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Sustainable Agricultural Productivity Recommended Readings

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Overview

This reading list identifies critical work from the academic literature to aid in defining sustainable agricultural productivity and to support the Agricultural Development initiative's strategic theory of change. The list includes literature that the Evans EPAR team drew on to create background slides on sustainable agricultural productivity as well seminal works on agricultural productivity, economic growth, sustainable agriculture, and sustainable rural development.

The methodology to generate this list included searching the University of Washington Libraries system, Google Scholar, the University of Minnesota's AgEcon Search, as well as the websites of the FAO, World Bank, and CGIAR. We also reviewed the most recent (2010) publications of the *Handbook of Agricultural Economics* and the *Handbook of Development Economics*. Search terms included combinations of sustainable/sustainability, productivity, agriculture/agricultural, ecological, and development in combination with the key lenses of nutrition, gender, environment, and climate change.

The weight of each work is approximately represented by the amount it is cited by other authors, with the caveat that newer works are less likely to have been already cited by others. We report three sources of citation records to triangulate the weight of evidence provided by each work. Notably, Google Scholar returns more citations in almost every case because it searches all journals while Web of Knowledge and Scopus search only journals in their respective libraries. We provide copies of articles where they are publicly available; in cases where distribution is limited to UW affiliates, we provide links where the articles may be obtained.

Recommended Reading

Conceptualizing Sustainable Agricultural Productivity

Alston, Julian M., Bruce A. Babcock, and Philip G. Pardey, Shifting Patterns of Global Agricultural Productivity: Synthesis and Conclusion. In "The Shifting Patterns of Agricultural Production and Productivity Worldwide." Available at: http://www.matric.iastate.edu/shifting_patterns/

This book assembles a range of evidence to develop an improved understanding of recent trends in agricultural productivity around the world. The fundamental purpose is to better understand the nature of the long-term growth in the supply of food and its principal determinants. Chapter 15 provides a synthesis of recent work on agricultural productivity and summarizes the contributions of the individual chapters.

Alene, A. & Coulibaly, O. (2009). The impact of agricultural research on productivity and poverty in Sub-Saharan Africa. *Food Policy 34*, 198–209. doi:10.1016/j.foodpol.2008.10.014

This article presents an economic model providing evidence for a causal linkage between agricultural research and development, agricultural productivity growth, increased incomes and poverty reduction. It provides a thorough review of the empirical literature on the impact of agricultural research and development spending (national and international) on agricultural productivity growth, followed by a novel econometric model specific to Sub-Saharan Africa. While the methodology of this study is quite technical, it builds upon a strong body of previous research and makes an important contribution to evidence for the impact of agricultural research on productivity growth, incomes, and poverty reduction.

Cited by: 6 in Google Scholar, 1 in Web of Knowledge, 1 in Scopus

Byerlee, D., & Murgai, R. (2001). Sense and sustainability revisited: the limits of total factor productivity measures of sustainable agricultural systems. *Science*, *26*, 227-236.

This article presents a review of the practical and conceptual considerations in measuring Total Social Factor Productivity (TSFP) as well as the limitations of TSFP. The authors present a critique of the emphasis on determining a TSFP measure for sustainability and recommend instead a production function that incorporates economic, agronomic, and resource quality variables. They conclude by highlighting the need for improved agro-ecosystem indicators that relate to productivity trends and longitudinal, disaggregated data sets.

Cited by: 20 in Google Scholar

FAO, The State of Food and Agriculture, 2007: Paying Farmers for Environmental Services.

Sustainable agricultural development requires that the natural resource base on which the poor depend for their livelihoods be preserved and enhanced. The State of Food and Agriculture 2007 highlights the potential of agriculture for enhanced provision of ecosystem services that are not usually compensated for by the market. Agricultural production processes can result in impacts on other ecosystem services that are not traded in markets, referred to in this report as "environmental

services". Paying farmers for the environmental services they provide is akin to viewing environmental protection as a business transaction. This extensive report shows how such services can be conceptualized, measured, valued, and paid for.

