

# Fact Sheet • AGRICULTURAL PRODUCTIVITY STUDIES

▶FOOD SECURITY II COOPERATIVE AGREEMENT◀

between

▶U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT and MICHIGAN STATE UNIVERSITY◀

▶IN-COUNTRY TIME PERIOD: OCTOBER 1992 - AUGUST 1997<sup>1</sup>◀

## 1. Cooperating Institutions

Agency for International Development, Africa Bureau, Office of Sustainable Development, Productive Sectors, Growth and Environment Division, Food Security and Productivity Unit (AFR/SD/PSGE/FSP)

Agency for International Development, Global Bureau, Economic Growth Center, Office of Agriculture and Food Security (G/EG/FSA)

Department of Agricultural Economics, Michigan State University (MSU)

## 2. Researchers Involved

**AFR/SD/PSGE/FSP:** George Gardner

**G/EG/FSA:** Dr. Ralph Cummings

**African Collaborators:** Bocar Diagana (Institut Senegalais de Recherches Agricoles (ISRA), Senegal, and Ph.D. candidate, MSU), Abdoulaye Fall (ISRA, Senegal), Matar Gaye (ISRA, Kaolack, Senegal), Anastase Murekezi (Division of Agricultural Statistics (DSA), Ministry of Agriculture, Rwanda), Jean-Leonard Ngirumwami (DSA, Rwanda), Pierre Rwalinda (DSA, Rwanda), Kimsey Savadogo (University of Ouagadougou, Burkina Faso), Manievel Sene (ISRA, Bambey, Senegal), Bosco Sibomana (DSA, Rwanda), Tobias Takavarasha (Ministry of Lands, Agriculture, and Rural Resettlement, Government of Zimbabwe), Laurence Uwamariya (Ministry of Agriculture, Rwanda), Joseph Rusike (University of Zimbabwe), Nango Dembele (IFDC/Burkina Faso)

**PARTS African Fellows:** Hosted Mr. Okuku (Uganda) June-July 1993; hosted Mr. Diagana (Senegal) June-July 1994

**MSU Researchers:** Thomas Reardon (coordinator), Eric Crawford, Daniel Clay, Thomas Jayne, Valerie Kelly, Fidele Byiringiro, Josue Dioné (also INSAH/CILSS), John Duncan, Jaakko Kangasniemi, Mattias Lundberg, Kyösti Pietola, Takeshi Sakurai, Duncan Boughton, Maria Wanzala, David Yanggen

**Other Collaborators:** Ousmane Badiane (IFPRI), Yougesh Khatri (University of Reading), Colin Thirtle (University of Reading), Stephen Vosti (IFPRI), Jane Hopkins (IFPRI), David Tardif-Douglin (DAI)

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<sup>1</sup> Version of Fact Sheet: October 1996

### **3. Objectives of the Research**

Development Fund for Africa (DFA) targets 3 and 4.4 seek to raise agricultural productivity in Africa, while enhancing the longer-term sustainability of natural resources required for food production and improving food security. The FS II Cooperative Agreement has priority applied research themes of studying ways to improve food access and to design more market oriented and cost-effective food systems, and related technologies and institutions. To help inform DFA and FS II objectives, this cross-country synthesis research focuses on (1) studying empirical patterns and determinants of agricultural productivity in four African case studies—Burkina Faso, Rwanda, Senegal and Zimbabwe; (2) identifying cross-country policy and research issues related to agricultural and food (output and input) system productivity increases; (3) clarifying methods for measuring productivity; (4) strengthening African capacity to study agricultural and food system productivity issues; and (5) exploring policy options to increase farmer access to fertilizer and improved seed in cost-effective ways.

### **4. Research Approach**

Synthesize policy-relevant research findings and implications from work sponsored by the MSU-based Food Security Cooperative Agreements, and from others, on factors affecting agricultural and food system productivity in Africa. Examine empirical patterns and determinants of farm productivity and input system performance in African case studies. In country-level and cross-country studies, determine policy and research issues related to productivity increases; methods for measuring productivity at micro and meso levels, and comparison of these with measurement issues at macro levels.

### **5. Outputs to Date**

#### **5.1. Presentations to African Audiences**

Rusike, presentation in Zimbabwe to seed and fertilizer industry representatives and policymakers, October 1996.

Reardon, presentation at the Colloque International sur Intensification Agricole au Sahel: Mythe ou Realite? (organized by INSAH, IER, AB-DLO, Wageningen, ICRISAT, CIRAD, ICRAF, ILRI) "Capital-led intensification in Sahel agriculture: addressing structural constraints after policy reform," from joint paper with V. Kelly, J. Dioné, B. Diagona and D. Boughton. This paper was requested by INSAH as one of the presentations representing INSAH, Mali, November 30, 1995.

Kelly, briefing INERA and IFDC on productivity research results. Burkina Faso, October 1995.

Kelly, briefing ICRISAT Sahel Center on productivity research results. Niger, September 1995.

Kelly, presentation on constraints to fertilizer use in Africa at the USAID INTERCRSP Workshop. Niger, September 1995.

Diagana, talk at PRISAS/INSAH/CILSS workshop on devaluation impacts in the Sahel, "Agricultural intensification and productivity in Senegal: impacts of devaluation." Mali, July 1995.

