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of Agricultural Economists (ASAE)  
International Conference**

**14-17 October 2014**

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(ASAE) International Conference

Conference Program	.....	1
Abstracts		
Contributed Papers	.....	7
Organized Sessions	.....	61





**Mahabub Hossain**  
(1945-2016)

**This special issue of the Asian Journal of Agriculture and Development is dedicated to Dr. Mahabub Hossain, scholar and progressive thinker, researcher, leader, and mentor who championed rural development, especially the plight of small farmers. Above all Mahabub was a true friend.**

**Let us remember him with love, respect, and gratitude.**

# 8th ASAE International Conference

15–17 October 2014, BRAC Center for Development, Dhaka, Bangladesh

## CONFERENCE PROGRAM

**15 October, Wednesday**

7:30 Registration

8:30 **INAUGURAL SESSION**

*Welcome Address*

**Faruque Ahmed**

Executive Director, BRAC International

**Mercedita A. Sombilla**

General Secretary, ASAE

*Presidential Address*

**Arsenio M. Balisacan**

Economic Planning Secretary and Director-General and Director  
National Economic Development Authority, Philippines

*Keynote Address - Small Farms: Large Numbers, Great Diversity, Big Role for  
Economic Transformation and Innovation*

**Joachim von Braun**

Professor, ZEF, University of Bonn

*Inaugural Speech*

**Begum Matia Chowdhury**

Minister of Agriculture, Bangladesh

10:00 **PICTURE TAKING and COFFEE BREAK**

10:30 **PLENARY LECTURES**

Moderator: Joachim von Braun, University of Bonn

*Small Farms and Productivity*

**Klaus Deininger**, Development Economics Group, World Bank

*Institutional Innovations and Small Farms: Chinese Experience*

**Jikun Huang**, Center for Chinese Agricultural Policy, CAS

*Water Markets for Small Farmers' Access to Irrigation*

**Randolph Barker**, Cornell University, Ithaca, USA

12:30 **LUNCH BREAK**

13:30 **PARALLEL SESSIONS**

*Transformation of Agrarian Structure*

Moderator: Cynthia Bantilan, ICRISAT

*Climate Change, Adaptation and Risk*

Moderator: Ainun Nishat, BRAC University

*Institutional Innovations and Development of Markets for Agricultural Services*

Moderators: Randolph Barker, Cornell University, Ithaca, USA

Saidatulakmal Mohd, Universiti Sans Malaysia

*Farm Size and Productivity Revisited*

Moderator: Mahabub Hossain, BRAC

*Migration, Gender, and Multi-Occupation Livelihood Strategy*

Moderator: Agnes Quisumbing, IFPRI

*Rural Non-farm Economy and Multi-occupation and Strategy for Sustaining Livelihoods*

Moderator: M.A. Sattar Mandal, Bangladesh Agriculture University

*Microfinance as a Foundation of Agriculture to Non-Agriculture (Organized Session)*

Moderator: Yasuyuki Swada

*Distribution and Impact of Stress Tolerant Varieties in South Asia (Organized Session)*

Moderator: Takashi Yamano, IRRI

15:30 **COFFEE BREAK**

**FELLOWSHIP DINNER**

19:00

*Dinner Speech: New Foods and Old Food Policy: The Great Asian Disconnect*

**Prabhu L. Pingali**, Cornell University, USA

**16 October, Thursday****8:30 PLENARY LECTURES**

Moderator: Keijiro Otsuka, National Graduate Institute for Policy Studies

*Sectoral Productivity Growth and Poverty Reduction: National and Global Impact*

**Will Martin**, Agriculture and Rural Development Research Group, World Bank

*Migration, Gender, and Farming Systems*

**Agnes Quisumbing**, IFPRI, Washington D.C., USA

**10:00 COFFEE BREAK****10:30 SPECIAL SESSION: Bangladesh Economy and Agriculture**

Moderator: Arsenio M. Balisacan, ASAE President

**12:30 LUNCH BREAK****13:30 PARALLEL SESSIONS**

*Seed and Fertilizer Policies in Asia: Implications on Smallholders in South Asia  
(Organized Session)*

Moderator: Promod Kumar Joshi, IFPRI, India

*Farm Size and Productivity Revisited*

Moderator: M.A. Sattar Mandal, Bangladesh Agriculture University

*The Economics of Farm Size: A Global Perspective (Organized Session)*

Moderator: Will Martin, World Bank, USA

*Targeting of Grain Legumes for Income and Nutrition (Organized Session)*

Moderators: Kumara Charyulu and Uttam Deb, ICRISAT

*Technology Assessment and Farm Household Segmentation for Inclusive Poverty  
Reduction and Sustainable Growth in Agricultural Productivity  
(Organized Session)*

Moderator: Joachim von Braun, Bonn University, Germany

*Challenges and Opportunities to Trade in Rice Seeds between India and Bangladesh  
(Organized Session)*

Moderator: Shushil Pandey, Former Senior Scientist, IRRI

*Institutional Innovations and Development of Markets for Agricultural Services*

Moderator: M.A. Sattar Mandal, Former Member Planning Commission, GoB

**15:30 COFFEE BREAK****17:00 ASAE EXECUTIVE COMMITTEE BUSINESS MEETING****18:30 CULTURAL SHOW followed by DINNER**

**17 October, Friday****8:30 PLENARY LECTURES**

Moderator: Keijiro Otsuka, GRIPS, Tokyo, Japan

*The Quiet Revolution in the Agri-food Value Chain in South Asia*

**Thomas Reardon**, Michigan State University, USA

*Management Training as a Driver of Non-farm Economic Development*

**Tetsushi Sonobe**, Grips Global Development Program, Tokyo, Japan

10:00 Coffee Break

**10:30 PARALLEL SESSIONS**

*Institutional Innovations and Development of Markets for Agricultural Services*

Moderator: Thomas Reardon, Michigan State University, USA

*Public Policy for Supporting Small Farms in Asia*

Moderators: Sushil Pandey, Former Senior Scientist, IRRI

Nipon Poapongsakorn, Thailand Development Research Institute

Aldas Janaiah, Acharya N.G. Ranga Agricultural University, India

*Institutional Innovation and Markets for Agricultural Services*

Moderator: Mercedita Sombilla, Secretary, ASAE Executive Committee

**12:30 LUNCH BREAK****13:30 PARALLEL SESSIONS**

*Analytical and Policy Insights on the Future of Farm Sector: Japan, China, and Korea  
(Organized Session)*

Moderator: Yasuo Ohe, Chiba University Japan

*Institutional Innovations and Development of Markets for Agricultural Services*

Moderator: Abdul Bayes, Jahangir Nagar University

*Public Policy for Supporting Small Farms*

Moderator: Nobuhiko Fuwa, Member, ASAE Executive Committee

**15:00 COFFEE BREAK****15:30 CONCLUDING SESSION**

*Report of the ASAE President*

*Declaration of New Executive Committee*

**Mercedita A. Sombilla**, Secretary, ASAE Executive Committee

*Closing Remarks from the Incoming President*

**Mahabub Hossain**, Bangladesh Rural Advancement Committee

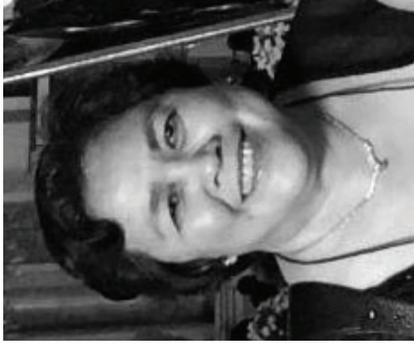
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Thailand  
Member



Saidatulakmal Mohd  
Malaysia  
Member

## Contributed Papers

## **THEME 1**

### **Transformation of Agrarian Structure**

Cynthia Bantilan (Moderator)

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

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### **Reform and Transformation of Agriculture in Malaysia**

Mohd Izat Amer Ghazali, Saidatulakmal Mohd, Mohd Zulkhairil Ahmad

Universiti Sains Malaysia, Malaysia

eicydda@usm.my

Although the contribution of agriculture to the national income of Malaysia has reduced more than half from more than 50 percent in the 1970s, its importance to the economy is indisputable. The agriculture sector has faced many challenges, including losing its importance as main income generator to its rebranding in the effort to revitalize the sector. During the process, many agriculture policies were formulated to assist the sector beginning with the Colonial Age Policy, followed by the First National Agriculture Policy, Second National Agriculture Policy, Third National Agriculture Policy, and the National Agro-Food Policy. The main objective of this paper was to assess the specific impact of agriculture policies from 1987–2010 in reviving the agriculture sector. The paper also assessed the impact of industrialization and economic transformation of the agriculture sector. Inevitably, it was found that economic transformation highly influenced the size and importance of agriculture sector in Malaysia's economy. Undoubtedly, the policies in place had helped revitalize the sector in an attempt to sustain the importance of agriculture to the nation. The reform that took place moved agriculture towards a higher value-added supply chain. The paper concluded with a discussion on the need for a Fourth National Agriculture Policy and to shift the importance of the policy from just revitalizing the sector to thinking of the need to address the issues of food security in the nation.

*Keywords:* agriculture reform, agriculture transformation, agriculture policy

### **Village Income Dynamics in Odisha: An Insight from VDSA Villages**

Prabhakar Nanda, Mukesh Sinha, Ashwani Kumar

Directorate of Water Management, Bhubaneswar, Odisha, India

prabhakar.nanda@gmail.com

Odisha has been one of the poorest states in India. The data analysis under the village dynamics studies project reflect different income scenarios in the study districts, which are endowed differently with respect to the resources as well as agroecological scenarios. The analysis of income for all categories of farmers in the study villages reflect that the relatively interior villages in Bolangir District experience higher per capita income compared to the relatively less interior villages in Dhenkanal District. When the per capita income of the study villages are compared, it was observed that Bilaikani Village in Bolangir District recorded the highest per capita income of more than INR 12,000 followed by Sogar

Village in Dhenkanal District, which recorded a per capita income of INR 11,800 in 2010–2011. These can be compared to the per capita income of INR 10,316 for Chandrasekharpur and the lowest income of INR 6,884 in Ainlatunga in Balangir District, which still suffers from poverty despite watershed development in the village. The variation in the per capita income level is observed due to the diversification of agriculture in the study villages. Bilaikani Village now has vegetable production during rabi season because watershed development has ensured water availability for a second crop. The typically tribal-dominated villages are yet to capitalize on the benefits of development schemes. The income difference between two villages in Bolangir District was found to be more than 100 percent. The income difference between two villages in the less interior Dhenkanal District was found to be only about 10 percent, which shows that the two villages are comparably on equal footing with respect to utilization of income potential. It was also observed that the sources of income and income from agriculture differ substantially in the villages, which resulted in differential income for the sampled farmers.

*Keywords:* income, village dynamics, India, VDSA

## Agrarian Transformation through Rural Savings and Investment

Hermanto Siregar, Siti Jahroh, Heni Hasanah

Faculty of Economics and Management, Bogor Agricultural University (IPB), Indonesia  
hermanto@mma.ipb.ac.id

Dicky Firmansyah, Indra

Scholar, Brighten Institute, Indonesia

Tantan Hermansah

Faculty of Communication, Syarif Hidayatullah University, Indonesia

Currently, the agricultural sector in Indonesia employs about 35 percent of the workforce, while the gross domestic product (GDP) share of the sector is only around 14 percent. This indicates relatively low level of farmers' income compared with other sectors. One of the critical problems in conducting agrarian transformation is scarcity in savings and investment in rural areas. This problem limits not only the ability of the agricultural sector to grow optimally but also stops the improvement of non-farming and off-farming activities in rural areas. This will only retard any growth in agricultural employment and lead to poor accumulation in this sector. Therefore, studying agriculture/rural savings and investment and its relation to support agrarian transformation is very important. This study included analysis of factors affecting agricultural savings and investment. It utilized household data from three Indonesian provinces, which have played a predominant role with respect to the agricultural sector. A regression analysis found that farm-level investment is positively affected by the area of land operated and farm income. Households with more non-agricultural income tend to have higher savings and productive investment, which can potentially be used for financing non-farm and off-farm activities. Therefore, there is the potential to provide jobs to members of the existing workforce who are currently working below their capacity. As a result, agrarian transformation can occur. This study also suggested that the government needs to provide incentives to farmers, as well as non-farmers, to invest more in the rural agro-industry.

*Keywords:* agrarian transformation, rural savings, rural investment, household data, regression analysis

## **THEME 2**

### **Climate Change, Adaptation, and Risk Management**

Ainun Nishan (Moderator)

BRAC University, Bangladesh

-----

#### **Factors Affecting Perception of and Adaptation to Climate Change of Farmers in Nepal**

Suman Lal Shrestha, Keshav Lall Maharjan

Graduate School for International Development and Cooperation, Hiroshima University

sumanlal\_shrestha@hotmail.com; mkeshav@hiroshima-u.ac.jp

Agriculture is one of the sectors most affected by climate change, especially in a developing country like Nepal, which is highly dependent on the weather. Nepal is a mountainous country where most people's livelihood depend on rainfed agriculture. Climate change impacts in Nepal are expected to become more intense so the foremost option is adaptation. To adapt to climate change people need to first realize that climate change is happening and then adapt to those changes. Further, it is very important to understand the factors that are affecting people's perception and their adaptation. This paper used the Heckman selection model to analyze the factors affecting farmers' perception and adaptation to climate change. The analysis showed that perception of and adaptation to climate change are correlated. Information on climatic condition helps farmers perceive a change in climate. Women perceive climate change more easily than men as they are responsible in fetching the water for drinking. In addition, factors such as irrigation played an important role for farmers to adapt to any changes. Also, the ability to reach the market was positively related to adaptation as the market is a good source of information. Thus, there is a need to develop irrigation facilities and farmers' ability to reach the market to increase their adaptive capacity.

*Keywords:* perception, adaptation, climate change, Nepal

#### **Risk Management in Rice and Wheat Seed Production: A Case Study from Tarai Region of Nepal**

Keshav Lall Maharjan, Narayan Prasad Khanal

Graduate School for International Development and Cooperation, Hiroshima University

mkeshav@hiroshima-u.ac.jp; narayankhanal36@gmail.com

Seed production of rice and wheat under a community-based seed scheme is getting popular in recent years as these crops get lower priority for seed production by private companies due to low profit margin. However, seed-producing farmers, usually smallholders in marginal areas, face various financial and physical risks. This paper measured the profit risk of farmers in rice and wheat seed production, and

also project profitability in producing the seeds of these crops under different uncertainty situations. The data for this study were collected from 180 seed growers (farmers) spread across the three tarai districts of Nepal. It was found that farmers face more risk in rice seed production than in wheat seed production, and there is positive relationship between profitability and risk score. This implies that farmers getting higher profits bear more risks and vice versa. The risk bearing capacity of farmers also vary with differences in socio-economic characteristics.

Keywords: risk management, seed production, rice-wheat, tarai, Nepal

## Poverty Trap and Recovery from Winter Disaster in Mongolia

Shunji Oniki, Dagys Kadirbyek

Japan International Research Center for Agricultural Sciences

shunjioniki@gmail.com

This paper described the recovery process from a natural disaster depending on the asset level before the occurrence of the event in Mongolia. The analysis of panel data of households of nomadic pastoralists indicate that those with more animals before the disaster are likely to recover more quickly. The phenomenon of persistent poverty occurs not simply due to a low asset level after the event, but also due to asset level before the event. Individual factors, such as skills, knowledge, and human relationship may affect persistent poverty, suggesting that managerial capacity should be enhanced for successful recovery after the disaster.

Keywords: natural disaster, Mongolia, recovery, pastoralists

## **THEME 3**

### **Institutional Innovation and Markets for Agricultural Services**

Randolph Barker (Moderator)  
Cornell University, USA

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#### **The Socio-economic and Environmental Impacts of Micro-Irrigation Systems in India: A Study of Public Tube Wells in Gujarat, Western India**

P.K. Viswanathan, Chandrasekhar Bahinipati  
Gujarat Institute of Development Research, India  
pkviswam@gmail.com; chandrasekharbahinipati@gmail.com

This paper presents the results of the techno-economic analysis of the performance of 122 tube wells installed in pressure-induced irrigation networks and micro-irrigation systems (MIS) in nine talukas of Banaskantha District. The results bring forth significant economic and social benefits to the beneficiary farmers in terms of increase in crop yields during kharif, rabi, and summer seasons; considerable savings in energy consumption; reduction in the use of chemical fertilizers and pesticides; reduction in cost of weeding; reduction in groundwater over-extraction; and reduction in water scarcity induced labor migration, to mention a few. The analysis demonstrates that the farmers who have adopted the MIS as offered under a subsidy program by the state government have been compensated for the investments that they made to adopt the MIS. By and large, farmers have reported growing a range of crops especially during the kharif and rabi seasons; and most of these crops have been brought under the MIS. While farmers' adoption of MIS has been quite impressive during the kharif and rabi seasons, the use of MIS for growing summer crops has been found to be much lower and very much restricted to a few crops. More efforts are needed to rejuvenate local water harvesting structures through artificial groundwater recharge programs wherever such potentials exist. This may, in turn, help increase the adoption of MIS during the summer. The limited adoption of MIS among farmers belonging to poor communities is a matter of concern and this needs to be addressed in terms of implementing a specifically-targeted MIS program.

*Keywords:* micro-irrigation, public tube wells, India

## Impacts of Improved Natural Resource Management on Irrigated Rice Systems in Small Farms of Eastern Indonesia

Rowell Dikitanan, Rica Joy Flor, Madonna Casimero, Grant Singleton

International Rice Research Institute, Philippines

r.dikitanan@irri.org

Zainal Abidin

Balai Pengkajian Teknologi Pertanian, Southeast Sulawesi, Indonesia

The impacts of improved natural resource management (NRM) on irrigated lowland rice systems were examined using propensity score matching. Effects on income, yield, fertilizer, and pesticide costs were determined by calculating “average treatment effect on the treated” while controlling for selection bias from observable variables. Data were from a cross-section, farm-level survey of rice farmers in Sulawesi, Indonesia. Adoption of improved NRM technologies led to a significant increase in income of farmers. The adopters had a mean 53 percent increase in income compared with non-adopters. The logit regression model indicated that attendance at a farmer field school, which emphasized adaptive management, had a strong positive impact on the likelihood of adoption. Improved NRM reduced the intensity of input use without reducing yield, leading to reduced cost and higher income per household.

*Keywords:* economic impact assessment, propensity score matching, technology adoption, natural resource management, irrigated rice

## Can Integrated Rice Fish-Farming Increase Welfare of the Extreme Poor in Bangladesh?: Combining Matching with Difference-in-Difference Estimation Approach

Abu Hayat Md. Saiful Islam

Center for Development Research (ZEF), University of Bonn, Germany and

Department of Agricultural Economics, Bangladesh Agricultural University, Bangladesh

saiful\_bau\_eco@yahoo.com, saiful@uni-bonn.de

In the era of mounting population, food and nutrition security and extreme poverty are the urgent challenges for South Asia particularly for Bangladesh. One potential solution could be integrated rice fish (IRF) farming which can increase production of rice and fish simultaneously through sustainable use of diverse on farm resources. IRF farming has been actively promoted in different parts of Bangladesh since the 1990s because of its potential to contribute to food and nutrition security. However, rigorous casual analyses of these practices are still scanty. Most micro-level impact studies build on cross-section data, which can lead to unreliable impact estimates. This article filled this gap by rich panel data covering two time periods to estimate the impact of IRF on extremely poor indigenous farm households' overall welfare in terms of household food expenditure, total income and expenditure, total farm income and quantity of fish consumption per day for a month. Propensity score matching with a difference-in-difference estimator were combined to control for selection bias and account for temporal impact variability by utilizing two-year panel data from 21 villages, in 14 sub-districts in five districts

in three agroecological regions of Bangladesh. The results showed that IRF adoption has a positive and statistically significant effect on household food expenditure, total income and expenditure, total farm income, and quantity of fish consumption. Overall, the article provided evidence that promoting IRF farming is important to improve income, expenditure, and food security in rural areas specifically for the marginalized extremely poor indigenous (tribal/Adivashi) small-scale farm households in Bangladesh.

*Keywords:* integrated rice-fish farming, propensity score matching, difference-in-difference estimator, Bangladesh

## Structural Changes of Irrigation in Bangladesh: A Synthesis of Focus Group Discussions from 96 Villages

M. Saidur Rahman, M.A. Sattar Mandal

Bangladesh Agricultural University, Mymensingh, Bangladesh  
saidurbau@yahoo.com; m.s.rahman@irri.org

Kei Kajisa

School of International Politics, Economics, and Communication, Aoyama Gakuin University, Japan

Humnath Bhandari

International Rice Research Institute (Bangladesh Office), Dhaka

Groundwater irrigation through shallow tube wells (STW) and deep tube wells (DTW) started mostly after the 1970s. The main objectives in conducting focus group discussions (FGDs) in 96 villages were to identify the root level information regarding irrigation and its mode of payment. Irrigated land, especially rice land, has increased remarkably in Khulna and Rangpur divisions. There are plenty of sources of clear water in the villages, however, it was observed that water quality worsened over time—from clear to cloudy and reddish in color. Due to a tremendous increase in the number of STW, the command area for DTW decreased. Further, the command area under STW decreased with the significant increase in the number of machine owners. This implied the suitability of STW as a farmer-friendly irrigation technology. Owners' land increased and buyers' land decreased, which indicated that more farmers have more opportunity to own STW. Irrigator farmers are shifting from crop share to fixed rate and two-part tariff payment systems since it is economically viable for the buyers. Prices in fixed charge and two-part tariff systems are changing over time. Using more water from underground, the groundwater level is going down and iron, arsenic, and saline contamination are becoming a big issue in some areas. More than 70 percent of the farmers take credit from the bank, informal money lenders, and NGOs. Due to higher interest rates implemented by informal money lenders, farmers are getting more credit from NGOs now. In selling irrigation water, some disputes arise due to insufficient and irregular supply of water. Most of the disputes are resolved at the village level—through the help of the village council or people in the particular area, few reach the legal court system. At the division level, irrigation technology and efficient payment methods and guidelines for fixing the price of irrigation may help reduce the use of groundwater. Observing these dramatic structural changes in the water market, the determinants of water price, contract choice, and dispute resolution in groundwater irrigation were investigated.

