Artículos

Public Policies and Sustainability in Traditional Rural Communities*

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Abstract:

The main goal of this study is to evaluate the effectiveness, in terms of improvements in social and economic conditions, of a technical assistance and rural reach-out action carried out among a group of families from the Barra Nova Settlement, located in the city of Sidrolândia-MS, between 2013 and 2015. To do so, questionnaires were used, provided by the Instituto Nacional de Colonização e Reforma of the two periods, and a socio-demographic characterization of the families was carried out. Social and economic indicators were also calculated (Socioeconomic Index for Rural Settlements – ISAR), assessing the values before and after the rural reach-out actions, to identify the real impacts on the social and economic conditions of the families. Regarding the classification of the ISAR, it was noted that it remained as regular after the actions were carried out, although it has shown a significant improvement in its value (0.42 to 0.57). The results showed a high percentage of young people in the settlement and that women account for almost half of the properties with a single owner. Improvements were also observed in the quantity of productive assets and constructions, types of housing, generation of income, among others. In addition, there were improvements in food security, satisfaction with housing, fixation in rural areas, income diversification, and access to credit, among others. Likewise, we highlight that attention must be paid to some deficiencies such as the farmers' low level of education, little participation in associations, poor conditions of access roads to the properties, and commercialization strategies for products produced by the families.

Keywords: family farming, rural reach-out, socioeconomic indicators.

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Políticas públicas y sostenibilidad en las comunidades rurales tradicionales

Resumen:

El principal objetivos de este estudio es evaluar la eficacia, en términos de mejoras en las condiciones sociales y económicas, de una acción de asistencia técnica y extensión rural realizada entre un grupo de familias del Asentamiento Barra Nova, localizado en la ciudad de Sidrolândia-Mato Grosso del Sur, entre 2013 y 2015. Para ello, se utilizaron cuestionarios proporcionados por el Instituto Nacional de Colonização e Reforma de los dos períodos y se realizó una caracterización sociodemográfica de las familias. También se calcularon indicadores sociales y económicos (Índice Socioeconómico de Asentamientos Rurales - ISAR), evaluando los valores antes y después de las acciones de extensión rural, para identificar los impactos reales en las condiciones sociales y económicas de las familias. En cuanto a la clasificación del ISAR, se observó que se mantuvo regular después de la realización de las acciones, aunque ha mostrado una mejora significativa en su valor (0,42 a 0,57). Los resultados mostraron un alto porcentaje de jóvenes en el asentamiento y que las mujeres representan casi la mitad de las viviendas con un único propietario. También se observaron mejoras en la cantidad de activos productivos y construcciones, tipos de vivienda, generación de ingresos, entre otros. Además, hubo mejoras en la seguridad alimentaria, la satisfacción con la vivienda, la fijación en el área rural, la diversificación de ingresos y el acceso al crédito, entre otros. Asimismo, destacamos que se debe prestar atención a algunas deficiencias como el bajo nivel de educación de los agricultores, la poca participación en asociaciones, las malas condiciones de las vías de acceso a las propiedades y las estrategias de comercialización de los productos producidos por las familias.

Palabras clave: agricultura familiar, extensión rural, indicadores socioeconómicos.

Introduction

According to the 2017 Agricultural Census, Brazil has 5,073,324 rural properties, covering 351,289,816 hectares, employing about 15,105,125 people. It should be noted that family farming is present in approximately 77% of rural properties and 23% of the total area of these properties still has 67% of the number of employed people (IBGE, 2020) The value of family farming production in 2017 was R$ 107,000,000,000 (one hundred and seven billion reais), equivalent to 23% of all Brazilian agricultural production. Family farming in Brazil is the world's eighth-largest food producer. With annual sales of US $ 55,200,000,000, if the country had only family production, it would still be among the world's ten largest food producers. It produces 70% of national beans, 34% of rice, 87% of cassava, 46% of corn, 38% of coffee, and 28% of wheat, and is responsible for 60% of milk production, 59% of the pig breeding, 50% of poultry and 30% of cattle.

In the state of Mato Grosso do Sul [MS], there are about 71,164 properties, in an area of 30,549,179 hectares, with 254,971 people in rural areas. Family farming represents 61% of the number of rural properties in the state, about 4% of the total area of rural properties, and 40% of employed people in rural areas (IBGE, 2019). There are 206 rural settlements in Mato Grosso do Sul, covering 28,345 settled families, in an area corresponding to approximately 694,418 hectares (Incra, 2022). The municipality of Sidrolândia, the central area under analysis, has 23 settlements, with 4002 settled families. Barra Nova Settlement, the focus of this study, was created on December 27, 2005, and has 265 settled families (Incra, 2017).

Smallholder farmers face many challenges to agricultural development, as the frequent political marginalization of this group (Vorley et al., 2012); problems related to inadequate land management practices; limited access to credit, information, and inputs; and high marketing and infrastructure costs (Aliber & Hall, 2012). Additionally,

the distance between technical support teams and small farmers is an issue in potential when communication and assistance are required, as the first group is usually located in urban areas, while the second one is in rural areas. This makes it difficult to connect the demand for resources, information, training, and technology with the supply of these factors (Abebaw & Haile, 2013).

Due to the local demands perceived by the Regional Superintendency of the National Institute of Colonization and Agrarian Reform – Incra, a program for the provision of Technical Assistance – ATER service was carried out in Barra Nova Settlement, developed between 2013 and 2015, in order to help to overcome the main difficulties of the settled. Training courses were offered, meetings and workshops were promoted, demonstrative units were implemented for the practical application of innovative technologies and management, courses were given on health, environment, production and commercialization, rural administration, among other rural reach-out actions (Incra, 2014).

Rural reach-out services are determining factors for the development of rural communities (Davis et al., 2012; Hamilton & Hudson, 2017). Among these services, ATER actions promote the transfer of new technologies, develop new research, and transfer technical knowledge to the rural population. As they are public policies, they depend on mechanisms set by the government and can be executed by both public and private organizations (Peixoto, 2008).

These reach-out services also contribute to the decision on the technologies that will be used and the diversification of productive activities, based on the provision of information and training necessary to increase the productivity and income of farmers (Wossen et al., 2013). In this sense, the availability of such technical support is vital for the success of rural enterprises (Davis & Terblanché, 2016).