Diagana and Kelly, briefed 20 organizations on productivity research results; examples include: (1) Unite de politiques agricoles; (2) Unite de politiques economiques; (3) ISRA Bureau d'analyses macroeconomiques; (4) ISRA Director General office; (5) FAO/Senegal; (6) Ministry of Agriculture: Direction d'Agriculture; Direction de statistiques; (7) Direction de statistiques, ESAM; (8) Rodale/Senegal. Senegal, July 1995.

Reardon, talk at workshop at the Institut du Sahel in Bamako on Natural Resources Management, "Links between food security, productivity, and natural resource management in the Sahel." Mali, March 27-29, 1995.

Kelly, presentation at USAID Technology Development and Transfer Collaborators' Workshop, "Raising Farm Productivity in Africa to Sustain Long-Term Food Security" by Reardon, Kelly, Crawford, Savadogo, and Jayne. Zimbabwe, January 1995.

Kelly, presentation at USAID Technology Development and Transfer Collaborators' Workshop, "Agricultural Growth Linkages" by Delgado, Hopkins, and Kelly. Zimbabwe, January 1995.

Clay and Reardon, presentation at IAAE 22nd Congress to international audience including many African researchers, "Determinants of Farm-Level Conservation Investments in Rwanda." Harare, August 1994.

Jayne, Takavarasha, Attwood, and Kupfuma, poster presentation at IAAE 22nd Congress, "Postscript to Zimbabwe's Maize Revolution: Policy Lessons for Eastern and Southern Africa." Harare, August 1994.

Diagana, Kelly, and M. Gaye (ISRA/Kaolack), presentation at ISRA (Senegal), with participants from Ministry of Rural Development, Ministry of Finance, Seed Service, SONACOS. Diagana: A household typology approach to understanding links between nonfarm income and crop productivity in the cereal sector; Kelly: Links among nonfarm income, credit, and cropping productivity in the peanut sector; Kelly/Gaye: Changing patterns of peanut seeding densities: Implications for policies to maintain soil and seed quality. August 3-4, 1994.

Kangasniemi and Reardon, presentation at IAAE 22nd Congress to international audience including many African researchers, "Demographic Pressure and the Sustainability of Land Use in Rwanda." Harare, August 1994.

Khatri, Jayne, and Thirtle, presentation at IAAE Annual Meetings in Harare, "A Profit Function Approach to the Efficiency Aspects of Land Reform in Zimbabwe." Zimbabwe, August 1994.

Reardon, participation in mini-symposium at the biennial meetings of the International Association of Agricultural Economists (IAAE), organized by Peter Hazell (IFPRI), Carl Liedholm (MSU, Economics) and Thomas Reardon, "Potential for Increasing Rural Non-Farm Income and Employment in Africa." Eight papers were presented. Reardon presented results of productivity project on nonfarm income diversification's effect on productivity and farm capital expenditures. Harare, August 1994.

J. Dioné (on behalf of Reardon) "Income diversification in the WASAT, and implications for food security and natural resource management" at CIRAD/FAO conference on sustainable agriculture in the Sudano-Sahelian region. Dakar, 1994, January 11-14. The productivity research results were presented in this context.

Savadogo and Reardon, University of Ouagadougou, Faculty of Economics, "Farm-Level Productivity in Burkina Faso." Burkina Faso, December 1, 1993.

Uwamariya (Ministry of Agriculture, Rwanda), Kangasniemi, and Reardon, seminar to the Ministry of Agriculture, "Results of Productivity Work." Kigali, Rwanda, November 19, 1993.

Reardon, invited seminar presentation at the National University of Rwanda, Faculty of Agronomy, "Methods for Agricultural Productivity Research." Rwanda, June 7, 1993.

Reardon, invited seminar presentation at the Ministry of Agriculture, Division of Agricultural Statistics, "Methods for Agricultural Productivity Research." Rwanda, June 5, 1993.

## **5.2. Presentations to AID/Washington and USAIDs**

Kelly, briefing of USAID/Senegal, October 1996, on productivity results (joint with PRISAS results).

Diagana and Kelly, briefing USAID/Senegal on productivity and devaluation research in Senegal, June 1996. Discussed the brief "L'offre agricole suite a la devaluation: Pourquoi une reponse si faible?" and other work.

Diagana and Kelly, briefing World Bank Agricultural Sector Policy Initiative team on productivity and devaluation research results, June 1996.

Reardon, talk at the AID Africa Bureau, ARTS/SD/PSGE, "African Agricultural Productivity Research Results," March 1996.

Kelly, briefing to USAID/Niger on productivity research results. Niger, September 1995.

Diagana and Kelly, briefing at USAID/Senegal on productivity research results. Senegal, July 1995.

Kelly, talk at the 'Income, Employment, and Food Security for 21st Century Africa: Agriculture and Natural Resources Development Officer (ANRDO)/Private Sector Officer (PSO) Joint Conference' (a USAID conference sponsored by Africa Bureau, SD/PSGE), "Agricultural growth linkages in Africa." Annapolis, Maryland, July 1995.

Reardon, two talks at the 'Income, Employment, and Food Security for 21st Century Africa: Agriculture and Natural Resources Development Officer (ANRDO)/Private Sector Officer (PSO) Joint Conference' (a USAID conference sponsored by Africa Bureau, SD/PSGE), First talk: "Agricultural Productivity and Economic Growth in Africa"; second talk: "Links between Environment and Agriculture." Annapolis, Maryland, July 1995.

