Activity output

Choice Game for climate action

“Cultivando para Ganar”

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This report aims to disseminate interim climate change, agriculture, and food security research and practices and stimulate feedback from the scientific community.

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The Game Kit can be downloaded on:
http://cultivandoparaganar.s3-website-us-east-1.amazonaws.com/

Abstract

Smallholders are decision-makers with goals and strategies. Their decisions and behaviors towards the adaptation of climate-smart agriculture (CSA) options depend on individual livelihood goals, beliefs concerning the likelihood of uncertain climate events, and personal motives. Understanding the decision-making of farmers about the adoption of CSA practices and technologies to increase farming resilience against climate risks, which are embedded in many other risks, is a difficult task. Innovative approaches in action research, such as playing games, can generate a neutral environment to experiment and learn from simulated circumstances and outcomes and increase actors' awareness and capacity to plan the implementation of gender-sensitive CSA options properly. We developed and tested a choice game to understand and strengthen farmers' decision-making to implement (or not) CSA options after having received a seasonal climate forecast. The game was co-designed with CCAFS project partners in the Climate-Smart Villages of Olopa, Guatemala, and Santa-Rita, Honduras, and tested with farmers and extension in both countries. The game can be played in two settings, i) as a board game in a room where all players are present, and ii) as a virtual game where participants are connected through a video conference and accessing a shared document. Results provided general insights into farmers' perception of climate risks and the need and opportunities to proactively cope with them by implementing CSA practices. They were, however, hardly capable of developing strategies to do this in an economically reasonable way, and tried to implement as many strategies as possible. When playing the game in a virtual setting, agricultural experts and stakeholders from local institutions found the game to be an exciting tool to complement traditional learning methods in several ways. First, learning is promoted through the experience of the players. Also, the context of the game forms a safe learning environment for testing alternative decisions. Besides, discussion among players about the game outcome can be stimulating for real-world situations associated with adopting CSA practices. Simulation games can also make players aware of their mental models and potentially change these models or beliefs. Overall, the game is a useful tool for researchers to understand players' perceptions about climate risks, seasonal weather forecasts, and climate-smart agriculture options to cope with risks. For national stakeholder experts and development practitioners, it is a practical tool to be used in action research to complement other learning approaches, especially in low literacy communities.

Keywords

Climate Action, Choice-Game, perceptions, Climate-Smart Agriculture options, Seasonal forecasts

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Contents

1. Background/Rationale

Smallholders are decision-makers with goals and strategies. Their decisions and behaviors towards the adaptation of climate-smart agriculture (CSA) options depend on individual livelihood goals, beliefs concerning the likelihood of uncertain climate events, and personal motives (Eitzinger et al., 2018). While farmers have always had to cope with a certain level of variability (Darnhofer et al., 2010), the magnitude of climate change strikes the already stressed rural population. It makes decision making for farmers even more challenging.

Understanding and strengthening the decision-making of farmers about the adoption of CSA practices and technologies to increase farming resilience against climate risks, which are embedded in many other risks, is a difficult task. Innovative approaches in action research, such as playing games, can be applied to generate a neutral environment to experiment and learn from simulated outcomes and increase actors' awareness and capacity to plan for implementing gender-sensitive CSA options properly. Researchers can use games to study participants' behavior.

Games have been used to study diverse human behaviors. For instance, in repeated prisoner dilemma games, humans exhibit broad distributions of cooperativity and, on average, do not optimize their mean payoff (Spanknebel and Pawelzik, 2015). Role-playing games have been used to understand gendered knowledge and their role in decision making and responses in adopting practices to increase farming resilience against risks like climate change (Villamor et al., 2014).

Games can be played without real-world consequences. Game participants can repeat and learn from their own and others' decisions within the given game settings. Rumore, Schenk, and Susskind (2016) conducted a comprehensive study on a role-play on climate change adaptation in different communities to test different decisions. Games are often used for understanding behavior in a shared resource pool, where selfish rational behavior leads to a tragedy of the commons (Hardin, 1968). Climate Change is framed as a public good dilemma. However, it is much more complicated since decision-makers have to decide about trade-offs between mitigation, adaptation, and climate change damages in the face of a dynamic coupled climate-economic model disconnected in time and space.

