following the incentivizing of participation and establishment of viable organizations at the sub-territorial level, local community interest groups (both informal and established from associations, cooperatives, etc.) were invited to participate in a Rapid Participatory Diagnostic (*Diagnóstico Rapido Participativo*, DRP) exercise to identify priorities and address the main concerns of community groups, as well as actions that would help overcome specific developmental barriers.

A major thrust of the DRP was to identify gaps in social infrastructure such as access to water, electricity, sanitation, etc. that could be addressed through financial resources made available through GDV. In addition to improving welfare outcomes, it is assumed that impact in the form of economic opportunities (i.e. small-scale and commercial agriculture, processing, and value addition) is contingent upon first accessing basic services and infrastructure that would be provided via Component 1. As such, promotion of community-level infrastructure through participatory planning can be understood as both an intermediate outcome, and as a critical link in the theory of change from DRP towards poverty reduction by way of enabling economic opportunities (further strengthened through Component 2 where activities are identified for technical assistance).

In addition to articulating developmental problems, communities also identified cultural interests that they wished to promote. Some of the target communities belong to ethnic minorities (such as indigenous or quilombola communities); others have traditional practices such as music, dance, and *capoeira*, that are deeply integrated into manifestations of community self-esteem and pride. Through cultural activities, GDV sought to encourage empowerment, facilitate future identification of community interests, and promote later collective action.

As part of organizing local organizations, GDV provided training to enhance group capacity and facilitate collaboration with the formal political and economic system. It was expected that groups would develop project management skills required to effectively oversee the agreed-upon activities.[10] Emphasis was placed on incorporating women into leadership roles, with the expectation that projects would incorporate gender-specific concerns (such as addressing 'drudgery'-related tasks)[11] and that social perception would shift, leading to empowerment at both the household and community level. Youth were also incorporated as Social Developmental Agents (ADS – *Agentes de Desenvolvimento Social*), to further tailor interventions towards this target group and promote skills for employment. Youth, as ADS, were selected for each of the 104 sub-territories and trained to support project implementation.

The overall expected *outputs* of Component 1 were related to putting rural communities into the driver's seat to identify and address gaps in basic services through strengthened management and delivery capacity of local organizations; working with groups to identify and execute projects; strengthening group capacity and economic viability; and facilitating the delivery of required infrastructure and kits for community social and cultural activities.

Associated *outcomes* at the community level imply (a) increased organizational capacity of the communities; and (b) increased involvement of women and youth in community decision making. Assuming that a sufficient level of interest and support to community groups continues, these outcomes may result in *impacts* such as a greater empowerment (enhanced identity, self-esteem, and leadership strengths) and skills to mobilize and manage resources for future community needs.

These impacts and the way they ensure basic services at the community level are a prerequisite for creating an enabling environment needed to improve welfare outcomes and later economic opportunities. In addition, behavioral outcomes expected at the household level in the domain of empowerment were also sought by placing women and youth in positions of leadership.

**Component 2 (Productive and Market Development)** shifts from community-oriented services in the domain of human and social capital investments, towards productive and market development activities/initiatives to be implemented by economic-oriented groups and households.

Technical assistance was provided to community members on agricultural and non-agricultural activities capable of increasing crop production, dietary diversity, and, where surpluses emerge, generating additional income for beneficiaries. Interventions were done at two levels. First, at the crop production level, agro-ecological trials were conducted to demonstrate yield potential given the semi-arid environment. In each case, the idea was to compare current practices for specific crops at the farmer's site and alternative technologies and best practices on trial sites to demonstrate the benefits of adoption of the proposed alternative. Second, technical assistance extended to post-harvesting technologies in value addition (*beneficiamento*) including processing techniques, packaging, marketing, etc. was also provided.

[10] In addition, such training was expected to instill awareness of local governance, both in terms of understanding citizen rights such as communicating with local governance and entitlements such as social programs, but also to encourage self-advocacy for community interests in the long-run.

[11] An example of a drudgery task would be one that requires excessive menial labor or time, such as fetching water, and manual breaking of uricuri by women.

Promoted activities through this technical assistance were centered around (a) home gardens (*quintais produtivos*) dominated by horticultural and fruit crops for dietary diversity; (b) cassava production and value addition; (c) production, processing, and value addition of native/traditional crops such as umbu and uricuri; and (d) livestock herding and management. In addition to production and value addition technology/information transfer, under Component 2 the project delivered and supported the construction of water infrastructure for crop and livestock production and human consumption (cisterns and *barreiros*). Technical assistance was also provided for natural resource management, conservation agriculture, and production activities that were intended to encourage adoption of conservation best practices and discourage human activities that would have negative ecological impacts. Similar to Component 1, the delivery of technical assistance was articulated through the elected organizations, trained youth, and women serving as ADS and other technical service providers.

The provision of improved technologies for production and value addition that is environmentally friendly and diverse is expected to materialize (*outputs*) through strengthened and viable agricultural and non-agricultural groups, the exposure and adoption of new technologies for crop and livestock production and value addition, creation of new and more efficient water infrastructure, dissemination of techniques for natural resource management, and more productive household backyard gardens.

The outcomes and impacts of the GDV resulting from the provision of technical assistance and infrastructure to community groups and households are expected at different levels.

*Outcomes* at the household level are hypothesized to be an increased and more efficient use of water for human consumption and productive use, increased production diversity and marketability, increased value addition, reduced vulnerability to shocks, and reduction in drudgery. Second, at the community level, there is the expectation of reduction in environmental degradation, improved performance of community groups in economic activities, and increased participation of women and youth in decision making in groups and households.

Related *impacts* at the household level imply a reduction on poverty and improvements in broad-based welfare improvements, including better incomes, increased food security and dietary diversity, better health and sanitation, enhanced empowerment status of women and youth, and increased resilience for households. At the community level, impacts include more economically and environmentally sustainable groups, and the enhanced capacity to capitalize on future economic opportunities.

In sum, Components 1 and 2 offer a broad pathway towards poverty reduction, welfare enhancement, and empowerment for households and communities with a focus on politically marginalized and underdeveloped sub-populations.

**Figure 1: Theory of change**

## 2.2 Project coverage and targeting

Two sub-regions in Bahia, a sizeable state with an area larger than Spain, were selected to be covered by GDV: the northeast sub-region, and the southwest sub-region. Across the two sub-regions, 34 municipalities were identified to be targeted, 26 of which are in the northeast and 8 of which are in the southwest. These municipalities are listed in Table 2 and depicted in Figure 2.

**Table 2: List of municipalities**

| | |
|---|---|
| **Northeast sub-region** | Abare, Chorrocho, Glória, Macurure, Rodelas, Cansanção, Canudos, Euclides da Cunha, Monte Santo, Nordestina, Quijingue, Coronel João Sa, Jeremoabo, Pedro Alexandre, Santa Brigida, Sitio do Quinto, Banzae, Heliopolis, Ribeira do Amparo, Adustina , Antas, Cícero Dantas, Fátima, Novo Triunfo, Paripiranga, Itapicuru |
| **Southwest sub-region** | Mirante, Bom Jesus da Serra, Planalto, Poços, Araçatu, Caetanos, Boa Nova, Manoel Vitorino |

Together, these 34 municipalities covered a total of 2,622 identified potential beneficiary communities. Through the use of an algorithm and data from a community-level scoping survey undertaken by the GDV Project Management Unit, 282 communities were identified as eligible for project participation by using a combination of proxy variables such as agricultural production patterns, land size, predominant livestock types, access to water and electricity, and other implementation-relevant factors such as population density.[12] As indicated in Table 3, the 282 communities were grouped into 104 "sub-territories" that served to ensure the contextual relevance of interventions. The northeast sub-region included 226 communities (84 sub-territories), while the southwest included 56 target communities (20 sub-territories).

**Table 3: Breakdown of target municipalities**

| | Municipalities | Sub-Territories | Total Communities | Beneficiary Communities |
|---|---|---|---|---|
| Northeast sub-region | 26 | 84 | 1954 | 226 |
| Southwest sub-region | 8 | 20 | 668 | 56 |
| Total | 34 | 104 | 2622 | 282 |

Sub-territories (*subterritorios)* were formed by linking together communities that were similar in economic activities, ethnic background, and social organization. At this level, Development Councils (*Conselhos de Desenvolvimento*) were created as decentralized project management units, but

[12] Given the concern of political interference, or the appearance of it, the identified proxy variables contributed to a weighted points-base system. After aggregating the points, the final scores were used to make the community selection.

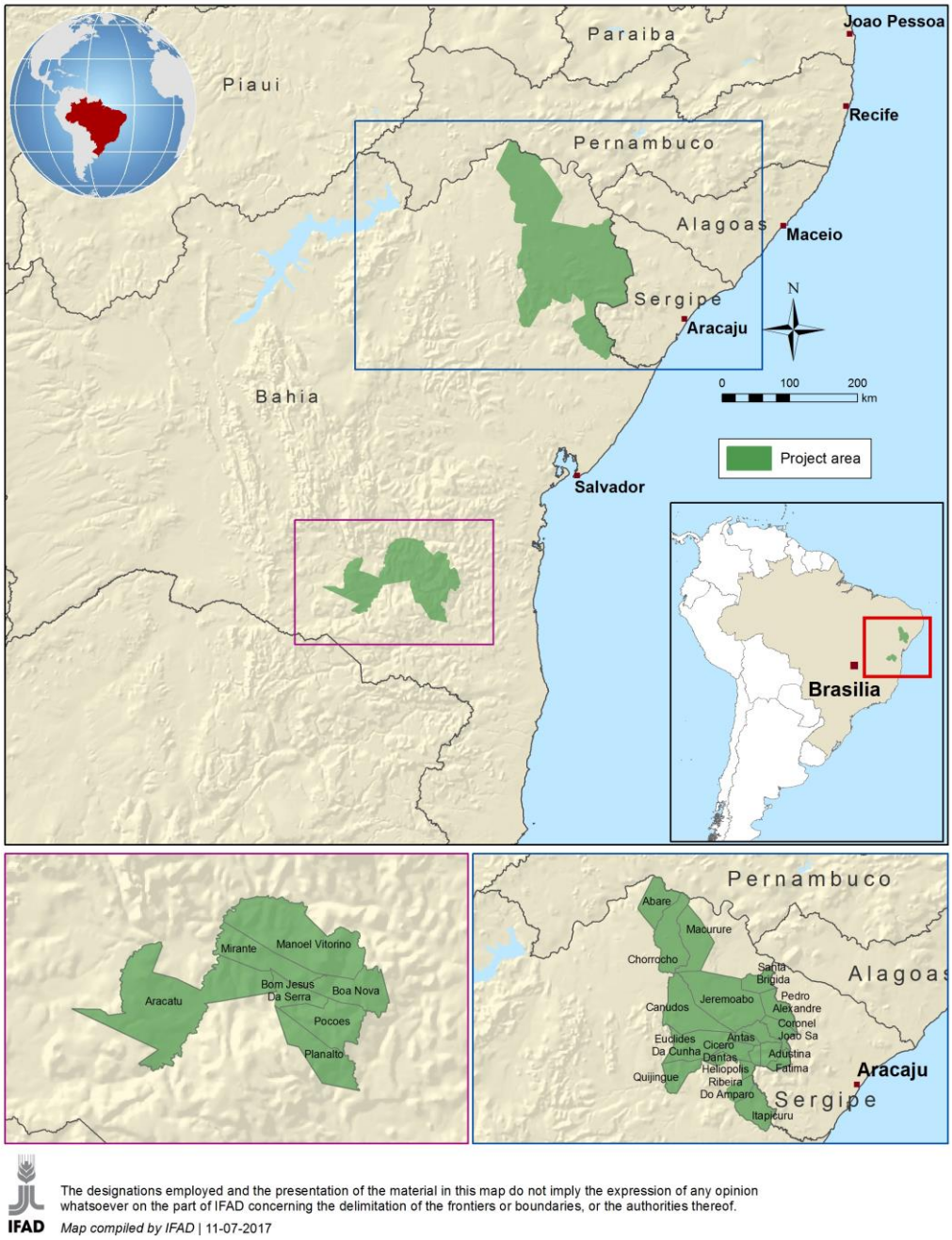
comprised of representatives from each of the communities. It is this unit of organization that was responsible for determining whether specific sub-projects would receive funding.

