

Articles List 4 - 2008

1. Introduction Managing agriculture and rural development for poverty reduction

Muhammad Aslam Chaudhry

Natural Resources Forum (2007) 31:250-252

2. Food Poverty Profile and Decomposition Applied to Ghana

Stephen S. Kyereme and Erik Thorbecke

World Development (1987), 15(9):1189-1199

Abstract

A new procedure for deriving a food poverty line and estimating a decomposable poverty measure is applied to the 1974-75 Ghana Household Budget Survey. A food poverty profile is constructed which estimates the relative contributions of regional and socioeconomic variables to overall food poverty. The incidence of food poverty is found to be more prevalent in: (1) rural areas and locations close to the Sahel; and (2) households with many members and illiterate, female, or self-employed heads. Comparisons of least-cost diets and observed diets incorporating tastes suggest that households exercise food preferences which have relatively high costs.

3. Transboundary Water Law in Africa: Development, Nature, and Geography

Jonathan Lautze & Mark Giordano

Natural Resources Journal (2005) 45

Abstract

This article documents and analyzes the largest collection of transboundary water agreements related to Africa. Collection contents are categorized to provide insights into the evolution and geography of transboundary water law in Africa, and – when possible- to situate that law within a global context. The findings reveal that both historic and geographic factors have influenced African agreements. Historically, there is a trend toward increasing robustness generally consistent with global trends. Geographically, agreements vary by the degree and type of water scarcity in associated basins. The findings help answer questions related to current transboundary water management in Africa and provide guidance for future institutional development.

4. Equity in Transboundary Water Law: Valuable Paradigm or Merely Semantics?

Jonathan Lautze and Mark Giordano

Colorado Journal of International Environmental Law and Policy (2006), 17(1): 89-122

Abstract

Equity has emerged as an important principle in transboundary water law in recent years, particularly in relation to water allocation. Yet basic questions remain unanswered. What constitutes an equitable transboundary water agreement? What constitutes an equitable allocation of shared waters? And has the inclusion of equitable language really made a difference in transboundary water law at the basin level? This paper uses Africa as a case study to critically assess past efforts to integrate equity into transboundary water law. The qualitative characteristics of agreements claiming to consider equity are first compared to those making no such assertion to reveal what differences, if any, exist. The paper then develops a quantitative methodology to measure equity in transboundary water allocations. This methodology is used to compare codified water allocations in agreements that purport to consider equity with those that do not. The findings reveal that agreements referring to equity differ substantively from others and, in fact, divide water in a more equitable manner. While the study is limited to Africa, it at least suggests that the equity concepts behind the 1966 Helsinki Rules and the 1997 United Nations Convention on Non-Navigational Uses of International Watercourses have had a tangible impact on basin level agreements.

5. Demanding Supply Management and Supplying Demand Management: Transboundary Waters in Sub-Saharan Africa

Jonathan Lautze and Mark Giordano

The Journal of Environment & Development (2007), 16(3): 290-306

Abstract

The emphasis of the world's transboundary water law has gradually shifted in the past half century from water resources development to water resources management and environmental protection. This change in institutional focus is a natural outcome of changing resource conditions, in particular the high levels of water resources development achieved in many regions as well as rising economic prosperity and associated changes in environmental perception. Surprisingly, this analysis reveals that transboundary water law in sub-Saharan Africa (SSA) follows these global trends even though SSA's levels of water resources development, economic prosperity, and food security are significantly lower than any other region in the world. These findings suggest that the nature of SSA's transboundary water law may be largely "handed down" from other parts of the world with different realities than those present in SSA. Recognizing this relationship can provide important lessons for improving transboundary water governance in the region.