In the current scientific literature, there are studies such as that of Yitayew et al., (2021) who, after identifying possibilities for increased productivity and yields through technological increments, examined whether enhanced reach-out services would cause farmers to try a new wheat variety on their farms after trials and field days. The authors assessed studies that find a way to improve reach-out systems to increase the adoption of new technologies as essential.

Other studies have evaluated the impact of reach-out programs for sustainable cocoa production (Attipoe et al., 2021), for the technical efficiency of rice farmers (Biswas et al., 2021), for the net income of smallholder farmers (Anang et al., 2020). Also, there are studies that evaluated the effectiveness of technician staff communication with farmers (Moyo & Salawu, 2018) and women's access to agricultural extension services (Alvi et al., 2021). Therefore, these studies contribute to identify deficiencies in policy implementation and aspects to be improved.

According to Bellen (2004), regardless of the intervention carried out by the State, its results must be evaluated through specific mechanisms. Among them, the indicators stand out, which can be used to interpret the degree of success or failure of an action and help in the design of intervention strategies in the face of the effects that have occurred. For Tavares et al. (2019), when used in the assessment of sustainability in rural settlements, the indicators identify, characterize, and provide a diagnosis of the reality of the settled population. Furthermore, due to their large dimensions, they are strong allies for decision-making in planning and implementing public policies aimed at land use and the quality of human life.

In the meantime, the objective was to measure, based on social and economic indicators, the effectiveness of rural reach-out actions developed in the Barra Nova Settlement.

This work is structured in five sections, including this brief introduction. In the next section, the bibliographic review is presented; then, we describe the methodology followed in the research and the method of analysis. Subsequently, the results and the discussion are presented, with emphasis on the measured indicators. Finally, the final considerations and references that support the research are highlighted.

Evaluating rural reach-out programmes and sustainability indicators

In Brazil, rural extension activities began in the late 1940s, with the creation of the Associação de Crédito e Assistência Técnica Rural de Minas Gerais. These reach-out activities were perceived as important intervention projects and were always driven by the idea that the increment of modern production techniques would lead to improvements in the living conditions of the people assisted by the actions (Castro & Pereira, 2017).

According to Knook et al., (2018), most of the literature evaluating Participatory reach-out Programs [PEPs] have used quantitative methods with economic performance indicators. Among the applied quantitative methods, the experimental research design makes an impact evaluation that can be estimated through the difference between the randomly allocated treatment and control groups to avoid selection bias. Another method that is commonly used and allows for sample selection bias is difference-in-difference [DiD]. This method compares the changes between the treatment and control groups at two points in time –before and after–. In addition, there were studies that also used methods that allow for sample selection bias such as Propensity Score Matching [PSM], Heckman correction, and Endogenous Switching Model [ESM].

In this sense, one of the challenges encountered in the implementation of public policies is the evaluation of their effectiveness. In this process, indicators become important for the evaluation of these actions and for the rural development as a whole.

Sustainability indicators are indispensable instruments to plan actions and support the monitoring and evaluation of changes in a given population after applying a program or action. They attribute superior value in an analysis when used together than individually, being a valuable means for understanding, measuring, and achieving development (Ibge, 2015).

When setting it out, a number of consecutive steps must be built, according to Feil and Schreiber (2017). This starts with the definition of the objective and the system to be analyzed, followed by selecting the main indicators, reflecting on the results, integrating information, and ending with the generation and result of the indicator.

Among the objectives proposed by the indicators, the main one is to assist decision-makers in assessing their performance against the objectives set, thus providing the basis for planning future actions. They are also considered essential means that link past and present activities with future goals, providing essential information for these actors (Bellen, 2004).

For Hirakuri *et al.* (2014), the use of indicators can subsidize the direction of public policies, research, technology transfers, and technical assistance, in order to eliminate possible barriers to sustainability. To fulfill their objectives, they must be grouped in such a way that they reach the environmental, economic, and social spheres.

In the meantime, some studies are presented below, focusing on the analysis of indicators. In order to assess the sustainability of the Chico Mendes III settlement, in the state of Pernambuco, Gamarra-Rojas et al. (2019), through the construction of productivity, stability, and self-management indicators, and using the arithmetic mean of the values found, they formulated the settlement's sustainability index. Its results pointed out average sustainability in this population, influenced mainly by the low productivity index, thus realizing the need for investment in disseminating knowledge, production practices, and partnerships with governmental institutions.

In order to identify possible obstacles to rural development, Leite Junior *et al.* (2013), considering the values found in indexes related to social, economic, and environmental spheres, measured, and using the arithmetic mean, the sustainability indicator of three settlements in the state of Goiás. The results pointed out the main obstacles:

the low level of education and the precarious infrastructure, which disfavors the commercialization of the products. As an alternative, they suggested the elaboration of technical assistance and rural reach-out programs.

Stoffel and Colognese (2015), used social and economic indicators to assess the sustainability of family farming in a specific region in the state of Paraná. In the economic dimension, the best indexes dealt with structural autonomy and investment capacity in the property, while the worst ones were the diversification of production and commercialization. In the social aspect, access to leisure and housing conditions stand out as strong points, while access to health and services were identified as unfavorable. In this sense, it was concluded that measurement models based on indicators are important tools to support public policies and achieve sustainability in the countryside.

Camargo (2017), analyzed the contribution of Agroforestry Systems – SAFs to family farming in the state of MS, in the environmental, social, and economic spheres. Its results pointed out a high potential for raising the socioeconomic and environmental sustainability of farmers through the management and conduct of this system while also alerting to the need for the effective presence of public policies of support to promote rural producers' development.

Oliveira *et al.* (2017), used socioeconomic, social capital, and environmental indexes to determine the Eldorado II settlement's sustainability indicator in Mato Grosso do Sul. Its results pointed out average sustainability for the settlement, this being alert information to the government, that needs to invest in the settlement. Other authors' recommendations related to the need to encourage cooperative work and agreements with public entities to conduct technical assistance actions.

Souza *et al.* (2017) analyzed the sustainability of the Lagoa Grande settlement in MS, using the arithmetic mean of the socioeconomic, social capital, and environmental indexes. The authors identified a low level of sustainability and suggested guidelines to the public authorities regarding investments in improving infrastructure and socializing the settled population.

Aiming to measure the social and economic changes of the population of the Lagoa Azul settlement, in the state of MS Moreno (2018), used a model based on socioeconomic indicators and analyzed the families who were benefited and not benefited by the National Program for the Strengthening of Family Farming [PRONAF]. As a result, the author pointed out that this program did not generate significant impacts for the beneficiary families and, therefore, considered the need to increase government support through public policies and technical assistance for these producers.