*Keywords:* groundwater, irrigation price, contract choice, dispute resolution, Bangladesh

# India-Bangladesh Cooperation in Rice Seed: Need for Structural Changes

K. Enamul Haque

United International University, Dhaka, Bangladesh

akehaque@gmail.com

Mahfuz Kabir

Bangladesh Institute of International and Strategic Studies (BIISS), Dhaka, Bangladesh

Suresh P. Singh

CUTS International (Consumer Unity & Trust Society), Jaipur, India

From the food security point of view, rice holds a place of prominence in both Bangladesh and India. In Bangladesh, it is a staple food for 70 percent of its population; in India, it is a staple for 30 percent of its population.

Food production in these two neighboring countries critically depends on adequate availability and accessibility to quality inputs, especially seeds (varieties). This is because seed is the base input used for the purpose of regeneration and also the cheapest input to rice production forming only a small fraction of the cost of cultivation. There is no substitute to this input; but seed quality could vary both within and between the two countries. Furthermore, the quality of the seed cannot be known until harvest time and farmers often take a big risk by choosing a seed variety which is unknown to them. On the other hand, developing new varieties is critical to ensure sustainable food production given the changing nature of the economy and the environment.

The level of research needed to produce quality seeds is quite high, but at the same time the quality of extension work that provides information to farmers is important to promote better seeds in the market. It has been observed that a degree of inadequacy to promote better seeds through formal market channels exists in both countries. As such, informal market channels exist among farmers on both sides of the border to search for quality rice seeds. The research also showed that despite the conspicuous absence of formal imports/exports of seeds between Bangladesh and India, there is demand for seeds across the borders through informal channels, which adds to the risk of using adulterated seeds on both sides of the border. As such, there is an additional challenge to ensuring food security for millions of people in both countries. Considering that the two countries have similar agro-climatic conditions and that there is cross-border demand for rice seeds in different seasons, the situation can be improved if the two countries establish a framework of cooperation covering areas such as joint development and release of hybrid and high-yielding varieties; harmonize their acts, policies, and regulations with regard to transboundary trade; and address issues relating to the protection of intellectual properties including farmers' and plant breeders' rights.

Improving the current situation calls for a structural shift on how the two countries consider the existing potential for transboundary cooperation in rice seed varieties. The paper attempted to understand why despite extant potential, transboundary cooperation through formal channels of trade, investment, and knowledge sharing in rice seed varieties is a non-starter. It also explored enabling factors that could facilitate greater transboundary cooperation and help these countries address future challenges to food security.

*Keywords:* cooperation in agriculture, trade in rice seeds, food security

## Assessing the Gains and Effects of Contract Farming: The Case of Three Banana Cooperatives in Davao del Norte, Philippines

Hermilie Oracion, Adela Ellson

School of Management, University of the Philippines Mindanao

agellson@yahoo.com

Contract farming has been defined as an agreement between farmers and sponsors for the production and supply of agricultural products under the sponsor's specifications. This farming scheme was implemented by the Department of Agrarian Reform for agrarian reform beneficiaries (ARBs) to gain access to high-end markets, have access to support services and facilities, and improve income. However, issues such as unequal bargaining relationship, equity, and sustainability arise. This study aimed to assess the gains and effects of contract farming on three agrarian reform cooperatives (i.e., HARBCO, SFARBEMCO, and SEARBEMCO). For the study, 115 ARBs from the three cooperatives, which ventured into contract agreement with local/multinational companies, were interviewed. In assessing the economic gains, profitability analysis using financial ratios was used. The social gains satisfaction rating was obtained using rank order centroid weights. Also, logistic regression model was employed to identify factors that influence ARBs perception of contract farming. The results showed that on the average, the three cooperatives are not gaining from contract farming participation. Furthermore, the average annual income generated by ARBs is low. Satisfaction of ARBs on belongingness in the cooperative is very low for HARBCO and SEARBEMCO; perception of social stability is low for SFARBEMCO. The results from logistic regression suggested that years of education, gender, and income affect ARBs perception of contract farming. Based on the results, it was found that the major factors that greatly affect the outcome of the contract agreement are the business partner of the cooperative and the nature of contract agreement. Hence, it is imperative for the stakeholders involved in the contract to conduct consultations and thorough discussions about the contract agreement. Lastly, evaluation of the contract must be put in place.

*Keywords:* agrarian reform beneficiaries, banana, contract farming, cooperatives, logistic regression, rank order centroid weights, sponsors

## A New Approach for Biomass-based Value Webs with a Focus on Horticultural Production to Improve the Access of Small-scale Farmers to Markets: Conceptual Thoughts and Outlook in an Emerging Bioeconomy in Asia

D. Virchow

Center for Development Research - ZEF, University of Bonn, Germany

d.virchow@uni-bonn.de

K. Weinberger

Centre for the Alleviation of Poverty through Sustainable Agriculture (CAPSA), UNESCAP, Indonesia

Global demand for biomass products from agriculture, both for food and non-food produce such as feed, energy, and industrial raw materials is rising significantly. This demand for biomass-based produce

is increasingly contributing to a transformation of traditional agriculture from a food-supplying to a biomass-supplying sector. This has severe implications for small-scale farmers. Supplying markets with sufficient quantities and quality of produce is already challenging for small-scale farmers, but in addition, the increasingly diverse demand is forcing small-scale farmers to make more and more complex production and postharvest decisions. In addition, the actors along the processing line of the various biomass-based raw products, especially the small and medium enterprises (SMEs), are challenged with increasing complexity of processing and consumption, and more sophisticated consumer demand. This development could stimulate increasing vertical cooperation between small-scale farmers and SMEs, taking advantage of their comparative advantages against larger scale enterprises. However, to optimize the system productivity from agricultural production to final consumption, new analytic approaches are needed that can better address the increasing complexities and connectivities. Conventional value-chain approaches analyzing single value chains are not sufficient anymore. In the paper, a biomass-based value web approach is presented, in which the ‘web perspective’ is used as a multi-dimensional methodology. This approach enabled the actors to understand the interrelationship among several value chains, including recycling processes and the cascading effects during the processing phase of the biomass utilization. In addition, it explored synergies and identifies inefficiencies in the entire biomass sector as part of the emerging bioeconomy in Asia. This is instrumental to increase the sector’s efficiency. One major constraint for optimizing the efficiency of small-scale farming is the continuing sub-optimal to non-existing access to markets for a significant number of small-scale farmers. The paper particularly explored horticultural production in the context of the biomass web approach to assess how horticultural production can be instrumentalized as “pioneer crops” to enable and facilitate the market access for subsistence-oriented small-scale farmers producing staple crops.

*Keywords:* biomass-based value webs, bioeconomy, horticulture, Indonesia

## Impact Evaluation of Innovation Platforms to Increase Dairy Production in Uttarakhand, Northern India

Shanker Subedi

University of Hohenheim, Stuttgart, Germany  
subedi\_shan@yahoo.com

Jean-Joseph Cadilhon, Nils Teufel

International Livestock Research Institute, Nairobi, Kenya  
j.cadilhon@cgiar.org

Thanammal Ravichandran

International Livestock Research Institute, Almora, Uttarakhand, India

Innovation platforms (IPs) have been identified as an effective approach to achieve development targets set by a group of multiple stakeholders through the participation and empowerment of various beneficiaries at the local level. However, few attempts have been made to test the efficiency of this approach. This paper reported results from field testing a conceptual framework to evaluate the impact of IPs. This framework is based on the structure-conduct-performance hypothesis along with concepts of new institutional economics and supply chain management and marketing. For this purpose, data were collected using group discussions and individual surveys of 62 members of two dairy IPs and 62 non-members from the same communities benefiting from the MilkIT dairy development project in Almora and Bageshwar districts of Uttarakhand, India. Principal component factor analysis was implemented to reduce the

number of factors for joint planning (“conduct”) and increased dairy production (“performance”). Multiple regression analysis was used to identify relationships among variables of structure, conduct, and performance. The qualitative information highlighted the positive relationship between indicators of the IP’s structure, the conduct of its members in planning, and resulting performance indicators. The econometric analysis supported the results from qualitative analyses. Joint planning, participation in IP meetings, and gender were found to influence increases in dairy production. Interestingly, the positive effects do not only apply to IP members but also to non-member farmers. Though results suggested that the framework to evaluate impact of innovation platforms is valid, the design of the study does not allow to conclude that increased performance is only due to project interventions. However, the results of field testing the framework suggested it to be an effective method to carry out impact evaluations of IPs jointly with other conventional methods.

*Keywords:* impact evaluation, innovation platform, joint planning, dairy production, India

## Farm-Retail Price Spread in Indonesia’s Beef Industry: A Panel Cointegration Approach

Anisa Dwi Utami, Bernhard Brümmer

Department of Agricultural Economics and Rural Development,  
Georg August University of Göttingen, Germany  
autami@gwdg.de; bbruem@gwdg.de

The study of marketing margin and price transmission along the value chain of agricultural products has sparked a growing interest among agricultural economists, particularly among those in developing countries. Thus, a better understanding of how the farm-retail price spreads may provide insights on the competitiveness and efficiency of markets. Like other developing countries, Indonesia’s beef industry is mainly characterized by the domination of smallholders and a large number of intermediaries along the value chain. This study aimed to analyze the behavior of farm-retail price spread by investigating the transmission between producers and retail prices, as well as factors affecting the margin. Furthermore, in order to accommodate for the heterogeneity across the regions and to deal with the issue of stationary factors, a panel cointegration approach was employed using monthly data derived from 32 provinces in Indonesia from 2008–2012. By adopting a panel cointegration test, this study found a long-run relationship between farm and retail price. The dynamics of farm-retail price spread was investigated by applying a panel heterogeneous model developed by Pesaran and Smith (1999), which uses the so-called PMG (pooled mean group) estimator. This model allowed the short-run coefficient and error variance to differ across regions. However, the long-run coefficient remains identical. Following Gardner’s marketing margin theory, the beef farm-retail price margin was evaluated as a function of shifts in retail demand, farm supply, and marketing services in the beef industry. The findings have confirmed that the aforementioned variables have significant effects on the farm retail margin.

*Keywords:* farm-retail price spread, price transmission, panel cointegration model, beef, Indonesia

## Determinants of Cottonseed Prices: A Case Study of Smallholder Cotton Growers in Khanewal, Pakistan

Manan Aslam, Shafqat Rasool

Institute of Business Management Sciences, University of Agriculture Faisalabad, Pakistan

This paper attempted to evaluate the impact of major factors affecting prices of cottonseed in the district of Khanewal using primary data. A representative sample of 40 cotton farmers was selected using stratified random sampling technique. The impact of major factors on prices of cottonseed was estimated employing double log form of regression analysis. The value of adjusted  $R^2$  was 0.58, whereas the  $F$ -value was 11.89. The findings revealed that color, length, and strength were significant variables affecting prices of cotton, whereas variables such as low evidence of contamination and lower use of pesticides showed insignificant impact. Awareness campaigns with the joint involvement of the public and private sectors should be initiated to help the cotton growers realize the importance of these traits and motivate them to produce quality cottonseed.

*Keywords:* seed cotton, stratified random sampling, double log regression analysis

## Hyperbolic Discounting and Induced Informal Credit Transactions: A Case of ATM Card Pawning in the Philippines

Nobuhiko Fuwa

Graduate School of Asia-Pacific Studies, Waseda University, Japan

nfuwa@waseda.jp

Kei Kajisa, Eduardo Lucio, Sharon Faye Piza, Yasuyuki Sawada

This paper focused on the emerging credit arrangement known as “ATM *sangla*” (ATM pawning) in the Philippines. Initial results of a survey of 300 factory workers in an industrial estate near the Metro Manila area were reported. ATM pawning is an informal loan arrangement wherein the borrower’s ATM card (together with its personal identification number [PIN]) is used as the collateral; the lender uses the ATM card to withhold repayment (principal and interest) from the borrower’s salary on every pay day (typically twice a month) until full repayment.

While almost all (93%) of our respondents were aware of ATM pawning, slightly less than half of our respondents (42%) had actually utilized ATM pawning at least once. The average amount of the loan (principal) was PHP 15,000, which corresponded to 1.3 times the average monthly salary. Most of the ATM pawning transactions were with private (and individual) money lenders (54%) or colleagues (21%); a relatively smaller proportion of transactions were with friends (16%), neighbors (6%), or relatives (4%). The main uses of loan proceeds included medical expenses, daily consumption, and education of children. Furthermore, it was found that workers with ‘present bias’ (on workers for whom hyperbolic discounting was observed) relied more on this loan scheme. It also discussed alternative interpretations of the findings.

*Keywords:* ATM *sangla*, credit arrangement, ATM card as collateral, Philippines

## Establishing a Facility for Technological Adoption in Cooperatives: The Case of Foundation for Agrarian Reform Cooperatives in Mindanao's ECOPark in Southern Philippines

Adela Garcia-Ellson, Albert Joseph Fedillaga, Jon Marx P. Sarmiento, Thaddeus R. Acuña, Nikko L. Laorden

School of Management, University of the Philippines Mindanao, Philippines  
agellson@yahoo.com

This paper attempted to document the establishment of the ECOPark, a facility that caters to the members of Foundation for Agrarian Reform Cooperatives in Mindanao (FARMCOOP), a federation of agrarian reform cooperatives. These cooperatives are composed of smallholder banana growers in southern Philippines. The facility processes production inputs that are used in the organic cultivation of bananas. Using the input-process-output model of operations management, this study aimed to analyze the factors and the processes that led to the creation of the ECOPark. Document analyses, focus group discussions, and key informant interviews were used to obtain necessary information. Results showed that the traditional chemical-intensive farming practice, the clear vision and aspirations of the federation founders, as well as the opportunity to tap into a niche market serve as primary inputs to the strategic planning process, ultimately leading toward the creation of the ECOPark. This finding reinforced the role of FARMCOOP in assisting its member cooperatives by lowering the risks involved in adopting new technologies and appropriate farming practices.

*Keywords:* southern Philippines, smallholder banana growers, cooperatives

## The Role of Building Resources Across Communities Seed on Livelihood Changes

Fathema Zhura Khatoon, Marziana Mahfuz Nandita, Md. Azhar Uddinare

Impact Assessment Unit, Research and Evaluation Division,  
Building Resources Across Communities (BRAC)  
fzkhatoonliza@gmail.com

Rina Ishio

Intern, Japan International Cooperation Agency (JICA)

This paper aimed to reveal farmers' perception of and satisfaction in the use of Building Resources Across Communities (BRAC) hybrid seeds in the purchase, germination, cultivation, harvesting and marketing, profitability, consumption, and home seed processing (including female participation) and to analyze how this understanding would contribute to improvement in farmers' livelihood. A qualitative method was used in this research. The results showed that local agroecological conditions and farming systems determine demand for different types of seeds. Farmers have specific reasons for preferring high-yielding varieties (HYV) and hybrid seed during different seasons. The commercial factors that drive farmers to buy hybrid seeds are mainly crop variety, input cost, and output price. Farmers cultivate hybrid seeds for commercial purposes and HYV/inbred seeds for personal consumption. Germination of hybrid varieties is sensitive due to accuracy and timing of the steps involved. In addition, the germination rate is vital and affects brand reliability in case of failure. Farmers are not bothered by the

price of seed if production is high. For farmers, high seed price works as a signal for the quality of the seed since it makes a big difference in their yield. The introduction of hybrid seeds changes a farmer's lifestyle and leads to sufficient production for yearly consumption. Higher income is derived from selling yield from hybrid seeds, which is then used for household development and children's education. Female involvement at the field level depends on household economic condition and on socio-cultural background. However, the price difference between HYV and hybrid paddy and overall paddy prices are still crucial to the farmer.

*Keywords:* hybrid seed, HYV, farmers' satisfaction, Bangladesh

## Organic Farming as an Alternative for Improving Economic Viability and Sustainability of Rice Farmers in North Sumatra, Indonesia

Diana Chalil, Riantri Barus

University of Sumatera Utara, Indonesia

ana.ch@lycos.com

In 1984, the use of high yield varieties (HYV) was regarded as a success story in tackling growing food needs. However, the use of HYV needs to be followed by the use of large amounts of chemical fertilizers, which in turn leads to an increase in fertilizer scarcity as well as increase in prices. Therefore, the Indonesian government provided subsidized fertilizers, especially for important commodities such as rice. In 2014, the Indonesian government spent as much as USD 1.8 million for fertilizer subsidies. In such a situation, sustainability and economic viability of conventional rice farming becomes a question—organic rice farming is then widely discussed as an alternative. However, many farmers believe that organic farming is less profitable because its productivity rate is relatively lower and its production costs are relatively higher. To analyze these assumptions, this study was conducted in an organic rice farming center in North Sumatra. Viability and sustainability of organic rice farming was compared with that of semi-organic and conventional farming. The farm-level data was calculated by using two selling price scenarios (i.e., existing selling price, potential selling price), as well as three cost scenarios (i.e., existing expenditure, expenditure without fertilizer subsidy, opportunity costs).

The results showed that, bar the cost of fertilizer, all cost components of conventional rice farming equaled that for the organic rice farming. Conventional agricultural fertilizer costs were only about 60 percent of the cost for organic farming. In fact, the difference mainly stemmed from the subsidized fertilizer price enjoyed by conventional rice farmers, which was provided at the minimum for the organic farmers. Average productivity rate of organic rice farming was only about 80 percent of conventional farming. Although the decrease in productivity was followed by an increase in selling price, it was only about 5 percent and was not enough as compensation. In fact, certified organic rice could be sold at a price two times higher than regular rice. In such a situation, the ratio of the selling price and cost per kilogram of the certified organic rice could also be two times higher than regular rice. The prices of organic and conventional rice were IDR 6.75 and IDR 3.28, respectively. Therefore, it can be concluded that with proper management, organic farming has great potential to improve the sustainability and economic viability of rice farming.

*Keywords:* organic, conventional, rice farming, farmers, viability, sustainability

## Opportunity Costs of REDD+ in the Mid-hills of Nepal: A Case Study of Thangsa Deurali Community Forest, Dailekh, Nepal

Niraj Prakash Joshi

Hiroshima University, Japan

nirajpj@hiroshima-u.ac.jp

Supa Paneru

Nepal Engineering College, Nepal

REDD+ has evolved to cover deforestation and forest degradation, two issues in climate change mitigation that had been previously overlooked. However, it is questionable as to whether REDD+ will benefit countries like Nepal, which has a relatively low deforestation rate, has fewer forests, and has a population made up predominantly of farmers with heavy dependence on forests. This demands an analysis of the opportunity costs (OC) of REDD+. This paper aimed to analyze the OC in community forests. Thangsa Deurali community forest (TDCF) of Dolakha district in the mid-hills of Nepal was selected for the study because of its involvement in REDD+ since 2009. Household surveys, focused group discussions, and key informant interviews were employed to collect data on community forest management including forest harvest and agricultural practices. The good practice guidance from the IPCC was followed to estimate the OC. Potato was taken as a high value crop; maize and millet were taken to be mid-value crops, considering their importance in the study area. The users of TDCF harvest mainly timber, fuelwood, fodder, and litter from 217.1 hectares of forest which have an economic value of NPR 1,873,880/year. Moreover, TDCF can generate net revenues of NPR 401,987/year from REDD+. Thereby, net revenue under REDD+ would be NPR 2,275,867/year. Given the yield of the crops and its market price, total gross revenue of high-value and mid-value crops would be NPR 8,351,666/year and NPR 7,684,693/year, respectively, from prospective land conversion of 150.8 hectares of forest. Thus, the OC for REDD+ would be NPR 6,634,275/year and NPR 5,981,088/year in the case of high-value and mid-value crops respectively. Unless carbon price is substantially increased to USD 216.14 per ton of carbon (tC) and to USD 196.19/tC, conserving the forest for REDD+ would not be profitable compared with cultivating high-value and mid-value crops, respectively. However, co-benefits such as biodiversity, water recharging, and the role of the forest itself in the farming system could make REDD+ a good choice for forest management with community participation.

*Keywords:* agriculture, high-value crop, mid-value crops, carbon trading, community forest, Nepal

## Participation of Smallholder Mangosteen Farmers in the Globalized Market Channel in Indonesia

Ronnie S. Natawidjaja, Haris F. Harahap, Henri W. Suudi

Padjadjaran University, Indonesia

ronnien@unpad.ac.id

Thomas Reardon

Michigan State University, USA

Mangosteen has been growing naturally in the forest from very old trees. Since 1998, demand for mangosteen has increased, especially from the international market. The production of mangosteen has continued to grow, although not as much as expected, and its export has risen steadily. From an

earlier study, it was found that farmers respond to strong market demand by cultivating mangosteen in commercial orchards and by innovating through seed development and cultivation technology. In the absence of government policy direction to support the commodity, the farmers have interestingly played an active role in responding to global demand. The main objective of this study was to identify factors affecting farmers' decision to participate in a globalized market. The study randomly selected 350 mangosteen farmers from a mangosteen farming population in North Sumatera Province, the second largest mangosteen production zone in Indonesia. The probit model with endogenous regressors was employed in the study to shed understanding on the factors constraining smallholder mangosteen producers. It also suggested more supportive policies for the inclusion of farmers in a more globalized market.

*Keywords:* globalized market, small-holder farmer, channel choice, mangosteen, Indonesia

## Determinants of Participation in Different Milk Marketing Channels in Bihar, India

Dhiraj Kumar Singh

International Livestock Research Institute (ILRI), India

D.Singh@cgiar.org

Smallholder and livestock development are part of a common vocabulary among academicians and policy makers. Whether smallholder dairy farmers will be able to exploit the benefits in an era of market integration still remains a question. In the last decade, Bihar's contribution to India's milk production rose from 3.2 percent in 2001–2002 to 5.2 percent in 2011–2012 and at the same time, per-capita milk availability doubled from 88 grams to 175 grams. It has been observed that the lack of an efficient market system and formal cooperatives forced small farmers to sell their milk to the informal market. Bihar is not different from the rest of India, where middlemen dominate the milk market and extract major benefits.