Choice games have been used to understand decisions as bounded rationality of farmers regarding a common resource problem (Meinzen-Dick et al., 2004). However, they may also be used to improve farmers understanding of economic benefits from

seasonal climate forecasts and the implementation of CSA options. While implementing CSA may sacrifice some portion of average income due to climate uncertainty and costs of implementing these practices, over time, it would reduce the variability of returns.

In such an imagined choice game of selecting climate-smart agriculture practices in response to a seasonal climate forecast, a game participant would need to maximize his trade-offs between productivity and food security, resilience to climate risks, and low-emission farming, in order to be the winner.

2. Scope

The Climate-Smart Village (CSV) AR4D approach (Aggarwal et al., 2018) promotes CSA technologies and practices by building local capacities for farmers and other relevant actors, and by supporting processes of participatory identification, testing, and scaling of best bets. Within the project '*Generating evidence on gender-sensitive Climate-Smart Agriculture to inform policy in Central America*,' we have designed, developed, and tested a choice game called 'Cultivando para Ganar' (Cultivating to win). The game is embedded in the project activity 'Increase households'/local level organizations' capacities to plan for and access, implement and monitor gender-sensitive CSA,' and follows the following principles:

- promote experiential learning
- provide a safe learning environment to test alternative decisions
- increase awareness through simulation of outcomes and show mismatches of players mental models within complex systems dynamics of climate change
- offer a learning potential through changing players' mental models
- make science more readily accessible

The game has been co-designed with project partners Asociación Regional Campesina Chortí (ASOREACH) in Olopa, Guatemala, and Comision de Accion Social Menonita (CASM) in Santa-Rita, Honduras. It has been tested with farmers and extension in both countries.

The game was designed to be played in two scenarios:

- board game in a room where all players are present
- a virtual game where participants are connected through a video call (Figure 1)

The presented activity is contributing to the project outcomes and is specific to the outcome:

- Enhanced capacity of local organizations to plan for, implement, and monitor gender-sensitive CSA interventions that help reducing gender inequalities.

Figure 1. The game can be played as a virtual game.

3. Objectives

Develop and test a choice game to understand farmers' decision-making to implement (or not to implement) CSA options after having received a seasonal climate forecast.

Specific objectives are:

- Understand the level of knowledge, perception, and attitude of producers towards adopting pre-identified CSA practices.
- Understand the difference in decision-making processes between men and women
- Improve participants understanding of trade-offs between co-benefits of CSA practices
- Improve participant's understanding of climate forecasts and their basic concepts of probability and the effects of different CSA practices and technologies to reduce climate-related risk on production.
- Increase the capacity of local actors to use games to build awareness for climate services and CSA options among farmers and extension agents

4. Methodological approach

The design and development process consisted of three phases:

4.1. Capacity building exercise with farmers to introduce the choice game

In October 2018, a two-day capacity building exercise based on economic choice games was carried out with a sub-sample of farmers, representing the different types of households found in Olopa Guatemala, i.e., we selected households that adopted CSA practices and households that did not adopt practices (Figure 2). The rationale of this approach was to understand the difference in perceptions about the usefulness of CSA practices between the two groups, but also to provide a game-like environment and observe if non-adopters would overcome the barriers of real life, and 'try-out' CSA options and observe results without running the risk of real economic losses. Game participants could become a winner and go home with a symbolic prize.

The game was played in several rounds. In each round, farmers would receive a weather forecast information at the beginning of each round and then select and implement from a choice of locally relevant CSA practices. Based on the weather forecast, however, they could also decide not to implement CSA options. At the end of each round, the 'actual' weather (that did occur) was presented by the game moderator on a dashboard. If a climate event, e.g., drought, heavy rainfalls, etc. occurred, farmers would see on the dashboard the results of their production system and the other players. Depending on their unique selection of implemented/ or not implemented CSA practices, the loss from the climate event would vary between players. In a 'normal' climate year, no loss would occur.