Pretty, J. (2008). Agricultural sustainability concepts, principles and evidence. *Philosophical Transactions of the Royal Society B 363*, **447–465. Retrieved from http://rstb.royalsocietypublishing.org/content/363/1491/447.full.pdf#page=1&view=FitH**

This article addresses the necessary components for sustainable agricultural systems, defined as those that do not have adverse effects on the environment, are accessible to and effective for farmers, and lead to improvements in food productivity and environmental goods and services. The author demonstrates that there are decreasing marginal returns to inputs in global agricultural production and that intensive, resource-inefficient agricultural production is nearing critical environmental limits. The article summarizes the resource conserving technologies and practices that have been shown to improve the stocks and use of natural capital in and around modern agricultural ecosystems but notes that there are significant transition costs for farmers to incorporate such technologies, explaining limited uptake to date. Using data from a purposive sample of farms utilizing resource conserving technologies, the authors provide empirical evidence that sustainable agriculture not only results in productivity gains but also yields several positive spillover effects through natural, social and human capital accumulation.

Cited by: 54 in Google Scholar, 29 in Web of Knowledge

Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature, 418(6898), 671-7. doi: 10.1038/nature01014.*

This article is one of the seminal works on sustainable agriculture and provides the definition of sustainable agriculture used by BMGF's Agricultural Development initiative: "practices that meet current and future societal needs for food and fibre, for ecosystem services, and for healthy lives, and that do so by maximizing the net benefit to society when all costs and benefits of the practices are considered." In order to feed the global population expected to double by 2050, the authors underscore that the proper incentives and policies must be in place to encourage increased crop yields, nutrient-use efficiency, judicious pest and disease management, and major changes in some livestock production practices. Most importantly, society must appropriately reward agriculturalists for the production of both food and ecosystem services.

Cited by: 701 in Google Scholar, 414 in Web of Knowledge, 443 in Scopus

Veeman, T. (2008). Development, Productivity and Sustaining Natural Capital. *Canadian Journal of Agricultural Economics 58*: **13–25. Available from http://www3.interscience.wiley.com/journal/119388914/abstract**

This article presents a literature review of sustainable development definitions, highlighting the four key components consistently identified of economic growth, social development, environmental sustainability, institutional capacity. Additionally, the article situates agricultural productivity growth and natural capital within the sustainable development paradigm, addressing the interrelationships and feedback loops whereby productivity growth and natural capital contribute to sustainable

development. The article culminates with a discussion of potential methodologies to assess and measure the components of sustainable development.

Cited by: 1 in Google Scholar, 1 in Web of Knowledge

Lenses on Sustainable Agriculture: Gender, Nutrition and the Environment

Gender:

EPAR: Gender and Crop Series Executive Summary, Request No. 64

The EPAR series *Gender and Cropping in SSA* offers examples of how gender issues can affect crop production and adoption of agricultural technologies at each point in the crop cycle for eight crops (cassava, cotton, maize, millet, rice, sorghum, wheat, and yam). This executive summary highlights innovative opportunities for interventions that consider these dimensions of gender.

Quisumbing, Agnes and Lauren Pandolfelli, 2009. Promising Approaches to Address the Needs of Poor Female Farmers: Resources, Constraints, and Interventions. World Development, Volume 38, Issue 4, April 2010, Pages 581-592.

This paper critically reviews some recent attempts to increase poor female farmers' access to, and control of, productive resources, focusing on Sub-Saharan Africa and South Asia. It surveys the literature from 1998 to 2008 that describes interventions and policy changes across several key agricultural resources. Compared to interventions designed to increase investment in human capital, only a minority of interventions or policy changes increasing female farmers' access to productive resources have been rigorously evaluated. Future interventions also need to pay attention to the design of alternative delivery mechanisms, tradeoffs between practical and strategic gender needs, and to culture- and context-specificity of gender roles.

Cited by: 6 in Google Scholar

Udry, C. (1996). Gender, Agricultural Production, and the Theory of the Household. *Journal of Political Economy*, *104*(5), 1010-1046. doi: 10.1086/262050.

In this seminal work on intrahousehold resource allocation, Udry uses disaggregated household data from a two-year study in six villages of Burkina Faso to show that inputs are unevenly distributed across crops managed by different household members, with men generally using more fertilizer and having higher labor inputs. Udry concludes that more efficient input distribution could increase household outputs by 5.89% on average. The model takes into account that control over land is individualized and shows that inputs and yields vary more across plots controlled by different households than across plots controlled by different members of the same household. This study demonstrates that gender and household resource allocation have a significant impact on agricultural productivity, and contributes to a growing literature arguing for intrahousehold allocation models that look at each individual within the household, as opposed to the prevailing method that treats the entire household as a unit.