Reardon, talk at USAID/Mali to the Economics Group, "Results of MSU Research on Agricultural Productivity and Sustainability: Implications for Strategic Planning." Mali, July 1995.

Clay and Reardon, presentation at AID, Global Bureau, Office of Agriculture and Food Security, and Africa Bureau, Food Security and Productivity Unit, "Promoting Agricultural Productivity in Rwanda." May 2, 1995.

Kelly, presentation to FSP Collaborators Workshop at AID Africa Bureau, SD/PSGE/FSP, "Agricultural Growth Linkages." Washington, D.C., November 29-30, 1994.

Reardon, presentation to FSP Collaborators Workshop at AID Africa Bureau, SD/PSGE/FSP, "MSU African Agricultural Productivity Research Results." Washington, D.C., November 29-30, 1994.

Diagana, presentation at AID/W-ARTS/FARA, "Income Diversification and Cereal Productivity in the Senegalese Peanut Basin." Washington, D.C., July 1994.

Kelly, briefing to USAID/Dakar, "MSU Senegal Case Study Work in Determinants of Cropping Productivity and Growth Linkages." Senegal, July 1994.

Kelly, presentation at AID/W-ARTS/FARA, "Links among Nonfarm Income, Credit, and Cropping Productivity in the Peanut Sector." Washington, D.C., July 1994.

Reardon, invited speech at AID, Global Bureau, Office of Agriculture and Food Security. Seminar "The Silent Challenge of Hunger," presentation: "Strategies for redressing chronic food insecurity: marriage of zone-specific strategies and broad-based growth". Washington, D.C., June 28-29, 1994.

Kelly, presentation to AFR/ARTS/FARA/FSP workshop on agricultural growth linkages in Sub-Saharan Africa, "Senegal Case Study of Growth Multipliers: Implications of Openness." Washington, D.C., May 26, 1994.

Savadogo, presentation to USAID/Burkina economists, "Results and Policy Implications of Farm Productivity Research in Burkina Faso." Burkina Faso, May 15, 1994.

Reardon, talk at AID Sahel/West Africa, "Long-term structural issues in monitoring effects of structural adjustment in West Africa." February 17, 1994 (covering productivity issues).

Reardon, Jayne, Kelly, and Weber, presentation at AID/W, "Agricultural Productivity Research for ARTS/FARA/FSP: Emerging Research Findings and Policy Implications." Washington, D.C., February 17, 1994.

Reardon, presentation at Round Table on Food Security and Productivity Research (A.I.D. Africa Bureau, ARTS/FARA), "Productivity Research Results Under the Food Security II Project." Washington, D.C., December 6-8, 1993.

Reardon, Clay, and Tardif-Douglin, presentation to USAID/Rwanda, "Research Results on Farm-Level Productivity in Rwanda." Rwanda, November 24, 1993.

Reardon, presentation at Round Table on Productivity of Agriculture in Africa (A.I.D. Africa Bureau, ARTS/FARA), "Labor Use and Productivity in African Households." Washington, D.C., April 22, 1993.

MSU researchers, presentation at ARTS/FARA/FSP seminar, "Synthesis of First Year Results of Productivity Studies." Washington, D.C., February 15, 1993.

Reardon, presentation at the Food Security and Productivity Unit's 'Premier Food Security and Productivity Collaborators' Round Table' (A.I.D. Africa Bureau), "The Agricultural Productivity Project of FS II." Washington, D.C., October 22-23, 1992.

### **5.3. Oral Presentations to Other Food Security Research and Policy Groups**

Reardon, invited presentation (on behalf of co-authors of paper, Kelly, Diagana, Dioné, Crawford, Savadogo, Boughton) (title: Sustainable Capital-led Intensification in Sahel Agriculture: Addressing Structural Constraints After Macroeconomic Policy Reform); International Symposium "Food Security and Innovations: Successes and Lessons Learned," Stuttgart-Hohenheim, Germany, March 11, 1996. Paper appears in conference proceedings volume and in Food Policy journal.

Reardon, invited talk at FAO/Rome on productivity, farm-nonfarm linkages, and food security in Africa. February 1996.

Kelly, participation in one-day workshop on soil fertility, World Bank. November 1995.

Reardon, invited talk at the African Studies Association Meetings, panel on "Sustainable Intensification and Environment in Africa"; talk title: "Intensification, Productivity, and the Environment in Africa: Policy effects and structural constraints." Orlando, FL, November 1995.

Reardon, invited talk at the American Anthropological Association Meetings, panel on "Post-Structural Adjustment and Food Security in Africa: Policy, Theory, and Cross-Disciplinary Evidence"; talk title: "Raising productivity in Sahel Agriculture: Addressing Structural Constraints in the Food System after Policy Reform." Washington, D.C., November 1995.

Reardon, invited talk on WKAR public television, panel on "Food and Hunger in the Third World," on World Food Day. East Lansing, MI, October 1995.

Kelly, invited briefing at the Agricultural Technical Division, World Bank. July and August 1995.

Reardon, invited talk at the Hunger Research Briefing and Exchange, World Hunger Program, in session entitled "Food Security and Agricultural Productivity in Resource-Poor Areas"; talk title: "Agricultural Productivity for Food Security in Africa." Brown University, Providence, R.I., April 7, 1995.