In order to analyze the level of sustainability of the Expedito Ribeiro settlement, in the state of Pará, Tavares *et al.* (2019) measured the global sustainability index, defined by the average between the indexes of the environmental, social, institutional, and economic spheres. The results demonstrated acceptable sustainability. As for recommendations, the authors emphasized the need for specialized technical assistance to help the population improve their production to expand diversification and increase income opportunities for residents.

Methodology

The study was developed based on data from the Barra Nova Settlement, located in the municipality of Sidrolândia, in the state of Mato Grosso do Sul. With an estimated population of 56,081 people and GDP *per capita* equal to R$ 28,426.58 in 2018, the municipality has 23 settlements, totaling 4,002 settled families (Ibge, 2018; Incra, 2017).

The first settlement in this municipality was created on October 20, 1989, and was called Capão Bonito. From that date, until 1999, three more settlements were built. Between 2000 and 2015, another nineteen new settlements

were created. In 2005, seven settlements were created, including Barra Nova, whose project was made by Incra, created through Decree No. 41, on December 27 of the same year (Incra, 2017).

When projected, the objective was to settle 320 families, but the capacity was reduced to 269. Currently, 263 families are established in this rural settlement, which has a Legal Reserve Area corresponding to 764 ha, a Permanent Preservation Area of 80 ha, and a Permanent Preservation Area (floodplain) of 141 ha (Incra, 2017). With a total area of 3,940,000ha, the Barra Nova settlement is located at geographic coordinates of latitude 20°55'55" South, longitude 54°57'39" West, and altitude of 484 meters.

Data source, Research type, and Analysis method

The study refers to quantitative research using primary data, provided by Incra, obtained from questionnaires applied to the families of the Barra Nova Settlement between 2013 and 2015. This survey was carried out to answer a Public Call made by Incra, entitled: Incra/SR (16), no. 01/2013, which aimed to execute an ATER program to support the small producer in planning and implementing local development projects.

Several courses were held related to production and commercialization, health, environment, cooperativism, associativism, and rural administration, among others. After the Public Call, the winning company applied questionnaires to the settled families. In 2013, when starting the reach-out actions, in 2014, and 2015 after the activities ended. In 2013, 196 questionnaires were applied; in 2014, 185, and in 2015 a total of 178 questionnaires were applied.

For the construction of the method of analysis of social and economic indicators, models presented in the literature were used as the basis, highlighting those proposed by Silva (2007), who formulated the Agricultural Environmental Sustainability Index (ISA); the model used for the Evaluation of Agroforestry Systems (INSSAFs), developed by Camargo (2017); and the model used to assess Rural Settlement Sustainability Indexes [INSARs], designed by Moreno (2018). Based on these models, adaptations were made, and an evaluation model was built to support the research proposal, entitled as the Socioeconomic Indicator for Rural Settlements [ISAR].

After adapting the models proposed by the literature, thirteen aspects of sustainability were defined, divided into social and economic dimensions:

- Social dimension: a) services provided in the settlement; b) associativism; c) food security; d) level of education; e) housing conditions; f) fixation in rural areas.

- Economic dimension: a) financial productivity of the land; b) total income of the land; c) diversification of income sources; d) equipment and constructions; e) autonomy of agricultural activity; f) commercialization of production; g) access to credit.

It should be noted that the parameters were classified according to the models proposed in the literature and are shown in Table 1. Subsequently, thirteen indicators were defined, consisting of six related to the social dimension and seven related to the economic dimension. For this purpose, additional literature searches were carried out to verify the use of such indicators in other studies. For each determined social and economic indicator, parameters were defined so that their values could be found. Among the studies, are: Leite Junior et al. (2013), Tavares et al. (2019), Silva et al. (2016), Gamarra-Rojas et al. (2019), Silva & Vieira (2016), and Camargo (2017).

TABLE 1.
Indicators and parameters used to build the indexes

Social indicators	Parameters
Satisfaction with the services provided by Incra	Percentage values (%) of families satisfied with the services provided by Incra in the settlement.
Association Presence	Percentage (%) of farmers who affirmed the existence of an association in the settlement.
Food Security	Food purchased for consumption by the families (Food produced entirely in the lot = 3; Most of the food produced in the lot = 2; Small part of the food produced in the lot = 1; Food totally purchased outside the lot = 0).
	Number of species/food consumed by the family from the lot (Above 10 species = 4; Between 7 and 10 species = 3; Between 3 and 6 species = 2; Below 3 species = 1; no species = 0).
Farmers' education	Farmers' level of education (Technical course or higher education = 6; Technical course or incomplete higher education = 5; Complete high school = 4; Incomplete high school = 3; Complete elementary education = 2; Incomplete elementary education = 1; illiterate = 0).
Satisfaction with housing	Percentage (%) of families satisfied with their homes.
Fixation in rural areas	Percentage (%) of families working with activities developed in the lot.
Economic indicators	**Parameters**
Financial productivity of the land	Determined by the quotient of agricultural income to the total area of the property (R$/ha). (Scales of values> = 0 to 100 = 0; > 100 to 200 = 1; > 200 to 300 = 2; > 300 to 400 = 3; > 400 to 500 = 4; > 500 = 5).
Total monthly income of the property	Identification of the total monthly income of the property (R$). (<= 1 sm = 0; > 1 sm to 2 sm = 1; > 2 sm to 3 sm = 2; > 3 sm to 4 sm = 3; > 4 sm = 4).
Income diversification	Verification of the amount of households' income. (One source of income = 0; More than one source of income = 1).
Equipment and Constructions	Quantity of equipment (in absolute number).
	Quantity of constructions (in absolute number).
Autonomy of the properties' productive activity	Determined by the quotient of agricultural income to total property income. (>50% = 2; =50% = 1; <50% = 0).
Forms of production commercialization	Identification of the different forms of commercialization (Direct selling + others = 4; Industry + others = 3; Direct selling + industry = 2; Direct selling + industry + intermediary agent= 1; Intermediary agent+ other = 0).
Access to credit provided by PRONAF	Percentage of producers that used the financing provided by PRONAF.

Source: Authors' elaboration based on the models proposed in the literature

Determination of sustainability indexes

For the calculation of sustainability indicators, the model proposed by Silva (2007), was used as the basis, in which the indicators selected for the calculation of sustainability assessment by social and economic dimensions are normalized and converted into indexes, using the metric presented in Table 2. Considering the variation of the values between 0 (zero) and 1 (one), the values closer to 1 (one) indicate more sustainability, and those closer to 0 (zero) indicate less sustainability.