Farmers could decide which crop system they would grow on each of up to five plots, a coffee system and different systems of basic grain production (Maize, Beans) were available. All participants started with two plots of grains, one plot for coffee, one without any use, and one consisting of a forest. We provided information to players about i) the cost for conventional crop production per round (without CSA option), ii) the income from selling the product without having loss from a climate event, iii) the cost of implementing a CSA option, iv) the per round maintenance costs, v) the likely impact from a climate event on income as a percentage, vi) and information about (non-economic) co-benefits of practices, like increased food security, environmental friendliness, and among others. Players were equipped with tables for cost planning. After every round, farmers could make changes and receive their new economic balance at the end of every round.

To achieve meaningful results, the game was played from a minimum of five, up to ten rounds. We also played different versions of the game; i) individual player, ii) player as household (usually consisting of a man and a woman), and iii) players organized in gender-segregated groups.

Figure 2. The paperboard shows the five plots and the house with home garden (left), a group of individual players making decisions about what CSA option they want to implement in the next round.

4.2. Co-Design the game with local actors

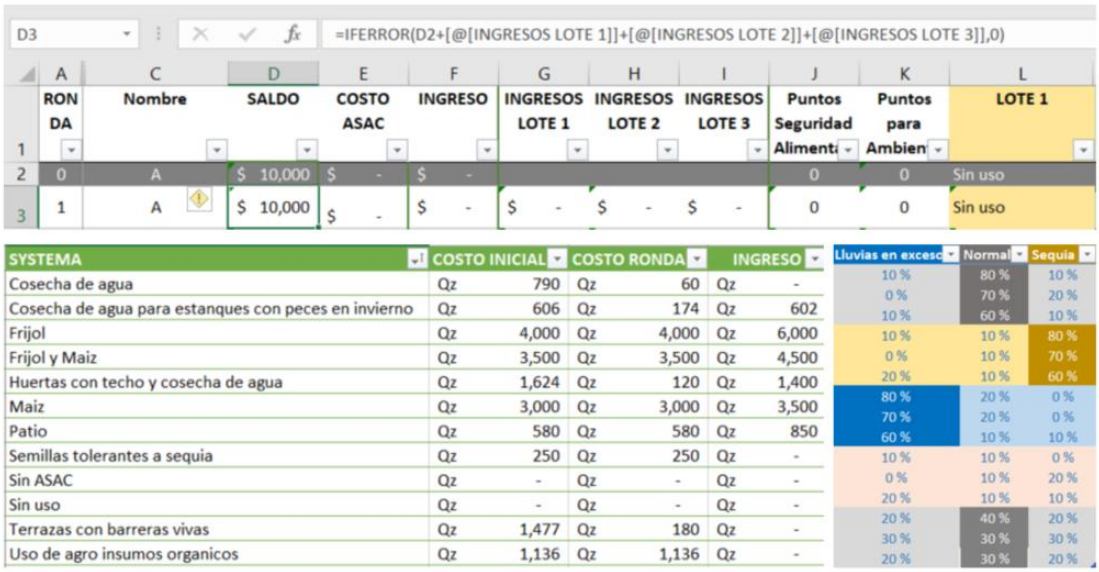
After the capacity building exercise with farmers, in May 2019, we organized another workshop with our local partners. We co-designed an improved version of the game. Teams from the local NGOs ASORECH and CASM met with researchers from CIAT and CCAFS. They first played the game in the same way as it was played with farmers and then started co-designing the final game, providing feedback to researchers, and developing the details for the game elements. The overall goal of the game was to understand the decision-making processes of farmers for the adoption of CSA practices under the threat of climate risks.

The objective of the workshop was to co-create this game, taking advantage of the local partners' knowledge and experience working in the area and with farmers, and to adjust the game to the local context in order to become a useful tool that can be used by researchers and national organizations to understand farmers' differences in perceptions and gender inequalities, and foster learning and build farmers' awareness for climate risks and the usefulness of climate information services and CSA practices.

4.3. Develop and release of the game

Metrics and formulas were developed in spreadsheet software (Microsoft Excel) (see example in Figure 3). For the board game, a laptop or tablet can be used by a game facilitator (in our game the Moderator) to input data to the control file. The economic

outcome and co-benefit indicators are auto-calculated and visualized in a dashboard-like view. To play the game in a virtual meeting, game participants access a shared online document and input their choices in individual sheets. The Moderator controls the course of the game and discusses with players the results after every round on the control sheet. First, we played the game virtually with a group of researchers. We received feedback to improve the game elements and the flow of playing it online. Finally, we played the game with national stakeholders from Guatemala and Honduras. They perceived the game as being a useful tool for awareness building among farmers and extension agents.