Reardon, Byiringiro, Clay, Kangasniemi, talk at Center for Advanced Studies in International Development (CASID), Michigan State University, "Soil conservation and fertility investments for long-term productivity increases in Rwandan agriculture." East Lansing, MI, October 30, 1994.

Hopkins, Kelly, and Delgado, selected paper presented at the 1994 AAEA meetings, "Farm-Nonfarm Linkages in the West African Semi- Arid Tropics: New Evidence from Niger and Senegal." San Diego, August 1994.

Reardon, 1994 Annual AAEA Meetings Symposium, title of session: "Policies for Fragile Lands Development in the Tropics: New Challenges for Economic Analysis"; talk title: "Sustainability issues in agricultural development in the Sahel." San Diego, August 1994.

Reardon, Crawford, and Kelly, 1994 Annual AAEA Meetings, principal paper session, organized by Peter Hazell (IFPRI) and Thomas Reardon, on behalf of the International Committee of the AAEA; title of session: "Promoting Farm-Nonfarm Growth Synergies in Rural Africa"; 3 papers presented: (a) Reardon, Crawford and Kelly. "Links Between Nonfarm Income and Farm Investment in African Households: Adding to the Capital Market Perspective." (b) Delgado, Hazell, Hopkins, and Kelly. "Promoting Intersectoral Growth Linkages through Agricultural Technology and Policy Reform." (c) Liedholm, McPherson and Chuta. "Small Enterprise Employment Growth in Rural Africa." San Diego, August 1994.

Reardon and Jayne, 1994 Winter AAEA Meetings Invited Paper Session, panel on "Agricultural Productivity in Africa: Concepts, Measures, and Implications." Five papers were presented: (a) Thomas Block (Abt/Harvard), "Macro productivity measures and issues in Africa." (b) Jayne and Thirtle, panelist (Jayne also an organizer), "Agricultural Productivity in Zimbabwe." (c) Reardon, "Farm Productivity in Burkina Faso: Effects of Animal Traction and Nonfarm Income." (d) Discussants: Robert Evenson (Yale) and Jock Anderson (World Bank); Uma Lele (Florida) was chairing the session. At Allied Social Science Association meetings in Boston, January 3-5, 1994.

Reardon, Department of Agricultural Economics, Michigan State University, Departmental Seminar Series. "Farm-Level Productivity in Burkina Faso." East Lansing, MI, December 9, 1993.

Reardon, invited World Food Day presentation at the University of Missouri (sponsored by FAPRI), "Sustainable Increases in Agricultural Productivity and Food Security – Issues and Tradeoffs." Columbia, MO, October 19, 1993.

Reardon, Crawford, Bernsten, Eicher, Jayne, Oehmke, and Savadogo, paper presented at the 1993 AAEA Pre-Conference Workshop on "Post-Green Revolution Agricultural Development Strategies in the Third World: What Next?" Talk title: "Challenges for Creating and Sustaining a Green Revolution in Africa." Orlando, Florida, July 30-31, 1993.

Reardon, invited rapporteur and panelist at Institute of International Agriculture, University of Florida (sponsored by Florida and Cornell), "Reconciling Sustainability with Productivity Growth." Gainesville, FL, May 19-21, 1993.

Reardon, seminar for Burkinabe and Senegalese case study collaborators, review of literature on methods for agricultural productivity research, Michigan State University, May 7, 1993.

Reardon, invited talks at Roskilde University, Conference on natural resource management in fragile lands of Africa. 1) "Alternate Income Sources and Natural Resource Management in

Fragile, Drought-Prone Areas of the African Semi-Arid Tropics," 2) "Issues in the Analysis of Macro and Sectoral Policy Impacts on Productivity and Conservation Investments at the Household Level." Denmark, November 1-4, 1992.

#### **5.4. Collaborative Research Activities with African and Other Researchers**

Research under the Agricultural Productivity set of activities has facilitated collaboration with:

Joseph Rusike is writing two papers in 1996 for the productivity project (as a joint activity with the strategic planning project funded by TDT) on constraints to and opportunities for increasing smallholder access to improved seed and fertilizer in Zimbabwe and Zambia. He is organizing (in October 1996) a seminar in Zimbabwe for seed and fertilizer industry representatives from the region (including Zimbabwe, Zambia, and Uganda) on the results.

Nango Dembele, IFDC/Burkina, collaborating with Kelly on fertilizer portion of productivity work, 1995/6.

In December 1995, Diagana traveled to Senegal to undertake another survey with Mr. Gaye, in the Peanut Basin and in May-June 1996 to work with ISRA.

Matar Gaye, ISRA Kaolack, conducted follow-up surveys from October-December 1994 and December 1995-January 1996 of a subset of households used in the Senegal productivity study. The surveys addressed peanut seeding density, credit access, and land tenure issues that were raised by the MSU productivity research. Manievel Sene (ISRA, Bambey) and Bocar Diagana (ISRA/BAME) also assisted in the effort.

Bocar Diagana (researcher, Senegalese Agricultural Research Institute) comes to MSU for 6 weeks in June-July 1994 as a PARTS African Intern, working with Kelly, Crawford, and Reardon, on productivity and food access (income diversification) issues.

