CONCEPT NOTE

JEEViKA-IRAP: Integration of Climate Information into JEEViKA for Climate Resilient Livelihood in Bihar, India

Partners:

Bihar Rural Livelihood Promotion Society (BRLPS), Government of Bihar:

and

International Research Application Program (IRAP) of the University of Arizona and International Research Institute for Climate and Society (IRI), Columbia University:

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JEEViKA-IRAP: Integration of Climate Information into JEEViKA for Climate Resilient Livelihood in Bihar, India

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Summary

JEEViKA-IRAP is a collaborative project between the Bihar Rural Livelihood Promotion Society (BRLPS), an initiative of the Government of Bihar for poverty alleviation; and the International Research Application Program (IRAP) of the University of Arizona and the International Research Institute (IRI) at Columbia University, supported by the National Oceanic and Atmospheric Administration (NOAA) of the United States. The goal of the project is to study the usefulness of integrating climate forecast information into JEEViKA, the rural livelihood program of the BRLPS, for climate resilient livelihood. In doing so, the project will pioneer in demonstrating the returns to a climate information dissemination component to a livelihood program. If successful, the project may serve as a template for effective designs of climate resilient rural livelihood programs in many other parts of the world, beyond generating scientific evidence on the values of demand-driven climate information services. In this note, we briefly describe our motivation, experimental design, potential outcomes of the impact evaluation, timeline, and the respective roles and responsibilities of JEEViKA and IRAP.

1. Motivation

Most developing countries are vulnerable to climate variability and change, particularly extreme events and stresses on water resources.[1] Insufficient rainfall leads to drought with impacts on water, with implications for energy and food security.[2] Episodic events (e.g., cyclones) portend flooding, coastal damage, and related risks. However, different communities

[1] http://www.theguardian.com/global-development/2013/sep/27/climate-change-poor-countries-ipcc

[2] David Lobell, Marshall Burke et al. (2008). "Prioritizing climate change adaptation needs for food security in 2030". *Science* 319, 607-610.

respond differently to the same climate event. This has to do with the fact that a community's climate vulnerability is determined by its ability to absorb or minimize the event and the capacity to recover to a pre-event stage. In this context, the development and provision of climate-related knowledge and information, such as rainfall forecasts for the coming weeks and months, customized to local conditions, offers promise to help communities better cope with weather and climate shocks under a changing climate.[3] This is the goal of the IRAP project, a joint effort between the University of Arizona and the International Research Institute for Climate and Society (IRI) of Columbia University, supported by NOAA and USAID.[4]

Bihar is the most flood-prone state of India. In north Bihar, over 76% of the population lives under the recurring threat of flood, and there is an increasing perception that recurring floods are becoming more unpredictable and damaging, accompanied by changes in the Monsoon pattern and the intensity of extreme weather events. South Bihar is prone to frequent and increasingly

[3] Rahman, Tauhidur; Buizer, James; and Guido, Zackry (2016). "The Economic Impact of Seasonal Drought Forecast Information Service in Jamaica, 2014-15." Working Paper, IRAP. A paper, without the technical details, prepared for the United States Agency for International Development (USAID). The paper studies the economic impact of the drought forecast information service provided to farmers by the Jamaican Meteorological Service (JMS) during 2014-15. The impact is estimated by comparing the self-reported losses in agricultural production of 453 farmers by their degree of exposure to the information service, and by comparing the losses of sub-groups of the farmers with/without the uncertainty of water, rainfall, and drought (WRD). For the group of farmers faced with the uncertainty of WRD, the loss in the agricultural production was on average 25% larger relative to the mean loss of 57%. However, in the former group, the reported loss in agricultural production declined with the increasing degree of exposure to the information service. In other words, the losses in agricultural production for the farmers faced with the constraint of WRD would have been much greater if not for the provision of the drought forecast information service. The information service contributed to agricultural production by influencing the agricultural decisions of farmers including changes in the planting and sowing time, choice of crops, harvesting time, amount of land cultivated, mulching practices, chemical and fertilizer use, and irrigation.