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	A	C	D	E	F	G	H	I	J	K	L
1	RONDA	Nombre	SALDO	COSTO ASAC	INGRESO	INGRESOS LOTE 1	INGRESOS LOTE 2	INGRESOS LOTE 3	Puntos Seguridad Alimenta	Puntos para Ambien	LOTE 1
2	0	A	$ 10,000	$ -	$ -				0	0	Sin uso
3	1	A	$ 10,000	$ -	$ -	$ -	$ -	$ -	0	0	Sin uso

SYSTEMA	COSTO INICIAL	COSTO RONDA	INGRESO	Lluvias en excesc	Normal	Sequia
Cosecha de agua	Qz 790	Qz 60	Qz -	10 %	80 %	10 %
Cosecha de agua para estanques con peces en invierno	Qz 606	Qz 174	Qz 602	0 %	70 %	20 %
Frijol	Qz 4,000	Qz 4,000	Qz 6,000	10 %	60 %	10 %
Frijol y Maiz	Qz 3,500	Qz 3,500	Qz 4,500	10 %	10 %	80 %
Huertas con techo y cosecha de agua	Qz 1,624	Qz 120	Qz 1,400	0 %	10 %	70 %
Maiz	Qz 3,000	Qz 3,000	Qz 3,500	20 %	10 %	60 %
Patio	Qz 580	Qz 580	Qz 850	80 %	20 %	0 %
Semillas tolerantes a sequia	Qz 250	Qz 250	Qz -	70 %	20 %	0 %
Sin ASAC	Qz -	Qz -	Qz -	60 %	10 %	10 %
Sin uso	Qz -	Qz -	Qz -	10 %	10 %	0 %
Terrazas con barreras vivas	Qz 1,477	Qz 180	Qz -	0 %	10 %	20 %
Uso de agro insumos organicos	Qz 1,136	Qz 1,136	Qz -	20 %	10 %	10 %
				20 %	40 %	20 %
				30 %	30 %	30 %
				20 %	30 %	20 %

Figure 3. Metrics, cost tables, and probabilities of climate events are targeted to the local context of farming communities.

5. Results

5.1. Preliminary Choice-game with farmers

When we played the game with farmer groups, it was still in an experimental design phase. We needed to know what level of complexity was doable in a board game setting with smallholder farmers from the project target regions. However, farmers' capability of participating in such action research exercises can vary between geographical regions. In Olopa, demographic characteristics of participating farmers showed overall low literacy, where 59% of women and 39% of men did not have access to education (source: Monitoring Results from 2018, GeoFarmer). Because of the low literacy of farmers, they were not able to anticipate economic consequences, and thus, were not able to correctly calculate progressing costs, income, and economic output related to the implementation of CSA practices. Instead, they acted intuitively, trying to cope with climate risks, and implement available practices.

Overall, results provided general insights into farmers' perception of climate risks and coping by implementing CSA practices. However, they were hardly capable of developing strategies to do this in an economically reasonable way and tried to implement as many strategies as possible.

During the first day of the game, when farmers had to play individually, it became challenging for them. They did not understand quite well to the overall purpose of the game exercise. During the second day, when farmers played together and organized in groups, it was easier for them to discuss and agree together on strategies. We also reduced the complexity of the game for the second day and did focus less on calculating exact costs for implementation; instead, we told them the costs, but let them estimate and decide based on group discussions.

At the end of the second day, farmers' feedback was much better than after the first day, when most of them did not capture the goal of the game. After the second day, they confirmed that they had understood the purpose of the game and the importance of taking measures against climate-related shocks on their crop production.

During the final open discussion and feedback, one farmer said:

" After the first day, I did not understand the purpose of the game. It was challenging for me to calculate the numbers. At the end of the day, I thought, I will not come back tomorrow. However, today it rained heavily in the morning, and I could not go to my field, so I decided to return. Today I understood the way how the game works and that

it is essential to adopt these practices that will help us to be better prepared for unpredictable weather like it was today."