At the community level, approximately 280 Development Committees (*Comites de Desenvolvimento*) were organized to be responsible for community-level implementation of sub-projects. In addition, Youth Development Agents were selected to manage the relationship between project beneficiaries and local management. In each community, interest groups known as Associations (*Associações*) were formed around each theme considered relevant for the producers. A total of 111 Associations were created to manage the activities and administer the funds made available by the project.

**Figure 2: Map of project area**

**Federative Republic of Brazil**

Rural Communities Development Project in the Poorest Areas of the State of Bahia (Gente de Valor)




The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

IFAD *Map compiled by IFAD* | 11-07-2017

## 2.3 Research questions

The development concept and the Theory of Change of GDV suggest two major levels for the expected impact of the project, subject to the assumptions identified. Those levels are: household and community. Therefore, the indicators required to assess the program impact have to be appropriate and distinct for those levels. For assessing GDV, the following themes will be considered:

**Table 5: Impact Themes and Questions**

| Themes | Questions |
|---|---|
| **Household Welfare** | Did GDV have the intended impact on the levels of household income, dietary diversity, market participation, income diversification, and ultimately resilience to climatic and economic shocks? |
| **Water Access** | Did GDV generate a noticeable difference in availability of water? |
| **Agricultural Technology Transfer and Best Practices** | Which technologies and best practices were most likely to be adopted? Is there evidence of intermittent versus sustainable adoption? |
| **Agricultural Production** | Did GDV generate impacts for increased crop yields? Did GDV have an impact on crop diversification? |
| **Women and Youth Empowerment** | Did GDV result in women's and youth empowerment that generated the enhancement of their social and economic status? |

# 3. Impact assessment design: Data and methodology

## 3.1 Data

This *ex-post* evaluation followed a mixed-method approach in order to capture both expected and unexpected impacts of GDV. The data collection took place six years after the closing of GDV, offering time to identify longer-term outcomes that can lead to more realistic interpretations of impact rather than if the project had been assessed immediately after closure. The event of the multi-year drought, in tandem with continuing erratic rainfall and the loss of support from farmer-orietned public programs, further allows for assessment of the ability of the project to make beneficiaries resilient to drought and economic shocks.

The qualitative portion of the evaluation was conducted prior to the quantitative survey in order to collect information on project targeting and implementation in the targeted areas. Two primary methodologies were employed: Focus Group Discussions (FGD) and Key Informant Interviews (KII). Qualitative interviews took place across seven subterritorios and 17 communities.[13] Interviews comprised of both mixed-gender and female-only FGDs, as well as KIIs with female beneficiaries, YDAs, local association leaders, and technical advisors. Communities chosen for the qualitative were identified based on the following economic activities: cassava, goats, and backyard gardens in combination with high intensity of water-based activities. A report detailing the qualitative findings was prepared by the survey collection firm.

The quantitative portion of the evaluation was primarily used for measurement of impact and consisted of two main instruments: a household-level questionnaire and a community-level questionnaire. These instruments covered a range of modules in order to estimate the multi-faceted aspects of welfare. In particular, the household questionnaire focused on agricultural production, agricultural sales, other income sources such as employment or government assistance, and consumption. Additionally, it included modules on assets, shocks, and migration in order to assess any wealth accumulation, exposure to shocks, and coping strategies. Given that the project placed emphasis on increasing women's leadership and decision-making, an abridged version of the Women's Empowerment in Agriculture Index (WEAI), known as the Project WEAI (Pro-WEAI) was fielded to collect data on indicators that comparatively assess agency and empowerment of male and female decision-makers in a household. The Pro-WEAI is a validated version of the Women's Empowerment in Agriculture Index (Alkire et al., 2013; Kabeer, 1999) that uses three inter-related domains of empowerment (intrinsic agency, instrumental agency, and collective agency) instead of the original five (production, resources, income, leadership, time).

The community questionnaire focused on services that are available to the community and relevant institutions such local infrastructure, economic activities, and access to services. The community

[13] The final municipality and community selection included the following, with the municipalities listed first and the communities followed in parentheses: Cansanção (Lagoa do Cigano, Fazenda Caixão, Lagoa Comprida), Itapicuru (Curralinho, Murituba, Manga), Macururé (Tim Tim, Marruá, Camisa), Abaré (Varjota de Cima, Varjota de Baixo, São Lourenço), Banzaê (Terra da Lua), Manoel Vitorino (Poço da Pedra, Fruiteira), Poções (Craúno, Água Branca).

questionnaire identified levels of community agency and resilience by asking about recent shocks, coping strategies, and collective action to promote local development. Because the project baseline was incomplete, project baseline data was not used, and respondents were asked to recall levels of assets owned at a reference period pre-GDV in both the community and household questionnaires.

For the purposes of survey sampling after community selection, a listing exercise was undertaken to identify members of the community that directly participated in the project as well as intervention heterogeneity and intensity at community level (given the diversity of options). By assessing all members of a community on their participation, the listing exercise further served the purpose of identifying share of beneficiaries at the community level.

Additional agro-climatic data such as precipitation, NDVI, temperature, and evapotranspiration were obtained from the Brazilian Agricultural Research Corporation (EMBRAPA), CHIRPS, TerraClimate, and NASA Modis.

## 3.2 Counterfactual Construction

The quantitative data collection covered 2,019 households, and 3,615 individuals (counting 1,615 partners interviewed for the WEAI), in 228 communities.[14] Given that the nature of the intervention expected both household and community impacts, the construction of a counterfactual was a multi-stage process stratified at the community, and then household level. The steps of counterfactual process are described below and then chronologically laid out in Table 6.

Potential control communities were identified using the project targeting survey.[15] The ultimate counterfactual community group was constructed using a multi-step propensity score matching process that incorporated baseline data from the project development stage, buffering to account for spillovers, and validation with M&E socio-economic data including the algorithm indicator used for objective targeting. Prior to matching, "clusters" of neighboring municipalities were created to stratify the sample pre-matching to simultaneously control for unobservable characteristics while ensuring a sufficient pool of potential control community matches with geographically contiguous neighbours.

Following the identification of paired treatment and control communities within neighboring municipalities, a listing exercise was utilized to identify the total pool of treated households, and intensity of participation at both the community and subterritory-level. Based on baseline population estimates from the targeting survey in conjunction with intensity of treatment, a projected sample was specified for each community weighted by population size relative to the entire sample, as well as treatment relative to the subterritory.

In the final stage, treated households were randomly chosen within their community pools according to the observed distribution household head's gender and varying participation in GDV. Control

[14] The timing of the data collection (2019 – 2020) followed the second phase of the 2018 Brazilian general elections and coincided with the dry season.

[15] The baseline targeting survey provided qualitative data critical to assesing the multi-diminesional nature of economic ecosystems at the community level. The counterfactual construction process particularly relied upon this tool for distinguishing the unique characteristics of very small communities.

households were chosen based on the sample size and gender distribution of their paired treatment community.

**Table 6: Construction of the Counterfactual**

| Step | | Description |
|---|---|---|
| 1 | **Treatment Community Selection** | Out of 282 potential treatment communities, 123 were chosen to reflect the final community sample based on the intensity of their participation in water-based activities. |
| 2 | **Buffering** | In order to control for spillovers, a buffer was constructed around each treatment community using GIS. Control communities that fell beyond 5 kilometers distance of a treatment became the control sub-sample for all later steps. If a control community was within the appropriate range for one community, but too close or far from another community, it was dropped from the sub-sample. |
| 3 | **Clustering** | For each of the 34 municipalities in the project coverage area, a **group** was created that included the municipality of interest and its immediate neighbors. Following the creation of 34 groups, **clusters** were created that consolidated neighboring groups. This resulted in 17 clusters. |
| 4 | **PSM** | Within each cluster, kernel density matching was conducted with the same characteristics utilized for project targeting with the addition of precipitation. This yielded 5 potential matches per treatment community. |
| 5 | **Validation** | Control communities and their matches were validated by the Project Management Unit who used their targeting algorithm that assigned scores to each of the communities based on their baseline characteristics. Through the use of this algorithm, the PMU identified control communities with the same targeting score or ± 1 point compared to the treatment community of interest. |
| 6 | **Control Community Selection** | The process of Validation (4) identified potential controls that were similar to their paired treatment communities using the targeting algorithm used by the PMU and matched baseline characteristics. For each treatment community, a first-best treatment community was identified followed by second and third best options as needed to allow for reserves. The hierachicial order of priority to identify first, second and third best options follows this order: (1) Same points from targeting (2) same Municipio (3) same crop economy. |
| 7 | **Listing** | Given that not all households in a community participated in GDV, a listing survey was done to collect information on treatment intensity, |

| | | |
|---|---|---|
| | | e.g. the types of activities that beneficiaries participated in, household head attributes, and access to household cisterns. Treatment intensity was in fact unknown at community level. The listing was conducted in both treatment and control communities. In control communities, only households head attributes and whether they had a cistern were collected. |
| 8 | **Household Selection** | Beneficiary households were systematically selected based on the intensity of their participation in the project relative to beneficiaries in their community and greater sub-territory. Given that the project was intended to have community-level impacts, both high and low intensity participation households were included to avoid biasing results. Control households were selected on the basis of household head gender. |

## 3.3 Questionnaire and Impact Indicators

Impact indicators were identified based on the GDV Theory of Change as well as IFAD10 corporate reporting requirements. Impacts described in this report largely focus on quantitatively-assessed household-level indicators.

### *i. Access to Water for Human Consumption and Agricultural Needs*

As part of the sample design, this study focuses on sub-territories where provision of water for human consumption and agricultural use was a highly-prioritized activity. This is motivated by the increasing risk of drought as climate change progresses, the vital role that access to water plays for welfare and production, the potential for time-use impacts following household cistern construction, as well as the over-arching government interest in cistern construction.

Access to water is proxied by multiple variables including: the households reported primary source of water, asset ownership to assist with water harvesting, and use of irrigation. *Distance to Water* is a categorical variable defined by the household's proximity to their primary water source. We allow for three tiers of distance including (1) within the household property, (2) using community infrastructure, and (3) external sources such as a river, emergency water truck, or purchased water. If a household indicated that they own a cistern but they depend on community infrastructure, they would receive a score of 2, for community infrastructure. Asset ownership includes *Number of Cisterns* and *Number of Caixas da Agua*. Caixas da Agua are water harvesting devices that are substantially smaller than cisterns and cheaper to install. Whether the household *First Received a Cistern* or Caixa da Agua since the baseline indicates improvement in water access since the baseline. *Irrigation* is a binary variable included encompassing all formal and informal methods of irrigation.

As part of the descriptives, we include whether the household received a cistern that was provided by any project such as Gente de Valor, Agua para Todos, or Um Milhão de Cisterns. We are able to capture this information using the cistern plaque that indicates the organization, year of construction, as well as a unique identification number.

### *ii. Agricultural Practices and Productivity*

Increasing capacity to produce suitable for the agro-ecological context using sustainable practices was a critical productive intervention for GDV. Through the construction of home gardens, demonstration of agro-ecological trials, dispersion of kits for crops and livestock, and technical assistance on permaculture practices and livestock health, the project encouraged diversified crop choice, adoption of inputs, adoption of best-practices, and increased crop productivity, and enhanced livestock health.