6. Hydroclimatology of the Volta River Basin in West Africa: Trends and variability from 1901 to 2002

Philip G. Oguntunde, Jan Friesen, Nick van de Giesen, Hubert H.G. Savenije

Physics and Chemistry of the Earth (2006) 31:1180-1188

Abstract

Long-term historical records of rainfall (P), runoff (Q) and other climatic factors were used to investigate hydrological variability and trends in the Volta River Basin over the period 1901-2002. Potential (E_p) and actual evaporation (E), rainfall variability index (d), Budyko's aridity index (I_A), evaporation ratio (C_E) and runoff ratio (C_Q) were estimated from the available hydroclimatological records. Mann-Kendall trend analysis and non-parametric Sen's slope estimates were performed on the respective time series variables to detect monotonic trend direction and magnitude of change over time. Rainfall variability index showed that 1968 was the wettest year ($d = +1.75$) while 1983 was the driest ($d = -3.03$), with the last three decades being drier than any other comparable period in the hydrological history of the Volta. An increase of 0.2 mm/yr^2 ($P < 0.05$) was observed in E_p for the 1901-1969 sub-series while an increased of 1.8 mm/yr^2 ($P < 0.01$) was recorded since 1970. Rainfall increased at the rate of 0.7 mm/yr^2 or 49 mm/yr between 1901 and 1969, whereas a decrease of 0.2 mm/yr^2 (6 mm/yr) was estimated for 1970-2002 sub-series. Runoff increased significantly at the rate of 0.8 mm/yr (23 mm/yr) since 1970. Runoff before dam construction was higher (87.5 mm/yr) and more varied ($CV = 41.5\%$) than the post-dam period with value of 73.5 mm/yr ($CV = 23.9\%$). A 10% relative decrease in P resulted in a 16% decrease in Q between 1936 and 1998. Since 1970, all the months showed increasing runoff trends with significant slopes ($P < 0.05$) in 9 out of the 12 months. Possible causes, such as climate change and land cover change, on the detected changes in hydroclimatology are briefly discussed.

7. Capacity Building: A Possible Approach to Improved Water Resources Management

Alexandra Pres

International Journal of Water Resources Development (2008), 24(1): 123-129

Abstract

This paper aims to reflect the complexity of capacity building. In providing some definitions and trends, it refers to the evolution of a concept that tries to adapt to, is applied to and faces a continuously changing environment. Further challenges will be highlighted, referring to improved water resources management. A possible approach will be described, reflecting InWENT's water programmes. Based on this reflection, some lessons learned will be shared and an outlook for future interventions and adaptations will be given. This paper does not claim to be either complete or scientific. It is the view of one practitioner, one among many others.

8. Agriculture and Food Security in Asia: The Role of Agricultural Research and Knowledge in a Changing Environment

Mark Rosegrant, Claudia Ringler, Siwa Msangi, Tingju Zhu, Timothy Sulser, Rowena Valmonte-Santos, Stanley Wood

International Food Policy Research Institute (IFPRI)

Abstract

Asia has made significant progress in increasing its agricultural productivity and reducing poverty since the 1960s. Yet real world food prices of most cereals and meats are now projected to rise, reversing a long-established downward trend with adverse impacts on poor consumers in Asia and elsewhere. Growing resource scarcity, particularly of water, will increasingly constrain food production growth, and climatic stresses will likely shrink Asian farmers' abilities to produce grains, as is predicted for the Indo-Gangetic plains. Meanwhile, growing demand for high-value foods, such as livestock, fish, vegetables, and fruits will put further pressure on the natural resource base. Moreover, bioenergy demands will compete with the land and water resources that are used for food. The consequences of these pressures will adversely affect food security and goals for human well-being, slowing progress in reducing childhood malnutrition. Drawing on projections of the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), we find that changes in investments in agricultural research and knowledge (ARK) are required to boost crop yields and growth in livestock numbers. If aggressive investments in ARK are combined with advances in other, complementary sectors, such as access to water and secondary education, then positive impacts could be further strengthened.