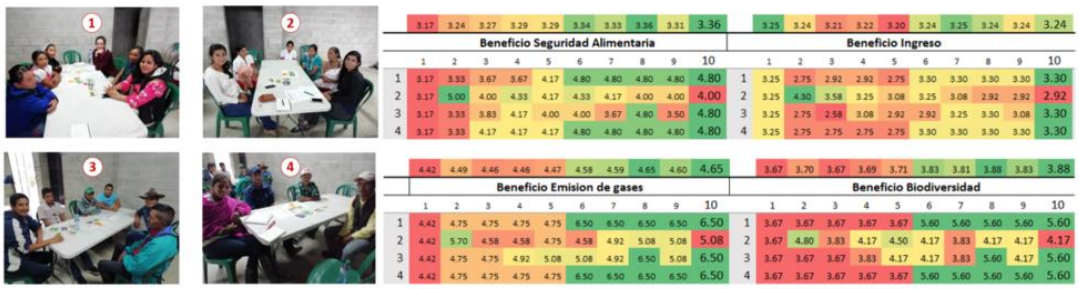


Figure 4. The group setting of the game, showing four groups of farmers playing (left), and results (green show high level of achieved Game points, red show low level) of co-benefits (right, from left-top to right bottom - Food Security, Income from productivity, mitigation through reduced Emissions, improved Biodiversity) ranked among groups after each of ten rounds.

Results of ranked co-benefits among playing groups (Figure 4) after ten rounds in the game of the second day show that all four groups improved their Game points during the game and optimized co-benefits.

5.2. Co-design of the game with local partners

During the two days of workshops with experts, the changes identified and validated by the participants focused on three aspects of the game:

- the different settings of the game,
- the rules of the game, and
- the specific game elements (cards, descriptions, illustrations).

As we already tested in our first workshop in Olopa, experts **recommended organizing the game in sessions where women/men and youth/elderly are separated**. They found this necessary in order to understand responses from these different player profiles better.

Regarding the rules of the game, experts recommended to use kind of a bank and using printed money bills (play money like in Monopoly) in local currencies. Players could go to the bank and purchase practices. Further, experts recommended that instead of having a predefined climate forecast, in previous game sessions, the climate forecast was defined by the Moderator, we should use a way that improves the understanding of climate forecasts of farmers. **They recommended linking the game to the Participatory Integrated Climate Services for Agriculture (PICSA)**, which has been used recently within the CCAFS program in Guatemala and Honduras. A concrete

idea was using a bag with colored balls, each representing climate risks. The number of balls in the bag refers to the probability of the climate risk to occur, e.g., two grey balls, three yellow ones, and five blue ones represent a 50% chance of a season with excess rainfall, a 30% chance of drought and 20% chance of an average year.

Finally, recommendations for elements that should be on the game cards were made:

- Farming system cards: Name and symbol, e.g., Intercropped maize/beans system
- Climate risk card: Name and symbol of climate risk, e.g., drought
- CSA card: Name, symbols, co-benefits, and costs
- CSA summary card: Name, illustration, description; when it is useful, and what are the co-benefits?

5.3. The final version of the Game: *Cultivando para Ganar* (Cultivating to win)

In the final version of the game, we present two different roles of game participants, the *'Game Moderator'* who facilitates the game process, and the *'Players,'* who participate in the game.

The game materials can be downloaded from this site: ***Cultivando para Ganar***

The Game Moderator

Before the game can be played, the Moderator needs to prepare the game configuration based on the conditions of the players and site characteristics. A game control file (Figure 5) is used to calculate the game outputs per round based on specific metrics, i.e., sets of production systems and CSA practices, cost and revenue of systems, impacts from climate events, and among others. The settings can be modified by editing the hidden configuration sheets but requires a basic understanding of formulas in Excel.

The Moderator edits the list of players. In playing with farmers, he needs to input all changes of farm configurations for each player in the individual input sheets.