We capture data on the use of inputs, separating out *Improved Seed*, *Organic Fertilizer*, *Chemical Fertilizer*, and *Herbicide*. Knowledge of best practices was collected by asking respondents about their *Awareness* of, *Practice* at any time, and continued *Adoption* of specific practices identified by the PMU. The six practices were identified by the PMU as ones that beneficiaries would recognize including minimum tillage and other conservation practices specific to the sertão. Using the local terms, these include: *reflorestamento*, *recatingamento*, *aterramento*, *faixa de grama*, *plantio direto (mobilização minima)*, and *agrofloesta*. Responses were aggregated as to whether respondents were exposed to any best practices, how many they were aware of, whether they practiced any, and whether they still adopted any.

Production and productivity are the primary impact indicators relevant to this module. Productivity is assessed as yield, a ratio of total production divided by the area of land devoted to production of a specific-crop. Production is assessed both in terms of total production, as well as a monetary value, in order to account for the potential agricultural income of households regardless of whether they sold anything.

Impact indicators include the total *Production* and *Yield* of beans and maize respectively, as well as the aggregate production and yield of beans, maize, and cassava. As an indicator of participation in agriculture, the total land size of *Agricultural Land* is reported in hectares as well as the total *Number of Crops* planted by the household. The value of *Cultivation* is determined using a standard price for all crops. This standard price was determined by considering the median crop-specific sale price in the dataset, with validation from external sources including the PMU, data collection team, and multiple online price aggregators for the state of Bahia. A standard price was used in order to avoid bias from method, location, or timing of sale.

### *iii. Livestock*

Livestock impacts are proxied by the total value of animals belonging to the household, converted into *Tropical Livestock Units* (TLU). Using TLUs allows us to distinguish between types of animals and identify a common value that is comparable across contexts. For each type of animal, a weight is given. Each cattle is given a value of .7, sheep are .1 each, goats are .1 each, horses are .8 each, mules are .7 each, donkeys are .5 each, pigs are .2 each, and chickens are .1 each. To assess the value of the household's herd over time, the *Change in Livestock Value* is determined by the difference between the current aggregate TLU value and the baseline aggregate TLU value.

Best practices for livestock are also considered and assessed similarly to crops to include a binary variable to indicate awareness of any practice, number of practices that the household is aware of, a binary value to indicate whether any practice was ever implemented, and another binary to indicate whether any practices have been adopted. Practices include pasture rotation, hygiene and reproductive care, and the construction of infrastructure. Local terminology used includes: *rotação de pastagem*, *manejo reprodutivo sanitário e alimentar*, *infraestrutura*, and *armazenamento de alimento*. Again, as

with crop best practices, these terms were identified by the PMU as terms that would be known to beneficiaries.

*iv. Sources of Income*

*Total Household Income* is calculated by summing together income from *Agriculture*, *Wage* labor, *Enterprise*, and *Transfers*. Agricultural income consists of the value of cultivation (including unsold produce), livestock sales, and livestock by-product sales. Wage income is the aggregation of earned income from all formal and informal jobs held by family members. Enterprise income is the gross income reported for self-employment. Transfer income includes any remittance from family members, or importantly, government transfers for programs such as Bolsa Familia.

To assess the relevance of each income source to households, the share of that source compared to total income is assessed. To understand further what drives agricultural income, the total value is additionally reported as disaggregated by crops, livestock, and livestock by-products, and whether or not the household participated in that form of income generation from agriculture.

Further insight into the diversity of income is reported through the *Number of Income Sources*, as well as an *Income Diversification Index*.

*iv. Wealth and Household Assets*

Following decades of practice within the development literature, wealth is proxied by asset-based indicators from different domains including *Housing*, *Durable Assets*, and *Livestock*. An *Overall* asset index is also constructed to proxy for total household wealth. Under each domain, two indices were created based on either baseline or current ownership of specific assets. Depending on the data structure, multiple correspondence analysis (categorical) or principal component analysis (continuous) is utilized.

Within each domain, a change in the household's asset index score since baseline is calculated as well as their change in economic mobility. While *Change* is a simple difference between continuous values of the asset index, E*conomic Mobility* reflects any upward and/or downward movement after having discretized baseline and completion distributions into quintiles of the asset index. A categorical variable has been created for whether the households position improved, stayed the same, or decreased since baseline.

*v. Food Security and Resilience*

To assess other dimensions of welfare such as the household's capacity to respond shocks, we link together the dimensions of nutrition and resilience, given that the majority of households suffered from exposure to persistent drought in recent years.

Dietary qualityis proxied by the Household *Dietary Diversity Score* (HDDS), and food security is proxied by an adapted *Food Insecurity Experience Index* Scale (FIES). The HDDS is a count of each food group that a household consumed in the past 24 hours with a possible range from 0 to 12. The FIES score calculated in this study is an approximation of the FIES methodology and provides scenarios of forms of food insecurity from minor to major while asking respondents to indicate if they experienced the scenario. The indicator presented in this report is a count of the number experiences the household acknowledged, with a possible range from 0 to 8.

As a proxy for resilience, we use household's *Ability to Recover* from both drought and overall shocks over the 12 months prior to the start of the data collection.

### *vi. Social Capital*

To measure the impact on social capital, we used a set of proxy variables that asked the respondents whether they participated in certain agricultural as well as non-agricultural groups in their community. The total number of community agricultural groups and the total non-agricultural groups were used, with higher numbers implying increased community-level participation by the household.

### *vii. Women's Empowerment*

The empowerment of women is a continuum, which is assessed according to how much improvements are made in terms of women's decision making over time. Common indicators of decision-making power are women's income, education, and assets (Sraboni et al., 2014). To measure women's empowerment, the Project-Level Women's Empowerment in Agriculture Index (pro-WEAI) was used. Pro-WEAI is a new survey-based index for measuring empowerment, agency, and inclusion of women in the agriculture sector. Developed jointly by the International Food Policy Research Institute (IFPRI), the Oxford Poverty and Human Development Initiative (OPHI), and thirteen partner projects in the GAAP2 portfolio, the tool helps agricultural developmental projects assess women's empowerment in a project setting, diagnose areas of women's disempowerment, design strategies to address deficiencies, and monitor project outcomes. Pro-WEAI is an adaptation of the Women's Empowerment in Agriculture Index (WEAI), uses the A-WEAI as a starting point, and adds specialized project-relevant modules, designed and tested by the WEAI team. Standardized components of the survey will be comparable across all projects using the pro-WEAI, and specialized project-relevant modules will be comparable within clusters of projects addressing similar pathways to empowerment in the agricultural sector. We fielded the standardized version of the index.

Pro-WEAI is composed of 12 indicators of women's empowerment in agriculture: autonomy in income, self-efficacy, attitudes about domestic violence, input in productive decisions, ownership of land and other assets, access to and decisions on credit, control over use of income, work balance, visiting important locations, group membership, membership in influential groups, and respect among household members. These indicators are organized into three domains: intrinsic agency (power within), instrumental agency (power to), and collective agency (power with).

A respondent is considered adequate in a particular indicator if she or he reaches a certain threshold. For example, a respondent is adequate in group membership if she or he is an active member of at least one group in the community. The indicators are weighted equally, and a respondent is considered empowered if she or he is adequate in at least 75 percent – or at least 9 out of 12 – of the indicators. The Three Domains of Empowerment score (3DE) is calculated from these 12 indicators, and reflects how many respondents are empowered across the three domains (intrinsic, instrumental and collective agencies) and the extent of their empowerment. Pro-WEAI is therefore a composite index that tells us how empowered the women surveyed are as a group. Pro-WEAI combines the 3DE score with the Gender Parity Index (GPI), which assesses how empowered women are in comparison with the men in their households.

### *viii. Youth Migration*

*Youth Migration* considers whether a household has had a young person permanently migrate and leave the household. In addition, *Number of Youth Migrants* per household is calculated. Given that the rural areas of Bahia are characterized by limited economic opportunity, combined with increased access to

transportation to cities, and a history of migration during drought periods, youth migration is used here to proxy for perception of local opportunity within the household.

## 3.4 Impact estimation

GDV's impact is calculated by estimating the **average treatment effect on the treated** (ATET). As described by Wooldridge (2010), ATET refers to the mean effect size of comparing those that participated in a program to those that did not. ATET can be expressed as follows, where $y$ refers to the outcomes for treated (1) and control (0) groups, $w$ refers to treatment status, and $x$ refers to a vector of demographic covariates:

$$ATET = E(y_1 - y_0 \mid x, w = 1)$$

However, we can only observe outcomes for a given sample under one treatment condition $w$, either treated or untreated, which is expressed as follows:

$$ATET = E(y \mid x, w = 1) - E(y \mid x, w = 0)$$

The challenge with directly comparing treatment and control groups as observed in the data, is the possibility that treated individuals are somehow unique in a way that could influence observed outcomes. The most common example of this mechanism is motivation, whereby individuals who are willing to exert more effort to improve their situation are inherently more likely to participate in a project that advertises a pathway to do so. Had they not participated in the project, we can assume that through this effort and motivation, they would naturally achieve higher outcomes than another person who did not participate in the project due to lack of motivation or interest. Random assignment of inclusion among interested individuals can help address the challenge of impact estimation, but the reality is that most projects do not randomly assign their beneficiaries due to political or pragmatic reasons.

Indeed, individual-level participation in GDV was not random. Beneficiaries were chosen by their respective communities and there was a limit to the number of people who could participate in specific activities. When estimating impact, it is critical to acknowledge the fact that while we know that the control community as a whole is comparable to treated communities, we do not know which households in the control group would have been chosen by their local associations to be beneficiaries, had their community been included in the treatment group. Selection was meant to target the most economically disadvantaged members of communities, but it is understood in CDD projects that members with higher social capital often utilize it to additionally benefit.

To account for the possibility of bias in the distribution and uptake of participation, ATET is estimated using experimental methods by employing propensity score matching (PSM) followed by inverse-probability-weighting regression-adjustment (IPWRA).

The use of PSM is appropriate to estimate the likelihood of treatment given that beneficiaries were selected by communities based on their relative economic status within the community. As such, a vector of demographic characteristics, $x$, are identified that proxy for economic status at baseline, i.e.

the time of treatment allocation. These covariates include the following characteristics for the household head: sex, age, level of educational attainment, and whether they have a partner. Other characteristics of the household's economic status at baseline were included such as: access to electricity,number of livestock assets (goats and sheep, pigs, cattle), average exposure to drought conditions prior to the baseline, number of drought events prior to the baseline, land size at baseline, access to water, rurality proxied by distance to a local school, and intagible socio-economic conditions proxied by region.

Given our assumption that treatment was likely allocated to both the poorest members of communities, as well as a minority of the most influential, matching based on observed economic characteristics at baseline allows us to replicate this non-random distribution within the control group. Relative economic status within communities is not specifically considered during this stage of the estimation design but was accounted for during the sampling by identifying communities with similar size, ethnic makeup, and economic characteristics as described in Section 3.2.

Beyond likelihood of treatment, the estimation of impact also needed to consider potential contamination by the number of ongoing development activities from other projects, namely the construction of household cisterns by other development partners. To account for this, data was collected on whether the household owned a cistern, whether that cistern was built by a development project, and who built it.[16] The proportion of households who received a cistern from a philanthropic source (either GDV or the government) was found to be sizeable in both treatment and control communities, while approximately half of treated households received their cistern from non-GDV sources.

Given that GDV worked collaboratively with ongoing government projects to provide cisterns that preceded the project, it is therefore concluded that access to a cistern among controls should not be considered as contamination. However, baseline access to water is included in the matching process given its importance for household and agricultural activities.