[4] For more information, see: http://irap.iri.columbia.edu/

intense droughts.[5] However, access to timely and relevant climate forecast information in rural communities is still very limited.[6]

JEEViKA has been working towards improving the livelihoods of poor households in Bihar since 2007 through access to less expensive credit, access to credit for productive activities and training for those activities, and the empowerment of women both within the household and for external collective action.[7] Numerous studies have documented significant successes of JEEViKA in changing economic livelihoods of poor households[8], women's executive function[9], women's mental and emotional health[10], aspirations[11], and gender-related social norms[12]. However, JEEViKA could be more effective in improving livelihoods with a well-defined climate information dissemination component. On other hand, IRAP's strength is in the production of demand-driven climate information including forecasts, but it is beyond its scope and capacity to alleviate economic, social, and institutional challenges to rural livelihoods. Thus, Bihar presents a tremendous scope for JEEViKA and IRAP to develop a collaborative project,

[5] State Action Plan for Climate Change, Government of Bihar, November, 2014.

[6] Bhatta GD, Singh RKP, and Kristjanson P. (2013). Summary of Baseline Household Survey Results: Vaishali Site, Bihar State (Northeast India). CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark.

[7] For details, see: www.brlp.in

[8] Datta, Upamanyu (2015). Socio-Economic Impacts of JEEViKA: A Large-Scale Self-Help Group Project in Bihar, India. *World Development,* 68: 1-18.

[9] Rahman, Tauhidur and Rao, Vijayendra (2015). Can a Women's Anti-Poverty Program Affect Women's Executive Function? Working Paper. Available upon request

[10] Kumar, Ashutosh and Rahman, Tauhidur (2016). Can a Women's Rural Livelihood Program Improve Mental and Emotional Health? Evidence from India. Working Paper. Available upon request.

[11] Rahman, Tauhidur and Rao, Vijayendra (2016). Women's Anti-Poverty Program Raises Aspirations for Girls: Evidence from a Quasi-Experiment in India. Work in progress.

[12] Rahman, Tauhidur and Rao, Vijayendra (2016). JEEViKA, Social Norms, and Women's Empowerment. Work in progress

JEEViKA-IRAP, to demonstrate and test the usefulness of integrating a demand-driven climate forecast information program into JEEViKA programming for climate resilient livelihood. In doing so, the project will pioneer in demonstrating the returns to a climate forecast information component to a livelihood program. If successful, the project may serve as a template for effective designs of climate resilient rural livelihood programs in many other parts of the world. In addition, the project will generate scientific evidence on the values of demand-driven climate information services.

1.1. Theory of Change

Figure 1 sketches the JEEViKA-IRAP's theory of change behind the development and integration of a climate information dissemination component into the programming of JEEViKA for climate resilient livelihood in Bihar.

Variations in temperature, precipitation, and frequency and intensity of extreme weather events (e.g., floods, droughts) have impacts on agricultural productivity[13], availability of resources (e.g., water, fodder, and fuel), health, and infrastructure, thus leading to climate vulnerability of livelihoods.[14] However, coordinated efforts to mitigate the (adverse) impacts of weather and climate shocks can help make livelihoods in rural Bihar less vulnerable, more secure and resilient to climate, and help them to adapt to a changing climate.

There are distinct challenges to climate adaptation in rural Bihar. Social, cultural, institutional, and geographic characteristics are community-level factors that make some

[13] Guiteras, Raymond (2009). The Impact of Climate Change on Indian Agriculture. Working Paper. University of Maryland.

[14] Hallegatte, Stephane, Mook Bangalore, Laura Bonzanigo,Marianne Fay, Tamaro Kane, Ulf Narloch, Julie Rozenberg, David Treguer, and Adrien Vogt-Schilb. 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Climate Change and Development Series. Washington, DC: World Bank

communities particularly vulnerable to climate risks. Institutional inertia and lack of cooperation, coordination, and information sharing among the communities are some of the obvious barriers. At the household level, poverty, education, access to credit, and access to climate information are the prominent limiting factors. Since access to climate information is very scarce in the rural Bihar, we posit that the climate resilience of rural livelihood can be enhanced through a demand-driven climate information program, customized to local conditions.