9. Increasing the Resilience of Dryland Agro-ecosystems to Climate Change

Richard J Thomas, Eddy de Pauw, Manzoor Qadir, Ahmed Amri, Mustapha Pala, Amor Yahyaoui, Mustapha El-Bouhssini, Michael Baum, Luis Iñiguez and Kamel Shideed

International Centre for Agricultural Research in the Dry Areas (ICARDA) 2007

10. The Rocky Road from Integrated Plans to Implementation: Lessons Learned from the Mekong and Senegal River Basins

Olli Varis, Muhammad M. Rahaman & Virpi Stucki

International Journal of Water Resources Development (2008), 24(1): 103-121

Abstract

There is an undeniable need to coordinate and harmonize water sector policies at the global level, particularly those in large, transboundary river basins. Recent decades have witnessed a number of large international summits and other important events for that purpose, events that have expanded substantially both in size and frequency. This study analyzed the most important events, beginning with the United Nations Conference on Water (Mar del Plata 1977) and up until the Fourth World Water Forum (Mexico City 2006). The main outcomes of the events are analyzed and a comparison is made of the developments of the water sector in the Mekong and Senegal river basins. On the one hand, the gap between international recommendations and reality in large international river basins appears to remain considerable, and on the other hand the evolution of the quality of the recommendations per se also appears somewhat questionable.

11 Climate Change Adaptation through Rice Production in Regions with High Poverty Levels

Reiner Wassmann and Achim Dobermann

Abstract

Climate change will severely set back agricultural development in tropical countries, where an increasing share of the poorest and most vulnerable population resides. Widespread and persistent poverty is a longstanding problem in both South Asia and Africa, particularly in areas without irrigation, areas referred to as "rainfed ecosystems". With the inherent problems in the agricultural sector -- such as lack of finances, poor irrigation infrastructure, etc. -- production levels in South Asia and Sub-Saharan Africa will be more affected by climate variability and change than in most other parts of the world. This review describes the expected impacts of climate change on rice

(*Oryza sativa L.*) production with emphasis on these two subcontinents and also outlines possible response strategies in rice production. Given recent progress in developing more resilient rice production systems, climate adaptation in this important income and food source could prove to be a key factor to forestall – or at least mitigate the adverse effects of climate change in South Asia as well as Sub-Saharan Africa.

12. Demand and distributional effects of water pricing policies

A. Ruijsa, A. Zimmermann, M. van den Berg
Ecological Economics (2008) 66(2-3): 506-516

Abstract

Worldwide, water scarcity threatens delivery of water to urban centers. Water pricing is often recommended to reduce demand. In this paper, demand and distributional effects of water pricing policies are examined in a block pricing model that is applied to the Metropolitan Region of São Paulo. Water demand functions are estimated using marginal and average price models based on monthly data for the period 1997–2002. Price elasticities of water demand range between -0.45 and -0.50 and income elasticities between 0.39 and 0.42. For the current combined regressive–progressive block price system, the poor spend almost 4.2% to 4.7% of their income on water. The rich only pay 0.4% to 0.5% of their income whereas they consume more than twice as much. A progressive block price or an income dependent price system may result in a more equalized income distribution. However, the analysis shows that there is a trade-off between a more equalized income distribution and revenues earned by the water company. More pro-poor pricing systems, may result as well in lower revenues for the water company.

13. Increasing water productivity in crop production—A synthesis

M.H. Ali, M.S.U. Talukder
Agricultural Water Management 2008

Abstract

Scarcity of water resources and growing competition for water in many sectors reduce its availability for irrigation. Effective management of water for crop production in water scarce areas requires efficient approaches. Increasing crop water productivity (WP) and drought tolerance by genetic improvement and physiological regulation may be the means to achieve efficient and effective use of water. But only high water productivity values carry little or no interest if they are not associated with high or acceptable yields. Such association of high (or moderate) productivity values with high (or moderate) yields has important implications on the effective use of water. In this paper we discussed the factors affecting water productivity, and the possible techniques to improve water productivity. A single approach would not be able to tackle the forthcoming challenge of producing more food and fiber with limited or even reduced available water. Combining biological water-saving measures with engineering solutions (water saving irrigation method, deficit irrigation, proper deficit sequencing, modernization of irrigation system, etc.), and agronomic and soil manipulation (seed priming, seedling age manipulation, direct- or wet-seeded rice, proper crop choice, integrating agriculture and aquaculture, increasing soil fertility, addition of organic matter, tillage and soil mulching, etc.) may solve the problem to a certain extent. New scientific information is needed to improve the economic gains of WP because the future improvements in WP seem to be limited by economic rather than a lack of technological means.