Following the construction of comparable treatment and control group on the basis of the observed characteristics outlined above, ATET was estimated using IPWRA. As a robustness check, a secondary estimation method, was implemented using covariate matching (NN). We also conducted a heterogeneity analysis. For the heterogeneity analysis, the following treatment variations are considered: Beneficiaries that received (1) only water-based interventions; (2) water and home gardens; and (3) water, home gardens as well as technical assistance and inputs.

Outliers were addressed using double-sided winsorization at 1 and 5 percent. The determination of levels was based on the likelihood of measurement error due to recall bias and was validated using responses to related questions.

[16] Identification of the organization constructing the cistern is relatively clean given the common practice of attaching a plaque bearing the organization's name and logo to the cistern, along with the year of construction, and a unique registration number.

Given the contextually relevant nature of interventions within a CDD-style project, it is anticipated that results will be externally valid only within an environment where conditions are ecologically, economically and socio-politically similar to Bahia.

# 4. Profile of the project area and sample

In this section, we present the distribution of data collected, by region, community-level indicators, and household-level indicators.

*Regional Characteristics*

GDV was implemented in 34 municipalities across 2 sub-regions. Using the sampling strategy outlined in Section 3.2, 31 of those municipalities were included in the data collection, which covered the entire territorial area.

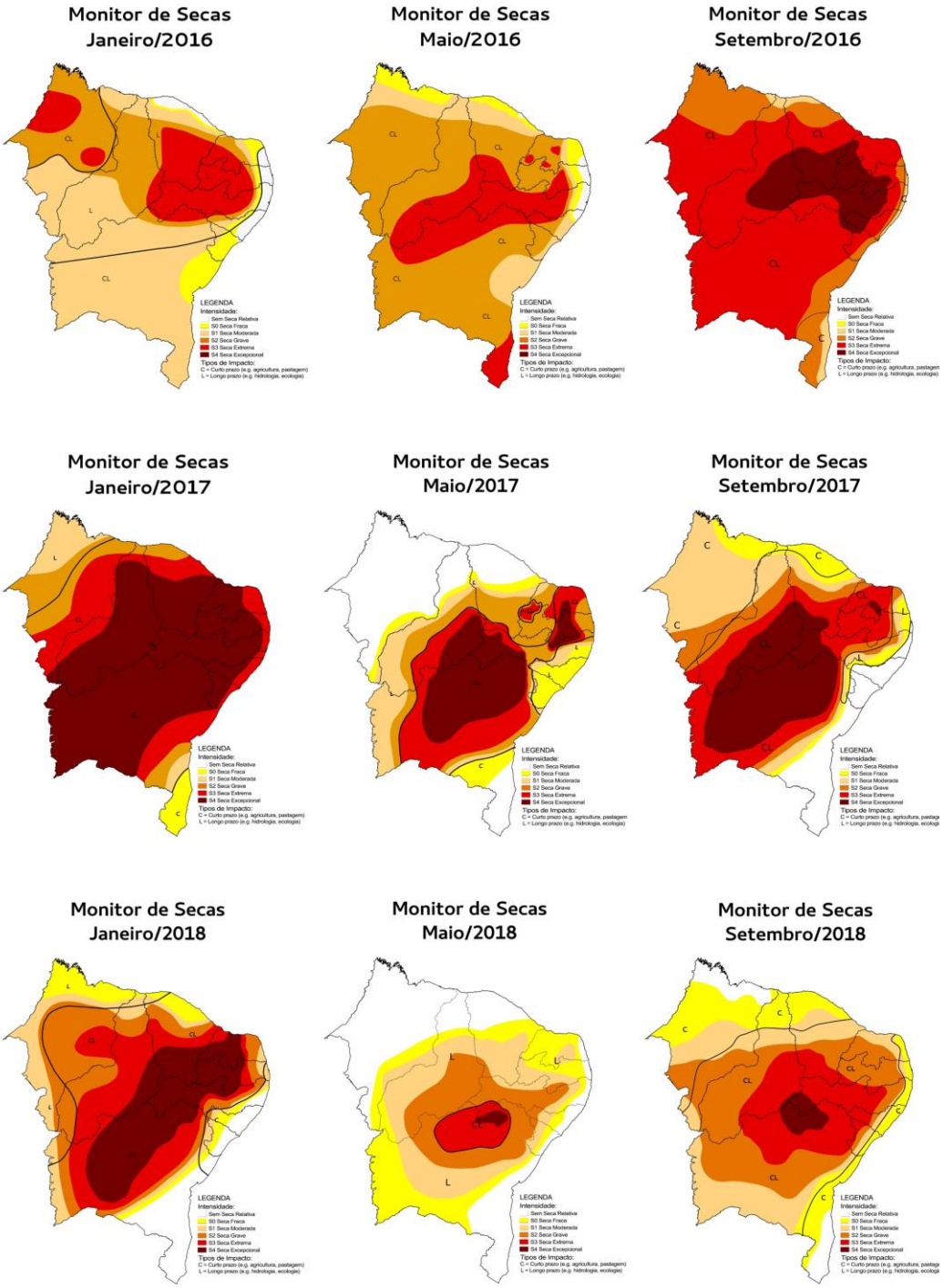
**Table 7: Sample Distribution by Territory**

| Region | Municipalites | Communities | Treatment Households | Control Households |
|---|---|---|---|---|
| Northeast | 23 (74%) | 192 (84%) | 768 (79%) | 856 (82%) |
| Southwest | 8 (26%) | 36 (16%) | 206 (21%) | 189 (18%) |
| Total | 31 | 228 | 974 | 1045 |

The Northeast of Brazil is prone to drought and recently experienced an extremely severe multi-year episode followed by a particularly severe drought from 2011 until 2017/2018. This is visually apparent based on maps produced by Brazil's Monitor de Secas (Drought Monitor) covering the most recent 3 year-period. In Figure 3 below, severity of drought is indicated from no designation (white) to S0 (Yellow – Slightly Dry), to S1 (Beige – Moderately Dry), S2 (Orange – Severely Dry), S3 (Red – Extremely Dry) to S4, the maximum category, (Maroon - Exceptionally Dry). The dark bolded lines indicate regions where drought is either having a primarily agricultural impact (C – < 4 months), or a hydrogical/ecological impact (L – 12 months).

Monitor de Secas identifies the likely impacts of S2 drought as crop loss and water shortages, S3 as large crop losses and intensified water shortages, and S4 as creating an emergency situation with exceptional crop and grazing loss, with water shortages affecting reservoirs, streams, and wells. It is extremely important to consider that this impact assessment assesses the outcomes in the year following an S4 level drought.

**Figure 3: Drought Severity Maps (Northeast Brazil, 2016 – 2019)**




*Source: Monitor de Secas (2019), edited by author*

*Community Characteristics*

For the descriptive statistics presented in Table 8, community leaders were asked in the community survey to describe aspects of their community that signal the enabling environment and level of rural transformation.

Based on the Table 8, it is observable that sustainability of communities is a challenge, largely driven by lack of employment opportunities. Overall, almost 1 in 3 communities is typified by permanent rather than temporary migration, with youth (ages 15 – 25) being more likely to migrate than other age cohorts. The possibility of finding work while remaining in the community appears limited, as demonstrated by fewer than 30% of communities indicating that daily commuting is a trend. Between treatment and control groups, control communities are more likely to experience permanent migration, and seek regular work opportunities outside of the community.

Access to water continues to be an issue. Very few communities either in treatment or control groups report having consistent access to water throughout the year. This can be explained by less than half having any community infrastructure for water despite the number of government programs in place to improve access. Almost 70% of communities receive emergency assistance in the form of government water trucks, and less than 50% of communities report having the capacity to meet their water needs.

In terms of capacity to derive income from agriculture, an overwhelming proportion of communities still rely on local markets and direct sale to neighbors for sale of crops, while less than 30% have access to extension to improve their productive capacities. The presence of communal resources such as gardens, grazing grounds, or water groups are also limited.

**Table 8: Sample Distribution by Community Characteristics**

| Indicator | Treatment | Control | Total |
|---|---|---|---|
| Female Leadership | 33% | 31% | 32% |
| Migration and Community Sustainability | | | |
| Permanent Migration | 23% | 39% | 30% |
| Cohort Most Likely to Migrate (15 – 25) | 58% | 67% | 62% |
| Cohort Most Likely to Migrate (25 – 35) | 40% | 30% | 35% |
| Abandoned Households | 12% | 13% | 12% |
| Daily Work Outside Community | 22% | 28% | 25% |
| Access to Water | | | |
| Share of Households w. Regular Access to Water | 15% | 10% | 12% |
| Community Infrastructure for Water | 49% | 45% | 47% |
| Water Trucks Visit Community | 69% | 67% | 68% |
| Capacity of Water To Meet Needs | 47% | 43% | 45% |

| | | | |
|---|---|---|---|
| **Community Resources** | | | |
| Community Garden | 12% | 3% | 7% |
| Community Grazing Land | 16% | 12% | 14% |
| Any Groups | 80% | 66% | 73% |
| Community Water Group | 19% | 18% | 18% |
| **Agricultural Environment** | | | |
| Primary Location for Agricultural Sale: Local Fair or Personal Sale | 75% | 68% | 71% |
| Access to Extension | 31% | 23% | 27% |

When asked about coping strategies on dealing with self-reported drought and similar shocks, a substantial number of communities asserted that they did not have any specific strategies. Following this response, responses included planting palma to feed livestock, being economical with water stocks, receiving assistance from water trucks, relying on Bolsa Familia, and seeking employment outside of their community.

### *Household Characteristics*

Despite the evidence that rural transformation still has a ways to go at the community level, it is also apparent that some action is taking place to help improve conditions. At the time the project started, less than one in five households had access to a household cistern to harvest rainwater. Since then, 88% of GDV beneficiaries and 60% of control households received at least one from a philanthropic source.

**Table 9: Sample Distribution by Household Characteristics**

| Indicator | Beneficiary Mean | Control Mean |
|---|---|---|
| **Household Attributes** | | |
| Household Head (HHH) Male | 76% | 77% |
| HHH Age | 53 | 52 |
| HHH Literacy | 18% | 22% |
| Household Size | 3.75 | 3.28 |
| Dependency Ratio | .63 | .54 |
| Total Land Size (HA) | 10.05 | 10.56 |
| Agricultural Land Size (HA) | 1.48 | 2.07 |
| Indigenous | 2.36% | 0.29% |
| Quilombola | 1.33% | 0.29% |
| **Baseline Attributes: 2012** | | |
| Access to Household Cistern | 22% | 24% |
| Access to Household Electricity (Any) | 56% | 50% |
| Access to Household Toilet | 31% | 38% |
| Durable Asset Index | .79 | .77 |

| | | |
|---|---|---|
| Housing Index | .65 | .65 |
| **Project Participation** | | |
| Received First Cistern Since Baseline | 68% | 48% |
| From GDV | 38% | -- |
| Bolsa Familia | 50% | 50% |
| Agricultural Program | 39% | 33% |
| Reported Drought | 95% | 95% |
| **N. Observations** | 974 | 1045 |

The table above provides descriptive statistics on beneficiary and control households. Even prior to matching, households are balanced on the following attributes of the household head such as age, sex, and literacy. There are also similar economic attributes in terms of household size, access to land, access to a cistern at baseline, as well as baseline assets and housing.

Since GDV started, 68% of beneficiary households received their first cistern compared to 48% of control households. Of the beneficiary households who received a cistern from a philanthropic source since 2012, just over half of them received it from GDV indicating significant integration into other programs to provide access to water storage devices.

At the time of data collection, 90% of beneficiary households and 70% of control households had at least one cistern. Only 10% of beneficiary households and 6% of control households have more than one cistern.

*Treatment Heterogeneity*

Given the demand-driven nature of the project, note that there is considerable heterogeneity within treatment type and intensity among beneficiary households. We consider here the variation among primary productive interventions, as reported by project beneficiaries.