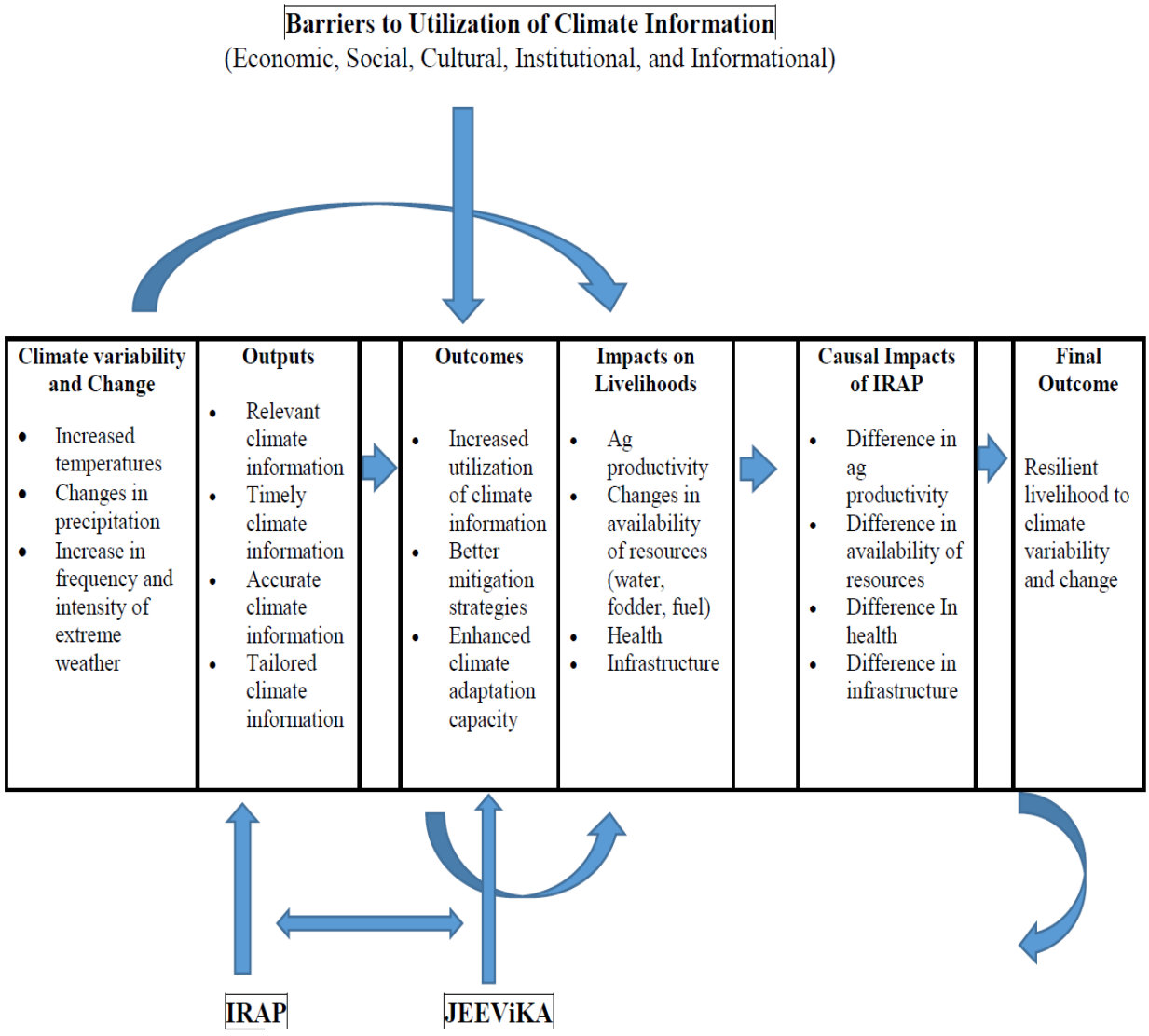


Figure 1. Theory of Change

Thus, IRAP intends to provide demand-driven tailored climate forecast information to the households in the treatment (JEEViKA-IRAP) villages (see Section 2) and identify its value by estimating its impacts on the rural livelihoods. It is well-known, however, that the availability and access to climate information do not guarantee that the information will be utilized by the households. Even if climate information is relevant and timely, a household may not be able to act on the new information because of other limiting factors (e.g., access to finances, lack of trust, inertia, risk aversion, and reliance on past experiences, etc.). Therefore, it is not surprising that many well-intended and targeted climate information services have not found acceptance and have failed to produce the desired impacts.[15]

This underscores the fact that IRAP's climate information program on its own is unlikely to find much success in enhancing climate resilient rural livelihoods. This is where JEEViKA's complementary role assumes significance. With JEEViKA focusing on poverty alleviation and the social empowerment of households, the climate forecast information from IRAP is more likely to be adopted and utilized by households in their livelihood management decisions. In other words, with JEEViKA remediating the barriers to the utilization of climate information, we can expect that the forecast information provided by the JEEViKA-IRAP will find greater acceptance and utilization, resulting in better-informed and expanded coping strategies available to the households. This, in turn, may minimize the adverse impacts of climate change on livelihoods. Thus, we argue that the JEEViKA-IRAP will enhance climate resilient rural livelihood in Bihar.

2. Experimental Design

[15] Mase, AS and Prokopy, LT (2014). Unrealized Potential: A Review of Perceptions and Use of Weather and Climate Information in Agricultural Decision Making. *Weather, Climate, and Society*, 6:41-61.

