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# **Trade and Environmental Sustainability in Cambodia: A Case Study of Rice, Cassava, and Fish**

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The Asia-Pacific Research and Training Network on Trade (ARTNeT) is aimed at building regional trade policy and facilitation research capacity in developing countries. The ARTNeT Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about trade issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. ARTNeT working papers are available online at [www.artnetontrade.org](http://www.artnetontrade.org). All material in the working papers may be freely quoted or reprinted, but acknowledgment is requested, together with a copy of the publication containing the quotation or reprint. The use of the working papers for any commercial purpose, including resale, is prohibited.

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## Acronyms/Abbreviations

ARTNeT	–	Asia-Pacific Research and Training Network on Trade
CARDI	–	Cambodia Agricultural Research and Development Institute
CDRI	–	Cambodia Development Resource Institute
CTIS	–	Cambodia Trade Integration Study
GTZ	–	Gesellschaft für Technische Zusammenarbeit
IFPRI	–	International Food Policy Research Institute
JICA	–	Japanese International Cooperation Agency
MAFF	–	Ministry of Agriculture, Forestry and Fisheries
MoC	–	Ministry of Commerce
RSA	–	Royal School of Administration
RULE	–	Royal University of Law and Economics
SWAp	–	Sector Wide Approach
TRADE	–	Trade-Related Assistance for Development and Equity
UNDP	–	United Nations Development Programme
UNESCAP	–	UN Economic and Social Commission for Asia and the Pacific
WTO	–	World Trade Organization

## Executive Summary

This report, prepared by a team of young Cambodian researchers assembled under the Trade-Related Assistance for Development and Equity (TRADE) project,<sup>1</sup> examines the possible environmental impact to result from intensified production and international trade in rice, cassava, and fish.

The team's key findings include:

- The application of chemical fertilizers is widespread in rice farming, with farmers using it to increase the yields of their second (and sometimes third) yearly plantings. Farmers understand that its use has negative consequences for the long-term sustainability of their land (overwhelmingly, their most valuable asset), and also feel that chemically fertilized rice is qualitatively inferior to organically grown rice, but they continue to use the artificial inputs.

The literature survey indicates that farming using chemical fertilizers is only marginally profitable (owing in large part to the high cost of the fertilizers themselves) and that environmentally sustainable “biodynamic” methods could greatly increase the activity's profit margin. However, the field interviews showed that farmers either do not know about these methods or perceive them to be too complex to undertake.

- Cassava production can be environmentally sound if remediation measures are undertaken in tandem with harvesting. The field research shows that many of the largest growers understand this and are taking appropriate action to protect their land's vitality (e.g., avoiding mono-cropping, using natural fertilizers, changing seed varieties, etc.). However, the nation's small landholders do not understand or are not aware of these remediation measures and, as a result, continue to utilize a system in which they abandon their land when yield falls, moving their farms to unclaimed plots on which to repeat the cycle.
- The report finds that previous studies on agricultural production and trade in Cambodia overlook several ways in which farmers – especially small farmers – can utilize integrated approaches to farming to generate greater income and also safeguard the future productivity of their land. By promoting rice field fisheries, to use one example from the study, rice fields are fertilized naturally and farmers enjoy the revenues generated by the sale of their fish, which, the research shows, can eclipse that which they earn from the sale of rice.

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<sup>1</sup> The Research Team included Prof. Adam Fforde (University of Melbourne and Victoria University, Australia), Mr. Bell Oudamketya (RULE), Mr. Kheang Praneth (RULE), Mrs Menh Vuthisokunna (RULE), and Mr. Om Macthearith (RSA). This Research Brief is based on a draft version submitted by the research team in September 2010.

## Introduction

The study focuses on the interplay between trade development and environmental impact in three products that generate, or have the potential to generate, significant export revenue: rice, cassava, and freshwater fish. The focus on environmental impact was selected both because it is a critical component of sustainable development and the Millennium Development Goals, and because it is inextricably linked with the production of agricultural goods, which have the potential to significantly increase the Cambodian export base.