**Table 10: Proportion of Treatment Typology**

| Treatment Tyology | Percentage |
|---|---|
| Water Only | 33.4% |
| Water and Home Garden | 30.11% |
| Water, Home Garden, Technical Asstiance and Technical Inputs | 23.43% |
| Other | 13.06% |

Of the three main productive interventions: Water Harvesting infrastructure, Home Gardens (HG), and a combination of Technical Assistance and Technical Inputs (TATI), 33.4% received only Water Harvesting infrastructure, while 30.11% received both Water Harvesting infrastructure and a HG, and 23.43% received all three interventions including TATI. A remaining 13% received alternative combinations of the three. This breakdown of treatment does not account for social interventions, which were offered to all members of the community.

### *Post-Matching Characteristics*

Matching was conducted on the following characteristics presented in Table 11. As can be observed, significant differences remain only for Household Head Sex, Baseline Drought Intensity, and Distance to School. However, it should be recognized that in economic terms, these differences are rather small. Overall bias following matching is 16.2%.

**Table 11: Post-Matching Characteristics**

| Characteristics | Treatment Mean | Control Mean | Difference |
|---|---|---|---|
| Household Head Sex (1 = Male) | .77 | .75 | 0.02* |
| Household Head Age | 53.19 | 52.87 | 0.32 |
| Household Head School Level 2 | 0.17 | 0.19 | -0.02 |
| Household Head School Level 3 | 0.10 | 0.10 | 0.00 |
| Union / Partner | 0.78 | 0.77 | 0.02 |
| Household Size | 3.76 | 3.69 | 0.07 |
| Total Land | 10.21 | 9.86 | 0.35 |
| Baseline Electricity | 0.45 | 0.45 | 0.00 |
| Baseline Goat Quantity | 5.31 | 5.43 | -0.12 |
| Baseline Pig Quantity | 0.09 | 0.10 | -0.01 |
| Baseline Cattle Quantity | 0.90 | 0.83 | 0.07 |
| Baseline Drought Intensity | 0.17 | 0.15 | 0.02* |
| Baseline Drought Events | 2.67 | 2.96 | -0.29 |
| Baseline EVI | 2947.90 | 2939.60 | 8.30 |
| Baseline Distance to Water Level 2 | 0.58 | 0.54 | 0.04 |
| Baseline Distance to Water Level 3 | 0.29 | 0.32 | -0.03 |

| | | | |
|---|---|---|---|
| Distance to School | 8.65 | 8.38 | 0.27* |
| Region | 0.78 | 0.75 | 0.02 |

# 5. Results

This section presents the estimates of impact from GDV on the indicators described in Section 3.3. To provide information on the average impact, as well as more specific interventions, the results are presented for both the full sample as well as disaggregated by intervention type. In interpreting the results below, we primarily rely on the IPWRA estimator for impact estimation. For the purposes of comparison and robustness, we also provide results using the covariate matching (NN) estimator. Units of measurement are indicated, and unless specified as a percentage, binary, or categorical, all indicators should be interpreted as levels.

These results focus on indicators related to intermediate outcomes and final impacts. It is recognized that these results reflect the estimated impact of the GDV following several years following the closure of the project in addition to continuous extreme drought years and diminished social safetynets. While it is anticipated that results for specific indicators such as agricultural sales income may not reflect the greater productive potential of beneficiaries in non-stress years, assessing impact at this time is appropriate given the objective of the project to prepare beneficiaries for drought-prone conditions. As such, these results convey information on the capacity of beneficiaries to respond to increasingly severe environmental conditions; a critical objective of the project.

In the results section, we first present the pooled analysis, which is the analysis conducted on the whole sample, and therefore conveys the full set of impact indicators for all beneficiaries post-matching. We then present specific results for subsamples whereby beneficiaries have been grouped by intervention typology.

## 5.1 Pooled Analysis

Table 12 presents the results for one of the most prioritized outcomes of participation in the project, i.e. improved access to water. Despite the fact that a number of control households participated in water-harvesting provision schemes, the results indicate that GDV was more effective at providing access.

**Table 12: Access to Water**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Current Number Cistern | | 1874 | .26***<br>(.03) | .26***<br>(.03) | .77 |
| Current Number Caixa de Agua | | 1874 | -.04<br>(.03) | -.04<br>(.03) | .62 |
| Use of Irrigation | Binary | 1310 | -.017<br>(.02) | -.02<br>(.01) | .07 |

Across both treatment and control groups, 73% received a cistern from a philanthropic source or government project since 2006. Even those who participated in GDV participated in programs that provided them with a cistern from another project. This cross participation is within the expectations of GDV, which facilitated the ability of beneficiaries to receive government benefits.

That said, there are clearly different levels of access to water between GDV beneficiaries and non-beneficiares. When considering the number of cisterns currently owned by households, the average control household has less than one. Control households have even fewer than one caixa de agua, which are smaller and have less water storage capacity. Results indicate that participation in GDV increased the number of cisterns owned by beneficiary households by 34%.

After establishing access to water, we further consider that how this access facilitated use of irrigation. The descriptives tell us that only 7% of control households made use of irrigation in any capacity. However, results indicate that the difference is essentially negligible between beneficiary and control hosueholds on average. This is consistent with expectations that even if access to water increased, the primary use is likely for household consumption. On average, beneficiary households own only one cistern.

As such, we conclude that GDV did increase access to water-harvesting technologies for human consumption, which is critical in drought prone-environments, but did not do so sufficiently (including the construction of community-based water-infrastructure) to promote access for productive purposes.

Input use of improved seeds, organic and chemical fertilizer, pesticides, and herbicides, is another area where intensification of agricultural practices was limited. Table 13 presents the results for input and best practice use, and curtails the sample to those who attempted any form of agriculture, i.e. ~70% of households. The most commonly used input by farming control households is organic fertilizer, which 20% of control households do, followed by 6% who use chemical fertilizer, 4% who use improved seeds, and 2% who use pesticide. Results are negligible regarding the difference in use of any input between GDV beneficiaries and control households.

**Table 13: Input Use and Adoption of Best Practices**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| **Input Use** | | | | | |
| Improved Seed | Binary | 1310 | -.01<br>(.01) | -.004<br>(.01) | .04 |
| Organic Fertilizer | Binary | 1310 | .03<br>(.023) | .03<br>(.02) | .20 |
| Chemical Fertilizer | Binary | 1310 | .001<br>(.01) | .007<br>(.01) | .06 |
| Pesticide | Binary | 1310 | .008<br>(.008) | .01<br>(.008) | .02 |
| Herbicide | Binary | 1310 | .003<br>(.002) | .002<br>(.003) | .002 |

| | | | | | |
|---|---|---|---|---|---|
| **Best Practices** | | | | | |
| Awareness | Binary | 1310 | -.01<br>(.02) | .01<br>(.02) | .17 |
| Practiced Ever | Binary | 1310 | .01<br>(.01) | .009<br>(.01) | .03 |
| Adopted | Binary | 1310 | .008<br>(.009) | .004<br>(.009) | .03 |

Similarly, awareness, practice, and continued adoption of best practices introduced during the project is also limited. As described earlier, the household questionnaire inquired about several soil conservation practices identified by the project management unit, for the purpose of promoting soil health and combating land degradation.

When asked about whether households were aware of any of the identified practices, only 17% of control households were familiar with at least one. Whether they had then practiced any, dropped to 3%, and continued adoption remained at a similarly low level. Motivations for never trying any practice largely centered around not being interested, with secondary reasons including lack of technical support and insufficient information. Among those who had previously practiced any soil conservation technique but then later disadopted, the lack of technical support was mostly widely cited, followed by expense.

Overall, we conclude that GDV did not lead to a sustainable uptake of either inputs or implementation of soil conservation practices inspite of the possibility of enhanced yields in the post-drought environment. This however, may also have been due to limited financial resources after multiple years of severe drought. If this scenario is representative of reality, then it worth questioning whether intensification of agriculture is sustainable in environments prone to climate shocks.

**Table 14: Input Use and Adoption of Best Practices**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Agricultural Land | HA | 1874 | -.08<br>(.11) | .12<br>(.09) | 1.17 |
| Number of Crops | | 1258 | .36***<br>(.12) | .43***<br>(.12) | 2.79 |
| Total Cultivation Value | BRL | 1258 | 263.47<br>(306.10) | 404.46<br>(306.18) | 983.93 |

Despite the fact that beneficiary households did not meaningfully irrigate or adopt intensified inputs, they were however more likely to diversify in the number of crops they cultivated and also proved to be more efficient in their cultivation of beans, and more productive in their cultivation of maize. Beneficiary households were 49% more efficient in their cultivation of beans, and produced 162% more KGs of maize than control households. This is highly promising given that these crops are staples.

However, even with significant gains in the number of crops grown, effiency, and overall production, the value of cultivation was not significantly different.

This is highly relevant given that a major expectation within the theory of change is that beneficiary households would increase their agricultural production value and have a marketable surplus that would then lead to income increases. Indeed, only 11 households in the sample cultivated any form of cash crop such as sugar, coffee, soy, etc.

**Table 15: Production and Yield**

| Indicator | Unit | N | IPWRA | NN | Control Mean |
|---|---|---|---|---|---|
| Production Staple | KG | 1096 | 4.39<br>(19.55) | 14.91<br>(20.84) | 179.94 |
| Yield Staple | KG / HA | 1096 | 212.49<br>(144.36) | 206.94<br>(142.97) | 635.40 |
| Production Beans | KG | 1047 | -2.45<br>(10.63) | 1.33<br>(10.69) | 83.65 |
| Yield Beans | KG / HA | 1047 | 325.49**<br>(150.59) | 280.33*<br>(150.35) | 667.83 |
| Production Maize | KG | 1056 | 163.14***<br>(59.55) | 172.24***<br>(59.36) | 100.71 |
| Yield Maize | KG / HA | 1056 | 45.96<br>(67.30) | 96.71*<br>(57.26) | 341.56 |

Moving beyond crop cultivation, beneficiaries were not more likely to have higher value livestock herds or adopt practices relevant to the management of livestock health and welfare. Optimistically, however, the change in livestock value, from baseline to the time of data collection did increase, despite the extreme drought the region experienced over multiple years. That said, there were no significant differences between beneficiary and control households.

Awareness (8%), practice (5%), and adoption (4%) of any best practices related to livestock care were minimal among livestock owners in the control group, with negligible differences compared to the treatment group.

**Table 16: Livestock Value and Best Practices**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Livestock Value | TLU | 1874 | .08<br>(.11) | .04<br>(.12) | 2.64 |
| Change Livestock Value | Delta TLU | 1514 | -.09<br>(.12) | -.04<br>(.13) | .68 |

## Best Practices

| | | | | | |
|---|---|---|---|---|---|
| Awareness | Binary | 1514 | -.0008<br>(.01) | .002<br>(.01) | .08 |
| Practiced Ever | Binary | 1514 | -.0008<br>(.01) | -.0004<br>(.01) | .05 |
| Adopted | Binary | 1514 | -.02<br>(.01) | -.004<br>(.008) | .04 |

Overall, beneficiary households were 16% less likely to sell any crops and livestock by-products such as honey or cheese. In the case of crops, this did not however affect the actual amount of money earned by households who sold crops, while treatment households earned 59% less BRL from livestock by-products.