We will study the efficacy of the JEEViKA-IRAP in promoting the climate resilient rural livelihood in both flood-prone and drought-prone areas. Accordingly, our field experiments will be designed and the samples will be constructed.[16] We first randomly select 132 villages[17], from a set of villages with the similar exposure to JEEViKA, from two flood-prone districts of Bihar. Then we randomly divide the 132 sample villages into treatment (JEEViKA-IRAP) and control (JEEViKA) groups (See Table 1). This village-level randomization is stratified by blocks, which are administrative units that consist of 100-200 villages. The 132 sampled villages will be spread across 12 blocks in the two flood-prone districts.

Table 1. Sample Design

	Flood-Prone Districts		Drought-Prone Districts		
	Darbhanga	East Champaran	Nawada	Jehanabad	
JEEViKA-IRAP (Treatment) Villages: 66	33	33	33	33	JEEViKA-IRAP (Treatment) Villages: 66
JEEViKA (Control) Villages: 66	33	33	33	33	JEEViKA (Control) Villages: 66
Total: 132 Villages	66	66	66	66	**Total: 132 Villages**

[16] Harrison, Glenn W. and John A. List (2004). Field Experiments. *Journal of Economic Literature*, 42(4): 1009-1055.

[17] A village in India is a rural area where the population is below 5,000 and the density of population is less than 400 per square Kilometer. In a village at least 75% of the males of the working population are engaged in agricultural pursuits.

Similarly, we randomly select 132 villages, from a set of villages with the similar exposure to JEEViKA, from two drought-prone districts of Bihar. Then we randomly divide the 132 sample villages into treatment (JEEViKA-IRAP) and control (JEEViKA) groups, where village-level randomization is stratified by blocks. The 132 sampled villages will be spread across 12 blocks in the two drought-prone districts.

2.1. Selection of Districts

Based on soil, rainfall, temperature, and terrain, Bihar has been classified into four agro-climatic zones (Figure 2). Zones I and II are flood-prone areas whereas zone III is drought-prone area.



