Transferring climate knowledge in the science-policy interface for adaptation to drought in Uruguay

Project duration: 30 months **Funding requested**: U$S 162.000

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Executive Summary (250 words max.)

In Uruguay, there is a high degree of institutionalization of the climate change issues at political level through the National System for Response to Climate Change and Variability (SNRCC), a network of government institutions. From the academia the University wide Interdisciplinary Center for Response to Climate Variability and Change (CIRCVC-UdelaR) generates climate change scientific knowledge. These two institutional assets make Uruguay an excellent case study for interdisciplinary science-policy interaction. The aim of this project is to develop a direct interaction at the science-policy interface to enhance the adoption of climate knowledge targeted to the decision-making in terms of public policy. It is conceived as a contribution to identify and overcome barriers to the application of climate knowledge to a specific agricultural Uruguayan situation: the adaptation to agricultural drought. A first team will apply social network analysis to represent the roads that climate knowledge runs and identify "nodes" where it is concentrated, interrupted or weakened, and test designs of different types of networks to explain the flow of information. A second team will study the interdisciplinary process through recording and providing feedback to the work of the first interdisciplinary team studying climate knowledge transfer at the science-policy interface. Both teams together will develop methodological guidelines for future design of interdisciplinary work. The main outcome will be the "bridge" between CIRCVC-UdelaR and relevant government institutions (Ministry of Agriculture and Ministry of Land Planning and Environment), strengthening CIRCVC as border institution to deal with the decision-making process for adaptation to climate change.

Introduction and Background Information

Much progress has been made in the scientific understanding of climate and in the development of climate services applicable to the agricultural sector. However, the degree of adoption of climate services or the use of the available climate information mismatch the rate at which it is produced or it is expected to be used (Baethgen et al, 2009; Dilling and Lemos, 2011). This mismatch between the scientific knowledge and adoption at the policy level is found in many other areas, and it has multiple causes. Two central issues involved in this problem relate to the disciplinary approach of scientific inquiry and the institutional linkages between scientific and policy institutions. Therefore, any contribution in the direction of adaptation to climate variability and change must consider at the same time the interdisciplinary process in science and the institutional aspects of knowledge flow.

This project proposes a contribution to better understand, explain and overcome barriers to the application of climate knowledge to a specific agricultural Uruguayan situation: the case of adaptation to agricultural drought. Grasslands in Uruguay occupy more than 70% of the soil surface (MGAP, 2002), involve 82% of agricultural producers and employ half of the economically active rural population (Caputi, 2005). The drought of 2008/2009 caused losses equivalent to U$ 342 million in the livestock sector with a strong impact on the national economy (Paolino et al, 2010). Partly in response to this crisis, the National System for Response to Climate Variability and Change (SNRCC) was created in Uruguay by the Executive Order No. 238/009 on May 20, 2009. This System constitutes a space of coordination and planning of public and private actions for risk prevention, mitigation and adaptation to climate variability and change. We understand that there is agro climatic information available in Uruguay to prevent and mitigate the effects of agronomic drought, but there are persistent problems in the process of transferring climate knowledge: communication, translation, adequacy and possible feedback to the availability of actionable knowledge (Meinke et al, 2006).

By climate knowledge we understand the smart use of climate information (Maia and Meinke, 2006). To acquire climate knowledge is necessary to understand climate variability (physical dimension), the system variability (climate impacts, biophysical dimension) and the vulnerability (results of climate variability, economic and social results of it, Maia and Meinke, 2006). Literature indicates the need to strengthen “border institutions” that can act as an interface between science and society to achieve socially beneficial applications of climate knowledge. Border institutions refer to settings (spaces) where issues are addressed in a comprehensive manner, transcending the reductionist analysis which is characteristic of normal science (Funtowicz and Ravetz, 2003). These spaces are conceived as multidisciplinary and with an explicit role of translation and mediation between science and society (Meinke et al, 2006; Cash et al, 2003). The University of the Republic in Uruguay (UdelaR) created the Interdisciplinary Space (EI) in 2009, aimed to gather researchers from different disciplines and other stakeholders to address current and complex problems with high social impact. In this context, one of the interdisciplinary centers developed within the EI was the Interdisciplinary Center for Response to Climate Variability and Change (CIRCVC), with the task of providing academic foundations for the development of a national strategy to respond to climate change in different systems (agriculture, health, energy). The