14. Comparing 20th Century Trends in U.S. and Global Agricultural Water and Land Use **Indur M. Goklany**

IWRA, Water International (2002), Volume 27, Number 3

Abstract

Globally and in the United States, agriculture is the major user not only of water but also of land. This paper compares trends in aggregate and per capita water and land use by the agricultural sector in the United States and the world during the 20th century. It finds that although cropland use per capita has been declining in both areas since the early 1900s, agricultural water use per capita only

began declining in the latter half of that century. That the increases in efficiencies of agricultural water use lagged behind the increases in the efficiency of cropland use is consistent with the fact that farmers (and farming communities) have traditionally had stronger property rights to their land than to their water. As a result, through much of the 20th century, farmers had a greater incentive to improve the efficiency of land use than that of water use and to substitute water for land (or irrigated land for dryland) in producing crops.

15. A systems approach to unravel complex water management institutions

V.S. Saravanan

Ecological Complexity (2008), 5:202– 215

Abstract

The study unravels the complexity of water management institutions by analysing the interactive nature of actors and rules to a particular water-related problem, using a systems approach in a hamlet in the Indian Himalayas. The approach builds on the strengths of institutional analysis development framework, but makes amendments to suit complex and adaptive water management institutions. It applies multiple research methods to collect both qualitative and quantitative information at different contextual levels. The information collected is applied in Bayesian belief network model to identify differential rules in influencing water management. Systems perspective in a problem context helped to comprehensively understand the socio-political process of water management by identifying broad array of actors and rules constraining water management, and at the same time identify actors and rules facilitating agents and their agency for a change in the water management process. In this socio-political process, the study reveals human entities –stakeholders, actors and agents – occupy different positions, which they actively shift in a problem context and when agents pursue 'projects' by integrating diverse rules and resources to remain adaptive. It is this adaptive and dynamic behaviour that contemporary programmes and policies fail to acknowledge. In this dynamic behaviour of the transformative capacity or power is everywhere, but they are displayed, maintained and upheld, only when agents pursue their 'project' by negotiating with other agents. The paper highlights the importance of comprehensive approach, in contrast to simplistic, linear and single package reforms to manage water. Such approach calls for conscious designing of rules and, at the same time, enabling actors to design rules. A conscious designing of rules is required to regulate water distribution, to build the capabilities of the poor, and to be adaptive to institutional and bio-physical crises. It calls for the development of infrastructures to further actors and agent's capabilities to design rules for informed water-related decisions. Such an approach will contribute towards sustainable water resource management.

16. An integrated modelling framework for simulating regional-scale actor responses to global change in the water domain

R. Barthel, S. Janisch, N. Schwarz, A. Trifkovic, D. Nickel, C. Schulz, W. Mauser

Environmental Modelling & Software (2008), 23: 1095-1121

Abstract

Within coupled hydrological simulation systems, taking socio-economic processes into account is still a challenging task. In particular, systems that aim at evaluating impacts of climatic change on large spatial and temporal scales cannot be based on the assumption that infrastructure, economy, demography and other human factors remain constant while physical boundary conditions change. Therefore, any meaningful simulation of possible future scenarios needs to enable socio-economic systems to react and to adapt to climatic changes. To achieve this it is necessary to simulate decision-making processes of the relevant actors in a way which is adequate for the scale, the catchment specific management problems to be investigated and finally the data availability. This contribution presents the DEEPACTOR approach for representing such human decision processes, which makes use of a multi-actor simulation framework and has similarities to agent-based approaches. This DEEPACTOR approach is embedded in DANUBIA, a coupled simulation system comprising 16 individual models to simulate Global Change impacts on the entire water cycle of the Upper Danube Catchment (Germany, 77,000 km²). The applicability of DANUBIA and in particular the DEEPACTOR approach for treating the socio-economic part of the water cycle in a process-based way is

demonstrated by means of concrete simulation models of the water supply sector and of the domestic water users. Results from scenario simulations are used to demonstrate the capabilities and limitations of the approach.