Figure 2. Agro-Climatic Zones, Bihar

Given our objective of studying the usefulness of climate forecast information in areas vulnerable to floods and droughts, we have selected the districts of Darbhanga and East Champaran from Zone I, and Nawada and Jehanabad from Zone III. The selected districts are among the most vulnerable districts in Bihar to climate change (Figure 3), making them suitable for climate adaptation interventions. The choice of the districts was also influenced by the districts' exposure to JEEViKA.

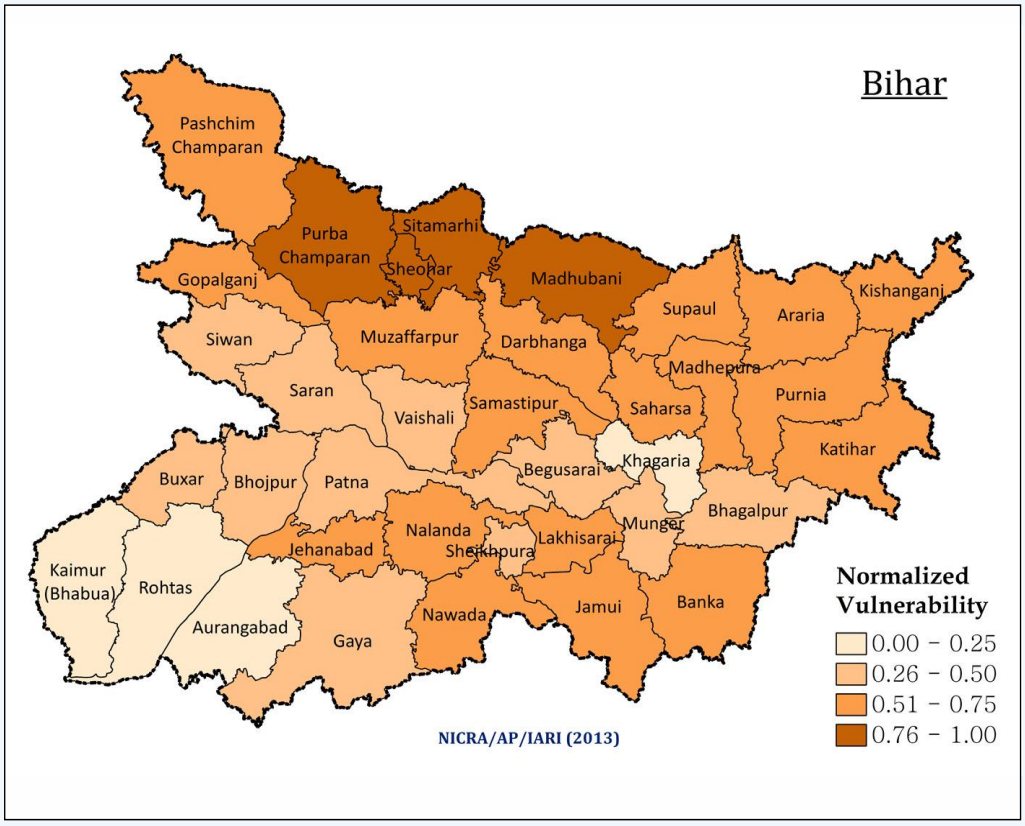


Fig. 32. Normalized vulnerability of agriculture to climate change in various districts of Bihar

Figure 3. Vulnerability of Agriculture to Climate Change

2.2. Sampling of Households

For the baseline survey, 25 households will be randomly sampled from the list JEEViKA of households from each of the selected villages. That is 132*25= 3,300 households from the flood-

prone villages and an equal number of households from the drought-prone villages will be surveyed. The baseline data will be analyzed for the households' climate vulnerability and resilience, identifying climate information needs, and informing the intervention design of the JEEViKA-IRAP.