CIRCVC has recently signed a cooperation agreement with the SNRCC with the aim of strengthening national capacities to mitigate and adapt to climate variability and change in the context of the activities of SNRCC.

The existence of these two institutions dealing with climate change issues (at the policy level the SNRCC, and academic level the CIRCVC-UdelaR) make Uruguay an excellent case study for interdisciplinary science-policy interaction for the adaptation to climate change. Therefore, in this project we focus in the two central issues described earlier: the "interdisciplinary process" of scientific construction (Lattuca, 2001) and the institutional linkages between scientific and policy institutions that are involved in climate knowledge transfer.

Objectives

The overall objective is to develop and improve the dialogue in science-policy interface for the adoption and application of climate knowledge in the case of adaptation to agricultural drought in Uruguay. This general objective will be reached through achieving the following specific objectives: 1) To identify the supply and demand for climate knowledge to support decision-making for adaptation to drought in grasslands systems, 2) To strengthen the channels of communication between climate scientists and public policy makers (SNRCC) 3) To consolidate the Interdisciplinary Center for Response to Climate Change and Variability (CIRCVC, UdelaR) as reference institution in exchanging climate knowledge between science and public policy in both directions, 4) To record and analyze the interdisciplinary process in order to delineate specific methodological guidelines for future interdisciplinary work.

Feasibility and Methodology

Several aspects make this proposal feasible. On one hand, the high degree of institutionalization of the climate change issue: at public policy level the existence of SNRCC and at academic levels the operation of CIRCVC. On the other hand, there is work experience from the proponent team members in successfully developing interdisciplinary and multinational projects. As a concrete example, the project "Assessment of current and future vulnerability of grasslands systems to Variability and Climate Change: Case Uruguay "(IAI, TSIG-P3) had a noticeable effect: the availability of an applicable methodology (Cruz et al, 2007) provided the request from the Ministry of Livestock, Agriculture and Fisheries (MGAP) for CIRCVC develop the second phase of the project "Study of the sensitivity and adaptive capacity of the main agro-ecosystems to the impacts of climate change and variability" (Picasso et al, 2012). Another aspect that contributes to increase the feasibility of this project is the synergy with running CRN3 (PI Cecilia Hidalgo) in the framework of international collaboration networks. Our proposal includes a formulation of objectives that is complementary between the two projects, while the expected results are enhanced by having the study case of Uruguay which was not incorporated into the mentioned CRN3 project.

<u>Study of relationship between science and policy</u> (objectives 1, 2 and 3)

The study will focus on climate knowledge flow to the specific problem of drought on grassland livestock production systems of Uruguay, understanding that impacts transcend the biophysical dimension of the system. What is proposed in this project is a direct interaction at the science-policy interface to enhance the adoption of climate knowledge in decision-

making, specifically in terms of public policy (Figure 1, represented by the dotted line). The historical repetition of agricultural drought and the different answers that have been given at political level, have allowed collective learning of social and political actors (Figure 1). However, it is understood that the proper management of climate knowledge by stakeholders would be an input to improve the system´s ability to actually and effectively respond to climate variability.