TABLE 2.

Calculation for determining sustainability indexes

Index	Components
$Index = \dfrac{Vo - Pv}{Mv - Pv}$	Vo = observed value for the indicator Pv = worst value Mv = best value

Source: Silva (2007, p. 125)

After determining the values of the indexes, they were categorized into levels of sustainability, by adapting the model proposed by the United Nations Development Program (UNDP/UN, 1998) and used by Silva (2007), who called it a sustainability indication thermometer (Figure 1).

FIGURE 1.

Sustainability indication thermometer

Source: Adapted from Silva (2007)

Figure 1 shows the model of the sustainability indication thermometer, used to classify the level of sustainability of the analyzed indicators. The indexes were classified into levels of sustainability, ranging from 0 to 1, divided into: critical (0 to 0.19); poor (0.20 to 0.39); regular (0.40 to 0.59); good (0.60 to 0.79) and excellent (0.80 to 1).

Socioeconomic Indicator for Rural Settlements – ISAR

Starting from the individual values of the thirteen indicators previously determined, weights were defined for the calculation of the indexes of the social and economic dimensions, using a weighted average for this purpose. Such weights aimed to provide quantitative values, the degree of influence on the final index, and the index of more influence on the final value received more weight as compared to the others. To determine weight values consistent with reality, specialists working in the rural reach-out area were consulted, following the Delphi method, and using the answers of those available to complete the questionnaires.

The Delphi method is configured as a technique used to achieve consensus on a given subject through the analysis of a group of specialists working in the area. To this end, rounds of questionnaires are carried out between the researcher and experts, who anonymously evaluate, ponder, and send opinions and criticisms about the subject under discussion. Several authors used this method in the elaboration of sustainability indicators. Among them, stands out the work developed by Silva (2007), in the construction of an environmental and agricultural sustainability index.

After determining the indexes of the social and economic dimensions, they were categorized according to the degree of sustainability, and the last step in the construction of ISAR was carried out. That is, arithmetic mean

was used between the values of the indexes of both dimensions, and in this way, the value of the settlement's ISAR was determined, as will be shown in the research results.

Results and discussion

The analysis will continue to highlight the Social and Economic Dimension indicators and the Sustainability Index in areas of Rural Settlements - ISAR. Also, this index's results will be compared considering the period before and after the implementation of the rural reach-out actions.

Social Dimension Index [IDS] of the Barra Nova Settlement

For the Social Dimension analysis, six indicators were used, as described in the previous section. Regarding the results obtained, there were several changes in their values between 2013 and 2015, both individually, among the six indexes analyzed, and in the IDS's final value, which is composed of the indexes' weighted average. As for the IDS, its value in 2013 was 0,51, changing to 0,60 in 2015, classifying it according to the sustainability thermometer, as regular in 2013, and good in 2015, thus confirming that, in general, the social conditions of the families improved after the reach-out actions.

Table 3 shows the values of the ISAR social dimension indexes. According to the sustainability thermometer, the values of the weights assigned to each index and their classifications are also shown.

TABLE 3.
Social Dimension Index (SDI) of the Barra Nova Settlement, in Mato Grosso do Sul, from 2013 to 2015

Indicator	Assigned weight*	2013		2015	
		Result	Classification	Result	Classification
Satisfaction with the services provided by Incra	7	0,46	Regular	0,49	Regular
Association presence	7	0,67	Good	0,47	Regular
Food Security	9	0,37	Poor	0,54	Regular
Farmers' education	5	0,24	Poor	0,27	Poor
Satisfaction with housing	7	0,66	Good	0,88	Excellent
Fixation in the rural area	8	0,60	Good	0,84	Excellent
IDS		0,51	Regular	0,60	Good

Source: own source based on the research results
* *Weight assigned following the Delphi Method.*

The IDS was classified as good in 2015, and its value improved slightly as compared to the previous period. When analyzing the results of the indicators, it appears that the indexes vary between 2013 and 2015. All six indexes studied had their values changed. However, two of them remained in the same classification concerning sustainability, one worsened, but three improved. That is why, as a whole, the Barra Nova Settlement Social Dimension Index improved over the period analyzed. It serves as a positive indicator of the reach-out action performed.

As for the indicators that continued with the same classification, in 2013 and 2015, there are those related to the satisfaction of the services provided by Incra and the education of farmers. As for the first, it was found that its value went from 0.46 to 0.49, remaining as Regular between the periods, demonstrating that the perception of the settled people about the services performed by Incra, such as the construction of houses, application of credit, attendance of employees, presence in the settlement and resolution of demands and problems has not changed so much after the reach-out actions.

Regarding the education level of farmers, the result was classified as poor in both periods of analysis. Also, its value was the lowest among all indicators of the social dimension. This fact deserves special attention because, according to Camargo (2017), the low level of education can negatively affect the financial management of the properties, hinder the commercialization of products and increase the difficulties in the development of productive activities.

Leite Junior et al. (2013), found similar results in a settlement in Goiás, when the authors detected a low level of education among the families, noting functional illiteracy. At this point, the authors stated that agrarian reform goes far beyond establishing a settlement and the level of education is an essential factor for the territorial development of these places.

Thus, it appears that the low education level of the farmers is common among them in several rural settlements, and the situation lacks State intervention. The need to create education policies aimed at the countryside is emphasized so that such indicators are improved and, consequently, improvements in rural development are possible.

As for the index that worsened, there is a topic related to the association's presence in the settlement in the period under analysis. It was classified as Good in 2013, but in 2015 it was considered Regular. As noted, the percentage of respondents who stated the existence of an association in the settlement in 2015 was lower than in 2013, which decreased the value of the index (Table 3). Therefore, it is noted that there is no unanimity in the answer, and thus, it is considered that there must be an association, but few producers feel aggregated or represented by it.

Sangalli et al. (2015), in a study in the Lagoa Grande settlement in MS, found several factors that can limit the development of a settlement. Among them, there was a lack of associativism activity with the producers, as this can be understood as a 'link' between settled people and public institutions for the emergence of partnerships, dissemination of information, in addition to projects and programs of income generation.