In this light, this study examined the factors influencing dairy producers to sell their milk in different milk market channels. Primary data was collected from 240 randomly selected dairy producers in three districts of Bihar. A multinomial logit (MNL) model was used to determine the factors determining participation in different types of milk marketing channels. Simple tabulation results showed that a proportionately lower number of dairy producers sell milk in the formal sector (38%) and the rest are divided between informal markets and consumers.

The MNL results indicated that dairy producers are more price sensitive. They also like to sell directly to consumers over informal and formal channels as direct consumers pay higher prices. However, if the producer has higher milk production, he prefers to sell in the formal market. It could be argued that small dairy producers try to maximize the benefits by selling directly to consumers at higher prices. If the distance to the consumer/informal market's buying point increased, dairy producers would be more likely to sell milk in formal markets. When the payment duration is longer, dairy producers move from the formal market to informal markets/consumers. Dairy producers with higher educational attainment are more likely to prefer selling in the formal market.

*Keywords:* smallholder, dairy producers, milk market channels, multinomial logit, India

## Hybrid Rice Seed Production: A Profitable Enterprise for Smallholders

Aldas Janaiah

School of Agribusiness Management, Acharya N.G. Ranga Agricultural University, India  
aldas.janaiah@gmail.com

This paper primarily focused on the economic viability of hybrid rice seed production based on a farm-level study conducted in Telangana state, India in 2010. For the study, survey data was collected from 60 sample seed producers in eight villages in Karimnagar District as part of a larger study. Telangana State alone produces nearly 80 percent of the total hybrid seed for all crops in India and supplies them to other parts of the country. Nearly 20 fairly large seed companies are now engaged in hybrid rice seed production in the state.

Most of the farmers at the study sites (selected villages) are seed producers of rice and other crops for leading companies. Thus, a random sampling technique was followed in the selection of sample seed producers. It is interesting to note that the average farm size of sample producers is only 1.22 hectares; 97 percent of which is under irrigation. This means that smallholder farmers are involved in seed production. Private seed companies purposefully opt to engage small farmers with irrigation facilities for seed production in almost all crop areas because they can engage fully in seed production without shifting to other farm activities.

All sampled seed producers had a contractual agreement with seed companies, which includes the seed price to be paid by seed companies to seed growers, supply of parental line seeds and gibberellic acid (GA3), and the payment of a risk allowance in case of crop failure.

Results indicated that an average seed yield of about 2.5 tons/hectare was obtained for sample seed farms during the 2009 dry season. Among the cost components, labor alone accounted for about one-third of total input cost because of additional labor required in seed production. However, labor requirement has come down significantly as seed growers gained experience and skills. On average, hybrid rice seed production generated a net profit of USD 2,007/hectare, which is about four times more profitable than in-bred rice cultivation.

*Keywords:* hybrid rice, seed production, contract growing, India

## Market Margin Study of Off-season Cabbage Value Chain in the Eastern Development Region of Nepal

Ghimire Purushottam, Nakayasu Akira, Matsuoka Atsushi

Ehime University, Matsuyama, Japan  
ghimirep246@yahoo.com

Kameyama Hiroshi

Faculty of Agriculture, Kagawa University, Kagawa, Japan

A case study was conducted to understand the market margin of an off-season cabbage value chain in the eastern development region of Nepal in May–June 2012. Production cost, farmers' gate price, and collector/cooperative level market margin in the collection hub at Sidhuwa market, Dhankuta District and wholesale market margin and consumers' price were thoroughly studied at three major markets (i.e.,

Dhankuta, Dharan, and Biratnagar) in the region. The study showed that market margin was more than double that of farmers' gate price in all three markets. The share of the market margin for Dhankuta was the highest at 29 percent of the total cost. The share of the farm wastage, postharvest handling loss between farm and collection hub, and losses borne by the retailers were the most important factors for higher marketing margin. The profit margin set aside by the value chain actors was another important factor for high market margin. Thus, attempts to reduce postharvest loss will be dynamic for reducing marketing margins in an off-season cabbage value chain.

*Keywords:* market margin, off-season cabbage value chain, production cost, farmers' gate price, postharvest loss, Nepal

## Profit Efficiency in Rice and Wheat Seed Production: A Case Study in the Tarai Region of Nepal

Narayan Prasad Khanal, Keshav Lall Maharjan

Graduate School for International Development and Cooperation, Hiroshima University  
narayankhanal36@gmail.com; mkeshav@hiroshima-u.ac.jp

Estimating profit efficiency is one of the popular measures to understand the performance of farmers. In this paper, the researchers measured the profit efficiency of farmers in rice and wheat seed production using the commonly used input variables (labor, chemical fertilizer, machinery, and land), and other socio-economic variables. A stochastic frontier profit model was estimated in a single step. The data for this study were collected from Tarai Region of Nepal covering 180 households. Result showed that average efficiency of farmers in rice, wheat and rice, and wheat seed production are 40 percent, 37 percent, and 43 percent, respectively. There is wide variation in the efficiency level among the households, which is mainly due to variation in irrigation, education of household head, and livestock. Moreover, the findings of this research implied that estimation of profit efficiency of farmers in rice-wheat system jointly is better than separate analysis.

*Keywords:* profit efficiency, rice, wheat, seed production, Nepal

## Contract Farming and Small Farmers in Indian Agriculture: A New Opportunity?

Braja Bandhu Swain

International Livestock Research Institute (ILRI), New Delhi, India  
brajacds@gmail.com; b.swain@cgiar.org

Farming based on a contract between farmers and agro-processing and/or marketing firms is catching on in Indian agriculture due to the conducive policy environment (i.e., Agricultural Produce Market Committee Act) and change in consumption patterns. The logic behind promoting this form of farming is to encourage private investment in agriculture and to reduce price risks as well as postharvest losses. The private sector may play a role in providing a range of services from input supply to crop assembly and marketing. In this context, this paper reviewed the theories of contract farming as well as explores the impact of contract farming on agriculture in general and on farmers in particular. In addition, it examined the extent by which contract farming can remove the constraints faced by farmers and help them move out of the poverty trap. The study observed that contract farming cannot be seen

as a panacea for all the problems afflicting Indian agriculture even though it has the potential to address many problems Indian farmers confront. These include problems in terms of market access (in markets for both inputs and output), access to new technology, and in obtaining better prices.

Contract farming, however, introduces problems such as degradation of traditional knowledge, deterioration of soil quality, and bias toward large farmers. Thus, there is need for a better institutional mechanism to make contract farming more inclusive.

*Keywords:* contract farming, private investment, small farmer, Indian agriculture

## How does Trust Matter in Cash Crop Adoption? Evidence from the Indian Himalayas

Thomas de Hoop

American Institutes for Research (AIR), Washington D.C., USA

tdehoop@air.org

Luuk van Kempen

Centre for International Development Issues Nijmegen, Radboud University Nijmegen, the Netherlands

l.vankempen@maw.ru.nl

This paper aimed to further explore the importance of trust in agricultural innovation by determining the link between trust, social networks in federations, and crop adoption in the Devrana valley, Uttarakhand state in the Indian Himalayas. A federation was set up by a non-governmental organization that was disseminating information about cash crops to the local community who were members of farmers federations. Their perceived trustworthiness could help determine whether cash crops were adopted by other community residents. We hypothesize that trust is positively related to the adoption of new crops when asymmetric information about new crops is addressed by social networks in federations.

The paper focused on the adoption of two relatively new crops in the Devrana valley: tomatoes and French beans. Tomatoes had already been adopted by several farmers before the baseline survey in 2008. In 2008, French beans had a less established position.

The researchers asked for agreement with the statement “Most people can be trusted” on a 5-point Likert scale to measure trust. They took advantage of a household-level panel dataset from 17 villages in the Devrana valley to test our hypothesis. Logistic model was used to determine the relationship between crop adoption of individual farmers in 2010 and prior crop adoption of local community residents in 2008. Subsequently, the paper extended the model with variables indicating access to federation, trust and interaction between the federation and trust, as well as fixed rural effects.

It was found that prior adoption of tomatoes and French beans by local community residents was significantly correlated with the likelihood of an individual farmer producing these crops in 2010. This relationship was stronger for tomatoes than for French beans. Furthermore, we found evidence that in the case of French beans, trust improved the effectiveness of the dissemination of information about new crops in social networks. Trust strengthened the relationship between the presence of the federation and the decision to adopt French beans but not tomatoes. The paper argued that the relationship between trust, social networks, and crop adoption is likely to be stronger when the prospects of crop adoption are relatively ambiguous. The returns to French bean adoption might be relatively ambiguous and the possibility of selling tomatoes in wholesale and local markets might make the decision of adopting tomatoes less risky than the decision to adopt French beans.

*Keywords:* trust, adoption, social network, French beans, tomatoes, India

## Institutional Innovation and Development of Markets for Agricultural Services: Agri-Clinics and Agri-Business Centres in India

P. Kanaka Durga

National Institute of Agriculture Extension Management (MANAGE), India

kanaka.manage@gmail.com

In India, the increase in agricultural production can be possible mainly through the growth in productivity. Productivity growth in turn depends on institutional innovation and development of markets for agricultural services for small and marginal farmers. To provide effective extension services to farmers in the public-private partnership mode, Agri-Clinics and Agri-Business Centres (ACABC) scheme was launched in 2002. ACABC provide agricultural advisory services to farmers through technically trained agriculture graduates at the village level, known as “agripreneurs.” The centers provide a wide range of services such as soil, water quality and input testing laboratory; plant protection services; vermicomposting units; horticulture; veterinary clinics; and agro-service centers for farm machinery and primary processing.

This evaluated the ACABC scheme in terms of provision of effective extension services to farmers and in linking them to markets. This paper analyzed the status of entrepreneurship development and the performance of units established under the scheme. The study was conducted in Ranga Reddy and Mahbubnagar districts of Andhra Pradesh. Out of the 26 activities in which ventures have been established, 11 agripreneurs covering 11 activities were chosen for analysis. The units were categorized into five based on activities undertaken. These groups were agri business units (sale of fertilizers, insecticides, pesticides, seeds, etc.); agriclincs (which provide consultancy services); tractors; dairy units; and nurseries. To study farmers’ views on the benefits derived from these units, each agripreneur contacted five farmers; their views on the importance, need, and benefits were elicited.

The field observations indicate that the training imparted to them was very useful especially for preparing project reports, for documentation procedures, and for other economic aspects of running an enterprise. Even though other activities were taken up by entrepreneurs, provision of agricultural inputs along with provision of consultancy services were found to be major activities. It was observed that agripreneurs were able to attract farmers due to good quality inputs, expert advice to farmers regarding proper use of inputs, and free consultancy services. The extension efforts of agripreneurs culminated in better awareness of dairy practices, feed and fodder management, and better production and price realization. Apart from providing employment to agricultural graduates, the ventures helped provide fruitful employment, (both direct and indirect) to several people depending on the nature of enterprise. With the intervention of extension services from agripreneurs, there was an improvement in cropping patterns and thereby, incomes of farmers.

Even though the objective of technological transfer has been met to a certain extent, there is still a need to involve private extension staff in the entire production, processing, transportation, and marketing chain as farmers have received very little support in improving the marketing of their produce. This needs to be enhanced by providing better market information to the farmers.

*Keywords:* agripreneur, extension, agricultural services, agri-business centers, agri-clinics, India

## Comparative Advantage in Production of Selected Agricultural Commodities in Bangladesh

M.A. Rashid

Agricultural Economics Division, Bangladesh Agricultural Research Institute, Bangladesh  
md.abdurr@yahoo.com

Uttam Deb

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Andhra Pradesh, India  
u.deb@cgiar.org

This study examined the relative efficiency in the production of different crops in Bangladesh and their comparative advantage in international trade. To know the comparative advantage in the production of different crops, we calculated net economic profitability, nominal rate of protection (NRP), and domestic resource cost (DRC). Data used in this study was collected through household surveys of 503 sample farms located in 12 villages under 11 districts in Bangladesh from 2009 to 2012 under the Village Dynamics Studies in South Asia (VDSA) project. The cultivation of selected crops (rice, wheat, maize, potato, groundnut, chickpea, and lentil) at the farm level provides much remuneration to its growers. The domestic-border price ratio of rice indicates that domestic rice production has been taxed and that consumers have been subsidized. The border prices of wheat, maize, potato, groundnut, chickpea, and lentil at the producer level were mostly higher than domestic producer prices. DRCs for rice were observed to be less than unity, implying that Bangladesh had comparative advantage in rice production for import substitution and export promotion. The estimates of DRC showed that Bangladesh also had comparative advantage in wheat, potato, groundnut, chickpea, and lentil production. Timely, up-to-date information regarding inputs, input prices, availability of improved varieties, output prices as well as agricultural and macroeconomic policies should be ensured to improve the competitiveness of farmers. To exploit export opportunities, Bangladesh will need to enhance its supply-side capacity as well as pursue broad-based diversified agricultural production and export strategy.

*Keywords:* nominal rate of protection (NRP), domestic resource cost (DRC), competitiveness, Bangladesh

## Exploring Postharvest Losses of Vegetables in Bangladesh

Fathema Zhura Khatoon, Zainu Sadia Islam, Fakir Md. Yunus, Azhar Uddin, Marziana Mahfuz Nandita

Research and Evaluation Division, Bangladesh Rural Advancement Committee, Dhaka, Bangladesh  
zainusadia58@gmail.com

Sophia Broos, Jan de Haan, Bas Jongerius, Bart Jan Sonneveld, Tristan Wesenhagen

University of Amsterdam, the Netherlands

This paper investigated the loss of perishable vegetables at different stakeholder levels in the supply chain in different geographical regions of Bangladesh (i.e., Jessore, Manikganj, and Dhaka), which are used as examples of food loss at the rural, semi-urban, and urban levels, respectively. The study

went further by investigating the potential added value of cold storage facilities and the effect their introduction may have on different stakeholder relationships. The study then addressed the potential of utilizing solar power to facilitate the introduction of cold storage facilities. The use of solar energy was investigated since it has been considered as a potential solution to current energy limitations in Bangladesh. The study was qualitative in nature and used standard data collection techniques (in-depth interviews, key informant interviews, focus group discussions, and direct observations) for the triangulation of information. The study concluded that perishable vegetable losses occur due to diverse, interlinked reasons involving different stakeholders and that losses vary across different geographical areas. The stakeholder relationships were found to be a factor that requires due consideration prior to intervention. Farmers were identified as a particularly disadvantaged and vulnerable stakeholder group. In this situation, the potential of utilizing cold storage facilities at the farmer level were found to be viable solutions. Finally, solar panels for commercial agricultural practices were currently not found to be economically nor technically feasible for small-scale practices. However they may be feasible in the near future due to a number of factors that include increasing efficiency of solar panels, decreasing price of solar cells, and changes in government strategy.

*Keywords:* postharvest losses, vegetables, cold storage, Bangladesh

## Value Chain Analysis of Premium Quality Rice Varieties in Bangladesh

Rafiqul Islam, Humnath Bhandari, Timothy Russell

International Rice Research Institute, Bangladesh

[h.bhandari@irri.org](mailto:h.bhandari@irri.org)

Rice cultivation is a major source of livelihood in Bangladesh. Despite significant increases in rice yields, farmers' income did not increase substantially in the past three decades. Cultivating premium quality rice varieties in both aman (BRRI dhan34) and boro (BRRI dhan50) seasons is one way to increase rice farmers' income because both these varieties can fetch significantly higher market prices (almost double) and earn two to three times higher gross margin than average-quality rice varieties. BRRI dhan50 has some milling problems with traditional husking mills, but this problem has been solved with auto-rice mills. The only problem with auto-rice mills is the sufficient quantity of supply for milling. Lack of branding, poor market linkage, and low share of farmers in consumer prices are other postharvest problems faced by BRRI dhan50 growers. This paper analyzed the value chain of premium grain quality rice variety (BRRI dhan50) and recommend strategies for its large-scale production. This study used both qualitative and quantitative data from farmers and traders in Bangladesh. Data was collected from 15 male and 15 female groups of rice farmers, 60 individual rice farmers and 60 rice traders as well as millers. Based on this data, the paper analyzed farmers' and traders' preferences for rice varieties and grain qualities, marketing margins and price spreads, profitability, processing, and marketing-related issues of BRRI dhan50. The results showed that the adoption of BRRI dhan50 has increased significantly in the last three years. Higher yield, fine grain, and higher market prices attracted farmers to grow the variety. The average farm gate price of BRRI dhan50 was 50 percent higher than that of the popular rice variety (BRRI dhan28). But with the typical supply chain of BRRI dhan50 (i.e., farmers → local traders → rice millers → wholesalers → retailers → consumers), the farmer's share in consumer's price is low in comparison to that for BRRI dhan28. Thus, any policy intervention related to marketing this premium quality rice variety can increase its cultivation. This could ultimately increase farmers' income significantly. The required efforts in this regard should be directed toward increasing supply of quality seeds (including packages of production practices), directly linking farmers to main

traders, establishing brands of premium quality rice varieties, and promoting exports.

*Keywords:* value chain, rice, premium quality, Bangladesh

## Sweetpotato Value Chain Analysis in Papua New Guinea

Christie Chang

Institute for Rural Futures, University of New England, Australia  
hchang@une.edu.au

John Kewa

Fresh Produce Development, Port Moresby, Central Province, Papua New Guinea  
Johnlark.kewa@gmail.com

Sweetpotato is the most important food crop in Papua New Guinea (PNG), accounting for 43 percent of all food energy intake. It is grown throughout PNG, but production is centered in the highlands, where 75 percent of the crop is produced. In recent years, sweetpotato has become an important cash crop for smallholder farmers who are driven by the need to generate income in a cash economy, by the growing demand from an expanding non-farm sector, and urbanization especially in coastal cities. Market opportunities exist for highland sweetpotato in distant coastal markets. However, long distance sweetpotato marketing from the PNG highlands to coastal markets is plagued with heavy product losses and high costs of marketing. The objective of this paper was to identify socio-economic constraints to and opportunities for improving marketing efficiency of the long distance sweetpotato value chain in PNG.

The value chain analysis was conducted based on extensive consultation with various stakeholders along the value chain through personal interviews of key supply chain operators (e.g., microfinance institutions, transporters, wholesalers, local market traders, institutional buyers, etc.), focus groups of farmers' groups, and consumer survey. The results indicated that there were serious issues regarding access to credit; transport infrastructure (high costs, poor roads, and no specialized transport system); postharvest handling (no sorting or grading, poor packaging, rough and multiple handling, and no proper storage facilities); chain coordination (no collaboration or communication between value chain operators); and lack of support services (market information and training as well as extension) to facilitate behavioral changes and uptake of improved technologies. For women, there were gender-specific issues that were related to personal safety, poor market facilities, as well as inequality in the division of labor and the distribution of income within the household. The main conclusion was that to take advantage of the growing demand for high-quality sweetpotato in the coastal markets (which has occurred due to urbanization and due to the mining boom in recent years), smallholder farmers must organize themselves in groups and collaborate in order to improve their capacity and capability to access markets, credit, training, and extension as well as to meet market demand for high quality product at competitive prices.

*Keywords:* value chain analysis, marketing, smallholder farmers, sweetpotato, Papua New Guinea

## Theme 4

### Farm Size and Productivity Revisited

Moderator: Mahabub Hossain

Building Resources Across Communities (BRAC)

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#### Productivity, Yield Gap, and Efficiency of Resource Use in Hybrid Rice Production in Bangladesh

Abdur Rouf Sarkar, Humnath Bhandari

International Rice Research Institute, Bangladesh

[h.bhandari@irri.org](mailto:h.bhandari@irri.org)

Bangladesh has made remarkable progress in rice production in the past three decades with production growing at three percent per year. This has led to self-sufficiency in rice for the first time in 2000 for its 150 million people. But now it faces the challenges of feeding an additional 1.8 million mouths each year with declining land, water, labor, and other production resources. The challenge is to produce more rice with less resources in a sustainable manner. This can be achieved by enhancing productivity through options such as narrowing yield gaps and improving efficiency of resource use. Better understanding of these options is needed to design effective technological, policy, and institutional interventions but the existing knowledge on these issues is limited for Bangladesh. This paper investigated technological adoption, productivity, yield gaps, and production efficiency of different categories of rice farmers (who have been categorized based on their farm size) in Bangladesh. The 2011–2012 dry-season hybrid rice production data collected from more than 500 randomly selected rice farmers who represent the whole country were used. These were analyzed using descriptive statistics and stochastic frontier regression model. Results showed that 28 percent yield gaps exist between potential and actual farm-level rice yields as well as 15 percent mean level of inefficiencies in input use in hybrid rice production. The productivity, yield gap and efficiency in resource use differed significantly between small and large farmers. Farm size, labor use, fertilizer use, irrigation, rice varieties, and the age of the decision maker significantly affected the yield gaps and production inefficiencies. Adoption of location-specific improved technologies, the right site-specific farm management practices, and effective as well as efficient extension approaches can overcome the yield gaps and inefficiencies in resource use. This will not only increase rice production and ensure food security but also enhance economic viability of smallholder farmers. The power of modern science makes such intervention easier. However, this requires strategies, policies, an effective institutional set-up, and adequate investment on rice research and development.

*Keywords:* hybrid rice, farm size, productivity, efficiency, Bangladesh

## Agricultural Production Performance in Small Farm Holdings: Some Empirical Evidences from Bihar, India

R.K.P. Singh

State Farmer's Commission, Government of Bihar, Patna, India

K.M. Singh, Abhay Kumar

Division of Socio-economics and Extension, ICAR Research Complex for Eastern Region, Patna, India  
akumar1904@rediffmail.com

Anjani Kumar

International Crops Research Institute for Semi-Arid Tropics, Hyderabad, India

Agriculture in India's Bihar State is characterized by small land holders. About 91 percent of farm holdings are marginal farms (<1.0 ha), which cover about 53 percent of the land area in the state. During the last 20 years, the number of sub-marginal farms (<0.50 ha) increased and now constitute about 40 percent of farm households covering 13 percent of the land area. Immediately after the Green Revolution, there was an intense debate on the observed inverse relationship between farm size and per hectare agricultural productivity in India. It was subsequently argued that the higher productivity of small holdings would disappear with the adoption of superior technology, modernization, and growth in general. Recently, National Sample Survey data show that small holdings in Indian agriculture still exhibit higher productivity than large holdings.