For the impact evaluation of the project, the households will similarly be sampled from the treatment and control villages. Given the experimental design of the project, identifying and estimating the causal impacts of the JEEViKA-IRAP will be straightforward. The project will be evaluated for its impacts on a range of outcomes (see Table 2), varying from changes in households' adaptation capacity, changes in coping strategies, economic outputs, to behavioral impacts.

Table 2. Potential Outcomes of Impact Evaluation

Real Outcomes	Changes in Coping Strategies	Adaptation Capacity	Behavioral Outcomes
- Agricultural outputs - Income - Others	-Crop diversification -Income diversification -Changes in saving and investment - Agricultural decisions and management practices	- Awareness - Training - Capacity - Others	- Attitudes - Perceptions - Bias - Understanding and processing of climate information

3. Roles and Responsibilities

The project will be a joint effort between JEEViKA and IRAP. It will be jointly developed, implemented, and studied for its impacts. However, each partner will take the lead in its respective areas of strengths (see Table 3). IRAP will lead the development of the project,

JEEViKA will lead the implementation. While IRAP will be responsible for integrity of the study, JEEViKA will be responsible for maintaining the integrity of the study (experimental) design.

The project will assign two senior officers, one with the responsibility of livelihoods, and the second with the responsibility of monitoring and evaluation. During the project implementation, one JEEViKA young professional will be assigned with the task of monitoring, documenting, and reporting the implementation progress. JEEViKA is leader in capacity building and developing extension services. For the project, JEEViKA will develop training modules and will build the capacity of implementation staffs, CBOs and Community professionals. While the specific methods of information dissemination will be identified according to the baseline results and the inputs from various focus groups, the methods will include workshops at the state, district, block, and village levels using cascading model. JEEViKA will also organize Consultation Workshop with stakeholders. JEEViKA will create the platform for the information dissemination.

IRAP will identify the information need of the households based on the baseline analyses and focus groups in the selected districts during August-December 2016. Accordingly, IRAP will develop demand-driven climate forecast information. It will also help in designing of the training modules, building capacity of JEEViKA Project Staffs and in the development of learning cases. IRAP will provide the intellectual leadership to the project.

The partnership will also incubate, beyond JEEViKA-IRAP, the exchange of ideas and knowledge sharing through regular academic visits of the respective project teams in the United States and Bihar.

Table 3. Core Team

Name	Affiliation
Buizer, James	Co-Director, IRAP Professor, School of Natural Resources and the Environment & Institute of the Environment, University of Arizona
Lisa Goddard	Co-Director, IRAP Director, IRI, Columbia University
Kishore, Siddharth	Graduate Research Assistant, University of Arizona
Kumar, Manoj	State Project Manager, Livelihoods, BRLPS
Kumar, Niranjan	Young Professional, BRLPS
TBD	Post Doc/Graduate Research Assistant, IRI
Rahman, Tauhidur	AREC, University of Arizona
Ranjan, Ajit	State Project Manager, Monitoring & Evaluation, BRLPS
Robertson, Andrew	Senior Research Scientist, IRI, Columbia University

Dr. Tauhidur Rahman will be responsible for the overall progress of project. In addition, when needed, he advise other JEEViKA programs and initiatives.

4. Project Timeline

The baseline data will be collected from May 2016 to November 2016 (see Table 4) by a third party under the supervision of JEEViKA-IRAP. It is estimated that the intervention will occur from March 2017 to December 2017, allowing sufficient time to cover all of the project treatment villages.

Table 4. Activities

Baseline Analysis	Development of Intervention	Intervention Period	Impact Evaluation
1. May-Nov 2016: Data Collection 2. Oct-Dec. 2016: Baseline analysis - Vulnerability - Resilience - Gaps and Needs - Identification of climate info needs	1. May 2016-March 2017 2. Pilot of climate information 3. Pilot of medium of information communication	1. March 2017 to December 2018 - Will adjust with ag cycle - Cover at least two cropping seasons	1. February-April 2018: Data collection 2. May-August 2018: Impact evaluation 3. August-Dec 2018: Recalibration of JEEViKA-IRAP