As for the indexes that improved, there are those related to food security, satisfaction with housing, and fixation in the countryside. The first classification went from Poor to Regular between the periods analyzed, with a significant improvement in value, going from 0.37 to 0.54 (Table 3). Therefore, it appears that the amount of food consumed by families, which were produced in the lots, increased between 2013 and 2015. That is, families started to produce more food for their consumption. This fact reflects the increase in the production diversification of the lots and the increase in the cultivation of crops such as vegetables and orchards.

This result demonstrates that the settlement fulfills one of its crucial roles, improving the nutritional aspects of families and favoring the community's food safety (Schneider, 2016).

Regarding satisfaction with housing, as can be seen in Table 3, its rating went from Good to Excellent between 2013 and 2015, going from 0.66 to 0.88, which is the highest value index of the social dimension in 2015, noting that families are satisfied with their homes. This fact is due to the increase in the houses' average size and the improvement in the type of constructions, combined with the increase in the number of brick masonry houses, which reflected in the satisfaction of the settled families and, consequently, in the improvement of the indicator.

As for the index related to fixation in the rural area, its classification also went from Good (0.60) to Excellent (0.84), showing that after the reach-out actions, families started to occupy themselves more with work activities in the settlement and diversified their production and income, among other changes, which reflected in the improvement of this index. This result favors the continuity of activities and the fixation of farmers' children,

who, when viewing the possibility of income and improving the quality of life, in addition to incentive programs, can see a future in the settlement itself.

Thus, it appears that the most prominent indexes for improvement in the social dimension were those related to satisfaction with housing and the fixation of people in the countryside, which were classified as excellent in 2015. Only one of the six indicators worsened between the periods, showing that, after the reach-out action, a families' social conditions improved. The results of the indexes related to the economic dimension of the settlement's ISAR will be presented in the next topic to broaden the analysis.

Economic Dimension Index (IDE) of the Barra Nova Settlement

Regarding the economic dimension, seven indexes were analyzed. Table 4 presents the values, as well as the weights assigned to each one and their classifications according to the sustainability thermometer, as proposed in this study.

As shown in Table 4, the economic dimension index, as well as the social dimension, improved between 2013 and 2015. Its value showed a significant increase, from 0.34 to 0.54, and its classification went from Poor to Regular between the periods. Even considering the small change in the classification, it is worth noting the occurrence of several significant changes in the indexes when analyzed separately, which, once again, might be reflecting the various changes that emerged in the settlement with the actions developed.

TABLE 4.
Economic Dimension Index (IDE) of the Barra Nova Settlement, in Mato Grosso do Sul, from 2013 to 2015

Indicator	Assigned weight*	2013		2015	
		Result	Classification	Result	Classification
Financial productivity of the land	8	0,13	Critical	0,22	Poor
Total monthly income of the property	8	0,16	Critical	0,41	Regular
Income diversification	9	0,63	Good	0,92	Excellent
Equipment and Constructions	7	0,28	Poor	0,63	Good
Autonomy of the properties' productive activity	9	0,37	Poor	0,47	Regular
Forms of production commercialization	8	0,7	Good	0,55	Regular
Access to credit	7	0,0	Critical	0,66	Good
IDE		0,34	Poor	0,54	Regular

Source: own source based on the research results
Weight assigned following the Delphi Method

In the economic dimension, more notable changes were observed in comparison to the social dimension. Among them, there are more significant increases in the indexes' values and a larger number of those that improved, of which seven out of six analyzed improved, and only one worsened, which refers to the products' commercialization produced by the farmers. As for the index related to the land's financial productivity, its value in 2013 was 0.13, classified as critical. In 2015, its value was 0.22, classified as poor. Furthermore, it is observed that even with a small improvement, the land's financial productivity, which measures the financial yield per hectare in the properties,

was considered poor in 2015. Although it has improved, it deserves special attention, since it presented the lowest value among the seven indexes in the last period under analysis.

Similar results were found in other studies, which differed in the values, but presented the same classifications. Among these studies are: Gamarra-Rojas et al. (2019), in a settlement in the state of Pernambuco, where the value was 0.16; and Stoffel and Colognese (2015), in a settlement in the state of Paraná, where the value was 0.36. In both studies, this index was classified as Poor and was identified as the most negative value concerning sustainability.

For Stoffel and Colognese (2015), the similarity of such results is explained by the increase in the production cost to which farmers are subject. As alternatives, Santos and Braga (2013) emphasize the need for technical guidance for producers, guiding them in ways of adding value to production, increasing production in smaller spaces, in addition to financial management mechanisms, so that results control can be measured and improved.

As for the index related to the total monthly income of the property, this was considered critical in 2013. However, its value increased significantly, going from 0.16 to 0.41, classified as regular in 2015 (Table 4). In this sense, it is noted that the families' income improved after the reach-out actions, which may indicate the improvements that occurred from these actions.

Another settlement with similar results in the state of Mato Grosso do Sul was studied by Souza et al. (2017), when this index was 0.42, also pointing to average sustainability. Due to this classification, the results show that there are still opportunities for improvement in this regard, which is influenced by other factors, such as the financial productivity of the land and the commercialization of production, which also deserve attention because it is a variable that influences people's quality of life.

The index related to income diversification is highlighted in the 2015 Economic Dimension Index - IDE, which presented the highest value among that year's indexes. In 2013, it was classified as Good, with a value equal to 0.63, reaching 0.92 in 2015, when it was classified as Excellent. It is noted that families increased the number of income sources between periods. This result reflects the diversification of productive activities carried out by families and influences the income value increase, as shown in the previous index.

This result is favorable to the settlement because according to Oliveira et al. (2015), the diversification of production promotes different benefits, such as complementation and diversification of income, food security, nutritional improvement of meals, nutritional improvement of meals, and increased participation of the female workforce in the field.

As for the index related to equipment and constructions, which measures the number of productive goods (machines, equipment, and vehicles) and the constructions made in the lots (excluding families' households), its value went from 0.28 to 0.63, going from poor in 2013 to good in 2015 (Table 4). Thus, it appears that families had greater availability of goods for their productive activities and increased the number of constructions in the lots, which favors the development of the families' productive activities and, consequently, in production and income.

At this point, there was a significant increase in the totality of goods in the settlement, which in 2015 was 1,130 pieces of equipment, as compared to 685 in 2013, and in the last period, all lots presented at least one productive piece of equipment, especially the tractor. In the same way, constructions also increased, from 334 in 2013 to 534 in 2015, with particular emphasis on warehouses, pigsties, and stables. In 2015, practically 93% of the properties had some construction, against 74.5% in 2013.