This study was undertaken to analyze the relationship between food grain productivity and farm size. The study used primary data collected under the project entitled Tracking Change in Rural Poverty in Household and Village Economics in South Asia. Food grain area constitute more than 85 percent of gross cropped area of farms, however, the proportion of food grain area is higher in larger farm holdings than smaller farm holdings. Rice and wheat emerged as the two most important crops, constituting about three-fourths of gross cropped area. Per hectare rice productivity was 33 quintals (or 3,300 kg) on large farms, which declined with the decline in farm size. This was mainly due to higher use of critical inputs (fertilizer, quality seed, and irrigation) on larger farms because they had more liquidity for acquisition of inputs. Hence, it may be inferred that there is a positive relationship between farm size and productivity of food grain crops in Bihar. The lives of smallholder families can be improved only by building on their higher per acre agricultural productivity and by promoting off-farm rural employment.

*Keywords:* farm size, productivity, farm technology, small holdings

## Farm Size Productivity in Rice Farming: Recent Empirical Evidence from Bangladesh

M. Saidur Rahman, M.A. Sattar Mandal

Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh  
saidurbau@yahoo.com, m.s.rahman@irri.org

Kei Kajisa

School of International Politics, Economics and Communication, Aoyama Gakuin University, Japan

Humnath Bhandari

International Rice Research Institute (Bangladesh Office), Dhaka

Productivity in rice farming is increasing since modern inputs and techniques are being adopted in production systems. In developing countries, farm sizes are also a concern in estimating productivity. In this study, primary data were collected from 958 households in 96 villages of 48 upazilas under 31 districts of Bangladesh in 2013. Upazilas, unions, villages, and households were randomly selected from five rice-growing divisions with shallow tube well (STW) irrigation. The study has covered landless farmers (18.68%), small farmers (73.80%), medium farmers (7.20%), and large farmers (0.31%). In terms of farm productivity, medium farmers have the highest yield of 6,818 kg/ha followed by the small farmers (6,309 kg/ha), landless farmers (6,089 kg/ha), and large farmers (5,495 kg/ha). The margin from rice farming is minimal and medium farmers have the highest earnings of BDT 27,033/ha whereas small, landless, and large farmers are earning BDT 18,184/ha, BDT 12,292/ha, and BDT 1,094/ha, respectively. Farm-specific technical inefficiency was calculated using translog stochastic production frontier function and estimated by the maximum likelihood estimation model. There are also inefficiencies in using farm inputs by different types of farmers. It was found that medium and large farmers have the higher level of inefficiency and landless farmers have the least inefficiency among the farm types. Cheaper price of rice during harvest season is one of the main reasons for lower margins in rice farming as perceived by most of the farmers. In addition, government policy in paddy procurement and the increasing trend of farm input prices are also reasons for lower margins from rice cultivation. It is suggested that the declaration of the procurement price of rice and lower farm input prices are good incentive for farmers to continue rice farming in the long run.

*Keywords:* rice farming, productivity, farm size, technical inefficiency, Bangladesh

## Technical Efficiency of the Farmers of Two Upazilas in Bangladesh: Stochastic Frontier Approach

Islam Md. Aminul, Keshav Lall Maharjan

Graduate School for International Development and Cooperation, Hiroshima University  
aminlab701@gmail.com; mkeshav@hiroshima-u.ac.jp

This study used the stochastic frontier approach to measure the technical efficiency of the farmers in two upazilas (sub-districts) in Bangladesh in terms of crop cultivation. The main aims of this study were to analyze the actual production level, determine how much is deviated from the maximum attainable production level in terms of technical efficiency among different tenure categories of farmers, and identify the impact of the factors associated with technical efficiency. A case study was conducted in Basail Upazila, Tangail District and Titas Upazila, Comilla District based on cross-section data in January–March 2013. The age of the household head, education, farm size, off-farm income, and other

relevant variables were assessed. Maximum likelihood estimation and ordinary least square regression techniques were used to estimate the parameters of the stochastic production frontier. Analysis of variance was used to analyze the mean difference of technical efficiency. Ordinary least squares regression was used to identify the factors associated with technical efficiency. It was found that technical efficiency varied among different categories of farmers. Land rent and weed management had significant positive impact on technical efficiency. This showed the potential of improving the technical efficiency through structural change by taking proper measures in land tenure arrangements in consideration of land rent and providing the required weed management support for the farmers.

*Keywords:* stochastic frontier, maximum likelihood estimation, ordinary least squares regression

## Do Farm Size and Tenancy Relations Matter for Resource Utilization and Economics of Scale in Paddy Production?

Md. Shakil Ahmed, Mohammad Abdul Malek

Research and Evaluation Division, Bangladesh Rural Advancement Committee

malekr25@gmail.com, malek.a@brac.net

Using recent data, this paper confirmed empirical evidence for two research questions: (1) Does an inverse relationship between farm productivity and farm size still exist? and (2) Does the recent transformation in tenurial arrangement give a different perspective in resource utilization across different tenant groups? Sample survey dataset of about 4,300 farm households drawn from a census of more than 60,000 rural households were used. The census was conducted in 240 villages in 40 upazilas of 22 districts representing six different agroecological conditions (e.g., elevated, flood-prone, saline land) and different levels of infrastructural development (e.g., access to irrigation and proximity to market) throughout the country. Four categories of farm households (functionally landless, marginal, small, and medium) under different tenurial arrangements (pure tenants, mixed tenant, and owner farms) were included in the sample. For detailed cost return analyses, we used plot level cost return data for 7,418 large plots (owned land and also rented land). The paper applied the generalized Cobb-Douglas production function to estimate factor productivity and returns to scale of the agricultural farms in three different seasons. The study found that the functionally landless farmers produced a significantly larger amount of output than the other three types of farms in aus (pre-monsoon) and aman (monsoon) seasons. To produce this output, landless farmers utilized relatively greater amounts of family labor, capital service, and materials. In boro (irrigated) season, the amount of output produced in all four types of farms were not significantly different but the material cost was significantly higher in the case of functionally landless farmers. In this season, landless and marginal farmers also use huge high amount of family labor. Marginal productivity of land is relatively higher in medium farms compared to other types of farms throughout the year. Marginal productivity of labor was very low for landless farms in all the three seasons. In the context of resource utilization, output increased with a proportionate increase in inputs, in most cases. Across the tenant groups, the pure owner farm households invested more and produced more paddy per unit of land in comparison to mixed tenant and pure tenant farms; however, the net returns to all three tenant groups do not differ significantly. If we consider only those with rented land and those who own land, it was found that farmers are investing and producing more in their own lands than in rented land. However, there is no significant difference in their ultimate net return.

*Keywords:* tenancy relations, resource utilization, paddy production, Bangladesh

## Adoption Pattern of Improved Rice Varieties and Their Farm-Level Impacts in Rainfed Areas: Microlevel Evidence from Odisha

Prabhakar Nanda, Mukesh Sinha, Ashwani Kumar

Directorate of Water Management (Water Technology Centre for Eastern Region), Bhubaneswar, India  
prabhakar.nanda@gmail.com

The spread, adoption, and determinants of modern rice varieties under different water regimes and their farm-level impacts were analyzed from household panel data that were collected from 115 rice farmers under the village level studies project in 2010–2012. The coverage of modern varieties was found to be only 37 percent in medium land plots and 11 percent in low land plots. A multivariable probit model was used to study the factors affecting adoption of modern varieties. The important factors influencing the adoption of a modern variety were the type of land, tenurial status of plots, and status of irrigation. Therefore, wider adoption of modern rice varieties in these areas depends on the development of new varieties that are specifically adapted to these environments. The study suggested that the development of new varieties and irrigation along with adoption of land reform measures will facilitate a faster spread of modern rice varieties in the area. In terms of farm-level impacts, it was found that the incomes of these households were quite diversified. Against the general impression that crop income dominates household income, it was observed that non-farm income has emerged as an important source. Rice, which has traditionally been the main source of income in this area, has slipped to third position, next to remittances and income from non-farm activities. The income from non-farm work and rice accounted for 71 percent and 20 percent of total income, respectively. Non-farm sources contributed more than 90 percent toward income inequality. The source-wise income share also showed a similar trend at the disaggregated level of farm-size categories. The income share for livestock has been comparatively high for large farmers. The analysis of employment pattern showed that male workers dominated labor market participation—a sizeable proportion of which has been in the non-farm sector. Creation of more non-farm employment opportunities, increase in investment on human resource development, greater research on development of rice varieties, and assured irrigation will be needed to increase and stabilize household income in the affected rainfed areas.

*Keywords:* adoption pattern, improved rice varieties, rainfed, non-farm income, India

## Revisiting Farm Size and Productivity Relationship: Farm-Level Analysis across Three States in India

Vidyarthi Vikas

A.N. Sinha Institute of Social Studies, Patna, India  
vidyarthiv@rediffmail.com

Madhusudan Bhattarai

International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India  
b.madhu@cgiar.org

For a long time, an inverse relationship between farm size and productivity was a debated policy issue among development economists at the global level as well as among the development economists and planners of South Asia from the 1960s to the 1990s. Varying estimates and policy implications across

regions and over time were selected for the study. In each decade, this relationship had been re-opened with new issues and new twists. This is especially true now when labor wage rate is simultaneously increasing at a rapid pace in India, Bangladesh, and in several other countries in Asia.

When a smallholder farm becomes unviable, its cultivators become tenants and wage laborers. Ultimately, they migrate to the nearest town and become urban dwellers. The lives of small farmers can be improved by increasing agricultural productivity and by promoting off-farm rural employment in order to reduce their migration to cities.

After reviewing and synthesizing the literature on farm size and productivity, the researchers provided empirical findings on the relationship between farm size and productivity and explained the specific issues surrounding this topic. This study is based on empirical analysis of 450 households spread over 10 villages in three different states of India (Uttar Pradesh, Madhya Pradesh, and Gujarat). Our empirical results and consultation with farmers in these villages also provided ample evidence of the case of reverse tenancy in many of the villages. This trend of reverse tenancy is facilitated by the development of rental market (custom-hiring) of heavy farm machinery, as well as rapid increase of urban labor demand and urban wage rate, which in turn, lead to migration of not only farm laborers but also of smallholder farmers. These factors have further diluted the effect of farm size on productivity. Based on the empirical evidence from the villages (and 450 farms), a policy for enhancing welfare benefits to smallholder households in India, by including options for diversified farm/off-farm work and social safety nets in rural areas was recommended. As a result, all can participate in the growth process. This study also provided options for enhancing productivity and profitability of smallholder farmers in India.

*Keywords:* farm size, productivity, smallholder farmers, farm income, off-farm income, India

## Farm Size and Productivity of Rice in Eastern States of India with Special Reference to West Bengal

Bhanudeb Bagchi

Nadia Zilla Farmers' Development Organisation, West Bengal  
drbagchi2004@yahoo.co.in

Since the introduction of modern rice varieties in India, the yield per hectare has increased considerably although this increase in yield is not uniform among different states. It has been seen that in eastern states, increase in rice productivity lagged behind the southern and northern states of India. In four eastern states, a wide variability in rice productivity was found. Plot-wise data regarding the cost of cultivation was collected from rice growers for the year 2009–2010. No uniformity in farm size and productivity of rice was seen in these four states. It was seen that smaller farms had higher yield than the average state level yield. The use of the most important yield increasing input (i.e., fertilizers) shows no relation to its use in farm groups of different sizes. Use of nitrogen fertilizer per ha in smaller rice farms in West Bengal was found to be higher than the state average. The same was observed in Bihar and Orissa. Zone-wise agro-climatic data in West Bengal revealed diversity in rice varieties. Moreover, no relationship was found between rice yield and farm size. In some cases, it was found that smaller farms were more efficient in input use, which was in turn reflected in their output and profitability.

*Keywords:* farm size, productivity, West Bengal, India

## Benchmarking the Cost and Profitability of Paddy Production in Selected Asian Rice Bowls

F. Bordey, P. Moya, J. Beltran, C. Launio, A. Litonjua, R. Manalili, A. Mataia, J. Besenio, F. Macalintal, R. Malasa, E. Marciano, M. Milanés, S. Paran, R. Relado, M. San Valentin, I. Tanzo, E. Tulay, S. Valencia, C. Viray, C. Yusongco

Philippine Rice Research Institute

fh.bordey@philrice.gov.ph

Given the pending implementation of free trade agreements that are expected to increase the flow of rice trade among Asian rice bowls, this study evaluated the cost and profitability of producing paddy rice in irrigated and intensively cultivated areas in selected Asian countries. A total of 600 farmers in China, India, Indonesia, the Philippines, Thailand, and Vietnam were interviewed about their paddy output and inputs costs during the January–June 2013 harvest. A comparative farm budget structure was constructed using actual and shadow prices.

Vietnam has the highest average yield of 6.8 tons per hectare (tons/ha) while China, Indonesia, and the Philippines followed with an average yield above 6 tons/ha. The respective yield levels of Thailand and India are 5.7 and 4.7 tons/ha. Major rice-exporting countries such as Vietnam and India have unit costs of USD 156 and USD 188 per ton, respectively. Meanwhile, rice-importing countries like the Philippines and Indonesia produce paddy at USD 220 and USD 196 per ton, respectively. The higher labor cost is the main reason for the cost differential between importing and exporting countries. Thailand, a traditional rice exporter, has a unit cost of USD 218 per ton due to high cost of material inputs and expensive land rent. China, a marginal rice exporter until 2010, has the biggest unit cost at USD 287 per ton. The high opportunity cost of land was also a key factor that drives the large cost of producing paddy in China.

Aside from yield and cost differences, variation in paddy price also affected the relative profitability of paddy production in selected countries. The high support prices in China and Thailand led to higher gross revenues and consequently to bigger net profits. Despite medium costs, Indonesia and the Philippines have moderate net profits due to their high yield levels. In contrast, India and Vietnam have minimal net profit despite low production costs because of depressed paddy prices. By only considering the irrigated and intensively-cultivated areas, the results implied that net-importing countries are improving their relative cost while some of the traditional exporting countries seem to be losing their cost advantage.

*Keywords:* rice trade, China, India, Indonesia, the Philippines, Thailand, Vietnam

## Estimating the Spread of Improved Wheat Varieties and Rice Hybrids in Eastern Uttar Pradesh and Bihar, India

Anurag Ajay, Mamta Mehar, Arindam Samadhar, Anurag Kumar

CSISA-CIMMYT, Bihar Hub, Patna, India

a.ajay@cgiar.org

Timely availability of quality seeds is the most important prerequisite for a good harvest. Although new seed varieties are developed and released considering the fall in productivity and the changing

requirements of nature (i.e., climate change) and farmers, their spread and usage is less than expected mainly because of deficiencies in the delivery system. This study attempted to understand the spread of improved varieties and hybrids on a wider scale by interviewing major seed wholesalers (of rice and wheat). In a recent survey, we estimated the total diffusion of seeds of respective crops through markets in the pre-selected regions of Bihar and Uttar Pradesh (eastern) states.

Since the list of seed wholesalers is not available in the public domain, different approaches and networks were used to identify the major wholesalers at the district level. The total sample size in both the states is 80 and the wholesalers as a whole are representative of almost 90 percent of the market in the studied regions.

The results showed that improved varieties and hybrid sales have increased in the past two years. As a result, it can be assumed that there has been increased usage of such seeds among farmers. However, the spread is not uniformly distributed across the two studied states. Timely availability, accessibility, and acceptable quality of improved wheat varieties and rice hybrids can be substantially increased by decentralized seed production arrangements at the farmer level.

*Keywords:* adoption, rice hybrids, improved wheat varieties, seed wholesalers, India

## **Theme 5**

# Migration, Gender, and Multi-Occupation Livelihood Strategy

Moderator: Agnes Quisumbing

International Food Policy Research Institute

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## Gender Impact of Changing Rice-based Cropping System in Bangladesh

Kamala Gurung, Humnath Bhandari, Thelma Paris, Samarendu Mohanty

International Rice Research Institute

[h.bhandari@irri.org](mailto:h.bhandari@irri.org)

Rice and fish are the staple food of more than 150 million people in Bangladesh. Rice is the dominant crop; it occupies more than three-fourths of the country's cultivated area. Rice provides half of agricultural gross domestic product (GDP), one-sixth of rural household income, half of rural employment, two-thirds of per capita daily calorie intake and half of per capita daily protein intake. Almost 15 million farming families grow rice. Both men and women contribute to rice cultivation, which is labor-intensive. However, labor participation varies by sex as well as geographical regions and socio-economic groups. Despite its significant contribution to rural livelihoods, rice-based farming systems have been diversifying and changing in Bangladesh. Commercial aquaculture farming (CAF) has been expanding in rice fields over the past two decades. Moreover, traditional subsistence-type fish ponds are also being converted to CAFs. These transformations may have affected livelihood options, gender roles and responsibilities, as well as access to production resources. The objective of this paper is to examine transformation in rice-based cropping systems and derive implications of CAFs on household food security as well as gender roles and relations. The paper analyzed primary data that was collected from 10 villages of three districts in Bangladesh. The conversion of rice to CAF disproportionately benefitted upper-middle class and rich farming households, which had a significantly lower labor requirement for CAF than for rice farming. CAF has threatened the household food allocation and created greater income inequality in society. The transformation has decreased the workload of women in comparison to rice cultivation, however, women's access to and control over agricultural products have declined. They have become more dependent on their husbands' income and have lesser control over income use. With the promotion of female-friendly mechanization, diversification of rice-based farming systems could be an effective intervention mechanism to make rice-based farming more profitable. Equitable access to credit for the poor and for medium farmers, including women, could let them engage in CAF.

*Keywords:* rice, commercial aquaculture, cropping-system, gender, Bangladesh

# Labor Out-migration from Rice-based Cropping System in Bihar, India

Abhay Kumar

ICAR Research Complex for Eastern Region, Patna, India  
akumar1904@rediffmail.com

R.K.P. Singh

State Farmer's Commission, Govt. of Bihar, Patna, India

K.M. Singh

Department of Agricultural Economics, RAU, Pusa (Bihar), India

Anjani Kumar

IFPRI, New Delhi, India

Migration has been a recurrent phenomenon since the dawn of human history. Though its form has changed, it remains a dominant event in the global social system. In modern days people migrate from underdeveloped areas to the developed ones in search of better opportunities.

A number of social, cultural, economic, spatial, climatic, and demographic factors induce migration. However, the economic factors are considered as the primary reasons for inducing migration. Migration of male labor force from Bihar has increased during the last two decades. It was observed that the youngsters are more prone to migration and most of them are migrating to urban centers for non-farm work. Migration contributed to more rational use of two critical inputs—labor and irrigation—in rice production.

The migration seems to have helped in judicious use of human labor in the place of origin due to migration of surplus labor force for gainful employment to destinations of migration. Remittances have been utilized for meeting consumption needs, improved livelihood, better education for children, and better health care facilities. Migrant households also preferred to save money to meet their requirements in unforeseen situations. It can thus be inferred that migration may be a risk-coping strategy for the weaker sections of the society and has inculcated the habit of saving among migrant households. The allocation of remittances on agricultural inputs could have increased if proper infrastructure facilities were present in rural areas for faster dissemination of modern agricultural technology to increase agricultural production. Analysis of determinants of migration revealed that a male member of lower caste, with a larger size of land, and more dependents is more prone to migration in Bihar. The caste barrier for migration has weakened but still persists; however, the size of the farm is no longer a hindrance to migration.

*Keywords:* migration, rice production, labor migration, remittances, Bihar

# Role of Seasonal Migration on Asset Accumulation and Moving Out of Poverty: The Case of Dokur Village in Andhra Pradesh, India

G.V. Anupama, Uttam Deb, Cynthia Bantilan

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

G.Anupama@cgiar.org

Rural households in many countries have used temporary or seasonal migration as a strategy to cope with natural shocks such as drought. These have also used it as a means of employment, income generation during the lean season and to move out of poverty. This paper studied the linkages between migration, employment in economic activities, asset accumulation, and poverty reduction among rural households in a drought-prone village of India over the last four decades. The Dokur Village of Mahbubnagar District in Andhra Pradesh, India experienced persistent drought over a decade. To cope with this situation, many households in the village temporarily migrated to nearby and faraway cities. ICRISAT conducted household surveys in Dokur under the Village Level Studies (VLS) programme for the period 1975–1984, 1989, and 2001–2008. In 2009, the same households were resurveyed by ICRISAT under the Village Dynamics Studies in South Asia (VDSA) project. This study used this rich dataset (1975–2012) and tried to answer the following questions: When and how did the Dokur households opt for temporary or seasonal migration as a mechanism to cope with the adversities of drought and as part of their livelihood strategy? What factors contribute to the decision to migrate? What was the impact of migration on employment and income situation? What was the role of migration in asset accumulation of households? Has it helped them move out of poverty? If so, what was the process?

To answer the questions, the researchers reorganized the sample households into 48 dynasty households. For each year, sample households were grouped in poor and non-poor categories using both lower (USD 1.25 ppp per day per person) and upper (USD 2.00 ppp per day per person) poverty lines. In addition, based on their participation in migration, the households were grouped into two categories each year: migrant and non-migrant. Household income was computed by source in all households for all study years. The contribution of income from migration and remittances to the total household income were quantified. Critical dependence on income from migration during the drought years was examined. To identify the factors responsible for migration decision, fixed effect panel data model was used. The researchers also tried to understand the role of temporary migration on accumulating assets and in moving out of poverty. The study revealed that seasonal outmigration helped many households move out of poverty even though they had experienced a decade of drought. In-depth analysis of asset accumulation behavior of households over time also provided important insight regarding their coping mechanisms and the process of moving out of poverty.

