Integrated Farming Systems for Agricultural Development

The Case of Integrated Agriculture Aquaculture on Palawan, Philippines

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Marco Hartmann

Content

Figures

Tables

Abbreviations

ADB	Asian Development Bank
AKVAFORSK	Institute for Aquaculture Research, Norway
AEA	Agro Ecosystem Analysis
ASEAN	Association of Southeast Asian Nations
AusAID	The Australian Government's Overseas Aid Programme
AW-IPMArea	Wide Integrated Pest Management
BAS	Philippine Bureau of Agricultural Statistics
BFAR	Philippine Bureau of Fisheries and Aquatic Resources
BMZ	Federal Ministry for Economic Cooperation and Development
BRDF	Bio-Resource Flow Diagram
CAO	City Agriculture Office, Puerto Princesa City, Palawan
CGIAR	Consultative Group on International Agricultural Development
CIAAP	Cabayugan Integrated Agriculture Aquaculture Project
CU	Consumer Unit
DAP	hilippine Department of Agriculture
DAT	Days After Transplanting
DENR	Philippine Department of Environment and Natural Resources
DFIDUK	Department for International Development
FAO	Food and Agriculture Organization of the United Nations
FiBL	Research Institute of Organic Agriculture
FMFI	Farmer Managed Implemented
FSA	Farming Systems Approach
FSD	Farming Systems Approach to Development
FSR	Farming Systems Research
FSRE	Farming Systems Research Extension
GAP	Good Agricultural Practices
GAS	Golden Apple Snail
GDP	Gross Domestic Product
GIFT	Genetically Improved Farmed Tilapia
GMT	Genetically Male Tilapia
GNI	Gross National Income
GTZ	German Technical Cooperation
HVC	High Value Commodities
HYV	High Yielding Varieties
IAA	Integrated Agriculture Aquaculture
ICLARM	International Center for Living Aquatic Resources Management
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFF	Integrated Fish Farming
IFOAM	International Federation of Organic Agriculture Movements
IFPRI	International Food Policy Research Institute
IIRR	International Institute of Rural Reconstruction
ILEIA	Centre for Information on Low External Input Agriculture
ILO	International Labour Organization
IMTA	Integrated Multi-Trophic Aquaculture

INRM	Integrated Natural Resource Management
IP	Integrated Production
IPM	Integrated Pest Management
IPP	Integrated Production and Protection
IRD	Integrated Rural Development
IRRI	International Rice Research Institute
LAR	Living Aquatic Resources
LEIA	Low External Input Agriculture
LEISA	Low External Input Sustainable Agriculture
MASIPAG	Magsasaska at Siyentipiko para sa Pag-unlad ng Agrikultura
MDG	Millennium Development Goals
ME	Men Equivalent
NACA	Network of Aquaculture Centers in Asia-Pacific
NGO	Non Governmental Organization
NRM	Natural Resource Management
PAR	Participatoy Action Research
PCI	Per Capita Income
PCSD	Palawan Council for Sustainable Development
PIDS	Philippine Institute for Development Studies
PPP	Purchasing Power Parity
PRA	Participatory Rural Appraisal
RAVC	Returns Above Variable Costs
RFDS	Rice-Fish-Duck-Snail
RMRI	Researcher Managed and Researcher Implemented
RMFI	Researcher Managed and Farmer Implemented
RRA	Rapid Rural Appriasal
SA	Sustainable Agriculture
SEAFDEC	South East Asian Fisheries Development Center
SL	Sustainable Livelihoods
SLA	Sustainable Livelihoods Approach
SOM	Soil Organic Matter
SWOT	Strengths Weaknesses Opportunities Threats
TOT	Transfer of Technology
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNRISD	United Nations Research Institute on Social Development
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
WCED	World Commission on Economic Development
WFS	World Food Summit
WHO	World Health Organization
WTO	World Trade Organization

Abstract

Lowland rice farming represents the traditional farming system in the case study region, *Cabayugan* on Palawan island, southwest Philippines, yet farmers are confronted with stagnant yields, low productivity and food insecurity. Rice farming is predominantly operated on a small-scale with limited resources at hand. Given that farms are largely cut off the market due to their peripheral location, households are forced to produce within a situation near autarky, along with an unstable external environment further aggravating the situation. Decision-making in subsistence agriculture is recognized as a complex endeavour, including sociological, psychological, physical and economic considerations. There are a number of alternatives open to the farmer in order to achieve a sustainable outcome for the farm family. One of these options within a smallholder environment is the diversification of farming operations to include low input aquaculture technologies, crop- and livestock components at the same time (referred to as integrated agriculture aquaculture, IAA).