As for the index related to the autonomy of the properties' productive activity, which evaluates the percentage of the monthly income generated by agricultural activities concerning total income (agricultural or not), there was also an improvement in values and classification. From 0.37, its value went to 0.47, being classified as regular in 2015, differently from 2013, when it was classified as poor (Table 4). Therefore, it appears that the properties, after the reach-out actions, became more self-sustainable, due to the increase in the proportion between the agricultural financial income and the total income of the families. This fact is influenced by the diversification of income and the increase in activities in the settlement and favors the rate of fixation in the rural areas, which has also improved.

As for the index related to access to credit provided by PRONAF, which evaluated the percentage of financing applications provided to farmers, there were also improvements in the results. It was classified as critical in 2013, going to good in 2015. With this index, it was observed that no family had used credit lines provided by PRONAF in 2013, which changed in 2015, when more than 60% of the population used this resource, as shown in Table 4.

Access to credit by the family producer can grant several gains. A study by Miranda and Gomes (2016) showed that the credit granted by PRONAF helped improve productive capacity, maintain agricultural activities, and improve the families' income. In summary, the authors considered that this aid, given the benefits that concern farmers, could provide the reach of sustainable rural development.

Once again, the importance of the reach-out actions carried out in the Settlement it's noted. In addition to training, this brings information to people because, as the results indicate, families probably had little knowledge of this resource, which favors and helps farmers in their various activities.

As for the only index that worsened between the periods analyzed, there is the one related to the commercialization of family production, which identifies the commercialization channels or points of sale that the products are destined to be sold. Table 4 noted that in 2013, it was classified as Good, but in 2015, it was classified as Regular.

Based on this result, there was a strong presence of intermediary agents who resell products in places where the settled families do not reach. Besides, it was noted that public entities, fairs, and supermarkets are not yet reached by producers, requiring attention from entities, which encourage and assist such families in reaching new markets, which may further favor diversification and income generation.

A study by Moreira and Souza (2018), in another settlement in the state of Mato Grosso do Sul, showed better results in this regard. As means that favored the commercialization of production, they highlighted public policies, such as the National School Food Program – PNAE and the Food Acquisition Program – PAA. In this sense, they highlighted the importance of these mechanisms, which, in addition to these gains, promote the improvement of the quality of life and families' social and economic conditions.

There were several improvements between the periods analyzed, in addition to income, thus showing that the economic conditions of families improved after the reach-out actions. This index, in addition to the Social Dimension Index [IDS], constitutes the Socioeconomic Indicator for Rural Settlement, ISAR, presented below.

Socioeconomic Indicator of the Settlement - ISAR

Table 5 presents the values and classifications in both periods of analysis regarding the settlement ISAR determination. Apparently, its value in 2013 was 0.42, while in 2015, it reached a value of 0.57, classifying it as regular in both periods. It is noteworthy that, even with this classification, the individualized results of each indicator, already presented in the analysis of the indexes of the social and economic dimensions, showed significant improvements.

Socioeconomic Indicator of the Barra Nova Settlement		
Analysis period	2013	2015
Indicator	0,42	0,57
Classification	Regular	Regular

Source: own source based on the research results

Furthermore, even without changes in the classification of the settlement's ISAR value, it is considered that the social and economic indexes showed several significant improvements between 2013 and 2015. It leads to the observation that there are strong indications that the reach-out actions carried out in the Barra Nova Settlement favored several changes in the settled families' social and economic conditions.

However, the study by Oliveira (2017) in the same settlement stands out with an econometric analysis of panel data. With the study, it was concluded that the assistance actions improved the social and economic situations of the families, with emphasis on the increase of access to rural credit, an increase of productive goods and constructions, and an increase of families producing for commercialization. As factors to be improved, the author highlighted the need to create a cooperative and increase residents' actions in the association. Moreover, even with a different methodology, the results were similar in this work.

For the state of Mato Grosso do Sul, the studies of Oliveira et al. (2017), stand out with a value of 0.53; and Souza et al. (2017), where the indicator was 0.56, and for both, the indicator was classified as an average level of sustainability. Another study with a similar result was carried out by Moreno (2018), in which the authors compared families benefited and not benefited by PRONAF, resulting in a value of 0.46 for beneficiaries and 0.47 for non-beneficiaries, classified as regular for both groups.

Given the similarity of the results, there is a convergence of the settlements in presenting average values, which deserves public officials' attention, as their sustainability is regular. As considered by Sangalli et al. (2015), the common problems faced by different settlements can be minimized with proper planning in their project and concern related to peoples' quality of life, which must consider factors such as local characteristics, soil fertility, access to the consumer market, health services and education level.

Final considerations

Regarding indicators' analysis, both the families' social and economic conditions showed significant differences at the end of the reach-out actions. In the social dimension, the most relevant results were related to food security, satisfaction with housing, and fixation in the countryside indexes. As for the less significant, there is satisfaction with the services provided by Incra, followed by the presence of the association, and the farmers' level of education.

Therefore, it is considered the need to establish an association in the settlement, which could favor collaborative work, reaching new markets, and solving problems. In addition, means that favor the improvement of farmers' education must be formulated because this factor influences the management of properties and the empowerment of farmers in decision-making, and directly interferes with agricultural activities and local development.

The indexes related to the land's financial productivity, total monthly income of the property, and income diversification stood out significantly in the economic dimension. The index related to equipment and constructions, the autonomy of productive activity, and access to credit also showed significant improvements after the reach-out actions. There is a considerable relevance among them, given that the use of credit influences the investment in resources on the property, which favors diversification and increased production, increasing, consequently, families' purchasing power. It was found that the properties improved their ability to maintain themselves with the revenues from the productive activities, a factor of great relevance, as it reveals how self-sufficient they could be. Another aspect highlighted is the access to credit, which demonstrated that families started using it only after the reach-out actions.

Regarding the classification of the Socioeconomic Index for Rural Settlements - ISAR, it was noted that its classification remained as regular after the actions were carried out, although it has shown a significant improvement in its value (0.42 to 0.57). Even with this result, several changes were noticed in families' social and economic conditions, which demonstrate the crucial relevance of the reach-out action. We conclude that the results of the socioeconomic indicators were positive, and that the implementation of the reach-out action provided significant improvements for the families.