**Table 17: Agricultural Commercialization**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Sold Crops | Binary | 1275 | -.09***<br>(.03) | -.003<br>(.03) | .55 |
| *Value Sold* | BRL | 1275 | 56.50<br>(164.63) | 118.43<br>(153.92) | 409.75 |
| Sold Livestock | Binary | 1514 | -.02<br>(.02) | -.006<br>(.03) | .40 |
| *Value Sold* | BRL | 1514 | 18.22<br>(63.50) | 53.61<br>(66.57) | 647.08 |
| Sold Livestock By-Products | Binary | 1513 | -.03*<br>(.02) | -.01<br>(.02) | .18 |
| *Value Sold* | BRL | 1513 | -92.06*<br>(41.68) | -40.89<br>(30.55) | 156.64 |

Overall, beneficiary household income was 16% less than control households. This is largely driven by wage income. On average, beneficiary households made 50% less than control households in wage income and 22% less in enterprise income. Beneficiary households had fewer sources of income depended more on transfers such as remittances and Bolsa Familia. Control households however, were also very dependent on transfer income, which made up 68% of their total income.

**Table 18: Household Income**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Total Income | BRL | 1874 | -1342.43***<br>(342.14) | -668.77*<br>(342.09) | 8350.07 |
| Agricultural Income | BRL | 1874 | -99.74<br>(72.29) | 82.34<br>(67.07) | 1072.29 |
| *Share* | % | 1874 | -.13<br>(.95) | 1.33<br>(.93) | 15.81 |
| Wage Income | BRL | 1874 | -545.05***<br>(120.00) | -468.97***<br>(123.08) | 1080.54 |

| | | | | | |
|---|---|---|---|---|---|
| *Share* | % | 1874 | -4.74***<br>(1.07) | -4.71***<br>(1.11) | 11.38 |
| Enterprise Income | BRL | 1874 | -70.15*<br>(42.38) | -43.96<br>(43.38) | 316.44 |
| *Share* | % | 1874 | -.64<br>(.61) | -.60<br>(.66) | 4.66 |
| Transfer Income | BRL | 1874 | -627.49**<br>(306.77) | -238.18<br>(308.85) | 5880.79 |
| *Share* | % | 1874 | 5.50***<br>(1.3) | 3.97<br>(1.43) | 68.15 |
| Number Income Sources | | 1874 | -.11***<br>(.03) | -.06*<br>(.03) | 2.26 |
| Income Diversification Index | Margalef Berger Parker | 1874 | -.004<br>(.004) | -.0007<br>(.004) | .27 |

From these cross-sectional results however, it is not clear that control households were meaningfully better off. For example, it is possible that control households sold more crops and livestock by-products due to financial stress; and similarly, that off-farm work opportunities were pursued due to the recent drought.

Information on assets, is one other way to assess other domains of well-being. Using recall of assets at the baseline for control households, change in the asset index was also computed for housing, durable assets and overall assets. Results indicate that beneficiary households increased their housing assets by 10% compared to control households, and 2% overall.

**Table 19: Wealth and Assets**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Housing Assets | MCA | 1266 | .04***<br>(.01) | .02*<br>(.01) | .40 |
| *Change* | Delta | 1266 | -.01<br>(.01) | -.01<br>(.01) | -.24 |
| Durable Assets | PCA | 1266 | .01<br>(.01) | .01<br>(.01) | .46 |
| *Change* | Delta | 1266 | -.004<br>(.01) | -.008<br>(.01) | -.29 |
| Overall Assets | PCA | 1266 | .01**<br>(.007) | .006<br>(.008) | .53 |
| *Change* | Delta | 1266 | -.009<br>(.008) | -.01<br>(.008) | -.22 |

In addition, despite having less income overall, there is little evidence that beneficiary households consumed less or had limited capacity for resilience. According to both the Household Dietary Diversity Score, and an approximation of the FIES, there was no difference between beneficiary and control

households. Similarly, there was no statistical difference in the capacity of beneficiary households to recover from shocks, despite having lower levels of income diversification.

**Table 20: Food Security and Resilience**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Household Dietary Diversity Score | HDDS | 1874 | -.07<br>(.09) | .05<br>(.10) | 5.97 |
| FIES | Aggregate FIES | 1874 | .07<br>(.11) | .04<br>(.12) | 2.08 |
| Ability to Recover (ATR) All Shocks | ATR Index | 1818 | .09<br>(.06) | .02<br>(.06) | 3.70 |
| Ability to Recover Drought | ATR Index | 1787 | .08<br>(.06) | .03<br>(.07) | 3.74 |

On social considerations however, beneficiary households did experience gains in welfare compared to control households. Table 21 shows the results for group membership, which provides strong evidence that participation in GDV increased beneficiary participation in groups by 44% compared to the control group.

**Table 21: Group Participation**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Number of Groups HH Participates In | | 2017 | .11*** | .13*** | .25 |

Social welfare gains were also experienced by women, as demonstrated by higher values for the average empowerment index (pro-WEAI).

**Table 22: Women's Empowerment**

| Indicator | Treatment Average | Control Average |
|---|---|---|
| PROWEAI | .66 | .61 |

Differences in the specific domains of the pro-WEAI are presented in Table 23. In this table, significant differences in empowerment can be found in autonomy of income, self-efficacy, group membership, and particularly membership in influential groups.

**Table 23: Domains of Women's Empowerment**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Autonomy in Income | Binary | 1645 | .04*<br>(.03) | .05*<br>(.03) | .41 |
| Self-Efficacy | Binary | 1645 | .06**<br>(.02) | .08***<br>(.03) | .58 |
| Attitudes on Domestic Violence | Binary | 1645 | -.01*<br>(.006) | -.008<br>(.007) | .99 |
| Input in Productive Decisions | Binary | 1645 | .005<br>(.02) | .009<br>(.02) | .78 |
| Ownership of Land and Assets | Binary | 1645 | .008<br>(.01) | .002<br>(.02) | .92 |
| Access and Decisions on Credit | Binary | 1318 | -.04*<br>(.03) | -.005<br>(.03) | .26 |
| Control over Income Use | Binary | 1645 | .01<br>(.02) | .02<br>(.03) | .67 |
| Work Balance | Binary | 1645 | .02<br>(.02) | -.005<br>(.02) | .71 |
| Visiting Important Locations | Binary | 1645 | .02<br>(.03) | .05*<br>(.03) | .56 |
| Group Membership | Binary | 1645 | .08***<br>(.02) | .09***<br>(.02) | .26 |
| Membership in Influential Groups | Binary | 1645 | .06**<br>(.02) | .08***<br>(.02) | .22 |
| Respecting Among Household Members | Binary | 1645 | .02<br>(.02) | .02<br>(.03) | .47 |

The likelihood of youth migration was found to be 43% less among beneficiary households. The number of youth that migrate per household was also 40% less. In circumstances where a multi-episode shock has occurred, it would be expected that youth would be more likely to migrate in search of opportunities in urban sectors.

**Table 24: Youth Migration**

| Indicator | Unit | N | (1) IPWRA | (2) NN | Control Mean |
|---|---|---|---|---|---|
| Youth Migration | Binary | 1874 | -.03***<br>(.01) | -.02**<br>(.01) | .07 |
| Youth Migration Number | | 1874 | -.04**<br>(.02) | -.02<br>(.02) | .10 |

## 5.2 Heterogeneous Impacts

As a CDD project, not every community received the same interventions given the unique intervention plans determined by local development councils. Pooled results were presented in Section 5.1, following the assumption that each community is best able to determine their own needs, and that the major thrust of the project was to facilitate investment in order to meet those needs.

As can be seen in the breakdown of treatment heterogeneity described in Section 4, three primary development typologies stood out accounting for up to 87% of treated households in the sample. The fact that we are able to isolate these typologies, however, allows for some insight into practices that had greater impacts than others. Indeed, GDV was not a pure CDD program, as it did have certain parameters that were actively encouraged through Components 1 and 2. By examining differential impacts by intervention typology, we aim to understand where GDV was most effective and where emphasis should be placed in the future.

To disaggregate the results, the treatment group was parsed to include only the households that received that particular treatment typology. Results per treatment type are shown in Table 25 below, which presents a sub-set of the total findings from: the total treatment group *Pooled* together, the *Water Only* group of 33.4% that received primarily cisterns, the *Water + Home Garden (HG)* group of 30.11% that received both cistens and home gardens, and then the most intensely treated group, making up 23.43% of the total treated sample, that received *Water, Home Gardens, and Technical Assistance as well as Technical Inputs (TATI)*. A breakdown of descriptive for each group is presented in Table 25.

**Table 25: Baseline Characteristics by Intervention Type**

| Characteristics | Water Only | Water + HG | Water + HG + TATI |
|---|---|---|---|
| Household Head Sex | .73 | .78 | .81 |
| Household Head Age | 54.13 | 53.55 | 51.35 |
| Household Head School Level 2 | 0.13 | 0.16 | 0.20 |
| Household Head School Level 3 | 0.09 | 0.09 | 0.15 |
| Union / Partner | 0.75 | 0.80 | 0.85 |
| Household Size | 3.43 | 3.87 | 3.97 |
| Total Land | 10.05 | 9.94 | 10.60 |
| Baseline Electricity | 0.40 | 0.49 | 0.44 |
| Baseline Goat Quantity | 3.03 | 5.47 | 7.89 |
| Baseline Pig Quantity | 0.06 | 0.12 | 0.11 |
| Baseline Cattle Quantity | 0.80 | 0.97 | 0.94 |

| | | | |
|---|---|---|---|
| Baseline Drought Intesntity | 0.09 | 0.20 | 0.22 |
| Baseline Drought Events | 3.78 | 2.38 | 1.97 |
| Baseline Distance to Water Level 2 | 0.57 | 0.57 | 0.62 |
| Baseline Distance to Water Level 3 | 0.35 | 0.26 | 0.25 |
| Distance to School | 9.67 | 7.79 | 8.15 |

Based on these characteristics we can see that *TATI* households have higher levels of education, more likely to have a partner, more land, and more livestock. They have greater levels of accessibility to water, and are also less isolated, as seen by their distance to schools. Additionally, they were less likely to have been affected by a severe drought event compared to the *Water* only households. In sum, at the time the project started, these households were systematically better off.

Results indicate a degree of variation in outcomes indicating that there is a strong case to be made for providing a holistic development plan. It is apparent, for example, that recipients of *Water, Home Garden, and TATI*, were the most likely to increase the value of their total cultivation, diversify the number of crops, and increase their total income from agriculture. Furthermore, the instances where negative gaps existed between the beneficiaries and control group within the pooled sample, such as total income, wage income, number of income sources, and current value of livestock is either less pronounced or no longer a negative gap (as with livestock).

Of greatest relevance, is the difference between the *Pooled* group and the *Water, Home Garden, and TATI* group regarding the share of transfer income as part of their total income. This is particiularly important given that it suggest that these beneficiary households were able to be more resilient based on their own productive capacity and less reliant on external support.