*Keywords:* migration, poverty, asset accumulation, drought, dynasty, panel data, India

# Impact of Rural-Urban Migration on Food Security at Origin in Bangladesh: An NELM Analysis

M.Z. Hossain

Department of Statistics, Shahjalal University of Science & Technology, Bangladesh

J.U. Ahmed

Associate Professor of Economics, Government Safar Ali College, Bangladesh

The urge to study the nexus between rural-urban migration and food security stems from the question of whether this migration process actually improves the food security condition of households left behind or leads to greater food insecurity. There is a dearth of model-based research that addresses this issue in Bangladesh. Therefore, this paper aimed to achieve the objective of exploring the impact of internal rural-urban migration on food security at the household level in the place of origin. The dataset was generated from a statistically representative sample of 60 clusters of two equal east-west domains on 2,255 units of analysis that consist of 1,509 cases and 746 controls all over rural Bangladesh. In addition to the survey, qualitative data was collected through 30 focus group discussions and 30 key informant interviews. The inferential analysis was performed through 2-stage and 3-stage NELM (New Economics of Labour Migration) regression models with instrumental variables. The 2-stage model considers calorie-intake (which is the proxy for food security) as the dependent variable while the 3-stage model considers income (off-farm income without remittance and on-farm income) for the same purpose. This model simultaneously separated out the impact of migration and remittance on income, the proxy of food security. The results showed that the number of migrants exerts significantly positive impact on the per capita calorie intake. A one unit increase in the number of migrants brings about a 2.2 percent increase in per capita calorie intake. The findings of the on-farm income model indicated that the number of migrants is marginally significant ( $p < .11$ ) and it has positive impact. Remittances on the other hand have a negative impact on on-farm income. The off-farm income model revealed a highly significant negative impact of remittance on off-farm income but showed a highly significant positive impact of the number of migrants on off-farm income.

*Keywords:* impact, instrumental variable, NELM model, food security

## Theme 6

# Rural Non-farm Economy and Multi-occupation Strategy for Sustaining Livelihoods

Moderator: M.A. Sattar Mandal

Bangladesh Agriculture University

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## Rural Non-Farm Economy in SAT India: Nature, Extent, and Determinants

Patan Elias Khan, Uttam Deb, Cynthia Bantilan

Research Program on Markets, Institutions and Policies, ICRISAT

Increased importance of the rural non-farm economy (RNFE) in the livelihoods of the rural population has been reported in recent studies. The RNFE includes all income-generating activities (either as paid work or as self-employment) that are not agricultural and which provide income to rural households. The RNFE is of great importance to the rural economy for its productive and employment effects, as well as for creating demand for agricultural commodities. This paper documented the occupational patterns among rural households in the semi-arid tropics (SAT) of India. It identified various types of rural non-farm (RNF) activities and quantified the contribution of various RNF activities to employment and household income. The paper also tried to understand the participation behavior of household members in non-farm employment and factors affecting rural non-farm activities. The study is based on household-level panel data collected by ICRISAT under the Village Dynamics Studies in South Asia (VDSA) project. A total of 864 households covering 18 villages across five states in India (Andhra Pradesh, Maharashtra, Karnataka, Gujarat, and Madhya Pradesh) were studied for four years (2009–2010 to 2012–2013). These 18 study villages and sample households come from different rainfall zones representing varied infrastructural and socio-economic conditions. Descriptive analyses were carried out to understand the occupational pattern and contribution of RNF activities to employment and income. The Tobit model was used to understand the contribution of various factors such as land ownership and tenancy, technology adoption level, age of household head, number of household workers, dependency ratio, average education of working family members, and asset ownership, which affect the intensity of participation in RNF activities. Gini and pseudo Gini indices were used to understand the distributional pattern and inequality of household income. The study revealed significant contribution of RNF activities as a source of primary and secondary occupations, as well as an important source of employment and household income. However, the extent and contribution of RNF activities varied across villages and states.

*Keywords:* rural non-farm economy, Tobit model, panel data, SAT India

## Rural Non-Farm Economy in Bangladesh: Nature, Extent, Trends, and Determinants

Soumitra Pramanik, Uttam Deb, Cynthia Bantilan

Research Program on Markets, Institutions and Policies

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

p.soumitra@cgiar.org, soumitra.pramanik@gmail.com

Recent literature suggest increased importance of non-farm economic activities in the rural areas of many Asian countries. This study examined the trends in rural non-farm (RNF) economic activities in Bangladesh during the last 25 years. Changes in relative importance of the non-farm sector of rural livelihoods and their linkages with farming activities were investigated. This study documented all different types of RNF activities, the level of diversity in RNF activities, the changes over time, and their determinants. The paper also tried to understand the participation behavior of household members in non-farm employment and in factors which enable or prevent them from engaging in RNF activities. The study is based on long-term household-level panel data from 480 households located in 12 villages spanning 11 districts in Bangladesh. These 12 villages are a subset of the “62-Village Survey” conducted in 1988, 2000, 2004, and 2008 (Hossain and Bayes 2009). The study used the Mahabub Hossain Panel Dataset for 1988–2008 and the same households for 2009–2012 under the Village Dynamics Studies in South Asia (VDSA) project. The 12 study villages and sample households come from a number of agroecological zones and represent varied infrastructure and socio-economic conditions in Bangladesh. Using this rich dataset, a household panel for the period 1988–2012 was constructed. Both descriptive and econometric analyses were carried out to examine the above mentioned issues. Role of land ownership, education of household head, family size, sex of head, asset ownership, and access to credit in the process of participation and intensity of participation in RNF activities were examined using probit model and Tobit model, respectively. Gini and pseudo-Gini indices were used to understand the distributional pattern and inequality in household income. The study revealed a significant increase in RNF activities over time. However, the extent and growth in RNF activities varied across villages. Households have increasingly been using RNF activities as a multi-occupational strategy to sustain their livelihoods.

*Keywords:* rural non-farm economy, livelihood, panel data, probit and Tobit regressions

## Agricultural Diversification and Impact on Small Farmers: An Investigation of Diversification toward Grape Cultivation in Karnataka

D.A. Murali

University of Hyderabad, India

alijnvd@gmail.com

Indian agriculture is largely dominated by small farmers with 82 percent of landholdings less than two hectares. If the agriculture sector has to achieve four percent annual growth rate (as targeted in the last two five-year plans), then smallholder farmers will have a significant role to play. Crop diversification toward high-value crops seems to be a solution for problems at two levels. At the macro level, it will help rejuvenate the agriculture sector; at the micro level, it will increase the income of small farmers, as well as generate employment. However, crop diversification toward high-value crops is not a costless process; this is particularly true for small and marginal farmers. It involves several production processes and

price-related risks. The production risk can be redefined as variability in yield per acre, whereas price risk could be due to fluctuations in market prices or due to the exploitative nature of intermediaries. This study attempted to analyze these risks at the micro level, through a village-level study, across different landholding sizes. Furthermore, the study presented the mechanism adopted by farmers to mitigate the above-mentioned risks.

The study was conducted in seven villages, largely through personal interviews. The standard deviation was calculated to capture the variability in production and price risks. The study showed that high-value crops, like grapes, have higher variability in yield per acre in comparison to traditional crops, like ragi. Furthermore, it was also shown that small and marginal farmers have higher variability in yield per acre in comparison to medium and large farmers. Similarly, small and marginal farmers were more vulnerable to price risks, due to the exploitative nature of intermediaries. A mechanism adopted by farmers to mitigate these risks was repetitive exchanges. The class wise landholding analysis demonstrates that farmers with repetitive exchanges have less price variability. However, small and marginal farmers fall largely in non-repetitive exchanges, which expose them to higher risk; in contrast, medium and large farmers are the ones who have mostly succeeded through such a mechanism. Given that crop diversification is necessary and that smallholder farmers have a crucial role to play, there is no appropriate institutional mechanism to handle the risks involved in the process. The small farmers with a weak asset base and with very little surplus produce might find it very difficult to cope with the crop diversification process.

*Keywords:* crop diversification, small farmers, production and price risks, repetitive exchanges

## Rural Transformation and the Sustainability Question: Multi-occupational Strategy of Small and Marginal Farm Households in India

Renbeni Kikon, Chitrasen Bhue

School of Economics, University of Hyderabad, Andhra Pradesh  
renbenikikon@gmail.com; chitra.hcu@gmail.com

In the 'Structural Change of Indian Economy' discourse, the recent debate on the role of the non-farm sector in sustaining the rural farm economy, especially small and marginal farmer households and their sustainability, has become a central point of analysis. The argument that spillover growth (urban-rural spillover) is an important driver for employment and income generation in the rural economy is polemical. Evidence in one aspect shows that significant diversification from the farm to the non-farm sector in recent years by small and marginal rural farming households has led to a significant change in the structure of the rural economy. Between 1983 and 2004, the rural non-farm gross domestic product (GDP) has grown at a rate of 7.1 percent. It has grown faster by more than a percentage point in comparison to non-farm GDP and has grown 4.5 percentage points faster than agricultural GDP. In the period 1993–2004, non-agricultural employment growth in rural areas accelerated from 3.5 percent to 4.8 percent. In the 1980s, four out of 10 rural jobs were in the non-farm sector, now it is six out of 10. The emergence of the rural non-farm sector has opened up the rural employment generating market. By engaging in multi-occupations, the rural farming households are taking their major share of income from the non-farm sector. On the other hand, it has also been argued that structural transformation in the Indian economy is slow and atypical, mainly on account of a low share of manufacturing, disappointing growth, and poor employment performance. The sustainability of the construction sector, the highest employment-generating non-farm sector, is questionable. The gloomy picture of agriculture (which

has a decreasing share in GDP), on the other hand, has brought distress to agricultural households at different levels. As the bulk of agricultural households belong to small and marginal holding categories, the sustainability of farming households has become the center of attraction in the study of agrarian distress, considering the potential of demand generation in the economy. Diversification is not costless and small and marginal farming households face greater uncertainty than large farmer households.

So the present study focused on the diversification pattern in the rural economy by analyzing the changing land holding pattern of agricultural households and their labor market engagement over the time period. This gave a clear picture of those who are diversifying, which has greater policy implication when the development aspect of migration is targeted. It also visited the issue of sustainability of the farm and non-farm sectors, which are insecure and highly uncertain in nature. Small and marginal farmers tend to go into multiple occupations for sustenance and are involved in interdependent farm and non-farm economic activities. The study also ran a thorough investigation on the causality effect of both farm and non-farm growth structure. The analysis used data from various National Sample Survey Organization (NSSO) employment and unemployment surveys, informal sector, and migration (mentioned as round number, report number, and year). Visiting the sustainability question, the study asserted that there is an interlinkage between the farm and non-farm sectors that needs to be studied deeply. The farm and non-farm sectors have probably survived due to the existence of both and due to the causality between them (which has been shown in this study through employment and income channels). This has greater policy implication while targeting agricultural growth and development. The study suggested that the improvement in agriculture is a pre-condition for the survival of the non-farm sector as well as for small and marginal farmer households. The study was supported with micro level field work emphasizing on the multi-occupational structure of households both in rural and urban India.

*Keywords:* structural change, farm, non-farm sector, sustainability, spillover effect, multi-occupation, diversification

## Assets and Livelihood Strategies of Farm Households in Kerala: An Exploratory Analysis

A. Sajitha

Centre for Development Studies, Prasanth Nagar, Ulloor  
sajitha12d@cds.ac.in, sajiananthkrishnan@gmail.com

Many studies have already recognized the importance of livelihood strategy selection in the process of development. However, aspects such as the nature and determinants of farm household's choice of livelihood strategies have received less attention in the context of Kerala wherein agriculture provides livelihood for more than half of the people in the state, both directly and indirectly. In this context, this paper attempted to identify the livelihood strategies of farm households in the state and the role of various assets on the decision regarding the selection of livelihood strategies by using 59<sup>th</sup> National Sample Survey (NSS) round on Situation Assessment Survey of Farmers. With the help of cluster analysis and multinomial logit model, the study shows that diversified livelihood strategies involving off-farm and non-farm activities provide better income than specializing in farming per se. Furthermore, various socio-economic factors, which exhibit different forms of assets, play a significant role in devising farm household livelihood strategies in Kerala.

*Keywords:* livelihood strategy, agriculture, farm and non-farm activities, cluster analysis

# Multinomial Logit Model Impact of Saltwater Intrusion on Livelihoods of Different Groups in the Coastal Areas of the Mekong Delta, Vietnam

Duong Ngoc Thanh

Mekong Delta Development Research Institute, Cantho University, Vietnam

The Mekong Delta occupies an extremely important position in terms of socio-economic development. This is especially true for agriculture (fisheries). However, this region has been and will be heavily influenced by climate change; this is because people in the Mekong Delta (especially in coastal provinces) face the challenge of deep saltwater intrusion in the dry season. The objective of this study is to consider the impact of saltwater intrusion on agricultural production and livelihoods of different groups, as well as to consider the possibility of coping strategies and adaptation techniques of different households in the delta before any case of saltwater intrusion in the future. Results showed that encroachment of land is increasing due to saltwater intrusion.

Salinity affects production by: (1) making the land saline, production difficult, and productivity low; (2) reducing fresh water availability especially in the dry season; and (3) raising production costs. Saltwater intrusion also significantly affects household income—up to 51.7 percent of households see decreasing income and face difficulties due to saltwater intrusion. Household livelihoods in the future will still mainly focus on agriculture and aquaculture but they should also develop non-agricultural activities further and pay attention to trading activities and services. Poor households concentrate on off-farm and non-farm activities while better off households are involved in agriculture and aquaculture. Among the solutions that exist are planned irrigation systems, compliance with the planning in the locality, and changes in the structure of farming systems. It is also necessary to diversify production in limiting risk, reducing losses, and improving investment performance.

*Keywords:* impacts of saltwater intrusion, coping strategies, Mekong Delta, Vietnam

## Rural-Urban Income Disparity in the Northern Region of Malaysia

Saidatulakmal Mohd

Universiti Sains Malaysia, Penang, Malaysia

eieydd@usm.my

As a country aiming to attain the status of a developed nation in 2020, Malaysia has been successful in increasing the nation's per capita income from MYR 3,011 in 2002 to MYR 5,000 in 2012; this means that the per capita income has almost doubled in one decade. The income levels of the urban and rural areas have shown tremendous improvement over the years. Nevertheless, the rural-urban income gap has worsened. The urban areas are known to generate high income due to their high-value economic activities (these are mainly the results of urbanization and industrialization). The rural communities, on the other hand, are facing farm consolidation, shrinking population with a higher elderly population, and limited planning capacity. With these in the background, this paper attempted to empirically determine the rural-urban income gap in the northern regions of Malaysia, which covered the states of Perak, Penang, Kedah, and Perlis. Kedah and Perlis are two states with the higher percentage of rural

areas while Perak and Penang are two states with a higher percentage of urban areas. The paper used household income survey data for the years 2009 and 2012. This paper also attempted to understand the factors that affect the rural-urban income gap. Among the factors considered are the age of the population, economic activities, ethnicity, and education.

*Keywords:* rural-urban, income disparity, economic well-being, Malaysia

## **Theme 7**

### **Public Policy for Supporting Small Farms in Asia**

Moderators:

Sushil Pandey

Former Senior Scientist, International Rice Research Institute

Nipon Poapongsakorn

Thailand Development Research Institute

Aldas Janaiah

School of Agribusiness Management, Acharya N.G. Ranga Agricultural University, India

Nobuhiko Fuwa

Graduate School of Asia-Pacific Studies, Waseda University, Japan

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### **A Socio-economic Analysis of Conservation Agriculture Technologies in Diverse Cropping Systems in Bangladesh**

Md. Akteruzzaman, Hasneen Jahan

Department of Agricultural Economics, Bangladesh Agricultural University, Bangladesh

hasneenjahan@gmail.com

Md. Enamul Haque

Conservation Agriculture Project, iDE, Bangladesh

High-yielding varieties along with chemical fertilizers, pesticides, and irrigation were introduced in Bangladesh in the name of the Green Revolution to feed the huge population of the country. This resulted in degradation of soil health and reduction in productivity in the long run. In this context, conservation agriculture (CA) is becoming increasingly important in overcoming the problems of declining agricultural productivity. This paper investigated the benefits and impacts of CA practiced by farmers in Bangladesh. The study covered a range of soils and cropping systems for the evaluation of CA in Rajshahi, Mymensingh, Rajbari, and Thakurgaon districts. Data and information were gathered through focus group discussions, household surveys, and case studies. A total of 458 households were interviewed considering the level of adoption of CA from different cropping systems. The results showed that most of the farmers in Mymensingh and Thakurgaon districts do not have any knowledge

in sowing/transplanting seeds using machines, whereas farmers in Rajbari and Rajshahi districts have comparatively better knowledge on this. Overall, 76.45 percent of the respondents know the benefits of using organic matter in soil. For tillage operation, draft power use is higher than that for other machineries in all cropping seasons. The retention of crop residues was found higher in boro rice in comparison to that for aman, aus rice, and a few other crops. A few farm households (20%) had little knowledge about ways to improve soil health through retention of crop residues. Only 39.30 percent practiced crop rotation and 30 percent practiced mixed cropping. Most of them experienced increased production. The major constraints to the adoption of CA as mentioned by the respondents are: low production (47.66%), more weeds (47.38%), low animal feed (36.03%), lower cooking fuel (35.15%), and CA being a bothersome job (29.91%). Proper knowledge and training of CA should be provided to farmers for sustainable agricultural productivity.

*Keywords:* conservation agriculture, diversified cropping system, Bangladesh

## Factors Affecting Use of Direct-Seeded Rice among Previously Trained Farmers in Eastern India

Sampriti Baruah

International Rice Research Institute (IRRI), India Office, New Delhi, India  
s.baruah@irri.org

The dominant method of rice establishment in the rice-wheat growing areas of the Indo-Gangetic Plain is transplanting. However, rising labor costs for establishing nurseries, puddling fields, and transplanting rice have increased costs for transplanting in the region. Direct seeded rice (DSR) is an alternative method that could reduce the labor and irrigation water requirements for crop establishment. However, the number of farmers who use the DSR technology remains negligible. In this paper, we identify constraints to the use of DSR technology by examining the continuous use of the technology among farmers who were previously trained on the DSR, or those currently using the technology, or those who had previously used the technology.

In Uttar Pradesh and Bihar states in Eastern India, some farmers have been trained to use the DSR technology or have received DSR services from service providers who in turn were trained in the Cereal Systems Initiative for South Asia (CSISA) project. By using a list of farmers who were trained or used DSR technology, the determinants for the continuous use of DSR technology of 342 farmers who have used DSR technology at least once in a four-year period from 2009 to 2012 were estimated.

It was found that about 61 percent of the sample farmers applied DSR in 2012. The major reasons for not applying DSR in 2012 included water scarcity (65%), weed problems (23%), and unavailability of service providers (11%). However, the major reasons differ depending on farmers' landholding size. Among small farmers (whose landholding size is <0.5 ha), unavailability of service providers was one of the major reasons for not applying DSR in 2012. However, this was not a major problem for medium and large farmers.

It was found that farmers fear germination failure after planting rice seeds directly in the soil through DSR technology. This is why farmers indicated water scarcity as the main reason for not using this technology. It is important to reduce transaction costs of small farmers by aggregating their demand. Otherwise, the diffusion of DSR technology will be limited only to large farmers in Eastern India.

*Keywords:* direct-seeded rice, adoption constraints, diffusion, India

## Increasing Livestock Productivity through New Balanced Concentrate Feed: A Study of Eastern India

Dhiraj Kumar Singh, Nils Teufel

International Livestock Research Institute (ILRI), India

D.Singh@cgiar.org

S.P. Sahu

Bihar Veterinary College, Bihar Agricultural University, India

Dairying is an integral part of smallholder farming systems as well as an important source of subsidiary income for most households in Bihar, India. Nevertheless, the per capita milk availability in Bihar is very low (175 gram/day) compared to India average (290 gram/day) in 2011–2012 as productivity is low, mainly because current feeding is based primarily on crop residues. Constraints to improving these feeding practices include limited farm resources, weak support services, and poor knowledge on nutrient requirements and contents.

This study examined the effect of balanced feed on livestock productivity in Bihar, in comparison to existing feeding practices. Farmers supplement residues with either individual concentrate components or commercial feed. The new balanced feed consists of crushed grains (37%), cereal brans (30%), pulse husks (10%), oil cakes (20%), and minerals. This resulted in higher levels of metabolizable energy and digestibility compared with the other commercial feeds, based on laboratory analysis. This new feed was introduced through a combination of participatory trainings on nutrition and feeding, demonstrations on feed preparation, and farm-based feeding trials on 1,040 crossbred dairy cattle.

On average, farmers were feeding 4.0 kg commercial and/or home-made feed per dairy animal/day, adjusted to individual milk yields. After replacing the existing supplements with a reduced amount (3.4 kg) of new feed, average milk yield, fat, and solids-not-fat increased by 14 percent, 16 percent, and 4 percent, respectively. Analysis suggested that dairy farmers can simultaneously reduce their cost of milk production and increase their revenue from increased milk sales. The new balanced feed also showed better palatability and positive effects on health and reproductive performance in terms of animal appearance and early conception. Finally, the new feed does not require cooking, a common practice. Methods are explored to disseminate this balanced concentrate feed to a larger section of farmers in the state.

*Keywords:* balanced feed, experimental, trials, SHGs, livestock productivity

## Factors Impacting Adoption of Organic Farming in Chitwan District, Nepal

Mrinila Singh, Keshav Lall Maharjan, Bijan Maskey

Graduate School for International Development and Cooperation, Hiroshima University, Japan

singh\_mrinila@hotmail.com; mkeshav@hiroshima-u.ac.jp; mr\_bijan@hotmail.com

Soil management practices deserve greater attention for various reasons, especially food insecurity. Nepal is no exception to this and faces similar challenges. Due to the increase in modern inputs such

as chemical fertilizers, pesticides, and performance-enhancing inputs such as hormones and vitamins, this challenge has been further intensified by the decline in soil fertility. The main objective of this study is to assess the extent of adoption of these modern inputs along with traditional organic means of soil fertility management techniques by partially organic and inorganic farmers in Chitwan district, Nepal. Partially organic farmers are defined as those who separate farms for the purpose of organic and inorganic farming. Even though there is an influx of modern inputs such as chemical fertilizers in developing countries, farmers still incorporate traditional soil management practices such as use of farm yard manure. Data was analyzed using multivariate probit model, which regressed seven soil fertility management practices (i.e., mulching; compost-shed; bio-slurry; bio-pesticides; nitrogen, phosphorous and potassium (NPK); hormones; and vitamins) against various socio-economic variables of farmers and their farming systems. Results showed that soil fertility management practice is influenced by various socio-economic variables. Moreover, partially organic farmers are more inclined toward inorganic means of soil management, mainly NPK. The inorganic farmers, on the other hand, rely as much on other performance-enhancing products as expected. Groups that were formed for the purpose of organic farming and training had a positive impact on farmers' awareness about the harmful impacts of modern inputs used over time. Thus, farmers are now more careful in its usage. As a result, such groups can be given credit for increasing farmers' awareness regarding the use of such inputs, despite the difficulties farmers face in converting their entire farms to organic farms.