Bocar Diagana, researcher at Institut Senegalais de Recherches agricoles (ISRA) spent 1 month at MSU November-December 1993 working with Dr. Valerie Kelly, and produced single-authored working paper on household typologies.

Dr. Valerie Kelly was a researcher with IFPRI until October 1, 1993, when she joined MSU. Dr. Kelly (working with Reardon) supervised a field project in Senegal 1988-1993 (working with Senegalese Agricultural Research Institute, ISRA). She came to MSU for 2 weeks in May 1993 to work with Drs. Savadogo and Reardon on planning the Senegal case study.

Mr. Yougesh Khatri (graduate student, University of Reading) spent 2 weeks at MSU in July 1993 working with Jayne and Reardon, and then Jayne spent 1 week in September at Reading working with Thirtle and Khatri; several papers coming out of this collaboration

have been finished, and one underway in which a Zimbabwean graduate student at MSU is participating; one of the papers was presented by Jayne and Thirtle in Boston at the ASSA meetings in January 1994.

Mr. Juma Okuku (professor, Dept. of Political Science, Makerere University, Uganda) came to MSU for 5 weeks in July-August 1993 as a USAID African Fellow, worked with Reardon and other MSU faculty and graduate students, as well as productivity research collaborators Savadogo and Uwamariya.

Donna Perry, Department of Anthropology, Yale University, is doing her dissertation on "Production, Power, and Islam in the Senegalese Peanut Basin." Kelly is working with her to facilitate access to the Senegal data base and coordinate her research with that of others working on the same data base. She did her pre-dissertation field work last summer, producing a paper about how the market in Dioly has changed consumption and production behavior. Dissertation fieldwork: August 1994-November 1995.

Dr. Kimsey Savadogo (Professor, Faculty of Economics, University of Ouagadougou, Burkina Faso):

In July-August 1995, Dr. Savadogo came to MSU to collaborate in productivity work.

In July-August 1994, Dr. Savadogo came to MSU to collaborate in productivity work.

In November-December 1993, Reardon spent a week at University of Ouagadougou working with Savadogo, and presented a seminar on results at the Faculty.

In April-July 1993, Dr. Savadogo came to MSU and worked closely with Reardon and Pietola (a number of research documents first-authored by Savadogo, resulting from this work).

Ms. Laurence Uwamariya (Agronomist-researcher, Division of Agricultural Statistics (DSA), Ministry of Agriculture, Rwanda) spent 2 months at MSU June-August 1993 working with Reardon and two graduate students, Kangasniemi and Byiringiro (Rwandan student on leave from Ministry of Agriculture); Reardon spent three weeks at DSA working with her in November 1993, and presented seminar on results at the Ministry. She produced a working paper first-authored by her.

Until April 1994, Ms. Uwamariya continued to collaborate on the productivity research, and was joined by Jean-Leonard Ngiruwami, Anastase Murekezi (director of DSA), and David Tardif-Douglin (DAI, working in subordinate agreement with MSU in Rwanda) on coffee productivity and other crop-specific studies.

Dr. Colin Thirtle (Professor, University of Reading, England) was visited by Thomas Jayne and Thomas Reardon in Washington, D.C. in April 1993 to plan productivity work, and then came to MSU at the end of April to work out details of collaboration.

Matt Warning, Department of Agricultural and Resource Economics, University of California, Berkeley, is doing his dissertation on "Access to Credit, Agricultural Practice and the Organization of Agricultural Production." He has finished field work and is now back in U.S. to write dissertation. Kelly is working with him to facilitate access to the Senegal data base and coordinate his research with that of others working on the same data base.

### **5.5. MSU Backstop Trips to African Productivity Research Sites**

October 1996, Kelly to Senegal, 2 weeks.

August 1996, Reardon to Zimbabwe, 3 days.

June 1996, Kelly to Senegal, 2 weeks.

May/June 1996, Diagana to Senegal, 1 month.

February 1996, Kelly to Senegal, 1 week.

December 1995, Diagana to Senegal, 3 weeks.

November-December 1995, Reardon to Mali, one week.

September 1995, Kelly to Senegal and Burkina Faso, three weeks.

July 1995, Diagana to Senegal, Mali, three weeks.

July 1995, Kelly to Mali, Senegal, three weeks.

July 1995, Reardon to Mali, three weeks.

March 1995, Reardon to Mali, two weeks.

July 1994, Kelly to Mali, Senegal, two weeks.

July 1994, Reardon to Mali, part of a week.

November-December 1993, Reardon to Burkina Faso, one week.

November 1993, Jayne to University of Reading, England.

November 1993, Reardon to Rwanda, part of three weeks.

September 1993, Jayne to University of Reading, England.

August-September 1993, Jayne to Zimbabwe (stop-over visit).

June 1993, Reardon to Rwanda, part of three weeks.

## **5.6. African Field Surveys Used in Productivity Analysis**

Burkina Faso: Case studies are based on additional analysis of data already available from an ICRISAT survey of 150 households in three zones 1981-1985.

Rwanda: Case studies are based on additional analysis of data already available from an ongoing 1200 household sample survey undertaken by DSA/Ministry of Agriculture and MSU.

Senegal: Case studies are based on additional analysis of data already available from an ISRA/IFPRI survey of 360 rural and 70 urban households in eight rural and two urban zones 1988-1990.