References

Abebaw, D., & Haile, M. G. (2013). The impact of cooperatives on agricultural technology adoption: empirical evidence from Ethiopia. *Food Policy, 38*, 82-91. https://doi.org/10.1016/j.foodpol.2012.10.003

Aliber, M., & Hall R. (2012). Support for smallholder farmers in South Africa: challenges of scale and strategy. *Development South Africa, 29*(4), 548-562. https://doi.org/10.1080/0376835X.2012.715441

Alvi, M., Barooah, P., Gupta, S., & Saini, S. (2021). Women's access to agriculture extension amidst COVID-19: Insights from Gujarat, India and Dang, Nepal. ^# *Agricultural Systems, 188*,103035. https:/doi.org/10.1016/j.agsy.2020.103035

Anang, B. T., Bäckman, S., & Sipiläinen, T. (2020). Adoption and income effects of agricultural extension in northern Ghana. *Scientific African, 7*, e00219. https://doi.org/10.1016/j.sciaf.2019.e00219

Attipoe S. G., Cao J., Opoku-Kwanowaa Y., & Ohene-Sefa F. (2021). Assessing the impact of non-governmental organization's extension programs on sustainable cocoa production and household income in Ghana. *Journal of Integrative Agriculture, 20*(10), 2820-2836. DOI: https://doi.org/10.1016/S2095-3119(21)63607-9

Bellen, H. M. V. (2004). Indicadores de Sustentabilidade – um levantamento dos principais sistemas de avaliação. *Cadernos EBAPE.BR, 2*(1), 1-14. https://doi.org/10.1590/S1679-39512004000100002

Biswas, B., Mallick, B., Roy, A., & Sultana Z. (2021). Impact of agriculture extension services on technical efficiency of rural paddy farmers in southwest Bangladesh. *Environmental Challenges, 5*, 100261. https://doi.org/10.1016/j.envc.2021.100261

Camargo, G. M. (2017). *Sistemas Agroflorestais Biodiversos: Uma Análise da Sustentabilidade Socioeconômica e Ambiental.* [Dissertation Master's degree, - Curso de Agronegócios, UFGD]. Dourados/MS.

Castro, C. N., & Pereira, C. N. (2017). Agricultura Familiar, Assistência Técnica e Extensão Rural e a Política Nacional de Ater. Brasília, DF: IPEA (Texto para Discussão. Nº 2343). http://repositorio.ipea.gov.br/bitstream/11058/8114/1/td_2343.PDF

Davis, K. E., Nkonya, E., Kato, E., Makonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. *World Development, 40*(2), 402-413. https://doi.org/10.1016/j.worlddev.2011.05.019

Davis, K. E., & Terblanché, S. E. (2016). Challenges facing the agricultural extension landscape in South Africa, Quo Vadis?. *South African Journal of Agricultural Extension, 44*(2), 231-247. https://www.ajol.info/index.php/sajae/article/view/149143

Feil, A. A., & Schreiber, D. (2017). Análise da estrutura e dos critérios na elaboração de um índice de sustentabilidade. *Sustentabilidade em Debate, Brasília, 8*(2), 30-43. https://doi.org/10.18472/SustDeb.v8n2.2017.21516

Gamarra-Rojas, G., Mattos, J. L. S. de, Gamarra-Rojas, C. F. L., Lima, P. V. P. S., & Caporal, F. R. (2019). Análise de sustentabilidade em assentamento de reforma agrária: o caso de Chico Mendes III, Pernambuco, Brasil. *Extensão Rural, 26*(3), 21–41. https://doi.org/10.5902/2318179639471

Hamilton A., & Hudson J. (2017). The perceived impact of agricultural advice in Ethiopia. *The Journal of Agricultural Education and Extension, 23*(2), 159-173. https://doi.org/10.1080/1389224X.2016.1245151

Hirakuri, M. H., Castro, C. de, Franchini, J. C., Debiasi, H., Procópio, S. de O. & Balbinot Junior, A. A. (2014). Indicadores de sustentabilidade da cadeia produtiva da soja no Brasil. Londrina: *Embrapa Soja, Documentos, 1*(351), 1-70. https://www.infoteca.cnptia.embrapa.br/bitstream/doc/990556/1/IndicadoresdesustentabilidadedacadeiaprodutivadasojanoBrasil.pdf

IBGE. (2019). Instituto Brasileiro de Geografia e Estatística. Cidades. https://cidades.ibge.gov.br/brasil/ms/sidrolandia/panorama

IBGE. (2020). Instituto Brasileiro de Geografia e Estatística. Censo Agropecuário 2017. https://censos.ibge.gov.br/agro/2017/resultados-censo-agro2017.html

Instituto Brasileiro de Geografia e Estatística [IBGE]. (2015). *Indicadores de Desenvolvimento Sustentável*. Rio de Janeiro (Estudos e Pesquisas, Informação Geográfica). https://biblioteca.ibge.gov.br/visualizacao/livros/liv94254.pdf

Instituto Brasileiro de Geografia e Estatística [IBGE]. (2018). *Cidades@, IBGE. https://cidades.ibge.gov.br/brasil/ms/sidrolandia/panorama.*

Instituto Nacional de Colonização e Reforma Agrária [INCRA]. (2014). Relatório de Gestão, Exercício de 2013. Superintendência Regional do Mato Grosso do Sul – SR16. Campo Grande/MS. https://www.gov.br/incra/pt-br/acesso-a-informacao/auditorias/sr16-ms_2013.pdf.

Instituto Nacional de Colonização e Reforma Agrária [INCRA]. (2017). *Assentamentos. Informações gerais.* http://painel.incra.gov.br/sistemas/Painel/ImprimirPainelAssentamentos.php?cod_sr=16&Parameters%5BPlanilha%5D=Nao&Parameters%5BBox%5D=GERAL&Parameters%5BLinha%5D=1.