The research had two components:

- A review of the existing literature on the three sectors, linking trade sector development with the resulting environmental implications generated; and,
- Field research, which entailed the newly formed research team applying its skills to the task of understanding how the linkages outlined in the literature were supported by primary data collected in the field

## Literature Review

Before conducting field research, the team assessed the body of existing literature and the extent to which it might provide explanations about the roots and determinants of fast economic growth over the last decade in Cambodia. The team's main conclusion is that a large portion of existing research tends to overlook the micro-level dynamics that promote change in the Cambodian context.

While many authors and reports focus on governance problems and policy-related constraints undermining growth potential, the team chose to focus on the process of accumulation of human, social and physical capital at farm level, and on the “flexibility and mutability”<sup>2</sup> of norms and behaviours prevailing among rural Cambodian households. Against this background, farmers' livelihood strategies thus become the vectors through which trade and environment dynamics take shape.

### Rice

The use of chemical fertilizers and pesticides is the central issue covered by most studies that examine the environmental impact of modern rice production. Most studies also examine the link between the application of chemical fertilizers, the profitability of using these inputs for farmers, and the production of rice for export purposes.

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<sup>2</sup> See Ledgerwood, Judy, “Decision-making in rural Khmer villages,” in Ed. Ledgerwood, *Cambodia Emerges from the Past – Eight Essays*, Southeast Asia Publications, Center for Southeast Asian Studies, Northern Illinois University, 2002.

Several reports focusing on the rice sector agree that the application of chemical fertilizers – which typically are introduced by market actors – runs counter to traditional practices (e.g., relying on natural fertilizers such as green manure), which are considerably more environment-friendly. However, there is less agreement on the issue of whether this is a positive or negative development.

Although, surprisingly, none of the available studies factor the declining value of the farmers' land holdings into their equations, there are still different views on its benefits to the farmers in terms of income.

For instance, JICA finds in a 2008 study that:

*If a farmer follows the Cambodia Agricultural Research and Development Institute (CARDI) recommendations for fertilizer applications of urea at 50 kg/ha, and DAP at 75 kg/hectare, this would be an up-front cost of US\$102.50 per hectare to a farmer. Simply stated, Cambodian rice farmers would not likely see yield increases high enough to justify the cost of the recommended rates of nitrogen. The continued use of fertilizer seems to be a question of the absolute cost of fertilizer, and not one of adequate supplies in the marketplace, or its recognized efficacy in improving yields.<sup>3</sup>*

A 2004 GTZ study finds that replacing reliance on chemical fertilizers with the use of “biodynamic” techniques, e.g. Systems of Rice Intensification (SRI), that harness biological factors that influence rice tilling and final grain yield (e.g., soil tilth, water management, transplanting practices, early weeding, and seed selection) can be a preferable strategy.<sup>4</sup>

The study finds that, even when the relevant techniques have been adopted only partially by participating farmers, those farmers experience a 40 percent increase in yield. Interestingly, those yield increases are accompanied by a 75 percent increase in net income per hectare, with the difference being due in good part to the farmers' substantial reductions in costs of production – a result of the elimination of expensive fertilizer purchases.

A 2006 Oxfam America study finds that a programme to help farmers change their techniques to “fair-trade”, organic practices can result in the farmers producing as much rice as they did while using chemical inputs, and, furthermore, also see their profits more than double.<sup>5</sup>

The picture offered is one where the new techniques, including the use of chemical inputs, are such that farmers' cash costs are seen as relatively “high” compared to expected returns, while for non-chemical techniques input costs are lower and net earnings therefore higher. But the literature does not suggest why non-chemical techniques are not being adopted widely. The main arguments are either because farmers are slow to adopt newer techniques, such as SRI, or that such methods impose “hidden costs”, perhaps, for instance, by placing new

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<sup>3</sup> JICA, *Sector Analysis and Value Chains, 6.1: Rice*, JICA, July 2008.

<sup>4</sup> GTZ Technical Paper No 3, *Organic Rice Programme*.