**Table 26: Outcomes of Key Variables Disaggregated by Intervention Type**

| Indicator | Unit | Pooled | Water Only | Water + HG | Water + HG + TATI |
|---|---|---|---|---|---|
| Current Number Cistern | | .26*** (.03) | .29*** (.04) | .26*** (.04) | .34*** (.05) |
| Number of Crops | | .22** (.10) | -.26** (.11) | .54*** (.17) | .48*** (.18) |
| Total Cultivation Value | BRL | 264.47 (306.10) | -437.34** (168.71) | 257.88 (419.04) | 1493.54* (778.59) |
| Yield Staple | KG / HA | 212.49 (144.36) | 278.70 (194.47) | -25.77 (198.79) | 635.75** (257.11) |
| Yield Beans | KG / HA | 325.49** (150.59) | 562.06** (239.32) | 117.83 (205.88) | 568.72** (247.97) |
| Yield Maize | KG / HA | 45.96 (67.30) | 79.60 (96.24) | -38.37 (96.36) | 188.16* (105.23) |

| | | | | | |
|---|---|---|---|---|---|
| Livestock Value | TLU | .08<br>(.11) | -.04<br>(.13) | .15<br>(.16) | .23<br>(.21) |
| Sold Crops | Binary | -.09<br>(.03) | -.17***<br>(.04) | -.10**<br>(.04) | -.04<br>(.05) |
| *Value Sold* | BRL | 56.09<br>(166.26) | -92.72<br>(82.68) | 291.34<br>(447.45) | -73.66<br>(190.10) |
| Total Income | BRL | -<br>1342.43***<br>(342.14) | -<br>1524.83***<br>(440.10) | -1351.21***<br>(508.30) | -1257.36**<br>(9045.93) |
| Agriculture Income | BRL | -99.74<br>(72.29) | -163.66**<br>(70.19) | 60.23<br>(112.58) | -300.08*<br>(177.72) |
| *Share* | % | -.12<br>(.95) | -1.38<br>(1.10) | 1.76<br>(1.52) | -1.65<br>(1.98) |
| Wage Income | BRL | -545.05***<br>(120.00) | -560.11***<br>(129.81) | -675.62***<br>(163.68) | -583.53***<br>(206.73) |
| *Share* | % | -4.73***<br>(1.07) | -4.47***<br>(1.36) | -6.04***<br>(1.4) | -4.67***<br>(1.72) |
| Transfer Income | BRL | -627.49**<br>(306.77) | -708.04*<br>(407.72) | -626.78<br>(455.92) | -351.07<br>(490.18) |
| *Share* | % | 5.50***<br>(1.3) | 6.98***<br>(1.72) | 5.52***<br>(1.97) | 6.10***<br>(2.35) |
| Number Income Sources | | -.11***<br>(.03) | -.14***<br>(.04) | -.12**<br>(.05) | -.04<br>(.06) |
| Household Assets | MCA | .04***<br>(.01) | .04***<br>(.01) | .03**<br>(.02) | .003<br>(.006) |
| **Total Sample** | **N** | **1874** | **1288** | **1257** | **1180** |

When interpreting these results, a key question is to ask whether differences in intervention typology were indeed based on an objective assessment of needs, or if it represents some self-selection in the capacity of the community to self-diagnose their needs. In other words, should we assume that the *Water* group did not receive technical assistance because they were already self-sufficient in this regard? Or because they were uninterested in additional participation and did not optimize their participation in GDV?

Each community went through a rigorous process during Component 1 to organize themselves and identify development plans appropriate for their community. Out of the entire sample of 222 communities, there are only six communities where every single sampled household was *Water* only. These six are all very small communities where the number of people sampled in total made up less than 4% of the *Water* only group. This implies that alternative forms of assistance were available in other communities, and for some reason, specific households did not participate. If we can hypothesize that these households did not engage in agricultural training because they were more likely to participate in off-farm income, then it would be expected that there should be no differences in *Wage Income* between treatment and control. This is not the case, and in fact *TATI* households have even less difference.

The fact that 1.) the largest sub-group of the beneficiary sample is made up of households that did not participate in *TATI* – related activities and 2.) those that increased their participation in *TATI* exhibit

differences in baseline economic characteristics lends itself towards the interpretation that efforts to encourage community buy-in to participate in activities have substantial room for improvement.

## 5.3 Proof of Concept Impacts

As has been previously established, GDV was just one of a number of projects implemented in the State of Bahia with the intent to provide rural households with access to cisterns. As a reminder, at the time the project started, only 24% of beneficiary households, and 22% of control households had access to even one cistern. When the much smaller sized caixas da agua are considered, only 38% of beneficiaries, and 33% of control households had any form of water-harvesting infrastructure.

Since the time that GDV started, only 25% of households that did not have a cistern at baseline built their own without receiving assistance from either GDV or another philanthropic source. And still, about 10% of beneficiary households, and 30% of control households still do not have even one cistern. Given the availability of outcome data for these households in our dataset, we consider the impacts of GDV for beneficiaries who received a cistern from the project compared to control households that did not receive a cistern from an outside philanthropic source. It is not known why certain households did not receive assistance, whether this was because programs were not available in their area, or if they were unable to or uniterested in participating. While data are limited and the following analysis does not reflect a robust sampling strategy, we offer the following results as an informal 'proof of concept', had GDV been implemented in an environment where no other projects were taking place.

Results presented in Table 27 indicate that compared to households where no assistance for cistern construction was received, GDV households experienced a 280% increase in access to household cisterns, a 18% increase in the number of crops grown, and productivity increases of 90% (beans), and 53% (maize). However, despite these dramatic impacts, the total value of production was not statistically different.

These results convincingly convey that in the absence of external assistance that the contributions of GDV to meet basic needs and consequent impacts on productivity were substantial and significant.

**Table 27: Impacts Compared to Controls Without Cistern Aid**

| Indicator | Unit | Pooled | GDV Cistern | GDV Cistern Control Mean |
|---|---|---|---|---|
| Current Number Cistern | | .26*** (.03) | .84*** (.04) | .30 |
| Number of Crops | | .22** (.10) | .31** (.16) | 1.74 |
| Total Cultivation Value | BRL | 264.47 (306.10) | 622 (470.94) | 540.06 |
| Yield Staple | KG / HA | 212.49 (144.36) | 192.42 (205.75) | 597.90 |
| Yield Beans | KG / HA | 325.49** (150.59) | 529.17** (212.58) | 586.90 |
| Yield Maize | KG / HA | 45.96 (67.30) | 137.82* (81.90) | 260.77 |

| | | | | |
|---|---|---|---|---|
| Livestock Value | TLU | .08<br>(.11) | .14<br>(.22) | 2.38 |
| Sold Crops | Binary | -.09<br>(.03) | -.05<br>(.05) | .49 |
| *Value Sold* | BRL | 56.09<br>(166.26) | -759.76**<br>(.327.32) | 691.44 |
| Agriculture Income | BRL | -99.74<br>(72.29) | -228.99<br>(169.18) | 1070.12 |
| *Share* | % | -.12<br>(.95) | .90<br>(2.26) | 13.53 |
| Number Income Sources | | -.11***<br>(.03) | -.16***<br>(.06) | 2.28 |
| Household Assets | MCA | .04***<br>(.01) | .08***<br>(.01) | .37 |
| **Total Sample** | **N** | **1874** | **823** | |

## 5.4 Self-Reported Implementation & Impacts based on qualitative findings

To validate the findings of the quantitative analysis, this study also conducted a qualitative analysis comprised of FGDs and KIIs as described earlier. Additional qualitative data was collected as part of the household questionnaire. In the section below, we provide the findings from these two data sources regarding Participation, Representation, Implementation, and Perceived Impacts.

### *Participation*

Critical to the implementation of CDD is the assumption that households within communities meaningfully participate and that leaders are representative and communally minded. The logic of CDD is that by involving and empowering community members the development projects and investments are best suited to the needs and desires of the community. Moreover, the meaningful participation of project beneficiaries is expected to generate greater community buy-in thus increasing the project's sustainability over time.

To understand community buy-in and participation, we asked project beneficiaries in the household survey to detail the ways in which they participated in the project. According to responses, 68% attended meetings while approximately 10 to 11% were involved in intervention selection or beneficiary selection.

**Table 28: Household Particpation in GDV**

| Participation Mechanism | Percentage |
|---|---|
| Intervention Selection | 11% |
| Selected Beneficiaries | 10.5% |
| Implementation Leadership | 3.9% |
| Attended Meetings | 68% |

| | |
|---|---|
| Knowledge of Project Finances | 16.6% |

From Table 31, a few key points stand out. First, that ~90% of beneficiary households did not take part in intervention selection. Second, that over 30% did not attend any meetings. Third, that less than 17% of households have any knowledge of project finances. Given that participation is a critical component of the logic of CDD, low participation is a concern. However, it is built into project design that communities will identify leaders and that naturally participation will not be substantial for certain activities. To this end, the project also promoted leadership in its activities including leadership capacity building by young people. Nevertheless, the low participation in beneficiary and intervention selection is a concern.

Although low partication does not necessarily indicate that projects were not representative or well-suited to community interests, in fact the qualitiative survey reports satisfaction with project selection and leadership, if the main premise of CDD is that community members are actively involved in decision-making and implementation process, it is recommended that participation in these activities be increasingly promoted.

*Representation*

Juxtaposed against the previous findings, are those from the household survey and the qualitative data collection on themes surrounding representation. Indeed, using a 5 point Likert scale, respondents of the household survey largely indicated that GDV represented their interests and met their needs.

**Table 29: Household Perception of Representation and Needs Met**

| Representation | Percentage | Needs | Percentage |
|---|---|---|---|
| Very Well Represented | 23.7% | Needs Met & Have New Needs | 31% |
| Well Represented | 40.3% | Needs Met | 48.6% |
| Represented | 27% | Needs Somewhat Met | 10.9% |
| Not Very Represented | 7% | Needs Not Met | 7% |
| Not Included | 1.95% | Needs Not Met At All | 2.46% |

As part of the Focus Group Discussions and Key Informant Interviews, respondents emphatically praised the Rapid Participatory Diagnostic for its attention to detail in meeting with communities to document the history of their communities such as when it was founded and the hardships faced by the over time – especially by the oldest residents. After the formation of interest groups, investment plans were developed using interactive methods to encourage beneficiaries to consider their past, present, and

future needs. According to one FGD respondent, "*everybody was joking around, dreaming. Because each one was making his own drawing, one drew a tractor, a water tank, another drew a power line*".

Regarding leadership and beneficiary selection, the FGD and KIIs yielded responses of satisfaction. Leaders were selected through local elections and beneficiaries offered a positive assessment of their work. For beneficiary selection, respondents described a participatory process whereby need and technical considerations such as land size were the determining factors. Occasionally it was reported, there would be some instances of jealousy due to unequal distribution or opportunities to participate among the selected beneficiaries. Sentiments of disgruntlement however, were described as occasional in nature.

*Implementation*

The main impacts cited by FGD and KII respondents were technical knowledge, collective empowerment, and natural resource management. Examples of technical knowledge and natural resource management include livestock care – which promoted herd health and led to savings on veterinary fees, as well as stewardship over the environment and water savings. Access to water during drought periods is still an ongoing challenge, but respondents indicated that project participation encouraged coping strategies. Examples of community empowerment include cooperation in constructing community center structures or additional water harvesting infrastructure, and pursuing local rights through official recognition of communal grazing grounds (*Fundo de Pasto*) or quilombola communities.

Other forms of empowerment however were mixed. This is particularly true for the capacity of households to earn income from their efforts such as agricultural cultivation or the production of handicrafts. Communities continue to adopt a subsistence-surplus approach to agricultural commercialization, and market opportunities are largely relegated to local and regional fairs.

As a recommendation to future projects, respondents emphasized that they continue to struggle with middlemen when selling their production who capture a bulk of the profits. Additional concern regarding opportunities for value addition were related to capacity to use machinery. Trainings were reportedly provided to few beneficiaries per community, which did not result in effective dissemination of technical knowledge. Illiterate and elder beneficiaries additionally struggled to use modern inputs which limited capacity for utilization.

Participation in GDV has reportedly led to a greater number of women in leadership positions and increased respect for women as sources of influence and local authority. For Youth, some of those that engaged in GDV as YDAs used their experience to seek better work opportunities outside the community. Those who received certificates of participation, indicating acquisition of technical knowledge, claimed to have benefited as part of their search for employment. Though Youth personally benefitted and went on to effectively form new households elsewhere, the result is that the project did not provide for the generation of meaningful employment opportunities locally, and as such, human capital migrated elsewhere. While little information was provided about those that did not participate as YDAs, FGD and KII respondents indicated that non-participation was driven by the belief that GDV would not translate into financial return.

Access to water, one of the most critical outcomes of GDV, was both positive and yet too small to provide sufficient capacity to overcome extreme drought conditions.

Time management was additionally an issue. According to some technical consultants, the gap between the project's proposed start date and its actual start date, (i.e. between DRP and implementation) affected the motivation of communities and did not always allow for completion of all activities. Exit strategy was therefore also a stated concern, with respondents stating that a followup would have been beneficial to encourage continued use of technical methods.