The Players

Players receive a table board representing their farm for the game, the CSA co-benefit cards, and a start balance of the money. Each round, players can purchase cards (production system & CSA practices) and keep them for at least one round on their board (representing their farm). Players purchase CSA practices based on the climate forecast and money availability, benefit, and co-benefit. Once the moderator share if the forecast was accurate o no, the player can measure what happened on his farm

(loose or win money) and reflect on his decision to implement CSA practices or not. The Moderator can foster a debate among players to discuss why players have better outcomes than others.

The game's rolling out

The game starts with selecting a production system by each player and for each of the three available plots per farm. After deciding what to cultivate, the Moderator announces the weather forecast for the first round (representing a crop cycle). To do so, he can use the climate randomizer, or if available, the historical forecast for the site. Once the players have listened to the climate forecast, they can start making decisions about what CSA practices they want to implement for each of their plots (the first version of the game uses three plots); they can implement up to two practices in each plot (in the current version maximum 6 practices per round). However, the players need to decide based on available funds for buying CSA cards, considering the previously announced climate forecast and possible impacts on their production system. The Moderator is assisting the players during the decision-making process. Alternatively, the decision process can also start with an overall discussion of the group.

Once every player has decided which practices he wants to implement (CSA practices are set in stone for this round), the games round is closed. After using the Climate Randomizer Function (CRF) in the control file, impact values are calculated. All participants can see how the cropping season worked out for them. The CRF selects a random Climate Event based on the probabilities from the climate forecast, e.g., a 'normal' year would have a 0% impact on the player's revenue, a 'drought' year would have an 80% impact on the player's revenue if no CSA cards of drought resistance measures have been purchased for this plot. Alternatively to the CRF function, the Moderator can use climate events from historical records. After the moderator inputs the climate for the given round, all values are calculated based on the formulas. Players can see the results for this round on the control-board.

After a short discussion about the results of the current game round, i.e., reflecting on implemented measures (purchased CSA cards by players) and different outcomes for different players, the Moderator randomizes the weather forecast for the next round. The players can start making decisions for the next round.

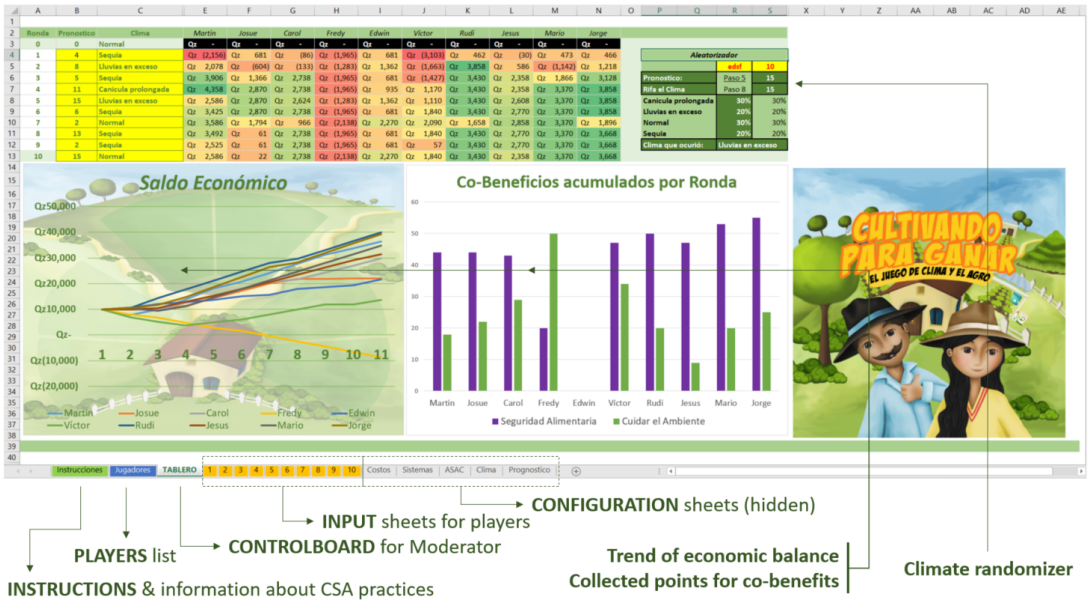


Figure 5. The Game control file.