17. Water use efficiency and water use of Mediterranean annual pastures in southern Australia

T. P. Bolger and N. C. Turner

Australian Journal of Agricultural Research 1999, 50: 1035-46

Abstract

There is a perception in the farming and research communities that annual pastures have low productivity and water use, and contribute disproportionately to problems of rising watertables and dryland salinity. Our aim was to determine potential pasture production in relation to water use and the influence of management factors on this relationship. Experiments were initiated at 4 locations along a gradient of 300-1100 mm annual rainfall across the Western Australian agricultural zone. At each site a high input treatment was compared with a low input control. There was a strong linear relationship between water use and pasture production up to 440 mm of growing season water use. After 30 mm of water use the potential pasture production was 30 kg/ha.mm. An upper limit to pasture production may be reached at about 12 000 kg/ha in this environment due to rainfall distribution patterns and soil water holding capacity in the root-zone. Although pasture production was increased by as much as 3500 kg/ha, water use was generally similar or only slightly more for high input compared with control plots. The marginally higher water use by the high input pastures resulted in an extra 18 mm of water extracted from the subsoil at one location by the end of the third season. A drier subsoil may provide a buffer for storing excess rainfall and reduce deep drainage. Estimated drainage was small at low rainfall sites so even marginal increases in water use by highly productive annual pastures could play a significant role in reducing water loss to deep drainage and mitigating water-table rise and secondary salinisation in low rainfall regions. Management practices aimed at promoting early growth and adequate leaf area should maximise water use, water use efficiency, and yield. The linear relationship defining potential pasture production provides a useful benchmark to farmers.

18. Institutional perspectives on participation and information in water management

Gail M. Cowie*, Stuart R. Borrett

Environmental Modelling & Software (2005), 20: 469-483

Abstract

Integrated urban water management is a framework to understand, control, and optimize elements of the urban water infrastructure as an integrated system is inherently complex. It becomes more complex and challenging, however, when public participation in management institutions is considered. This paper applies a systems perspective to explore institutional arrangements for participation. Our goal is to conceptually organize this complexity and provide starting points for systematic examination of participation in urban water management. The discussion highlights two rationales for engagement with external parties: (1) building support and legitimacy for integrated urban water management; and (2) enabling transformation in the management system. The general institutional framework is then illustrated by a case study of participation and transformation toward more integrated management in the metropolitan area of Atlanta, Georgia.

19. Economic analysis of water harvesting in a mountainous watershed in India

A.K. Goel, R. Kumar

Agricultural Water Management (2005), 71: 257-266

Abstract

Water management is an essential feature of any project related with overall development of agriculture. The Soan river catchment in the northwest Himalayas, is fed only by rainwater. Hence, a strategy of rainfed agriculture needs to be developed through water conservation and storage techniques. The Soan is an important river from a soil erosion and water management point of view and detailed economic analysis is needed for any proposal to be implemented in the field. The present

study was undertaken to propose an economic analysis of water harvesting structures for the Soan catchment. The purpose of the investigation is to control erosion and conserve water to meet the requirements of supplemental and pre-sowing irrigation for major cereal crops in the area and to maximise agricultural productivity. Benefit/cost ratios ranging from 0.41 to 1.33 are obtained for water harvesting structures of different sizes with estimated life of 25 and 40 years respectively, by taking into account different crop return from maize and wheat.

20. Implications of climate change for sustainable water resources management in India

P.P. Mujumdar

Physics and Chemistry of the Earth (2008), 33: 354-358

Abstract

This paper presents an overview of the current water resources scenario in India, and recent work carried out in India to assess the climate change impact on hydrology and water resources. Issues that need to be addressed with respect to climate change/variability in sustainable water resources planning and management are discussed.

If you are a member of the CPWF team and require details of the above manuscripts, please contact and request to: gis-communications@cgiar.org