### *Perceived Impacts*

As a validation check on the reported impacts of GDV from the qualitative portion of the data collection, respondents of the household questionnaire were asked to identify ways in which the project positively impacted them as shown in Table 30. For each type of impact, listed under *Potential Impact*, the *Percent* Table 30 indicates the proportion of households that indicated that they experienced this impact.

**Table 30: Household Perception of Impacts**

| Potential Impact | Percent | Potential Impact | Percent |
|---|---|---|---|
| Increased Income | 18.74% | Time-Use | 24.46% |
| Household Assets | 20% | Crop Choice | 4.57% |
| Livestock Assets | 6.23% | Market Engagement | .8% |
| Landsize | .46% | Engagement In Decision-Making | 1.49% |
| Housing | 7.77% | Community Cohesion | 1.02% |
| Dietary Diversity | 1.26% | Coordination With Public / Private Entities | .11% |
| Resilience To Shocks | .57% | School Services | .23% |
| Agricultural Production | 15.20% | Health Services | 1.14% |
| Input Adoption | 4% | Empowerment / Pride | 2.5% |
| Water Access/Consumption | 53.37% | Job Opportunities | 3.08% |
| Irrigation For Livestock | 12.58% | Motivation For Change/Improvement | 14.40% |

From the Table above, the greatest impacts were felt by households for Water Access/Consumption (53%), Time-Use (25%), Assets (20%), Increased Income (19%), and increased Agricultural Production (15%). Notably, the number of households who reported impacts related to community cohesion and empowerment, market engagement, and resilience to shocks, are minimal.

As a reminder, this exercise is a perception based check. It is reasonable that households may under-report experience of impact if they only consider their own current welfare outcomes or magnitude of change. Additionally, some of these impacts are indirect and may not be considered as directly attributable to GDV.

## 5.4 Results

When interpreting impact based on presumed economic trajectory since 2006, it is relevant to consider that the Government of Bahia and State of Bahia took multiple other steps, in addition to implementing GDV, to address the extreme development challenges faced by rural residents. Large-scale projects were implemented including the provision of electricity, rural roads, and household water-harvesting infrastructure. Overall, the region has experienced considerable investment and is in a state of general transformation. Simultaneously, since the project has ended, the region has also experienced a multi-year drought that was particularly extreme, on top of the generally dry conditions of the sertão and recent divestment in public programs in tandem with the economic crisis.

Table 31 presents the domains of impact and the overarching quantitative findings of the study. Impacts are denoted by either a (+) sign to indicate improved results or (-) to indicate diminished results compared to the control group. Symbols that are larger and in green indicate a consistently strong effect across indicator whereas symbols that are smaller indicate either no statistically significant effect or minimal economic effect.

**Table 31. Trends in Impact**

| Domain | Impact | Takeaways |
|---|---|---|
| Water | + | • GDV increased the number of cisterns that beneficiaries have access to – for many, this was their first cistern ever<br>• Access to irrigation for production remains extremely limited |
| Best Practices for Crops | n/a | • Use of inputs and promoted practices was generally extremely low across the sample |
| Agricultural Production | + | • GDV beneficiaries were much more productive in the cultivation of staples such as beans and maize<br>• GDV beneficiaries cultivated more crops |
| Livestock Production | n/a | • Despite the drought, on average livestock herd values did not decrease.<br>• There was not difference between beneficiary and control livestock TLUs. |

| | | |
|---|---|---|
| Agricultural Commercialization | – | • GDV beneficiaries were less likely to have sold any crops at all, but this did not affect income earned from crop sales<br>• GDV beneficiaries were much less likely to sell and earn money from livestock by-products |
| Income | — | • GDV beneficiaries earned less income overall than control households<br>• Major differences in income were driven by participation in off-farm work and other forms of diversification<br>• Transfer income such as cash transfers from Bolsa Familia made up for a substantial portion of income for both beneficiaries and control households |
| Assets | + | • GDV beneficiaries have higher quality housing<br>• GDV beneficiaries are slightly better off when considering current housing and durable assets together |
| Food Security and Resilience | n/a | • There is no difference in dietary diversity, or experience of food insecurity between beneficiary and control households<br>• There is no difference in resilience capacity and the ability to recover from shocks between beneficiary and control households |
| Gender and youth empowerment | + | • Female GDV beneficiaries are much more likely to experience empowerment through self-efficacy, autonomy in income, membership in community groups, and influential participation in community groups<br>• GDV beneficiary youth are less likely to permanently leave their communities |

Overall, this study provides evidence that GDV enabled enhanced access to water for human consumption (particularly for those who were in most desperate need), increased agricultural productivity, improved housing, and enhanced social empowerment – particularly for women. To this end, it appears that GDV met several of its key intermediate outcomes and impacts.

That said, evidence further indicates that far from increasing economc mobility, in fact, control households were more successful in generating income. Qualitative evidence and project documention

offers insight that lack of consolidation regarding training on value addition and market access, therefore undermining the capacity of the project to yield benefits in terms of strong rural enterprises. This is further underscored by perceptions of beneficiaries and consultants that the time it took to organize the social component of GDV, greatly detracted from training on commercial activities. Another factor described by project documents, is that access to value addition activities was ultimately limited to a small segment of the beneficiary population.

Regarding income, and the capacity to affect their economic mobility, while the results indicate that the control group earned more income, largely from off-farm work, we are constrained from drawing further conclusions on welfare under non-drought circumstances.

Under Scenario 1, it is possible that control households appear to earn more money due to stress-induced diversification and possible migration (with the implication that beneficiaries are better situated to sustain themselves during shocks). Under this premise, beneficiaries may rely on consuming their livestock and devoting their crop production towards home consumption. With such assumptions, the implication is that beneficiary households were more capacitated to thrive in the rural environment.

Under Scenario 2 however, it is also possible that GDV beneficiaries were not capacitated or empowered to take advantage of opportunities in a transforming rural sector. In this scenario, beneficiaries are over-relying on agriculture in a space where climate change is impacting production potential and the lack of training on commercialization diminishes the potential of production. The takeaway would be that the project shepherded beneficiaries into a stagnant sector without properly equipping them to reap enhanced benefits.

There is a middle ground however which posits that the project did indeed improve the capacity of beneficiaries to sustain themselves through enhanced productivity and access to water but did not offer transformative benefits for the formation of rural businesses.[17] The lack of truly transformative impact is bolstered by the fact that many of the larger benefits were experienced by households who engaged in all activities offered by the project and were already better off. In comparison to beneficiaries, control households potentially sought non-agricultural jobs given the lack of capacity to be sufficiently productive in a drought-struck environment.

The question ultimately for "who is better off?", depends on several factors. The first is to learn more about the juxtaposition between rural transformation and increased climate variability, which could encourage a greater shift to off-farm work and diminish the ultimate potential of enhanced agricultural potential. Another question is whether engaging in off-farm work requires commuting, temporary, or permanent migration. To what extent working outside of the community either temporarily or permanently impacts a household is a matter of unobserved personal preferences.

If an overarching objective is to strengthen rural communities, as it is with GDV, then we should assume a developmental preference for providing access to the necessary economic opportunities within communities, including off-farm opportunities, when drought conditions make agricultural production less viable. These concerns however reflect evolving needs and expectations given the changing ecological and economic environment.

[17] In essence, increased productive capacity did not traslate into a sustainable impact particularly thorugh the income channel..

# Conclusion

Gente de Valor (2007 – 2013) was a community driven development project implemented in the northeastern state of Bahia (Brazil) that ambitiously aimed to satisfy basic needs for water and enhanced agricultural productivity, while simultaneously transforming the income-generating capacity of residents in a rural space known for being isolated, underserved, and with poor economic potential. As part of its other objective, GDV incorporated beneficiaries as primary stakeholders in development plans, through a CDD process that served as a major primary component of the project. In addition to the existing complexity of the above, GDV was implemented in a vast project area known for its historical experience of devastating drought.

This ex-post impact assessment made use of econometric methods to assess the impact of GDV on indicators spanning agricultural production, to income, asset accumulation, and empowerment. The purpose of this study was to assess whether participants benefited from the project, through the comparison with excluded communities, and determine if participants were better off after the program. By evaluating GDV six years after the project ended, this study aims to capture sustainable impacts as well as assess the relative resilience of beneficiaries following the recent drought.

The results of this study indicate that Gente de Valor had a positive impact on access to water, increased agricultural productivity and crop diversification. In this way, the project led to greater capacity to meet the household's water needs for household consumption produce more with less land, produce staples for household consumption, and improve dietary diversity. With these three factors alone, beneficiaries were more equipped than the control group to be self-sufficient under rural and isolated conditions. In addition to basic needs of food and water, the project also improved social empowerment for women.

Understanding the impacts of the project on income, however, is complicated by the fact that non-participants were much more likely to derive their income from off-farm work compared to agricultural production. Findings suggest that beneficiaries earned less income, but without a more detailed household livelihood analysis it is difficult to know if they were more resilient due to their ability to rely on home cultivation, or if that cultivation was even sufficient. Through questions asked under the framework of the Food Insecurity Experience Scale, it is not apparent that the beneficiaries suffered any greater hardship in terms of food security compared to the control group. Indeed, experience of food insecurity was minimal for both groups.

The literature on CDD projects is mixed, given the different interpretations of expected benefits. This study finds that in support of proponents who contend that the main benefit is the efficient provision of infrastructure, that beneficiaries were more likely to have access to at least one water storage device, and that GDV was particularly impactful in addressing the needs of those that had never had a cistern. For those who anticipate that CDD would promote social benefits, this study also found that women in particular benefited, and now experience greater level of empowerment and participation in their communities, particularly in the collective agency sphere.

That said, there does appear to be some evidence suggesting that the implementation of CDD approaches could be revisited. When the impacts of treatment were disaggregated by intensity, it was found, as expected, that those who participated in other agricultural activities such as *TATI*, e.g. beyond the provision of a cistern, benefitted more, and relevantly, did experience significant gains in total cultivation value. It is noteworthy that the descriptive statistics on who participated in each treatment group (Water Only, Water and Home Garden, Water, Home Garden, and Technical Assistance) indicate that those who received technical assistance were economically better off at baseline on all characteristics. Statistically, those who received technical assistance were significantly more likely to have higher levels of education.

This study is unable to provide evidence on whether beneficiary driven interventions are more or less appropriate than externally driven interventions, however in the absence of efforts related to strengheting agricultural commercialization activities and providing an exit strategy for technical assistance, it is difficult to conclude that beneficiaries were truly relevant stakeholders in the implementation process.

What this study can assess is that within communities, intensity of participation was not distributed in an inclusive manner as evidenced by differences in those who only received a cistern compared to those who also undertook technical training and received inputs. This could be perceived as a weakness in implementation given that GDV's theory of change does not purport that access to social capacitation and the provision of a cistern are sufficient for transformative impact. It is therefore strongly recommended that future projects actively engage in targeting beyond the subterritory level to encourage participation by the most vulnerable members of communities.

It is further recommended that the options for intervention type seriously consider including training on off-farm work opportunities that are relevant to the rural context. In the event of increasing climate variability, future project design should consider the possibility that focusing on agriculturally oriented interventions may not be sufficient to significantly reduce rural poverty or reduce reliance on government support programs. Building on the experience of Gente de Valor, it is further recommended that future projects more directly identify the pathways between productive capacity and income generation, such that projecc design is founded in clear understanding of how interventions to increase productivity capacity translate into impacts on income.

With these suggestions in place, this assessment acknowledges even in the absence of income impacts that a substantial needs gap was filled by GDV in providing access to water. That impacts of social empowerment were also experienced demonstrates that critical achievements were made towards improving social capital for Bahia's sertanejos.

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