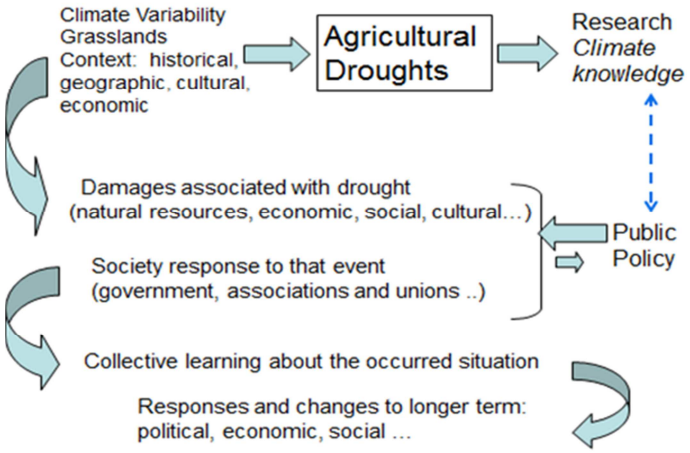

Figure 1. Chain of events after an agricultural drought

The approach to the study of climate knowledge flow can be conceived naively as a study of "supply" and "demand" (Sarewitz and Pielke, 2007). This initial step should lead us to identify the "networks" that are interconnected and which we need to understand; here is where climate knowledge is immersed and circulates. We propose to apply social network analysis (Serrat, 2009) to represent the roads that climate knowledge runs and identify "nodes" where it is concentrated, interrupted or weakened, and testing designs of different types of network that explain this flow of information. The concept and use of networks is shared by various sciences (sociology, ecology, engineering), and thus can in itself become a point of methodological interdisciplinary approach (Borgatti et al, 2009).

The methodology to systematize the "supply" will consist in interviews with qualified informants from institutionally legitimized sources (National Weather Service-DNM, National Institution for Agricultural Research-INIA, Agriculture Plan Institution-IPA, Universities and other institutions) that disseminate agro meteorological information and perform some processing and interpretation of data. Sources that produce climate products using global general circulation models (GCM) will not be covered by this project, this aspect has already being covered in detail by the CRN3 (PI Hidalgo). However, the project will identify which global sources were used by the institutions whose function is to integrate, translate and communicate that GCM information.

The analysis of climate knowledge “demand” starts in the general needs of the SNRCC, which as a whole is the main public policy network for climate adaptation. However to deeply understand the “demand” side, a more profound analysis should be performed by directly engaging Ministries that make decisions based on climate knowledge (for example Agriculture, Energy and Heath), local government institutions (such as Departments or Municipalities), the National Emergency System, and also the private sector (for example Agriculture producers), and the local community.

After concluding the “supply” and “demand” analysis a more complex analysis will be performed using the networks approach. Climate knowledge “nodes” will be identified and characterized as supply or demand, and also a characterization of the hierarchy of the nodes in the network will be performed. At last a “link” analysis will be performed using a link characterization based on concentration of knowledge flow.

Study of the production of interdisciplinary work (objective 4)

We propose the existence of a group (B) which will observe, record and fed back the work of the group responsible for objectives 1, 2 and 3 (group A) (Figure 2). In this working model we consider the presence of a member in both groups as facilitator (bridge). The expected achievement of group B is the feedback from group A to improve its performance (identify and mediate in conflict resolution, correct directions, etc.) and not just restricted to observation and description of the process. How do you ensure the proper functioning of group B? In principle, this group will have a small number of members, less heterogeneous in terms of their basic training (mostly social sciences) and are circumscribed only to objective 4, so we understand that complexity in their relationship will be less.

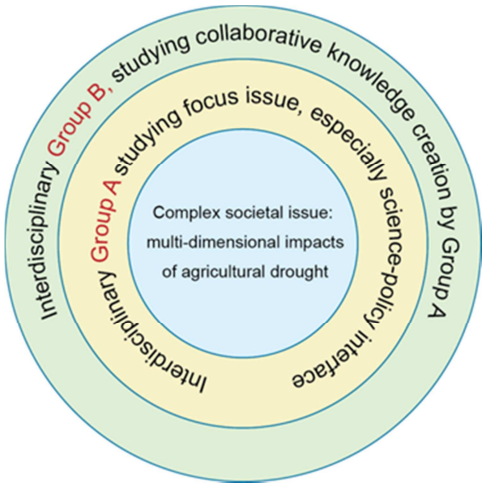

Figure 2. Interdisciplinary model

The monitoring, recording and feedback process from Group B to Group A will increase the likelihood of successfully achieving objectives 1, 2 and 3. On the other hand, the work of group B will also develop an experimental study basis to delineate specific methodological guidelines for futures interdisciplinary work.