Instituto Nacional de Colonização e Reforma Agrária [INCRA]. (2022). Projetos de Reforma Agrária Conforme Fases de Implementação. Sistema SIPRA. https://www.gov.br/incra/pt-br/assuntos/reforma-agraria/copy_of_relacao_assentamentos.pdf

Knook, J., Eory V., Brander, M., & Moran, D. (2018). Evaluation of farmer participatory extension programmes, *The Journal of Agricultural Education and Extension, 24*(4), 309-325. https://doi.org/10.1080/1389224X.2018.1466717

Leite Júnior, C. B., Fernandes, E. P., Souza, E. R. B. de, Leandro, W. M., & Frazão, J. J. (2015). Indicadores Social-Econômico e Ambiental em Assentamentos de Reforma Agrária no Cerrado Goiano / Social, Economic and Environmental Indicators in the Land Reform Settlements in Goias State Pastures. *Campo-Território: Revista De Geografia Agrária, 8*(16) 342-378. https://seer.ufu.br/index.php/campoterritorio/article/view/19593

Miranda, D. L. R., & Gomes, B. M. A. (2016). Desenvolvimento Rural e Políticas Públicas: um estudo de caso no Valo do Ribeira, PR, Brasil. *Revista Brasileira de Desenvolvimento Territorial Sustentável – GUAJU*, Matinhos, 2(2), 75-88. https://revistas.ufpr.br/guaju/article/view/49760/29789

Moreira, F. G., & Souza, G. M. de. A. (2018). Cooperação como meio de Comercialização da Produção nos Assentamentos Rurais: uma análise do Assentamento Santa Olga. *Revista Organizações e Democracia, Marília, 19*(2), 63-84. https://doi.org/10.36311/1519-0110.2018.v19n2.06.p63

Moreno, M. H. B. (2018). *Indicadores Socioeconômicos na Agricultura Familiar: uma análise do papel do crédito*. [Monography (Graduate) – Curso de Ciências Econômicas, Universidade Federal da Grande Dourados]. Universidade Federal da Grande Dourados .

Moyo, R., & Salawu, A. (2018). A survey of communication effectiveness by agricultural extension in the Gweru district of Zimbabwe. *Journal of Rural Studies, 60*, 32-42. https://doi.org/10.1016/j.jrurstud.2018.03.002

Oliveira, C. M. de, Silva, R. O. de, & Almeida, R. H. C. (2015). Diversificação Produtiva, Reprodução Socioeconômica e Mulheres no Assentamento Periurbano Mártires de Abril – Pará. *NUCLEUS – Rev. Científica da Fundação Educacional de Ituverava, 12*(1), 253-266. http://repositorio.ufra.edu.br/jspui/handle/123 456789/1002

Oliveira, M. de F. (2017). *Dinâmica Socioeconômica da Agricultura Familiar e o papel do crédito: uma análise de dados em painel*. [Dissertation Master's degree Curso de Agronegócios, Universidade Federal da Grande Dourados]. Universidade Federal da Grande Dourados .

Peixoto, M. (2008). *Extensão Rural no Brasil – uma abordagem histórica da legislação. Brasília. Consultoria Legislativa do Senado Federal*. https://www12.senado.leg.br/publicacoes/estudos-legislativos/tipos-de-estudos/textospara-d iscussao/td-48-extensao-rural-no-brasil-uma-abordagem-historica-da-legislacao. Acesso em: 29 set. 2018.

Sangalli, A. R., Silva, H. C. H., Silva, I. F., & Schlindwein, M. M. (2015). Associativismo na Agricultura Familiar: Contribuições para o Estudo do Desenvolvimento no Assentamento Rural Lagoa Grande, em Dourados (MS), Brasil. *Organizações Rurais & Agroindustriais, 17*(2), 225-238. http://www.revista.dae.ufla.br/index.php /ora/article/view/994

Santos, R. B. N. dos, & Braga, M. J. (2013). Impactos do Crédito Rural na produtividade da terra e do trabalho nas Regiões Brasileiras. *Economia Aplicada, 17*(3), 299-324. https://doi.org/10.1590/S1413-80502013000300004

Schneider, S. (2016). A presença e as potencialidades da Agricultura Familiar na América Latina e no Caribe. *Redes, 21*(3), 11-33. http://hdl.handle.net/10183/151154

Silva, L. F. da. (2007). *A Construção de um Índice de Sustentabilidade Ambiental Agrícola (ISA): Uma Proposta Metodológica*. [Thesis Doctorate degree, Curso de Economia Aplicada, UNICAMP], UNICAMP.

Silva, V. C. S., & Vieira, I. C G. (2016). Barômetro da Sustentabilidade aplicado a assentamentos rurais do leste do Estado do Pará, Brasil. *Desenvolvimento e Meio Ambiente, 36*(1), 201-221. http://dx.doi.org/10.5380/dma.v36 i0.39957

Souza, C. C. de, Deboleto, G. A. G., Favero, S., Reis Neto, J. F. Dos, Frainer, D. M., Silva, F. A., & Dias, R. O. (2017). Análise de sustentabilidade em assentamentos rurais nas dimensões econômica, social e ambiental. *Revista ESPACIOS, 38*(26), 1-16. https://www.researchgate.net/profile/Jose-Reis-Neto/publication/317588320_Anal ise_de_sustentabilidade_em_assentamentos_rurais_nas_dimensoes_economica_social_e_ambiental/links/5b4 4adae458515b4f65f89bc/Analise-de-sustentabilidade-em-assentamentos-rurais-nas-dimensoes-economica-soc ial-e-ambiental.pdf

Stoffel, J. A. & Colognese, S. A. (2015). A Sustentabilidade na Agricultura Familiar: Indicadores e Índices Econômicos e Sociais de Avaliação. *Revista Tempo da Ciência, 22*(44), 47-59. https://doi.org/10.48075/rtc.v21 i42.12626

Tavares, P. A., Coelho, Y. C. de M., Martins, A. M., Beltrão, N. E. S., Gutjahr, A. L. N., & de Paula, M. T. (2018). Índice de sustentabilidade global aplicado na avaliação do Assentamento Expedito Ribeiro, Santa Bárbara – PA. *DRd - Desenvolvimento Regional Em Debate, 9*, 59-76. https://doi.org/10.24302/drd.v9i0.1869

Vorley, B., Cotula, L., & Chan, M. K. (2012). *Tipping the Balance: Policies to Shape Agricultural Investments and Markets in Favour of Small-scale Farmers.* International Institute for Environment and Development (IIED) and Oxfam International.

Wossen, T., Berger T., Mequaninte, T., & Alamirew, B. (2013). Social network effects on the adoption of sustainable natural resource management practices in Ethiopia. *International Journal of Sustainable Development & World Ecology, 20,* 477-483. https://doi.org/10.1080/13504509.2013.856048

Yitayew, A., Abdulai, A., Yigezu, A. Y., Deneke, T. T., & Kassie, G. T. (2021). Impact of agricultural extension services on the adoption of improved wheat variety in Ethiopia: A cluster randomized controlled trial. *World Development, 146,* 105605. https://doi.org/10.1016/j.worlddev.2021.105605

Notes

* Research article