End of the Game

The game should be played several rounds to observe and reflect on changes between rounds. In the current version, it can be played up to ten rounds. Whenever the game is stopped, the winners have to be defined by the Moderator based on results from the economic balance and the points-balance for each of the co-benefits. The final results should be discussed among players. Topics to be discussed can be in the effect of climate on production, the probability nature of forecasts (sometimes accurate sometimes not) and on how to make decisions in this context, what were the best strategy to be resilient against specific climate events, if women and men made similar decisions in terms of practices and production systems choices.

Virtual Game session

To play the game in a virtual session between Moderator and players, the game control file needs to be shared in a public folder. During game development, we used Microsoft OneDrive, and it worked well for windows users; we did not test other platforms and cloud storage platforms. Once all players are connected in a virtual conference, the Moderator shares the link to access the control file to all payers and explains the game process and required actions by players. The game is played in the same way as it is played as a board game, though players can input their decisions on their respective input sheet; the Moderator can share his screen and show the results in the control board for the discussions.

To play this version of the game, it is necessary to check the player's access to ICTs and that they have the skills to use them.

The print version of the game

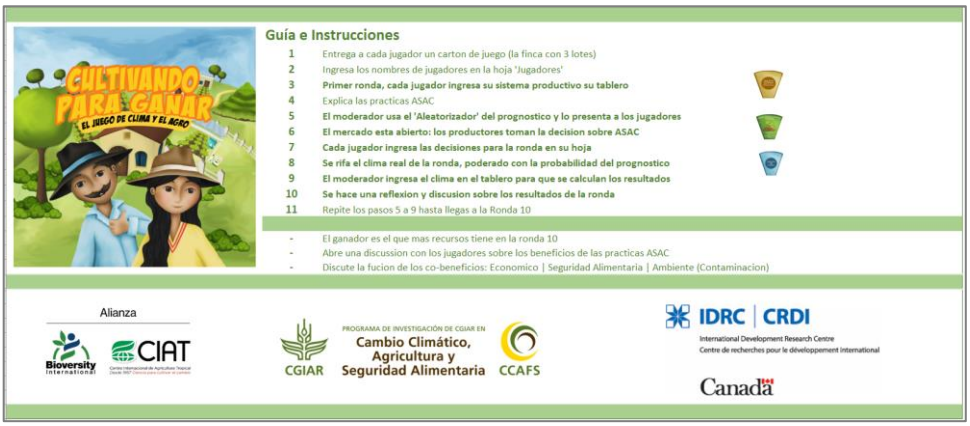
The printed version of the board game includes the following elements:

Game box cover

It can be printed and folded as a box cover.

Game box

It can be printed and folded to a box.



How to play: Instructions

Players Table board:

Each player receives an individual board to locate the collected cards for production systems and CSA practices on one of the three plots. Every round, he changes the collected cards based on his strategy to cope with the announced climate forecast.

Production Systems card:

Each card represents a different agriculture production system; they can be located on each of the free plots or changed before a new round starts.

Climate Event card:

Climate events cards are used by the game moderator to announce the climate forecast and present the occurred climate after each round.

CSA practices cards:

These cards describe, illustrate, and provide details about costs for implementing a CSA practice. Players can collect and locate them next to their plots and production systems.

CSA Co-benefits cards:

This information card is available for each CSA practice and provides further details, like co-benefits and when they are useful to be implemented.

6. Lessons learned and next steps

Games are an exciting tool to complement traditional learning methods in several ways. First, learning is promoted through gaining experience from the player's success and failure during the game. Also, the context of the game forms a safe learning environment for testing alternative decisions. Moreover, discussion among players about the game outcome can be stimulating for real-world situations of making decisions about adopting CSA practices. Simulation games can also make players aware of their mental models and potentially change them or beliefs about climate risks and farming. Overall, the game is a useful tool for researchers to understand players' perceptions about climate risks, seasonal weather forecasts, and climate-smart agriculture options to cope with risks. For national and local stakeholder experts, it is a practical tool to be used in action research and to complement other learning approaches. In the next step, the game will be made available online as a package for download and modification, e.g., including new CSA practices and production systems, to complement the existing package prepared for this project for two case studies in Guatemala and Honduras. Further, we aim to develop an online game that can be played by multiple players independent of location and time.

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