Cited by: 453 in Google Scholar, 84 in Web of Knowledge

Environment:

EPAR: Ecological Farming Literature Review, Request No. 52

Ecological farming and conventional farming are two approaches to producing food. Recent debate about the merits of ecological farming over conventional methods has centered on each system's ability to increase production in the context of numerous and varied biophysical and social constraints. A review of the literature suggests that ecological farming can offer some benefits to smallholder farmers, but that specific approaches must be tailored to local climate and soil conditions and availability of labor, training, and organic inputs.

Chappell, M. J., & LaValle, L. a. (2009). Food security and biodiversity: can we have both? An agroecological analysis. *Agriculture and Human Values*. doi: 10.1007/s10460-009-9251-4

This article provides a comprehensive literature review of works examining the interconnection between food security and biodiversity. The authors discuss the current food security crisis, various biodiversity definitions, and whether it is possible to address both problems using appropriate alternative agricultural methods and practices. The article then applies their findings to several case studies, concluding that there is evidence to suggest that alternative agriculture could provide food security and could even do so more efficiently and with higher producer profits than large-scale industrial farming.

Cited by: 1 in Google Scholar

Ehui, S. & Pender, J. (2005). Resource degradation, low agricultural productivity, and poverty in Sub-Saharan Africa: Pathways out of the spiral. *Agricultural Economics 32*, 225–242. doi: 10.1111/j.0169-5150.2004.00026.x

This article provides a thorough literature review of the evidence for Sub-Saharan Africa's poor agricultural performance to date as well as policies and strategies for its improvements. In their systematic analysis of different policy and strategy options, Ehui and Pender emphasize that appropriate responses to increase performance of the agriculture sector must be context-specific depending on the potential comparative advantage of a particular location. A case study of the East African Highlands (Kenya, Uganda, Ethiopia) then reviews the specific empirical evidence for different development domains, based on the level of agronomic potential and market access, to identify the best opportunities and policy options for each area.

Cited by: 30 in Google Scholar, 6 in Web of Knowledge

Nutrition:

EPAR: Agriculture and Diet Diversification: Evidence and Pathways to Improved Nutrition, Request No. 100

This report addresses five main issues: the impact of diversified diets on nutritional status; the effect of agricultural interventions on production and consumption behavior; the pathways from changes in production to changes in diet; whether agricultural interventions are cost-effective methods of improving nutrition; and the constraints to dietary diversification.

Perrings, Charles. Resilience and sustainable development, *Environment and Development Economics* 11: 417–427. 2006.

This is the introductory article to a special issue of the journal Environment and Development Economics that results from a call for papers to address the connection between resilience and sustainability. The ecological concept of resilience has been exercising an increasing influence on the economics of development. Resilience is interpreted in two different ways by ecologists: one capturing the speed of return to equilibrium following perturbation, the other capturing the size of a disturbance needed to dislodge a system from its stability domain, interpreted as the conditional probability that a system in one stability domain will flip into another stability domain given its current state and the disturbance regime The relevance of this concept for the problem of sustainable economic development has been recognized for at least fifteen years (and a research network – the Resilience Alliance – has subsequently developed around the idea.

Cited by: 23 in Google Scholar

Kumar, P., & Mittal, S. (2006). Agricultural Productivity Trends in India: Sustainability Issues. *Agricultural Economics Research*, *19*, 71-88.

This article contributes to the literature on total productivity of agricultural systems, building on previous literature and providing specific evidence of crop productivity in India. The authors review the fundamental work on the measurement and analysis of agricultural productivity as well as the prior literature specifically related to India. Their analysis of farm-level data provides empirical evidence of productivity trends and sustainability concerns with regards to eight crops grown widely in India. The study findings demonstrate that productivity gains have not been sustained in the second post-Green Revolution phase (beginning in the mid-1980s). The authors call for more investment in research and development for new region-specific technologies less dependent on input use, attention to the heterogeneity of production environments, and renewed resources for extension services to disseminate more sustainable production practices and new technologies.

Cited by: 8 in Google Scholar, 1 in Web of Knowledge

Key Background Readings in the Microeconomics of Agriculture and Rural Development

Binswanger-Mkhize, H. & McCalla, A. (2010). The Changing Context and Prospects for Agricultural and Rural Development in Africa. In K. Arrow & M.D. Intriligator (Eds.) *Handbook of Agricultural Economics* (pp. 3671–3712). Oxford, UK: Elsevier BV.