Senegal: Additional household surveys on input access in Peanut Basin-December 1994-January 1995 and December 1995-January 1996.

Zimbabwe: Case studies are based on secondary district-level data compiled by Colin Thirtle and Zimbabwean researchers, as well as by Thomas Jayne and Bernard Kupfuma.

## 5.7. Written Outputs on Agricultural Productivity

- **Published Synthesis Reports**

Clay, D. and T. Reardon. 1996. "Rwanda case study: Dynamic linkages among population, environment, and agriculture in the highlands of East Africa." In Clay, Reardon, and Shaikh *Population, Environment, and Development in Africa: Dynamic Linkages and their Implications for Future Research and Development Programming*. East Lansing: Michigan State University. Pp. 39-91. (Represents joint product SD/PSGE/NRM and SD/PSGE/FSP.)

Clay, D., T. Reardon, and A. Shaikh. 1996. *Population, Environment, and Development in Africa: Dynamic Linkages and their Implications for Future Research and Development Programming*. East Lansing: Institute of International Agriculture, Michigan State University. (Represents joint product SD/PSGE/NRM and SD/PSGE/FSP.)

Kelly, V., B. Diagana, T. Reardon, M. Gaye, and E. Crawford. 1996. *Cash Crop and Foodgrain Productivity in Senegal: Historical View, New Survey Evidence, and Policy Implications*. MSU International Development Paper No. 20. East Lansing: Michigan State University.

Reardon, T., V. Kelly, E. Crawford, T. Jayne, K. Savadogo, and D. Clay. 1996. *Determinants of Farm Productivity in Africa: A Synthesis of Four Case Studies*. MSU International Development Paper No. 22. East Lansing: Michigan State University.

Clay, D., F. Byiringiro, J. Kangasniemi, T. Reardon, B. Sibomana, L. Uwamariya, and D. Tardif-Douglin. 1995. *Promoting Food Security in Rwanda Through Sustainable Agricultural Productivity: Meeting the Challenges of Population Pressure, Land Degradation, and Poverty*. MSU International Development Paper No. 17. East Lansing: Michigan State University.

Kelly, V., J. Hopkins, T. Reardon, and E. Crawford. 1995. *Improving the Measurement and Analysis of African Agricultural Productivity: Promoting Complementarities Between Micro and Macro Data*. MSU International Development Paper No. 16. East Lansing: Michigan State University.

Reardon, T., E. Crawford, and V. Kelly. 1995. *Promoting Farm Investment for Sustainable Intensification of African Agriculture*. MSU International Development Paper No. 18. East Lansing: Michigan State University.

- **Other Synthesis Reports Submitted to USAID**

Kelly, V., B. Diagana, T. Reardon, M. Gaye, and E. Crawford. January 1995. *Cash Crop and Foodgrain Productivity in Senegal: Historical View, New Survey Evidence, and Policy Implications*. Submitted to USAID/AFR/SD/PSGE/FSP: MSU Staff Paper No. 95-05.

Reardon, T., V. Kelly, E. Crawford, K. Savadogo, and T. Jayne. November 1994. *Raising Farm Productivity in Africa to Sustain Long-Term Food Security*. Draft-for-review, to AID/AFR/SD/PSGE/FSP. MSU Staff Paper No. 94-77.

Savadogo, K., T. Reardon, and K. Pietola. November 1994. *Determinants of Farm Productivity and Supply Response in Burkina Faso*. To AID/AFR/SD/PSGE/FSP. MSU Staff Paper No. 94-79.

- **Anticipated Synthesis Reports**

Jayne, T.S., Yougesh Khatri, Colin Thirtle, Bernard Kupfuma, Takeshi Sakurai, and Thomas Reardon. Forthcoming (December 1996). *Agricultural Productivity Change in Zimbabwe*. MSU International Development Working Paper.

Rusike, J., V. Kelly, and T. Reardon. Forthcoming (December 1996). *A Comparative Analysis of Fertilizer Subsector Organization and Smallholder Access to Fertilizer: Case Studies from Zimbabwe and Zambia*. MSU International Development Working Paper (represents joint work for FSP and TDT).

Rusike, J., M. Maredia, and J. Howard. Forthcoming (December 1996). *A Comparative Analysis of the Impact of Seed Organization Structure on Smallholder Access to Improved Seed: Case Studies from Zimbabwe and Zambia*. MSU International Development Working Paper (represents joint work for FSP and TDT).

Savadogo, K., T. Reardon, and K. Pietola. Forthcoming (December 1996). *Determinants of Farm Productivity and Supply Response in Burkina Faso*. MSU International Development Paper No. 21. East Lansing: Michigan State University.

Yanggen, D., V. Kelly, and T. Reardon. Forthcoming (December 1996). *Identifying and Removing Constraints to Fertilizer Use in Sub-Saharan Africa: A Literature Review*. MSU International Development Working Paper.

Kelly, V., T. Reardon, and E. Crawford. Forthcoming (November 1996). *Raising African Agricultural Productivity: Multisectoral Strategies to Reap the Harvest of Recent Macro Policy Reforms*.

Reardon, T., T. Jayne, and M. Lundberg. Forthcoming (November 1996). *Policy Strategies to Promote Agricultural Productivity, Marketing Efficiency, and Consumer Welfare in Africa*.