*Keywords:* partial organic, inorganic, modern inputs, multivariate probit, Chitwan district

## Transformation in Demographic Structure among South Asian Farmers: Implications for Rice Research and Development

Humnath Bhandari, Samarendu Mohanty

International Rice Research Institute

[h.bhandari@irri.org](mailto:h.bhandari@irri.org)

The demographic structure of the South Asian farming population is undergoing a rapid transformation. Available evidence showed that South Asian countries are witnessing a significant decline in population growth, changes in population structure, declining family size, declining share of rural and farming population, rising outmigration of rural youths (which leads to deserted villages and abandoned farmland), rapid urbanization triggering rural outmigration, declining entry of youth in farming, aging of farmers, and increased feminization of agriculture. These changes are, however, occurring at different speeds across different countries in South Asia. Moreover, these changes are expected to be more rapid in the coming decades with far-reaching impacts on the nature and organization of Asian rice farming. This paper examined the depth and breadth of transformation in the demographic structure of the farming population across countries in South Asia. The primary long-run panel data of Bangladesh and secondary data from different South Asian countries were used in this paper. The number of farm households, the farming population size, and the agricultural labor force have started falling in both absolute and percentage terms in most South Asian countries. The trend is expected to speed up in the coming years. This will lead to a lower number of producers. The average age of a principal farm operator is around 50 years and it is rising over the years. Rising farm labor scarcity has increased the use of hired laborers in agriculture and has raised farm labor wage rates by 230 percent in the last decade. Rising labor costs and other input costs caused higher rice prices and hurt the poor disproportionately more. These findings will be useful for policymakers, researchers, and other stakeholders in anticipating and crafting necessary technological, institutional, and policy solutions

to manage or cope with future demographic changes in the farming population (so that sufficient rice is produced to feed the ever-growing mass of rice consumers in South Asia and beyond). This paper provided implications of the emerging demographic structure on future rice research and development by particularly focusing on labor supply, mechanization, food security, food value chains, food imports, as well as food trade.

*Keywords:* structural change, demography, farm population, South Asia

## Assessing Policy Intervention in Agribusiness and Allied Sector Credit versus Credit Plus Approach for Livelihood Promotion in Maharashtra, India

S.S. Kalamkar

Agro-Economic Research Centre, Sardar Patel University, India

dearshri@gmail.com

S. Shroff

Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, India

Availability of credit is a necessary but not a sufficient condition to enhance agricultural productivity. Recently, new organizations have emerged in the non-government sector that follow the 'credit plus' approach, which focuses on factors that enhance efficiency of credit use in agriculture. This study analyzed borrower and lender behavior under alternative systems of credit provision using survey data from the Indian state of Maharashtra. Cooperatives which refer to formal -2 were the most important source of credit in terms of actual access. Input-credit type of interlinkage was observed in transactions with cooperatives, self-help groups (SHGs), and input dealers. Services offered by cooperatives were cheaper than the comparable market. If these cooperative societies increased their credit plus approach and provide more inputs and extension services to farmers, they could go a long way in strengthening the cooperative credit structure and in maintaining their viability. Therefore, policies must be addressed in favor of the 'credit plus approach' as it will play a major role in strengthening agriculture.

*Keywords:* agriculture credit, credit plus approach, institutional, non-institutional credit, India

## Rainfall Insurance in India: Does It Deal with Risks in Dryland Farming?

K. Byjesh, Uttam Deb, Cynthia Bantilan

Research Program on Markets, Institutions and Policies

International Crops Research Institute for the Semi-Arid Tropics, India

k.byjesh@cgiar.org

Rainfall continues to be a major risk that confront dryland farmers in India. Dryland farmers experience erratic rainfall and frequent droughts. Crop yield and farm income in dryland farming is highly correlated with rainfall. In 2003, ICICI Lombard General Insurance Company formed a partnership with BASIX, a Hyderabad-based microfinance institution to pilot the sale of rainfall index insurance contracts to farmers in Andhra Pradesh, India. Later, it was expanded to other states as well. Policy holders will receive benefits if the actual rainfall in a region is higher or below a pre-defined range. However, farmers are reluctant to buy rainfall insurance products. In this paper, it was hypothesized that

low spread of rainfall insurance is linked with a situation in which farmers and other prospective buyers are unable to relate the product to regular exposure. For example, rural households from any village are aware of rainfall and its distribution pattern through their life experiences. Therefore, if the insurance benefits are received on the basis of actual rainfall in the village, then eligible villagers will be ready to buy it. On the other hand, if the basis for rainfall index calculation deviated more from the rainfall level in the village, then they would not be interested to buy the product. Of course, other factors such as amount to be paid as premium, benefit stream, complexity in claim, and receipt of entitled benefits play an important role. This study documented the rainfall insurance scheme and its operational modalities such as eligibility criteria, payment of premium, benefit structure, payouts, and technical hassles. It constructs and compares the rainfall indices of 18 villages located in five states (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, and Maharashtra) of the semi-arid tropics of India representing major areas where dryland farming is predominant. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has been regularly collecting daily rainfall and other socio-economic data from these 18 villages since 2009 and from a subset of six villages since 1975. Rainfall indices were computed and compared using three datasets: (1) ICRISAT dataset, (2) Mandal rainfall data, and (3) the rainfall dataset used by the insurance provider. Using both qualitative and quantitative socio-economic analytical framework, this study also collated the views of rainfall insurance policy holders. Finally, the study gave some feedback about the performance of rainfall insurance and provided some suggestions for further improvement of the product to cater to the need of dryland farmers.

*Keywords:* rainfall insurance, risk management, semi-arid tropics, dryland farming, India

## Agricultural Input and Output Trade in South Asia: Challenges and Opportunities

Joseph George, Saurabh Kumar, Nitesh Kumar Singh  
CUTS International (Consumer Unity & Trust Society), Jaipur, India  
sbk@cuts.org

Trade in agricultural inputs and outputs by South Asian countries with trading partners outside the region has far outgrown intraregional trade. Intraregional trade in South Asia, in general, has been below the potential level because of a number of non-tariff barriers that are in place. Despite having significant complementarities in agricultural production and trade, South Asia could not exploit it so far because of lack of agriculture-based trade promotion policies (unlike in the case of manufacturing and services). Mainstreaming regional trade in national agricultural policy still remains an unattended subject in all South Asian countries much to the detriment of sustainable growth in the region's agricultural sector. Another feature of the agricultural input trade scenario of South Asian countries is that, at a disaggregated level, intraregional trade in input categories such as fertilizers and machinery is high in certain cases. Such trends of existing intraregional trade in subcategories of inputs show export competencies in such subcategories within the region. Also, complementarities in input subsectors in fertilizers and machinery point towards substantial gains from cooperation in a number of areas including collaborative research and development in selected subcategories to increase production/supply capacity. If such trade and cooperation in agricultural inputs can be realized, then it would complement the policy instruments in the respective national agricultural policies of South Asian countries.

Through improvements in productive efficiency, South Asia can enhance the tradability of agricultural outputs, in terms of reduction in per unit production costs and export prices. Better trade facilitation measures, facilitative application of trade standards, preferential tariff liberalization in

agriculture, and other necessary trade reforms are absolutely necessary to foster intraregional trade in agriculture. It is possible to use trade as an effective policy instrument to enhance efficiency in agriculture without compromising the self-sufficiency and growth objectives of domestic agricultural policies. Thus, it is important to study the interrelations in the trade of agricultural inputs and outputs and how such trade can enhance productive efficiencies, remove current trade barriers in agriculture, and provide relevant remedies. In this context, this paper addressed the following questions: (1) What is the scope of regional trade and cooperation in agriculture inputs? (2) What are the interrelations between trade in agriculture inputs and outputs for reforms in domestic agricultural policies? and (3) What are the regional trade barriers in agricultural inputs and outputs and how can reforms be made?

*Keywords:* agricultural input-output, subsidy, South Asian trade, non-tariff barriers

## Quality and Safety Improvements in Informal Milk Markets and Implications for Food Safety Policy

Ma. Lucila A. Lapar, Ram Deka, Johanna Lindahl, Delia Grace

[l.lapar@cgiar.org](mailto:l.lapar@cgiar.org)

Milk marketing in Assam, Northeast India remains predominantly in the informal sector. Formal pasteurized milk and dairy product channels, both cooperative and private, account for at most three percent of total locally-produced marketed milk, while traditional market channels, either for fresh liquid milk or more importantly, for traditional products such as sweets, account for at least 97 percent of the market opportunities for farmers. This limits alternative market options for smallholder producers located in hard to reach areas with poor access to markets. Developments in the traditional dairy market are critical to lift the economic status of actors in this sector, and a set of interventions that could facilitate improvements could complement the ongoing efforts to develop cooperative organized milk markets. Nevertheless, there is hardly any government or non-government initiative to improve the traditional dairy sector. There is also growing concern among consumers about the purity and quality of milk marketed by informal milk vendors and the possible health risks they pose. ILRI's study (2007) on milk safety indicated that most of the milk samples (including pasteurized and ultra high temperature pasteurization [UHT]) available in Assam do not meet quality standards from the standpoint of physical quality, adulterants, and bacterial load (total bacterial count and coliform count). In 2009, a training and certification program was initiated to improve milk handling among milk traders who are the main conduits of milk being marketed in Assam. The impact of the program on milk value chain actors was assessed through a prospective matched cohort study using a double difference design. Data was collected from surveys of producers, milk vendors, and consumers. Rapid diagnostic tests on milk samples were conducted to assess levels of hazards from presence of pathogens in milk traded in informal milk markets. Through this program, a new governance institution brought together milk traders and officials. Increased risk mitigation was seen and reported benefits included personal satisfaction, customer satisfaction, sales and profits, acquired knowledge, increased number of customers, and milk quality improvements. Estimates of economic benefits showed positive effects in terms of increased average profit margins and value added. Relative shares of producer and trader prices in milk retail prices, on average, also suggested efficiency in informal milk markets in study sites. Sector level benefits as approximated from micro-level estimates of economic indicators showed that traditional dairy value chain in Kamrup generates about INR 0.8 million value added per day; this translated to an annual

estimate of economic impact in Kamrup of at least USD 5.6 million. The findings are consistent with other ILRI studies on food safety in informal markets (i.e., there is generally high level of unsafe food, but formal markets in poor countries often are not safer than informal markets, and there are many risk-mitigating practices). Given the important economic contribution of the traditional dairy value chain, public policy that affects informal milk markets and actors will need to be based on risk and not hazard; and improving capacity for risk assessment and incentives for better risk management will support the continued viability of the traditional dairy sector in Assam.

*Keywords:* smallholder dairy, informal milk markets, food safety policy

## Socio-economic Impacts of Oilseeds Research and Development in Bangladesh

M.A. Monayem Miah, S.M.A. Shiblee

Agricultural Economics Division (AED), Bangladesh Agricultural Research Institute (BARI)  
monayem09@yahoo.com

The acute shortage of edible oils has been prevailing in Bangladesh during the last several decades and spending on edible oils and oilseeds imports has been increasing over the years to meet the country's demand. However, oilseeds area has been decreasing over the years. The Bangladesh government has given emphasis to research and development (R&D) of these crops and invested a lot for attaining their self-sufficiencies in the country. The Bangladesh Agricultural Research Institute (BARI) and Bangladesh Institute of Nuclear Agriculture (BINA) have released a good number of improved varieties of oilseeds. The adoption of these varieties have created various socio-economic impacts that need to be evaluated. This study was conducted to assess the socio-economic impacts of oilseeds R&D in Bangladesh.

Both primary and secondary data were used in this study. Primary data were collected through household survey, while secondary data were collected from various published sources. The household survey was conducted at 11 purposively selected districts: Manikgonj, Faridpur, Tangail, Mymensingh, Rajshahi, Pabna, Dinajpur, Noakhali, Luxmipur, Comilla, and Jessore. Four major oilseed crops (i.e., mustard, sesame, groundnut, and soybean) were considered for the study. For the household survey, a total of 180 households cultivating selected oilseeds were randomly selected for each crop. Due to limited soybean growing-areas, soybean data were collected from two districts. Thus, the total sample size was 1,980. An ex-post evaluation using the economic surplus model under a closed economy situation was also adopted to estimate the rate of returns (benefit-cost ratio [BCR], internal rate of return [IRR], net present value [NPV]) of the investment in oilseeds R&D in Bangladesh.

The adoption of improved oilseed technologies at farm level made some significant positive impacts on productivity growth, farmers' income, employment generation, and foreign exchange savings through producing more of these crops. Ex-post analysis of the past investment (BDT 1,268.91 million) on oilseeds R&D from 1998 to 2012 revealed an IRR to investment of 24 percent. Under various

assumptions, the IRR ranged from 22–26 percent and BCR from 2.84 to 3.50. The yield advantages of different improved oilseeds varieties over BARI old varieties ranged from 5.27 percent to 48.67 percent. The amounts of NPV and foreign exchange savings due to R&D of oilseeds (i.e., higher production and less importation) for the period from 1997/98 to 2011/12 are BDT 4,769.04 million (USD 61.14 million) and BDT 7,574.19 million (USD 97.105 million), respectively. Therefore, the investment on R&D of oilseeds in Bangladesh was found to be encouraging.

*Keywords:* oilseeds, R&D investment, Bangladesh

## Assessing the Benefits, Welfare Costs, and Impacts of the Thai Paddy Pledging Policy

Nipon Poapongsakorn, Ammar Siamwalla, Kamphol Pantakua

Thailand Development Research Institute

nipon@tdri.or.th; ammar@tdri.or.th

Like other countries, Thai agricultural price intervention has changed from a regime that penalized the farmers to one that provides farm subsidy after Thailand began to have elected governments in the late 1980s. But unlike former socialist countries in Asia, which have recently changed their agricultural policy toward a more liberal one, Thai agricultural policy has been moving in the opposite direction of shoring up the domestic prices of agricultural products at above the world price, despite the fact that it is an agricultural exporter.

Mr. Thaksin Shinwatra's Pheu Thai party won a landslide election in 2011 mainly because of the populist policy platform. A paddy pledging policy was one of the most important campaigns that won the votes of the farmers who constitute the largest group of voters because it promised to buy every grain of rice at a price which was 50 percent higher than the market price.

After two years of implementation, the government already spent more than THB 770 billion (or 15.6% of the budget in 2013 and 2014) to buy 53 percent of total paddy production in five cropping seasons, but it still owes THB 99 billion to 0.9 million farmers. Some studies show that the accounting loss is THB 165 to 241 billion per year, depending on the assumptions. Despite such huge fiscal cost and widespread criticism against the policy, the government still insists that the policy is a "good" policy because it successfully raises the well-being of millions of poor farmers, which in turn stimulates economic growth. It also ignores the fiscal cost and other negative impact, and even argues that the policy to subsidize farmers is worth the fiscal loss.

Critics also argue that the rice pledging scheme has adversely affected Thai rice export, its quality, and the private rice market. The stockpile, estimated at the minimum of 16-18 million tons, is subject to rapid quality deterioration, let alone cumulative storage and interest costs in the future, given the fact that it will take many years to clear the stock. Media also reports that the scheme has been plagued with systemic corruption.

Since there will be an election soon and many political parties will still campaign to bring back the rice pledging policy, it is important that the Thai voters are fully informed of its net benefit for the society as a whole (i.e., farmers, exporters, consumers, and taxpayers). This paper assessed the "net" welfare cost of the paddy pledging policy (i.e., a complete accounting of all fiscal costs, loss of export, and benefits [producer surplus and consumer subsidy]) for all stakeholders of the scheme.

This study has the following specific objectives: (1) to briefly describe the operation of the paddy

pledging scheme; (2) to estimate its welfare cost and explain the sources of loss; (3) to analyze the underlying political motives of the policy; (4) and finally to propose some institutional reforms of the financing of the populist policies. A model which is used to measure the welfare cost of the pledging scheme is constructed from the ways government intervenes in the rice markets. While the government shored up the paddy prices above the market prices, it maintained the retail price for consumers at more or less the same level as the market price in the previous government. The low and stable retail rice price was achieved by selling government rice to a few politically connected traders at prices much lower than the wholesale price. At the same time, the government also wanted to increase the export prices of Thai rice, but failed due to competition from India and Vietnam. As a result, its rice stockpile had built up sharply.

The paper found that while most of the benefits go to medium and large-scale farmers and small groups of well-to-do rice millers, warehouse owners, and connected traders, the fiscal costs are borne by millions of dispersed taxpayers. The estimates showed the net welfare costs are enormous. The costs are comprised of producer subsidy, corruption, and operation costs (especially storage costs and impairment value of rice stockpile), as well as subsidy for the farmers in the neighboring countries. These fiscal costs are much larger than the dead-weight loss. Another loss, which may be as important as the fiscal loss, is a decline in the quality of Thai rice and the replacement of competitive rice market by cronyism.

*Keywords:* rice pledging policy, cost-benefit, welfare cost, impact assessment, Thailand

## The Outlook for Hybrid Rice in Bangladesh and India: Economic Evidence and Policy Considerations

David J. Spielman

International Food Policy Research Institute, USA  
d.spielman@cgiar.org

Deepthi E. Kolady

College of Agriculture and Life Sciences  
Cornell University, USA  
dek28@cornell.edu

Patrick S. Ward

International Food Policy Research Institute, India  
p.ward@cgiar.org

Harun-Ar-Rashid

Agricultural Advisory Society, Bangladesh  
harunaas@gmail.com

The governments of both Bangladesh and India have set impressive targets to expand hybrid rice cultivation in the next decade. Their rationale is primarily based on the notion that the gains from hybrid rice will contribute to the improvement in welfare of both resource-poor farmers and food-insecure households. While these expectations are largely driven by the historical experience of China (where hybrid rice accounts for more than half of all area under rice cultivation and where it has contributed significantly to gains in food security in recent decades), neither country is on the course towards success. Hybrid rice still accounts for less than 10 percent of all area under rice cultivation in both countries; adoption has been neither stable nor widespread. The purposes of this paper are to analyze the technical challenges, market opportunities, and policy constraints associated with hybrid rice development as well as its adoption in Bangladesh and India and to recommend solutions for accelerating its delivery and development through policies aimed at strengthening relevant public research expenditure and industrial investment behavior. Data and information used in this paper were drawn from: (1) publicly available materials on rice research, cultivation, and production collected from

government and private-sector sources, including peer-reviewed journal articles, government statistical reports, private databases, and documents from industrial sources; (2) interviews conducted with key informants in industry, government, and research in 2010–2011; and (3) household surveys conducted in Bangladesh and India in 2010–2011. Results suggested that while many of the technical constraints regarding adoption (such as issues of pest resistance, grain quality, and taste) can be addressed through continued investment in breeding, there still remain challenges in moving upstream public research on parent-line development to private sector efforts aimed at breeding, multiplying, and marketing better rice hybrids. Solutions to these challenges require better insight of the relationships between industrial structure, business strategies, and public incentive mechanisms. In turn, these solutions have been used to recommend policies that have been appropriately tailored to the innovative capabilities of public and private actors in each country's hybrid rice market, as well as to the needs of farmers and consumers in both Bangladesh and India.

*Keywords:* hybrid rice cultivation, adoption, India, Bangladesh

## Factors Affecting Farm Level Food Grain Stocks in Bangladesh: An Econometric Analysis

Ismat Ara Begum

Department of Agricultural Economics, Bangladesh Agricultural University  
ishameen@yahoo.com

Shaheen Akter

Freelance Consultant, Milton Keynes, UK

Mohammad Jahangir Alam

Department of Agricultural Economics, Ghent University, Belgium

In Bangladesh, rice crops are grown in three seasons—boro, aman, and aus—and the length of each season has been changing with new innovations. This pattern of change may be stabilizing prices between months, to a large extent. So, it is important to understand this behavior to make a reasonable estimate about private stocks coming from farmers. Public policies aimed to support farm income and/or to stabilize prices should use such estimates in order to formulate/implement appropriate policies, as well as to deal more appropriately with shocks in internal and international markets. Given this backdrop, this paper analyzed the determinants of farmer's stock in Bangladesh. The Household Income and Expenditure Survey 2010 data was used. The factors affecting stocking behavior was identified by estimating a stock function. Heteroscedasticity was detected using the Breusch-Pagan/Cook-Weisberg test. Therefore, the study used White's heteroscedasticity corrected robust standard errors. The effect of production on stock was found to be positive, as expected. A 10 percent rise in boro production causes a three percent increase in stock. Price appears to be a significant signal for influencing stock holding behavior of farm households. Positive price elasticity of stock may indicate partly the demand effect of price rise and partly the future expectation of price rise on stockholding behavior. Other significant variables were household size, kind of disposal, price variability, access to credit, farm size, land rental, spatial dummies, etc. The sign and size of most of the variables seem plausible. The results indicated that there are many constraints that farmers consider in keeping stocks other than production and prices. Policy makers must consider measures to ease farm level constraints in order to help farmers make competitive decisions regarding stocks.