The potential of IAA as a path to rural, agricultural development was investigated in traditional lowland rice farming systems. A modified farming systems approach (FSA) has been applied on project-level on-station in order to identify and further elaborate suitable ways for the integration of farm enterprises into the traditional farming system.

Following a smallholders` perspective, adaptive complementary research served to identify best practice guidelines to effectively steer IAA operations. For a period of two years, research was carried out within the scope of the local, non-governmental organization *Cabayugan Integrated Agriculture Aquaculture Project* (CIAAP) between 2004 and 2006. Basic data relating to the motivation of farmers to diversify their traditional farming system has been facilitated by the sustainable livelihoods approach (SLA). Direct observation, focus-group discussions and key informant interviews have been complementary utilized throughout the entire project period.

The decision whether or not to integrate a new enterprise in a traditional production system is generally associated with uncertainties (yield, market, information) and considerations relating to a minimization of farm risk. Given that farm decisions often follow distinct economic considerations of the farm household, a formal gross margin analysis has been carried out within a one year production-cycle within the CIAAP project in order to illustrate the performance of individual farm enterprises.

Economic analyses on-station showed the suitability of IAA operations to improve productivity and create cash income. In contrast, considerations beyond somewhat artificial conditions on-station reflecting the farmers` environment indicated a rather unfavourable result, yet a sensitivity analysis pointed at the potential of IAA to cushion harvest failures to a certain extent. The study identified several key barriers, which can hamper IAA as development approach, such as farmers` availability of financial resources, access to information, extension, skills, and varying conditions on farmer's fields. Evidence suggests that both an increase in operating knowledge to steer IAA systems as well as the improvement of post-harvest facilities are among the most driving factors to improve farm productivity. Basically, an increase in productivity can only be realized via site-related technologies in order to improve synergy-effects to enhance nutrient-recycling within IAA systems. Investigations on-station clearly point at a direct linkage between an increase in labour input and the improvement of synergy-effects.

Even though evidence from the case study reveals ample scope to increase labour input, it is not the labour issue alone to shape IAA as an approach for agricultural development. A focus on interdisciplinarity among stakeholders and further development of a systems approach is needed to grasp the multiple dimensions of smallholders` operating environments. The awareness of these coherences and its gradual conversion into development activities may open up the chance to secure economic, social and environmental sustainability by integrated agriculture aquaculture systems in the long run.

Zusammenfassung

Der Anbau von Tieflandreis stellt das traditionelle Bodennutzungssystem im Untersuchungsgebiet Cabayugan auf der Insel Palawan, Südwest-Philippinen dar. Bauern der Region sind konfrontiert mit stagnierenden Erträgen, geringer Produktivität und Ernährungsunsicherheit. Reis wird überwiegend unter extensiven Bedingungen von Kleinbauern kultiviert. Da die Bauern aufgrund ihrer peripheren Lage größtenteils vom Markt abgeschnitten sind, produzieren die Haushalte in einer autarkieähnlichen Situation, die überdies durch unsichere, externe Umweltbedingungen verschärft wird. Ressourcennutzungsentscheidungen von Kleinbauern sind komplex und beinhalten soziologische, psychologische, physische und ökonomische Faktoren. Der ländliche Haushalt verfügt über diverse Alternativen seinen Lenbensunterhalt nachhaltig zu sichern. Eine dieser Optionen stellt die Diversifizierung des traditionellen Produktionssystems hin zu einer gleichzeitigen Einbindung von Aquakulturtechnologien, Gemüseanbau und Tierzucht dar (bezeichnet als Integrierte Agrikultur Aquakultur, IAA).