- **Outreach Documents for Food Security Research and Policy Community**

**Briefs:**

Diagana, B. and V. Kelly. 1996. *La dévaluation du franc CFA: quelles perspectives pour une intensification durable de la production agricole dans le Bassin Arachidier du Sénégal?* MSU Policy Synthesis No. 9F. East Lansing: Michigan State University (joint for AFR/SD/PSGE/FSP and AFR/Sahel Bureau).

Diagana, B., V. Kelly, and M. Kébé. 1996. L'offre agricole suite à la dévaluation: pourquoi une réponse si faible? *Policy Brief*, presented at World Bank forum on agriculture sector in Senegal, June. East Lansing, Michigan State University (joint for AFR/SD/PSGE/FSP and AFR/Sahel Bureau).

Kelly, V., B. Diagana, T. Reardon, M. Gaye, and E. Crawford. 1996. *Cash Crop and Foodgrain Productivity in Senegal: Historical View, New Survey Evidence, and Policy Implications*. MSU Policy Synthesis No. 7, MSU Policy Synthesis No. 7F (in French). East Lansing: Michigan State University.

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## **5.8. Long Term Training-Agricultural Productivity Topics**

Mr. Fidele Byiringiro (MS at MSU, and researcher at the Rwandan Ministry of Agriculture, Productivity Unit) did an independent study on methods for analysis of agricultural productivity during summer semester, and estimated production functions. He completed his MS thesis on agricultural productivity in Rwanda in May 1995.

Mr. Bocar Diagana (Ph.D. candidate at MSU 1995-present, Senegalese citizen, also researcher at ISRA).

Mr. Jaakko Kangasniemi (Ph.D. candidate at MSU, Finnish citizen, is doing his thesis on land use and productivity/sustainability issues in Rwanda).

Mr. Bernard Kupfuma (MS at MSU 1994-1995 and Ph.D. candidate at MSU 1995-present and researcher at the Ministry of Lands in Zimbabwe) did his thesis with Carl Eicher on hybrid maize in Zimbabwe, and is participating in the writing of the International Development Paper from the case study.

Mr. Mattias Lundberg (Ph.D. candidate at MSU, Swedish citizen).

Ms. Maria Wanzala (Ph.D. candidate at MSU, Ugandan citizen).

Mr. David Yanggen (Ph.D. candidate at MSU, American citizen).

## **6. Overview of Ongoing Research Activities**

Activities to date have included:

- (a) analyzing large primary and secondary data bases,
- (b) involving African collaborators in the planning, analysis, write-up, and dissemination of the results,
- (c) leveraging Food Security buy-in field work (in Rwanda, in Mali, in the Sahel (PRISAS)),

- (d) creating situations where a number of collaborators from various African countries are interacting with each other and with MSU researchers on methods and issues,
- (e) disseminating the results in Africa-wide, country-specific, and extra-African policy and research circles.

The work analyzes basic patterns and determinants of factor productivity in Africa, using household- and district-level data with four case studies cutting across agroecological zones (Burkina Faso, Senegal, Rwanda, Zimbabwe). The goal is to derive cross-country development strategy and policy implications of use to governments, USAID missions, and AID.

Specifically:

What are productivity patterns in different types of years, zones, and policy contexts?

What are the policy and non-policy determinants of these patterns (contributions to knowledge of situation and measurement): (i) traditional physical factors (land, labor, and capital); (ii) non-traditional or non-physical variables; (iii) prices; (iv) access to off-farm income; (v) policy context; (vi) institutions; (vii) research and extension. How similar or different are stories in different agroecological zones, and at different levels of aggregation (macro, meso, micro)?

How can productivity be increased: what are the key policies and development strategies? (i) allocation of public resources to agriculture; (ii) public resources to the infrastructural context of agriculture; (iii) incentive policies faced by farmers.

How can farmer access to productivity-enhancing inputs (fertilizer and seed, in particular) be increased?

Study the way that different agricultural product mixes (e.g., cash crops with food crops, or trees/agroforestry with crops, or crops with livestock) affect overall factor productivity. How should methods of productivity measurement be improved to account for mixed production activities?

Examine factors (e.g., access to credit, cash crop revenues, off-farm income, and government policy) that affect key determinants of long-term productivity growth and agricultural transformation (especially investment dynamics, income growth, and asset accumulation). Explore interrelations among these factors (e.g., how access to credit is affected by linkages to off-farm income in the absence of asset collateral systems).

Identification of cost-effective and sustainable policy and investment options to raise household access to improved inputs and to increase the productivity of the food system. We explore the role of public action in promoting private investment and institutional change to increase the productivity and sustainability of the food and fiber systems in Sub-Saharan Africa.