*Keywords:* foodgrain stocks, farm level, Bangladesh

## Farmers' Willingness to Accept Aromatic Rice in Vietnam

Trang Tran Hoai Thao

Department of Agricultural and Resource Economics, Faculty of Economics, Kasetsart University, Thailand  
tranhoaitrao@gmail.com

Orachos Napisintuwong

Center for Advanced Studies for Agriculture and Food, Kasetsart University Institute for Advanced Studies, Kasetsart University, Thailand

Vietnam is the one of the three largest rice exporters in the world, accounting for 22.71 percent of the world's total rice export in 2013. Nevertheless, most of it is of low to medium quality. While rice consumption throughout Asia is experiencing a downward trend, (particularly among the higher income countries), aromatic rice (AR) is still in high demand. However, low quality rice (LQR) is less preferred. The Vietnamese government is encouraging farmers to decrease the area of LQR to less than 20 percent and to increase the area for AR in order to not only increase farmers' income but to also improve the quality of Vietnamese rice exports. However, LQR area is more than 40 percent and AR area is still low at 14.43 percent as of 2012. It has been hypothesized that one of the crucial AR adoption constraints is the small difference in AR and LQR prices. To test this hypothesis, premium prices for which farmers are willing to switch from non-AR adopters to AR adopters were estimated. Since farmers' responses to the change in the price of technology cannot be observed, a contingent valuation approach was used to estimate the willingness to accept (WTA) the price differences between the two types of rice varieties. The results indicated that WTA is positively related to the market price, to communication with extension officers, and to high adoption rate locations, while it is negatively related to income and to source of seed from private companies. The mean for WTA price difference is estimated at VND 1,027/kg, which is higher than the current price difference of VND 731/kg. The findings of this study suggested that one of the ways to improve AR adoption and reduce LQR area is to increase the market price premium for AR.

*Keywords:* aromatic rice, willingness to accept, price premium, Vietnam

# Organized Sessions

## **Organized Session**

### **Microfinance as a Foundation of Agriculture to Non-Agriculture Structural Transformation**

Moderator: Yasuyuki Sawada

London School of Economics and Political Science (LSE), UK

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### **The Impact of Subsidy on Microfinance Entry and Coverage: A Structural Evaluation**

Yuhei Miyauchi

Massachusetts Institute of Technology (MIT), USA

Yasuyuki Sawada, Junichi Yamazaki

London School of Economics and Political Science (LSE), UK

Financial development is one of the keys to promote economic growth and to improve livelihoods in least developed countries, but what are the determinants of microfinance institutions' (MFIs) outreach to people in different areas? How can we promote local financial development? How does subsidy work to change these factors? Using upazila-level information on each MFI from Bangladesh, we approach these two important questions, uncovering mechanisms of outreach.

The researchers constructed a set of three structural equations to grasp mechanisms behind outreach of MFIs to people in rural areas: (1) demand for MF loans (nested logit model), (2) labor and other costs of each MFI, and (3) entry into an upazila (binary choice model). Based on the structural estimation, it was found that moderate demand substitution (competition) among MFIs, which, in turn, affects the impact of subsidies on loan demand and entry.

*Keywords:* microfinance institutions, nested logit model, binary choice, Bangladesh

### **The Role of Microfinance in Empowering Women**

Minhaj Mahmud, Yasuyuki Sawada

BRAC Institute of Governance and Development, BRAC University, Dhaka, Bangladesh

Bangladesh achieved empowerment of women in the past decades, partly because of involvement in microfinance programs and in the ready-made garment sector. This paper aimed to investigate the role of microfinance programs and involvement in the ready-made garment sector in empowering women and in changing their preferences. In order to quantify the impact of the microfinance and garment sector on relative influence of spouses in decision-making regarding intra-household allocation, a nested method of canonical household surveys and artefactual field experiments were adopted.

## Are Multiple Borrowings Bad Signal? Evidence from Bangladesh

Yasuyuki Sawada, Minhaj Mahmud, Mari Tanaka

Stanford University, USA

sawada@e.u-tokyo.ac.jp, minhaj@igs-bracu.ac.bd, mrtanaka@stanford.edu

In recent years, there has been an increasing interest in multiple borrowings in Bangladesh. Some borrowers may borrow microfinance for making repayment of previous loans. Or, competition might worsen asymmetric information. However, it is not evident whether we should be concerned about the increase in multiple borrowings. Using the Livelihood System of Rural Households Panel Data collected from 2000 to 2008, the correlations between ability of household to produce income, idiosyncratic shock on productivity, and unobserved shock that leads to more borrowing were analyzed. It was found that there was neither adverse selection nor moral hazard. In addition, there was no evidence that ease of multiple borrowings leads to higher productivity, nor evidence that positive shock on productivity leads to multiple borrowing. Finally, there was no evidence that negative shock on productivity leads to multiple borrowings.

*Keywords:* multiple borrowings, microfinance, Bangladesh

## Impact of Seasonally-Adjusted Flexible Microcredit on Repayment and Food Consumption: Experimental Evidence from Rural Bangladesh

Abu Shonchoy

Institute of Developing Economies, IDE-JETRO  
parves.shonchoy@gmail.com

Takashi Kurosaki

Institute of Economic Research, Hitotsubashi University  
kurosaki@ier.hit-u.ac.jp

The mismatch between credit repayments and income seasonality poses a challenge to microfinance institutions (MFIs) working in developing countries. For instance, in northern Bangladesh, income and consumption downfalls during the lean season after the transplantation of major paddy crops pose a serious threat to the household economy. Poor landless agricultural wage laborers suffer the most due to seasonality as they face difficulty in smoothening their consumption. In designing microcredit products, MFIs do not usually provide any flexibility nor any seasonal adjustment during the lean season. This is mainly because MFIs are afraid of the possibility that such flexibility might break the repayment discipline of borrowers and result in higher default rates. The researchers conducted a randomized controlled trial in 2011–2012 in northern Bangladesh to test empirically whether seasonally-adjusted flexible microcredit leads to an increase in repayment problems for MFIs and whether it can increase as well as stabilize consumption of borrowing households. The results suggested no statistically discernible difference among the treatment arms in case of default, overdue amount, or repayment frequency. On the other hand, there was no positive impact of repayment flexibility on immediate food consumption during the lean season. After a year of initial intervention, however, the researchers started to see positive changes in the food intake during the lean season. Preliminary results were in favor of seasonally-adjusted flexible microcredit.

*Keywords:* microcredit, default, seasonality, consumption smoothing, Bangladesh

## **Organized Session**

### **Distribution and Impact of Stress Tolerant Varieties in South Asia**

Moderator: Takashi Yamano  
International Rice Research Institute (IRRI)

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#### **DNA Fingerprinting of Rice Varieties in South Asia: Do Farmers Know their Varieties?**

Takashi Yamano, Architesh Panda  
International Rice Research Institute (IRRI)  
t.yamano@irri.org

Previous studies on rice variety adoption have relied on farmers' knowledge about the varieties that they produced. However, few studies have verified their knowledge. Farmers could be misled to believe that they were producing hybrid rice, for instance, when they were actually producing local varieties. Accurate knowledge about the rice variety is necessary for farmers to choose the right varieties for their ecologies and apply inputs efficiently.

In this paper, the results from deoxyribonucleic acid (DNA) genotyping of rice seeds collected from 1,800 rice farmers in South Asia were used. Farmers' knowledge about the rice varieties that they cultivate were assessed using the data. In addition, the researcher used data from a household survey of 9,000 farmers, which include the 1,800 farmers from whom the rice seeds were collected. Survey areas were identified using agroecological zones as the primary stratification. Then, for each agroecological zone, sample households were randomly selected by using the district, zone, and village as stratifications. The survey was conducted in early 2014.

Results showed that rice farmers in South Asia mostly use old varieties that were developed 20 to 30 years ago. In many areas, a small number of rice varieties are dominant. The results showed that farmers stick to such mega-varieties for many years. The DNA fingerprinting results showed that the farmers know their varieties correctly in general, especially the mega-varieties. The study showed the other determinants of farmers' knowledge.

*Keywords:* DNA genotyping, rice varieties, South Asia

## Adoption Constraints to Stress-tolerant Crop Varieties: A Panel Data Analysis of a Submergence-tolerant Rice Variety in Eastern India

Maria Luz Malabayabas, Takashi Yamano

International Rice Research Institute (IRRI)

t.yamano@irri.org

Climate change is expected to increase the number of extreme weather conditions for farmers, thus, crop scientists have developed stress-tolerant crop varieties to help farmers prepare for them. The diffusion of the stress-tolerant crop varieties, however, may face different challenges compared to other crop varieties because the stress-tolerant characteristics of stress-tolerant varieties are only visible under stress conditions. Swarna-Sub1 is a submergence-tolerant rice variety that can survive up to 14 days of full submergence. It has been distributed among farmers in eastern India. However, it is not clear how fast farmers are adopting the variety and if the limited visibility of submergence tolerance is limiting the diffusion of the variety.

The study used data from a two-visit panel survey conducted in April–June and October–December in 2012. The surveys were conducted in two eastern Indian states: Uttar Pradesh and Odisha. The sample districts were chosen from a list of districts where four local non-government organizations (NGOs) have distributed Swarna-Sub1 seeds. From the NGOs, the researcher obtained lists of villages and farmers who have received the seeds. From the village list, 52 villages in Uttar Pradesh and Odisha were randomly selected. In the randomly selected households, a total of 565 representative households were interviewed twice. In the first visit, the households were asked about their crop production in the 2011 kharif season; in the second, the same sample households were interviewed after the 2012 planting season, and asked about their adoption and perception of Swarna-Sub1.

Results showed that the adoption rate increased in villages that suffered medium-duration submergence, under which the benefits of Swarna-Sub1 are substantial and visible. Also, farmers' perception of Swarna-Sub1 increased as the length of submergence (from short- to long-duration submergence). The occurrence of medium-duration submergence in the village positively affected the adoption of the variety.

Findings suggested that the visibility of the benefits of Swarna-Sub1 is an important decision factor among farmers. On the other hand, this may have a negative impact of the diffusion of Swarna-Sub1 because if the farmers do not observe the benefits, they may easily abandon the crops.

*Keywords:* submergence-tolerant rice, Swarna-Sub1, adoption, India

## Risk Preference and Rice Varietal Selection of Female-headed Households in Eastern India

Mamta Mehar, Architesh Panda, Takashi Yamano

International Rice Research Institute (IRRI)

t.yamano@irri.org

Many female-headed households are poor. The causes and remedies for their poverty status are unclear. Women are often considered as more risk averse than men. Hence a hypothesis was posed and tested that women choose low-risk but low-return activities than men in agricultural practices. However, because

the proportion of female-headed households is low in general, only large-scale household surveys can find an adequate number of female-headed households to conduct reliable analyses. This has limited the number of rigorous analyses on female-headed households' risk preference and farm productivity.

In this paper, a survey of 6,000 households in four eastern Indian states: Bihar, Odisha, Uttar Pradesh, and West Bengal was used. Survey areas were identified by using agroecological zones as the primary stratification. For each agroecological zone, sample households were randomly selected by using district, zone, and village as stratifications. The survey was conducted in early 2014. Because of the large sample size, there were enough number of female-headed households to investigate on their risk preference and rice varietal selection. To measure respondents' risk preference in the survey, a simple experiment was conducted and a large number of questions were asked about farm production.

Results showed that women are more risk averse than men measured by a simple experiment. As a result, they tend to stick to traditional rice varieties that they are familiar with and are reluctant to adopt new rice varieties. Traditional rice varieties may be tolerant against abiotic stresses but have low yields. To increase the productivity of women farmers, they need to adopt new technologies.

Findings suggested that women have different preference over the rice variety selection. Because of their aversion to risk, female farmers are more likely to select traditional rice varieties that female farmers are familiar with but have low yields. To encourage them to adopt new rice varieties, rice breeders need to develop stress-tolerant rice varieties which have high yields and extension workers need to encourage them to try new varieties. They may need to put extra efforts since women farmers are reluctant to take a new variety due to their risk preference.

*Keywords:* risk preference, female-headed households, rice varieties, India

## An Assessment of Block Demonstrations of Stress-tolerant Rice Varieties in Eastern India

Architesh Panda, Manzoor Das, Takashi Yamano

International Rice Research Institute (IRRI)

t.yamano@irri.org

Farmers in developing countries suffer from abiotic stresses, such as drought and submergence, and climate change is expected to exacerbate these stresses. Stress-tolerant crop varieties have been developed to help farmers mitigate the crop failures due to the stresses. For instance, the National Food Security Mission (NFSM) of India has been distributing both drought- and submergence-tolerant rice varieties in East India through large-scale block demonstrations (i.e., a typical demonstration covers 100 ha). However, the impact of the block demonstrations on the productivity of the participating farmers has not been estimated. There is a concern that the block demonstrations cover large areas too quickly.

To assess the impact of the block demonstrations on the continuous use of the promoted rice varieties, the researcher conducted household surveys of 90 villages that were covered by block demonstrations, covering more than 1,300 households, across five eastern Indian states. The block demonstrations demonstrated Swarna-Sub1, a submergence-tolerant rice variety, in submergence-prone areas and Sahbhagi Dhan, a drought-tolerant rice variety, in drought-prone areas in 2012. The survey was conducted in 2013, one year after the demonstrations, and asked about the use of the variety in 2012 and 2013. In the sample villages, farmers were randomly selected regardless of their participation in the demonstrations.

Results showed that the participation rate was about 50 percent among farmers in the Swarna-Sub1 demonstrations and about 58 percent in Sahbhagi Dhan demonstration areas in 2012. In 2013, about 60 percent of the Swarna-Sub1 demonstration participants used the variety, while 52 percent of the Sahbhagi Dhan demonstration participants used it again in the next year. Among those who did not participate in the demonstrations in 2012, the use rate was eight percent for Swarna-Sub1 and only four percent for Sahbhagi Dhan. Overall, the adoption percentage for Swarna-Sub1 decreased from 50 percent to 30 percent, while it decreased from 60 percent to 30 percent for Sahbhagi Dhan.

It was found that the percentage of farmers who use promoted rice varieties quickly decreased in the following year. In the survey, farmers were asked why they participated in the block demonstrations. Most of the farmers said that they participated in the demonstrations because NGOs encouraged them to participate. The traits of the promoted varieties were not among the main reasons. The lack of adequate knowledge of the rice varieties may have caused the quick decline in the user rates.

*Keywords:* block demonstrations, stress-tolerant rice varieties, Swarna-Sub1, Sahbhagi Dhan, India

## Farmer's Preferences for Abiotic Stress Tolerant Rice in Eastern India

Patrick S. Ward, Vartika Singh

International Food Policy Research Institute,  
New Delhi, India  
p.ward@cgiar.org

David J. Spielman

International Food Policy Research Institute,  
Washington, D.C., USA

David L. Ortega

Michigan State University, USA

Sangeeta Bansal, Anchal Arora

Jawaharlal Nehru University, New Delhi, India

India is one of the world's largest producers of rice, accounting for 20 percent of total global rice production. Rice is cultivated under extremely diverse agroecological conditions throughout the country ranging from fertile alluvial plains to terraced hillsides, from rainfed areas to well-irrigated regions. In the rainfed regions of eastern India, abiotic stresses such as drought and flood significantly constrain rice production and pose challenges regarding food security to farmers in these risk-prone regions.

This study used discrete choice experiments in assessing farmers' preferences for abiotic stress tolerant traits in rice. Farmers in two states in eastern India (Bihar and Odisha) were presented with sets of alternatives, each of which contained varying levels of pre-specified seed attributes. Among the different seed attributes presented to these farmers, the researchers included drought tolerance (framed as yields under different degrees of drought stress), submergence tolerance (framed as the length of time the plant can withstand being almost fully submerged during the vegetative stages), alternative genetic backgrounds (traditional inbred varieties vs. hybrid), duration (length of time from planting to maturity), recommended seed rate (kg of seed per acre) and price. By incorporating both yield under various degrees of stress as well as duration in our choice sets, we were able to determine preferences for two potential avenues of drought tolerance.

The results of this study demonstrated that farmers highly value these stress-tolerant traits and are willing to pay in excess of normal prices for these seeds. But there is also a great deal of variation in farmers' demand for these traits, which are due to the stresses to which farmers are exposed to and their

willingness to accept risks, as well as potential losses. Natural market segmentation between stress-tolerant varieties developed by the public sector and hypothetical stress-tolerant hybrids that may be developed from private sector research. This latter finding suggested that there is potential for public-private partnerships to accelerate the development and delivery of these technologies to farmers in risk-prone regions of eastern India.

*Keywords:* abiotic stress-tolerant rice, farmers' preferences, India

## **Organized Session**

### Seed and Fertilizer Policies in Asia: Implications on Smallholders in South Asia

Moderator: Promod Kumar Joshi

International Food Policy Research Institute, India

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### Strengthening the Philippine Rice Seed System

Mercedita A. Sombilla

National Development Office-Planning, National Economic and Development Authority, Philippines  
mercysom@yahoo.com

Karen P. Quilloy

Institute of Cooperatives and Bio-Enterprise Development, College of Economics and Management,  
University of the Philippines Los Baños, Philippines  
karenquilloy@gmail.com

The significant contribution of high-yielding seed varieties (HYVs) to the rapid increase of rice production since the Green Revolution have been established. Thus, the adoption of HYVs as a prime driver for achieving food security in the Philippines has been considered. However, despite its use advantage, the adoption of these seeds, particularly the certified rice seeds, has remained low in the Philippines. Most seed growers and rice farmers still use good seeds and farmer-saved seeds instead of certified inbred seeds and are engaged in the informal rice seed system. Adoption of hybrid seeds, which are known to have the highest yield advantage among all seed types, remains very low with only four percent of the total area harvested for rice planted with hybrid seeds. This study aimed to identify the factors contributing to low certified seed use. Key findings showed that the reasons for low adoption of certified seeds were the high cost of seeds and capital investment required, labor intensiveness, inadequate availability and access to inbred seeds, and inconsistent yield performance due to poor isolation of off-type seeds and varietal and ecosystem mismatch. Entering into the informal rice seed system was generally induced by the need for timely access to more affordable seeds that do not require

a costly and lengthy certification process. Based on the results, the following policy recommendations are suggested: continue strengthening provision of technical support and labor-saving seed technologies and facilities for small seed growers; increase investments in hybrid rice research and development; review the pricing policy for publicly-bred hybrid seeds; review the regulations on seed quality control and certification for both public and private hybrid seeds; and strengthen the focus of the Philippine integrated crop management system for rice on seed quality and crop establishment practices.

*Keywords:* rice, seed system, hybrid seed, certified seed, modern varieties, Philippine seed industry

## **Organized Session**

### Targeting of Grain Legumes for Income and Nutrition Security of South Asia

Moderators:

Kumara Charyulu and Uttam Deb

International Crops Research Institute for the Semi-Arid Tropics

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### Current Trends and Plausible Future Outlooks of Food Legumes in Asia

S. Nedumaran, D. Kumara Charyulu, P. Jyosthnaa, Uttam Kumar Deb

International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India

s.nedumaran@cgiar.org

Food legumes play an important and diverse role in the farming systems and in the diets of poor people around the world and for achieving food and nutritional security in developing countries. Given the importance of food legumes in developing countries especially in Asia, the objectives of this paper are to assess crop specific trends; distribution and developments in area, production, and productivity of three important legumes crops like groundnut, chickpea, and pigeonpea; and also to provide plausible outlooks of these crops in the changing climate. In this study, a global partial equilibrium multi-commodity trade model was used to assess the future projection of supply, demand, prices, and trade of the food legume producing and consuming countries around the world. The study revealed that production has not been able to meet demand due to the secondary treatment of pulses in Asian countries. The projected demand for groundnut, chickpea, and pigeonpea in Asia will grow much faster than production as a direct consequence of growing population in the region. By 2050 the production of chickpea is about eight percent less than that of demand in Asia. Although yield increases compensate for much of the production forgone due to area contraction, it does not fully satisfy demand, leading to a deficit of chickpea production intensifying with time. The aggregate production and consumption

of pigeonpea in Asia will more than double in 2050 compared to the level in 2000 at three metric tons. The projected demand for groundnut in Asia will increase from 7 metric tons in 2010 to 8.9 metric tons in 2050. To meet the increasing demand of food legumes in the region, there is a need to improve the average yield and profitability of the legume crops by developing short-duration, drought-resistant, high-yielding varieties and ensuring competitive prices to increase the adoption of new technologies by farmers in the region.

*Keywords:* food legumes, trend analysis, plausible future outlook, partial equilibrium model

## Targeting and Diffusion of Improved Chickpea Cultivars in Andhra Pradesh, India

K. Suhasini, D. Kumara Charyulu, I. Shakuntala Devi,  
D. Moses Shyam, Cynthia Bantilan

International Crops Research Institute for the Semi-Arid Tropics

Chickpea accounts for about 45 percent of total pulses produced in India, which is the major chickpea-producing country, contributing over 75 percent of world production. Andhra Pradesh is the fifth largest state in chickpea cultivation. In Andhra Pradesh, Kurnool and Prakasam districts occupy the first and second positions in chickpea production. The Tropical Legumes-II (TL-II) project was supported by the Bill and Melinda Gates Foundation and has been promoting improved chickpea cultivars in the state since 2007 improving farmer's livelihood by enhancing productivity. For this study, the Farmer Participatory Varietal Selection approach was followed. Further, a strategic deepening and widening of technology outreach to farmers across all categories was designed by involving farmers in the selection of varieties. This demonstrated the performance of improved cultivars over the chickpea cultivars in the two targeted districts. Based on farmers' preference, cultivars were identified, multiplied, and distributed to them in small seed pockets. During the first phase of the project (2007–2008 to 2010–2011), 476 seed pockets were distributed for free in 119 villages of two districts. A real tracking survey was taken up to track these farmers and understand their perceptions of TL-II cultivars. The main objective of this paper was to trace adoption of chickpea cultivars, drivers of diffusion and innovations in spread of chickpea technology, and examine the sustainability. In the real-time survey, 487 seed and non-seed beneficiary farmers were included using probability proportionate sampling. TL-II cultivars (i.e., JG 11, KAK 2, Vihar, JAKI 9218) have completely replaced the old cultivar (Annigeri). The logit and Tobit estimations showed that availability of household labor, access to formal seed sources, price information, and literacy increased adoption of improved cultivars. Subsidized seed hastened the diffusion process. Seed beneficiaries perceived a 40–60 percent yield enhancement through improved cultivars which led to a salient 'chickpea revolution' in the state.