<sup>5</sup> Perera, Andrea, *Cambodian Rice Farmers Go Organic*, Oxfam America. 2006.

time-consuming responsibilities upon women at crucial, labour-intensive times, such as transplanting.

However, the benefit of pursuing a “greener” rice industry remains a matter of debate. A 2009 International Food Policy Research Institute (IFPRI) study argues that the output gains recorded by the use of chemical inputs are eventually worth the costs.<sup>6</sup>

Even while acknowledging that these practices lead to only minimal gains in farmer income, the study finds that the increases in rice production help foster the growth of a higher value-added domestic rice sector and also reduce consumers’ cost of purchasing rice. Both of these macro-economic national gains, it argues, are sufficiently worthwhile to the Cambodian economy to justify higher costs of production.

In sum, the existing literature is marked by opposing views on the different rice production methods and the income distribution issues associated with them. It also is weak in addressing the long-term effects of modern techniques on the value of the land.

The short-term focus of the surveyed literature indicates an analytical focus on export possibilities, and tends to neglect the positive effects of domestic demand for natural rice. The main conclusions of the literature review include a belief that national targets of increased rice output and land yields may not be consistent with farmers’ desires to increase their net incomes, both now and – probably more importantly – over the medium-to-long term.

## Cassava

The link between cassava and international markets is indisputable, as the great majority of the local output is exported either raw or semi-processed. Studies examining the impact of trade in cassava on the natural environment typically focus on one of two elements:

1. The way in which growing the root exhausts the soil, depleting its nutrients; and,
2. The air and water pollution that arises from processing the raw commodity.

Most studies examining the sector dedicate limited – if any – attention to cassava’s environmental consequences. Although most acknowledge the potential for harm from a large-scale national cassava industry (especially as the use of chemical fertilizers appears to be expanding), the general view is that the activity is presently of a sufficiently small scale not to pose significant threat.

Some studies, however, do focus on the impact of cassava on natural resources. A 2007 analysis of the product, for instance, examines the conventionally held view that cassava is an “exploitative” crop, a term that alludes to its propensity to significantly diminish the fertility of the soil in which it is grown.<sup>7</sup> The report, while acknowledging this possibility, also

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<sup>6</sup> Yu, Bingxin and Shenggen Fan, *Rice Production Responses in Cambodia*, IFPRI 2009.

<sup>7</sup> Preston, T.R., *Potential of Cassava in Integrated Farming Systems*, 2007.

demonstrates that cassava farming – which can capture nutrients from animal manure – can be a sustainable activity if the product is grown as part of an integrated crop/livestock system.

Another study suggests that the practical harm done by cassava cultivation in Cambodia arises from a lack of understanding in the small-scale farming community about the optimal techniques for growing it.<sup>8</sup> In particular, if farmers knew about the dangers of mono-cropping, much of the actual harm to future soil viability could be averted.

This research team found that, while the environmental consequences associated with cassava's production are acknowledged and discussed in the literature to varying degrees, the environmental consequences associated with local cassava processing are left unexplored.

## Fish

In dealing with fish, the research team sought to analyze the presence of fish *within* farming systems. This choice draws on modern analyses of rural economies, such as those common in Southeast Asia, where sub-systems of production can be closely integrated. This frequently generates environmental benefits, as fish farming creates by-products that can provide natural inputs to such crops as rice and cassava, thereby decreasing the use of chemical inputs.

The research team found that the available literature neglects to focus adequate attention on the role of rice field fisheries, which are a significant source of fish and other aquatic animals and which provide rural Cambodians with important sources of both nutrition and income. As demonstrated by Hortle et al.,<sup>9</sup> a lack of quantitative information contributes to rice field fisheries being overlooked by development planners. This oversight often results in promoting growth in rice production to the detriment of the fisheries. What is even more striking in Hortle's findings is that the capture fishery activity can generate even greater revenue for the farmer than the production of paddy rice.<sup>10</sup>

However, the literature does agree on the growth potential of aquaculture-based fish production, which it finds can be exploited in conjunction with raising livestock and the watering of rice or cassava fields, thus contributing to the practice of integrating fish within farming systems.

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