Das Potential von IAA als Pfad zur Förderung ländlicher Agrarentwicklung wurde am Beispiel traditioneller Tieflandreis Bodennutzungssysteme untersucht. Zu diesem Zweck wurde ein modifizierter *'Farming Systems Approach' (FSA)* auf Projektebene in einem Modellprojekt angewandt, um auf diese Weise Ansatzpunkte für eine mögliche Einbindung zusätzlicher Produktionsverfahren in traditionelle Bodennutzungssysteme zu identifizieren und weiter zu entwickeln. Unter besonderer Berücksichtigung der Perspektive von Kleinbauern dienten angewandte Forschung und Feldversuche der Identifizierung von *'Best Practice'* Richtlinien für ein effizientes Management von IAA Systemen. Innerhalb eines Zeitraumes von 2 Jahren (2004-2006) wurden die Forschungsarbeiten im Rahmen der lokalen Nicht-Regierungsorganisation CIAAP (*Cabayugan Integrated Agriculture Aquaculture Project*) durchgeführt. Basisdaten bezüglich der Motivation der Bauern zur Diversifizierung ihrer traditionellen Systeme wurden mit Hilfe des *'Sustainable Livelihoods'* Ansatzes ermittelt. Teilnehmende Beobachtung, fokussierte Gruppendiskussionen, sowie Interviews mit Schlüsselinformanten wurden ergänzend verwendet.

Die Entscheidung für eine Einbindung neuer Produktionsverfahren (Sub-Systeme) in das traditionelle Produktionssystem ist grundsätzlich mit Unsicherheiten und Überlegungen hinsichtlich einer Minimierung des Produktionsrisikos verbunden. Da ökonomische Kriterien den Entscheidungsprozess von Kleinbauern maßgeblich beeinflussen können, wurde zur Darstellung der ökonomischen Vorzüglichkeit einzelner Sub-Systeme eine Deckungsbeitragsanalyse auf

der Basis eines einjährigen Produktionszyklus im CIAAP Modellprojekt durchgeführt.

Die ökonomische Analyse des IAA Modellprojektes belegt die Eignung von IAA zur Produktivitätssteigerung und Einkommensgenerierung. Demgegenüber zeigen Überlegungen für das Produktionsumfeld von Kleinbauern ein ungünstiges Ergebnis, jedoch belegt eine Sensitivitätsanalyse das Potential von IAA Systemen Ernteausfälle bis zu einem gewissen Grad abzufedern.

Die Verfügbarkeit finanzieller Ressourcen, der Zugang zu Information, Beratung und Ausbildung, sowie unterschiedliche Produktionsbedingungen der Bauern stellen Schlüsselbarrieren dar, die IAA als Entwicklungsansatz maßgeblich behindern können. Zudem gibt es Anzeichen dafür, dass sowohl eine Zunahme an Fachwissen zur Steuerung von IAA Systemen, als auch die Verbesserung von Nach-Ernte Kapazitäten eine entscheidende Rolle zur Steigerung der Produktivität einnehmen.

Eine Produktivitätssteigerung kann grundsätzlich nur über standortangepasste Technologien zur Steigerung von Synergie-Effekten zur Verbesserung von Nährstoffkreisläufen erfolgen. Untersuchungen im Modellprojekt verweisen eindeutig auf die enge Verbindung zwischen steigendem Arbeitseinsatz und einem Anstieg von Synergie-Effekten. Wenngleich es Hinweise dafür gibt, dass innerhalb des Untersuchungsgebietes die Möglichkeit zur Steigerung des Arbeitskrafteinsatzes besteht, so ist eine Steigerung des Arbeitseinsatzes alleine noch nicht ausreichend um IAA als Ansatz für ländliche Entwicklung zu gestalten. Vielmehr ist ein interdisziplinärer Ansatz gefordert, der einerseits alle beteiligten Anspruchsgruppen einbindet und zum anderen einen systemorientierten Ansatz weiterentwickelt, um die vielfältigen Dimensionen der kleinbäuerlichen Produktionsbedingungen zu erfassen. Die Erkenntnis dieser Zusammenhänge und deren schrittweise Überführung in Entwicklungsaktivitäten eröffnet die Chance ökonomische, soziale und ökologische Nachhaltigkeit langfristig durch Integrierte Agrikultur Aquakultur-Systeme sicherzustellen.