*Keywords:* diffusion, improved chickpea cultivars, FPVS approach, TL-II project, chickpea, India

## Targeting and Introduction of Chickpea Improved Cultivars in Bihar State of India

Meera Kumari, Madhusudan Bhattarai, Rakesh Kumar,  
D. Kumara Charyulu, Moses Shyam Davala, P. Jyosthnaa

International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India

Chickpea is one of the major pulses in Bihar, with a crop yield of 1000 kg/ha, which is higher than the

national average (841 kg/ha). Despite the huge potential and comparative advantage, the crop acreage and production of chickpea in Bihar has been declining. Lack of availability of the seeds of improved varieties, problems in marketing the produce, and insecurity and/or widespread theft of crop from the field are some of the prominent reasons. A baseline survey was conducted in eight villages in two districts of Bihar, with the aim of increasing the area and production of chickpea through adoption and diffusion of improved crop varieties. This was also associated with improved management practices in target districts of Bihar. The objective of this study was to appraise the existing situation of production and marketing of chickpeas in selected districts/villages of Bihar, with respect to adoption of alternate technologies and their impacts on crop productivity. This also included estimation of farmers' profitability in growing the crop. This is based on a survey of 135 farmers from each of the two districts; which were further divided into control and treatment groups. In 2012/2013, the average yield of improved variety in adopted villages was 9.5 quintal/ha and the yield of local variety was 8.5 quintal/ha. The per capita income of farmers of improved varieties was more than that in the control village, even though only about 54 percent of total household income was derived from the crop enterprise. However, chickpea alone contributes about INR 9,000 to INR 15,000 per hectare in the sample villages surveyed. The study also suggested that chickpea has a comparative advantage in Bihar over several other crops; and they are highly profitable in the study sites. Among the traits that farmers prefer for production, consumption, and marketing include higher yield; better taste; good keeping and better cooking quality; and fetches high price in the market. The involvement of women in chickpeas production is very high, especially for harvesting and threshing activities. Major constraints in cultivation of chickpeas in the studied sites are high pod borer incidence, shortage of seed of HYV, lack of crop type suitable for flood receding agro-ecology, and lack of marketing infrastructures and storage of crops after harvest

*Keywords:* chickpeas, Bihar, Bhagalpur; Banka, socio-economic analyses, production constraints

## Increasing Productivity and Profitability in Legumes Cultivation: Opportunities, Challenges, and Lessons Learnt from Tropical Legumes- II (Phase 1 and 2) Project

D. Kumara Charyulu, D. Moses Shyam, Cynthia Bantilan, P. Parthasarathy Rao, Uttam Deb, G.D. Nageswara Rao

International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India  
d.kumaracharyulu@cgiar.org

The Tropical Legumes II (TL-II) project, funded by the Bill and Melinda Gates Foundation, aims to improve the lives and livelihoods of smallholder farmers in the drought-prone areas of sub-Saharan Africa and South Asia through improved productivity and production of six major tropical legumes—chickpea, common bean, cowpea, groundnut, pigeonpea, and soybean. It has been implemented in 10 target countries in West and Central Africa, in Eastern and Southern Africa, and South Asia in two phases (Phase 1: 2007–2008 to 2010–2011; Phase 2: 2011–2014). This paper discusses only three legumes (chickpea, pigeonpea, groundnut) and the interventions carried out in India only. Specifically, this initiative focused on proper targeting for development of improved cultivars of food legumes, promotion of their adoption, proactive public sector policies, and finally linking these smallholders to markets and value chains. A number of studies have been completed in six states (Andhra Pradesh, Maharashtra, Bihar, Karnataka, Odisha, Tamil Nadu) in India and in the Barind region in Bangladesh during the last eight years (2007–2014) of project implementation. The main objective of this paper is to summarize the key findings across crops and also to identify various potential opportunities and challenges for promotion of legumes in the future. These studies examined and documented the existing situation

in legumes cultivation, constraints faced by the farmers, market linkages, potential opportunities for their expansion, etc. In close association with crop improvement scientists, the Farmers' Participatory Varietal Selection (FPVS) approach was implemented to assess farmers' preferred traits in these crops. These preferred varieties were identified, released formally, multiplied, and supplied as seed samples to legume growers in intervention sites. Subsequently, studies were also conducted on monitoring early adoption of newly-introduced improved cultivars and their performance in the targeted locations. All those findings emanated from various studies along with lessons learned during the process are highly valuable to share among NARS partners, researchers, academicians, and donors.

*Keywords:* legumes in South Asia, income and nutritional security, lessons learnt, TL-II Project

## **Organized Session**

### Technology Assessment and Farm Household Segmentation for Inclusive Poverty Reduction and Sustainable Growth in Agricultural Productivity

Moderator: Joachim von Braun  
Bonn University, Germany

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### Identifying Technology Innovations for Marginalized Smallholders: A Conceptual Approach

Mohammad Abdul Malek  
University of Bonn-Center for Development Research (ZEF), Bonn  
BRAC Research and Evaluation Division (RED), Dhaka

Franz W. Gatzweiler  
University of Bonn-Center for Development Research (ZEF), Bonn

This paper contributed to existing literature in terms of theoretical and conceptual background for the identification of idle potentials of marginal rural areas and people by means of technological and institutional innovations. The goal was to contribute to the inclusion of marginalized agricultural smallholders by an improved way of understanding the interactions among technology needs, farming systems, ecological resources, and poverty characteristics in the different segments of the poor, and to link these insights with productivity-enhancing technologies.

*Keywords:* marginality hotspots, technological and institutional innovations, innovation potentials

# Characteristics of Smallholders for Agricultural Productivity Program in Marginality Hotspots in Bangladesh

M.A. Malek, J. Yesmin, M.L. Hoque, M.S. Haque

Research and Evaluation Division (RED), BRAC, Dhaka

In the first step of the ex-ante assessment of agricultural technology innovations for inclusive growth in agriculture, we identified underperforming areas for Bangladesh (i.e., rural areas in which the prevalence of poverty and other dimensions of marginality are high and agricultural potential is also high since in such areas yield gaps [potential minus actual yields] are high and productivity gains [of main staple crops] are likely to be achieved). This paper addressed the second step of the assessment with the following research questions: (1) Which income strata and segments of the rural poor (by agroecological and socio-economic clusters) live in those areas? (2) What are the strategic options already available for each segment? and (3) Which segments of poor smallholders could be eligible for any agricultural (crop) productivity program or which characteristics are relevant with regard to crop technology innovations? The researchers used standard survey and analytical methodology to address those questions. Results suggested that smallholders' income mainly accrues from cereal crops income and low productive non-farm sources (e.g., working as agriculture day laborers) and their capital bases do not differ significantly among different strata except for a few characteristics (household head gender, number of years of schooling, farm size, non-agricultural productive assets, etc.). Natural calamities (e.g., river erosion), physical health, yield loss, and limited household income have major roles in worsening smallholders' economic condition. Finally, it was concluded that among the five available strategic groups of poor smallholders, focus can be on three strategic options in agricultural (crop) productivity programs: cereal and non-cereal crops with day laboring, cereal crops, and business with cereal crops.

*Keywords:* off-farm labor, smallholders, agricultural productivity program, Bangladesh

# Potentials of Integrated Rice-fish Farming System in Bangladesh: An Ex-Ante Value Chain Evaluation Framework

Abu Hayat Md. Saiful Islam

Department of Agricultural Economics, Bangladesh  
Agricultural University, Mymensingh, Bangladesh

Franz W. Gatzweiler

Center for Development Research(ZEF),  
University of Bonn, Germany

Like many Asian countries, Bangladesh has large areas which have the potential for rice-fish production. Unfortunately, this potential has not been tapped and rice-fish production is still a marginal farming system. Thus, it is necessary to assess the ex-ante socio-economic competitive potential, as well as to identify the crucial factors which are necessary for widespread adoption and diffusion of this technology. To assess the true performance of a sector/activity/action, upstream and downstream actors have to be taken into account; earlier studies on rice-fish technology, however, did not do so. This study introduced value chain, partial budgeting, and SWOT (strength, weakness, opportunities, and threats) analysis as ex-ante tools for assessing the competitive performance and identifying the key factors affecting adoption and diffusion of rice-fish technology by indigenous farmers in Bangladesh. Based on in-depth survey data from the main actors in the rice-fish value chain, value chain mapping showed that there

is little processing (mainly icing, grading, and transportation) and the time period from harvest to final consumption is short (typically in the same day) due to the live/fresh nature of all sales. The overall quantitative results from gross margin, partial budgeting, and gendered employment analysis showed positive benefits of rice-fish technology instead of rice monoculture, which makes rice-fish technology a socio-economically competitive alternative to rice-monoculture in Bangladesh. An important feature of this study is the integration of SWOT analysis with value chain and partial budgeting which identified the policy and institutional strength, weaknesses, opportunities, and threats of rice-fish technology. These information should be taken into account to realize the technology's full potential. This study emphasized the benefits of value chain analysis along with partial budgeting and SWOT analysis as a useful tool to assess integrated farm performance and claims for its wider use.

*Keywords:* integrated rice-fish farming system, ex-ante, value chain evaluation framework, gross margin, partial budgeting, SWOT and Bangladesh

## Agricultural Innovations and Their Impact on Productivity Growth in Odisha and Bihar

P.K. Joshi, Devesh Roy

International Food Policy Research Institute

The paper started with the current state of agricultural productivity, technology innovations, and indicators of food security in Bihar and Odisha and explains the justification of identifying marginal districts in the two states. Subsequently, it looked at the profile of the identified technologies following a clearing house approach in terms of their uptake over time. Results showed that in both states there is significant lack of awareness about technology, more so in marginal districts of Odisha. Some modern technologies such as hybrid rice in Bihar have become quite well known, while others like system of rice intensification (SRI) have not. Awareness about technologies stratified along socio-economic lines. Smallholders belonging to the lowest caste fare badly in awareness and adoption. In general, varietal adoptions have been comparatively successful. Policies for technology promotion take into account the current state as well as the aspirations related to crops/activities/technologies. Farmers who are illiterate, with small land sizes, and those with social barriers mandate a tailored approach. Much-publicized technologies (e.g., SRI, LLL) had limited success because underlying conditions did not support. However, some technologies that clearly take into account smallholders' needs and exhibit high potential should be promoted (e.g., hybrid rice, varietal improvement in wheat, organic/semi-organic farming). On the crop front, maize and pulses technology should be made more focal in policy.

*Keywords:* agricultural innovations, impact, smallholders, policies for technology promotion, India

## Organized Session

### Challenges and Opportunities to Trade in Rice Seeds between India and Bangladesh

Moderator: Shushil Pandey

Former Senior Scientist, International Rice Research Institute (IRRI)

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### Trade in Seeds of Inbred Rice Varieties between India and Bangladesh: Why Has It Remained Informal?

Bipul Chatterjee, Suresh P. Singh

CUTS International, India

Ensuring availability and accessibility of inbred rice seeds is critical for sustainable rice production. This can be achieved through either local production, through trade (import), or an ideal mix of the two. In India and Bangladesh, it is observed that while there are several issues that adversely impact availability and accessibility to rice seeds, there is hardly any initiative at the government level to address the issue through trade. In such a scenario, farmers to a large extent rely on self-saved seeds. Another offshoot of such a scenario is farmers' greater reliance on rice seeds available in the neighboring countries, made accessible through contacts and relatives across the border. This informal trade is happening in the case of India and Bangladesh, particularly in the border areas.

Ensuring adequate availability and accessibility of rice seeds calls for initiatives to formalize trade in rice seeds. It is expected that such an initiative can boost availability and accessibility to quality rice seeds to farmers at the right time and at an affordable price for both countries. This presentation included an assessment of the potential for such trade and policy responses that will promote trade in rice seeds.

*Keywords:* informal trade, inbred rice seeds, India, Bangladesh

### Harmonization of Varietal Release/Testing Procedures in India and Bangladesh

Umesh Singh

International Rice Research Institute (IRRI)

u.singh@irri.org

Lack of official acceptance of seeds produced across the border seems to be a serious issue that hinders farmers' prospects of accessing quality seeds at the right time and at affordable prices. One initiative that can facilitate trade is harmonization of seed acts, policies, regulations, and seed certification systems. This presentation highlighted major benefits of such harmonization based on international experiences. It also sought to highlight lessons learned from experiences of other countries that may be of relevance for promoting the trade in rice seeds between the two countries.

*Keywords:* policy harmonization, seed trade, Bangladesh

## Rice Seed Chain in India: Does Exportable Surplus of Rice Seeds Exist?

Debdutt Behura

Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Rice seeds are produced by a number of public and private sector agencies in India. The seed chain links various players involved in the production of breeder seeds, foundation seeds, certified seeds, and other types of seeds that are ultimately used by farmers. This presentation highlighted some key factors that determine the efficiency of the rice seed chain and may constrain the production of exportable surplus of seeds.

*Keywords:* rice seed chain, seed surplus, India

## Intellectual Property Rights on Rice Seeds in Bangladesh and India

A.K. Enamul Haque, Unnayan Shamannay, Mahfuz Kabir

Bangladesh Institute of International and Strategic Studies (BISS), Dhaka, Bangladesh

Intellectual property rights and related issues seem to be important reasons, which hinder formal trade in rice seeds between Bangladesh and India. Newly-released rice seed varieties are usually subject to patent, royalty, copyright, and therefore import or export of seeds might not be a readily acceptable solution. There is a need for both governments to have an appropriate framework that not only protects the interests of the developers but also facilitates cooperation between the two countries. Fortunately for the farmers, the governments in the two countries have started discussions on how to promote cooperation in varietal development, recognition of varieties, and seed exchange. This presentation sought to stimulate a discussion on creating a framework of cooperation with regard to intellectual property rights that could help both the countries be more open for trade in rice seeds.

*Keywords:* intellectual property rights, seeds, Bangladesh, India

## Experience of Fruits/Vegetable Seeds Trade between India and Bangladesh

P. Sateesh Kumar

Nuziveedu Seeds, India

Presently there are at least 13 types of seeds that Bangladesh imports from India, primarily consisting of fruits and vegetable seeds. Major fruits and vegetable seeds exported from India to Bangladesh include tomato, cabbage, forage plants, cauliflower, fruit, radish, onion, sugar beet, and others. The presentation explored the opportunities and challenges in the fruit/vegetable seed trade between India and Bangladesh and draws implications for promoting rice seed trade.

*Keywords:* fruits and vegetables, trade, India, Bangladesh

## **Organized Session**

### **Analytical and Policy Insights on the Future of Farm Sector: Japan, China, and Korea**

Moderator: Dr. Yasuoo Ohe, Chiba University, Japan

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#### **Farmland Policy and Structural Change in Agriculture: The Japanese Experience**

Daisuke Takahashi

Waseda University, Japan

d-takahashi@aoni.waseda.jp

Masayoshi Honma

University of Tokyo, Japan

ahonma@mail.ecc.u-tokyo.ac.jp

This paper aimed to discuss the farmland issues in Japan from the viewpoint of the development strategy for an economy in the middle and high income stage of economic development. First, the current conditions of Japanese agriculture were explained. The paper also showed why structural change in land intensive agriculture sector has become one of the most important policy agenda for the Japanese government. Next, the historical development of farmland policy since World War II were reviewed. The paper examined the effect of the Farmland Law established in 1952 and the policy effort to promote structural changes in agriculture afterward. Furthermore, the results of quantitative analysis regarding the scale economies of rice production resulting from technological progress were discussed. The paper also proposed statistical analysis on why the structural changes of Japanese agriculture have been very slow even with the scale economies. The transactions costs related to farmland, such as expectation of farmland conversion for non-agricultural use, are the main obstacles to farmland mobilization. Finally, the necessary policies to achieve efficient agricultural production by core farmers and adequate agricultural resource management by rural communities are needed. Policy implications of farmland policy in Japan for the development of strategy were also discussed.

*Keywords:* farmland policy, structural change, scale economy, transaction cost, farmland conversion

## Land Rental Development in Rural Japan and China, and Its Implication on Other Fast-growing Asian Countries

Junichi Ito

Kyoto University, Japan

jito@kais.kyoto-u.ac.jp

Preceding studies demonstrate that there are two important prerequisites that facilitate land rental in agriculture; one is outmigration of farm labor, and the other is securing farmers' land rights. This is especially true for the counties and/or regions, where the farm sector is overemployed and land rights are ambiguously defined. Considering these empirical findings quite tenable, this paper paid special attention to rural organizations that mediate farmland transactions in Japan and China. Our empirical study suggested that the organizations play an important role in reducing transaction costs associated with land use rights movements, and thereby encourage land rental/consolidation activities. In addition, there is the other land-market characteristic that is shared by Japan and China. The farmland areas leased to non-farm household entities, including private enterprises, increased substantially over the past decade, accounting for around 30 percent of the total area at present. The degree to which the central government restricts land lease to non-farm household entities differs between the two countries. This posed a serious challenge to other fast-growing Asian countries: in the case when economic development accompanied by outmigration erodes comparative advantage in agriculture, who will run the farm, households, or enterprises?

*Keywords:* land rental, transaction costs, comparative disadvantage in agriculture, Japan, China

## Evaluating Structural Change in Korea from the Perspective of a Family Farm

Jaehyeon Lee

Kagoshima University, Japan

yijh31@yahoo.co.jp

This paper aimed to evaluate the structural changes of family farms in Korea. The characteristics of the inheritance system of farm households and the relationships between the farm householder and the local community were investigated. Secondly, using the Agricultural Census data, the production behavior of family farmers were examined by focusing on how they manage to procure input resources and practice operations. First, the inheritance system of family farms does not require farm succession by sons or daughters and their farm management is not affected by the community institutional constraints, unlike their Japanese counterparts. Therefore, entry to the farm sector from outside is relatively easy and these newcomers play a substitutable role in farm succession. Second, it is common for family farms to do land transactions through the market rather than hierarchical organizations. Regardless of farm sizes, many farm operations in Korean family farms are practiced by using contracted machinery and labor services provided by firms. Thus, they don't rely on owning farm machinery and employing workers. Third, it is hard to expect that a new form of farm enterprise such as group farming or corporate farms will complement or substitute for the family farm in Korea.

*Keywords:* family farm, structural changes, farm succession, farm enterprise, Korea

## Identity of Successors and Farm Diversification: Exploring a New Role of the Farm Sector

Yasuo Ohe

Chiba University, Japan

yohe@faculty.chiba-u.jp

Educational activities provided by farmers to visitors to their farm have recently been gaining attention and enable consumers to learn about food, life, and rural heritage. This paper reported the attitudes of the next-generation successors of educational dairy farms (EDF) who are currently working on these farms, in comparison with their counterparts in ordinary dairy farms in Japan. This paper evaluated the hypothesis that operators need to expand their identity from a traditional farm to an enlarged farm that will enable them to successfully embark on a new activity such as educational service. First, the main findings were that the EDF successors tended to have longer and more varied training experience (in the country and/or abroad) compared to their counterparts in ordinary dairy farms. EDF farms also had higher female involvement. This means that EDF successors have both a wider perspective and more extensive human networks, which they developed from social learning opportunities. These factors should be promoted to enable the next generation of operators to develop an enlarged identity. Support measures will be more effective if expansion of identity is considered in addition to conventional training to improve technical skills.

*Keywords:* educational tourism, agritourism, dairy farm, farm tourism, network, Japan

## Effect of Market Strategy on Small Farmers' Incentives to Engage in Sustainable Farming: Case of a Joint Stakeholder Program in Higashiosaka City, Japan

Misa Aoki

Nara Women's University, Japan

There is widespread interest in healthy and environmentally-friendly farm products in both developed and developing countries. However, selling the resultant value-added farm products can be a challenge because of the lack of a market or supply chain for such crops.

The purpose of this study was to investigate farmers' motivations for initiating sustainable farming under a market strategy held by multiple stakeholders. This study focused on the production and sale of certified environmentally-friendly vegetables at a farmers' market in Higashiosaka City, Osaka, Japan. In 2009, this farmers' market managed by the farmers' cooperative introduced a frequent shoppers program (FSP), supported by the city government, to promote sustainable vegetable production in the city. FSP is a system where consumers earn points as they shop, which can then be redeemed for discounts on future purchases or small gifts. This study was based on an analysis of interviews and quantitative data collected at the market and from farmers participating in the program.

The study found that the consumption of environmentally-friendly vegetables increased after the introduction of FSP at the farmers' market. As a result, farmers expanded their existing production or initiated new production. According to analysis of the data from participating farmers, the reasons for initiating sustainable farming can be divided into three: non-economic reasons, lower transaction costs, and financial benefit. The first and second reasons are particularly crucial for small farmers initiating

sustainable farming. This study showed that the strategic marketing of value-added farm products is important to increase both consumption and production levels and to give opportunities for farmers to sell their own agro-crops and continue farming in a sustainable way.

*Keywords:* incentives of small farmers, transaction cost, sustainable farming, local farmers' market, Japan

## ICT-based Agriculture Policy of South Korea and Japan Accelerated Economic Growth in Rural Areas

Anwarul Azim

Department of Electronics & Communications Engineering, East West University, Bangladesh

Major agricultural policies of South Korea and Japan paid special attention to information communication technology (ICT). Thus technology was induced in every stage of agriculture and in the product processing systems in these two economic powers in Asia. Both South Korea and Japan encouraged and inspired public-private partnership (PPP) to boost up economic growth in agriculture and its allied fields. High-tech, competent manpower, high quality, and high income are considered as four main pillars of successful agriculture policy in South Korea since the early 1960s. On the other hand, in the Japanese agriculture sector, best quality, best technology, and most skilled and efficient experts brought higher income for the country through optimum utilization of ICT-friendly agricultural policies since the end of World War II. Increasing research and development (R&D) investment along with dissemination of new technologies have been driving forces of future competitiveness in South Korean agriculture. Quality of a product is given more importance than its price in both countries, especially in Japan.

*Keywords:* information communication technology, public-private partnership, R&D

# Asian Journal of Agriculture and Development

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