Included in the latest publication of the *Handbook of Agricultural Economics*, this article provides a comprehensive literature review and synthesis of recent work on the opportunities and challenges for African Agriculture, including an entire section summarizing the "Bottom Billion" work of Collier and others. The article emphasizes the enabling factors for agricultural growth and provides evidence for the link between agricultural growth and poverty reduction. Section seven, in particular, addresses the institutional constraints and needs for rural development in Africa. The authors stress the importance of long-term, continuous investments in governance, institutional capacity, infrastructure, markets (particularly financial markets), and coordination between donors, governments and regional bodies in order for Africa to be able to seize opportunities for agricultural growth.

Cited by: 4 in Google Scholar, 1 in Scopus

Goldstein, M., & Udry, C. (2008). The Profits of Power: Land Rights and Agricultural Investment in Ghana. *Journal of Political Economy*, *116*(6), 981-1022.

This study focuses on the role of political power and its impact on land rights and agricultural productivity in Ghana. Goldstein and Udry argue that farmers who hold positions of power within local institutions have more secure land rights, leading to longer fallow periods and therefore higher productivity. The authors use data from a two-year rural survey of four village clusters (60 married couples surveyed per cluster) to model the annual risk of loosing land left fallow as a function of the individual's position in local society. The authors conclude that insecure land tenure is associated with lower investment in land fertility, which then results in decreased productivity. While the methodology is somewhat technical, this article provides evidence for the importance of political systems and institutions in growth and development.

Cited by: 133 in Google Scholar, 1 in Web of Knowledge

Morduch, J. (1995). Income smoothing and consumption smoothing. *The journal of economic perspectives*, *9*(3), 103–114. JSTOR. Retrieved from http://www.jstor.org/stable/2138428.

This seminal work describes two risk coping mechanisms for households in low-income economies: income smoothing and consumption smoothing. Morduch highlights the importance of income smoothing as well as its associated costs. While consumption smoothing is significant, he points out that many small farmers face serious borrowing constraints. The author concludes that understanding the complexities of income and consumption smoothing are critical to understand the limits and possibilities for economic growth in developing countries.

Cited by: 628 in Google Scholar, 133 in Web of Knowledge

Pingali, P. (2010). Agriculture Renaissance: Making "Agriculture for Development" Work in the 21st Century. In K. Arrow & M.D. Intriligator (Eds.) *Handbook of Agricultural Economics* (pp. 3867–3894). Oxford, UK: Elsevier BV.

Published in Volume 4 of the *Handbook of Agricultural Economics*, this article presents a review of the function of agriculture in development. The author emphasizes the importance of looking beyond economic growth to carefully examine the impact on food security, decreased poverty, gender empowerment, and environmental factors. Pingali also highlights the effects of agricultural productivity on the urban poor through decreased food prices and the undetermined, but crucial impact of climate change. The article then outlines the agricultural transformation process and its implications for development. The author concludes with a discussion on the importance of redesigning public policies that are appropriate for the various stages of agricultural transformation.

This article has not yet been cited by other authors.

Strauss, J., & Thomas, D. (1995). Human Resources: Empirical Modeling of Household and Family Decisions. *Handbook of Development Economics*, *III*, 1883-2023.

Published in Volume III of the *Handbook of Development Economics*, this seminal work provides a comprehensive literature review and highlights the importance of household dynamics in understanding development and economic growth. We suggest focusing on section 2, which provides an overview of the complex relationship between income and nutrition. The section specifically highlights the controversies in the literature regarding the nature and direction of causality between income and nutrition. Some studies argue that increased income has almost no impact on nutrition, while others argue that they are highly correlated. Strauss and Thomas suggest that the collection methods of nutrition consumption data explain much of the diversity in these conclusions. They argue that income policies potentially impact nutritional status and that health in general positively affects productivity.

Cited by: 786 in Google Scholar, 204 in Scopus

Thomas, D., & Frankenberg, E. (2002). Health, nutrition and prosperity: a microeconomic perspective. *Bulletin of the World Health Organization*, *80*(2), 106-13. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2567722&tool=pmcentrez&rendertype=abstract.

In this article from a 2002 World Health Organization bulletin, the authors acknowledge that there may be a missing link in the relationship between nutrition and income but that nutrition does appear to be a significant determinant of productivity. The article provides a review of various studies on the importance of iron in determining work output, other health related factors that influence economic well-being, and the impact of overall calorie intake on productivity. While concluding that nutrition does affect productivity, the authors are adamant that further longitudinal data is needed on a variety of health indicators.

Cited by: 95 in Google Scholar, 25 in Web of Knowledge

Please direct comments or questions about this research to Leigh Anderson, at eparx@u.washington.edu.