## 7. Project Impact to Date

Impacts on policymaker and research strategic thinking--that leads to long-term impacts on policies and strategies:

*Making productivity research count in the strategic discussions following devaluation in West Africa:* In many national, regional, and international policy circles a critical issue following the January 1994 devaluation of the franc CFA (following 40 years at a fixed rate) is whether and how agriculture can respond to changed incentives by increases in farm investments, competitiveness, and productivity. There was great interest shown in those policymaking and policy research circles in the papers and talks given by Diagana, Kelly, Reardon, and Savadogo on the productivity results. In particular, there was keen interest in the message that for agriculture to respond to the new macro incentive climate policy actions were needed to make fertilizer and animal traction equipment more accessible, improve the farm-level investment climate through reducing risk, and using applied research to address issues of environment and agricultural links. The manifestations of that interest is illustrated as follows: (1) the work was presented in summary form at FAO in Rome; the Assistant Director General, Abdoulaye Savadogo, was present for the presentation in March 1996, and was so interested he asked for copies of the four sets of papers for him and the Director General. They took them to their discussions about agricultural policy after the devaluation at the European Community and the World Bank; (2) the World Bank and USAID in Senegal used the work as central reference documents in their policy round table discussions and informed MSU of its value and uniqueness; and (3) the Institut du Sahel requested that the work be integrated into its own contribution at the regional intensification conference sponsored by INSAH, Wageningen and ABL-DO in December 1995 in Bamako.

*Making the productivity research count in agricultural sector and food security strategizing in the Greater Horn:* Mr. Gary Nelson, ex-director of USAID/Rwanda (he was director during most of the the FS II Rwanda project's field portion which ended April 1994), was a strong supporter of our productivity research in Rwanda and organized USAID briefings on the results. Starting in 1995, Mr. Nelson spread the results and productivity documents from the Rwanda project to the countries of the Greater Horn (including, for example, Ethiopia), as he was a primary USAID consultant to the strategic planning exercises of missions in that region. Research results from Rwanda were considered crucial to forming strategies for food security, agricultural productivity, and rural environment protection in the region. Nelson noted that the Rwanda project was an example of a very productive way to do productivity-enhancing research.

*Making the productivity research count in the international debate on how to raise soil fertility in Africa:* The research results have been used extensively in policy debates at the World Bank, at FAO, and at USAID on addressing this issue. The results have done much to support the reversal of complacency in policy circles on increasing access to fertilizer, seed, and animal traction to African farmers. We have done this by emphasizing the damage to productivity caused by the erosion of access to these inputs over the 1980s, and the need to find cost-effective solutions within a situation of tight budgets.

*Making the productivity research count in the reengineering and restructuring debate at USAID (Washington and missions):* The results have fed into these debates in Washington (via, for example, the ADONR/PSO conference in 1995) and in the missions (e.g., in Madagascar and Mali). The emphasis in our message was placed on the need to link environment and agricultural strategies, and small-business and agricultural strategies.

Below we outline impacts by group:

Impact on PVOs:

CARE, Catholic Relief, and World Vision, using productivity project outputs to inform their strategies in Africa.

World Vision/Eritrea request for mission to discuss how productivity results inform agriculture strategy; World Vision/Ghana, the same.

Requested to present results to Brown Hunger Briefing, to large group of NGOs and others. Bread for the World (BFW) especially affected by this presentation (nomination to board).

Impact on regional African institutions:

CILSS (West Africa) requested that MSU productivity work represent CILSS at West Africa conference on agricultural intensification in November 1995.

CILSS food security strategy informed by results (especially related to investment, and links between environment and agriculture).

Presentation of results at Africa workshop (TDT) in January 1995 led to spontaneous formation of an interest group across regions of researchers that want to pursue fertilizer access issue (WARDA, REDSO/West Africa, IFDC, IITA, WB, AID/W, IFPRI, ISRA, ICRAF, CRSP).

Impact on USAID missions' strategy, policy debate and formulation in Africa and Asia:

Burkina Faso mission economist's work informed by results.

Kenya ADO request to have presentation of results to inform their strategy discussions.

Madagascar mission widely distributed our Rwanda report, to inform their strategy discussions.

Mali mission requested presentation of results to inform their strategy and reengineering discussions.

Rwanda mission (before war) used results to connect PSO and ADO activity. After the war, used results to inform relief to development efforts.

Ex-director of Rwanda mission, now working with GHAI, used Rwanda report results to inform agricultural and environmental strategy, particularly in Ethiopia.

Senegal mission.

Bangladesh mission found results useful.

Impact on national and international agricultural research systems and development agencies--strategic planning and approach:

Food and Agricultural Organization (FAO) (see above).

Food security planning in Guinea informed by our synthesis report.

Ministry of Agriculture in Rwanda--shifted focus to productivity and comparative advantage; request by MA for renewal of research activity after war.

Senegalese Seed Service and the Agricultural Research Institute--alerted to soil degradation outcomes from declining productivity, and policy impacts of devaluation on intensification potential via fertilizer, and need to renew animal traction equipment.

Ministry of Agriculture, and FAO, in Senegal, very interested in fertilizer access issues, and in follow up. Very interested in our troubling results about decline of animal traction equipment in Senegal, and need to formulate policy to deal with this.

Impact on Africa Bureau and AID/W generally, and World Bank, informing debate on agriculture development strategies and growth-environment links:

Presentation of results to plenary of ADO/NRM/PSO 1995 conference; also important in debate on reengineering and links between agriculture and environment in AID's strategy.

Strong response to work (and citation of it) from World Bank, including effect on fertilizer access, and from country desks; SPAAR agenda affected by results.

Policy Consultative Group, sponsored by AFR and WRI: affected direction of the group toward productivity-environment linkages; letter with productivity results sent by group to Carol Lancaster.

Request for productivity synthesis from Food For Peace.

Request for collaboration from the World Bank group on soil fertility.