Contribution to Science Integration / Expected Results / Outcomes

The most important outcome will be the establishment of a "bridge" between the EI and Uruguayan relevant government institutions for this study (Ministries of Agriculture and Environment). Although intangible, this result will enable genuine dialogue and mutual recognition around the decision-making process for adaptation to CC. Strengthening CIRCVC as border institution involves adjusting the ways and levels of engagement with political actors, developing a "semipermeable membrane" which will safeguard what the literature emphasize: salience, legitimacy and credibility (Meinke et al, 2006). The study will highlight network places, institutions or individuals where climate knowledge flow is slowed, eased or interrupted, which will enable the team to detect which actors and/or processes contribute to strengthen the system so that

others can learn and imitate. Indicators for assessing the achievement of objectives 1, 2 and 3 are: graduate students enrolled and developing its program according to the framework of the project; publishing a book with the mapping of actors and study of networks along with other partial results of the project; number of workshops and representation within the sector of interest, jointly developed short publications (research and policy) on individual cases of successful collaboration.

The group B will develop methodological guidelines for future design of interdisciplinary work. At least one postgraduate student will be fully dedicated to the interdisciplinary study. Other indicators are the number of "plenary" meetings; feedback to Group A, and develop of specific publications of work progress.

Work Plan/Activities/Timeline, including deliverables

	Year 1	Year 2	Year 3	Total
Postgraduate students	3	5	2	5
Workshops	1	2	1	4
Local seminars	4	4	2	10
Virtual communication	sustained	sustained	sustained	-
Deliverables	Annual report Web page	Annual report Publications	Final report, Book Publication	3 Reports, web page, 1 Book, Publications

Contribution of Project Team / Institutional & Multidisciplinary collaboration

In the context of multidisciplinary collaboration, the main contribution of the team is training five postgraduate students (3 of Uruguay, 1 of Argentina, and of 1 Brazil). Such training will be inserted into postgraduate programs that include specialization of some students within objectives 1, 2 and 3 of this project. Other students will specialize in the area of interdisciplinary research.

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Gabriela Cruz is a lecturer and research professor at Center for Response to Climate Variability and Change (CIRCVC) of the Interdisciplinary Space (EI) and at the Agronomy Faculty (FA), both from the University of the Republic (Uruguay). Firstly trained in agro climatic research, MSc (Ing. Agr.) Cruz has led multidisciplinary projects related to vulnerability of Uruguayan agro ecosystem to climate change and variability. She also developed studies for assessing agricultural vulnerability to climate variability in request of Ministry of Livestock Agriculture and Fisheries from Uruguay. She is active in tutoring graduate and postgraduate students in topics related to climate change and interdisciplinary.

Publications most relevant to this proposal

Picasso, V; Cruz, G; Astigarraga, L; Terra, R. 2012. Cambio y Variabilidad Climática: Respuestas Interdisciplinarias. Espacio Interdisciplinario, Universidad de la República. Book of the *Interdisciplinary Collection*. 167 p.

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Relevant experience and achievements:

- PI in IAI-funded TSIG-P3 focused on design a methodology to assess the vulnerability of grassland systems from Uruguay to climate change (2006).
- CoPI in the institutional strengthening project of the Agronomy Faculty “Sustainability of Farming Systems” (2012–2017).
- Co-organizer of international workshops on issues related to climate change and variability (IAI-CIRCVC-IRI, 2011; CIRCVC - FA, 2011 and 2012; FA, 2007).