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Restructuring the Vietnamese Rice Sector: Towards Increasing Sustainability

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Abstract: Although Vietnam is one of the biggest rice exporters today, there is an urgent need to restructure the sector. To guide the transition from being a quantity-focused producer to a credible supplier of quality rice, this study explores the sector's opportunities for sustainable value chain upgrading. Data was collected through focus group discussions with farmers, stacked surveys with rice value chain stakeholders, and a participatory workshop bringing several value chain actors together. Stakeholders perceive the sector's capability to grasp opportunities (including growing export and domestic markets) to be higher than its resilience to potential threats (including more stringent food safety regulations and climate change). Three strategies are discussed for making rice value chains more sustainable; embodying sustainability in the product through certified sustainable production labels; internalizing sustainable production standards through vertical coordination (e.g., contract farming); and disembodying sustainability through book and claim certificate trading.

Keywords: Vietnam; rice; value chain; sustainability; stakeholders; SWOT

1. Introduction

Vietnam's development performance in the last two and a half decades is considered as 'one of the most spectacular in the developing world' [1]. Its rapid and sustained economic growth has transformed the country from one of the poorest in the world to a country with lower middle-income status. The rapid growth of the agriculture sector and in particular the rice subsector served as the foundation for Vietnam's success story. The rice sector in the Mekong Delta (MKD), the country's rice producing belt, has transformed the country from suffering a rice deficit into a huge rice surplus economy. In fact, it has more than surpassed this goal, as rice exports now serve both commercial urban markets in Africa and the food security programs of rice importing countries like the Philippines and Indonesia by stocking their public food distribution and safety net programs [2]. The rice sector provided affordable and accessible food, ensuring food security. The rice sector was instrumental in generating foreign exchange revenues, which were used to finance the development of manufacturing and service sectors as well as providing surplus labor for urban centers [3].

In recent years, the role of rice as an engine for rural growth and poverty reduction has subsided. Rising input costs, including those for fertilizer, fuel, and labor, have outpaced nominal increases in producer paddy prices [2]. According to this World Bank Report, 40% to 50% of the costs of exportable rice are associated with imported fertilizer and agro-chemicals. Due to increasing production costs, the Vietnamese rice export sector can no longer rely on cost-competitiveness, a strategy it has successfully maintained for decades. In 2015, rice production in Vietnam reached 28 million tons of which 7 million tons were exported [4]. Most of the rice exported by Vietnam stays within Asia with China (2.16 million tons) and the Philippines (1.14 million tons) as main importing countries. Export to Africa is diminishing due to strong competition from India, Thailand, and Pakistan. In terms of quality,

Vietnam exports all types of rice qualities including 5%, 10%, 15%, 25%, and 100% broken, glutinous, and Jasmine rice. The government still hopes to increase rice exports, especially for high value Jasmine rice, which accounts for 18% of the total milled rice export. However, it should also be noted that Vietnamese fragrant rice is consistently discounted compared to Thai fragrant rice [5].

Vietnam's past growth track was based mainly on high production of low quality rice. The overarching concern then was widespread hunger, which had to be resolved quickly and decisively by ensuring available stocks of rice [2]. The rice export strategy followed the same route, specifically going for high volumes of low quality rice and selling at low price [6]. Coupled with low production costs, the strategy worked, making Vietnam one of the top five rice exporting economies in the world. However, the perceived image of Vietnam's rice subsector in the world economy is as a supplier of low quality rice. The sector suffers from a weak reputation in international markets and the absence of a national brand [7].

Although international commodity prices spiked in 2008, Vietnamese rice growers have benefitted little from these elevated international and domestic food prices [2]. Many of the MKD rice growers are net buyers of rice. Farm households with very small landholdings are no longer able to advance their standard of living by making incremental productivity gains in rice mono-cropping. Consequently, they have to rely increasingly on off-farm sources of income and employment. These findings suggest that it is not the broad mass of smallholder rice growers that benefit from the rice exports, which is a socially unsustainable situation.

The Vietnamese rice sector is also dealing with severe environmental issues. Strategies for increased production have mainly focused on intensified rice farming systems, using high-yielding varieties and increased use of agrochemicals [8]. The use of pesticides has increased drastically the past decades [9]. The overuse of fertilizers led to high pest and disease infestations and resulted again in even higher usage of pesticides. Also future problems should not be ignored. The Mekong Delta has been identified as significantly vulnerable to climate change [10], which is leading to increasing water shortages in the dry season [11].

Sustainable Food Value Chain Development

There is an evident need to gradually, yet very substantially, modernize the domestic and export-oriented rice value chains. This would help to realize major advances in technical efficiencies at different levels, and promote the introduction and spread of an ethos focused on greater (environmental) sustainability, product quality, and customer service [2]. Whilst sustainable production and trade have been addressed for a number of higher-value commodities, the rice value chain has generally been neglected, despite its critical importance for global food security. However, attention is growing. Worldwide, sustainability has been put in the centre of attention through the Sustainable Development Goals [12]. In the rice sector, the Sustainable Rice Platform (SRP) attempts to promote resource efficiency and sustainability both on-farm and throughout the rice value chain [13]. SRP is a global alliance of agricultural research institutions, agri-food businesses, and public sector and civil society organizations convened by the United Nations (UN) Environment and the International Rice Research Institute (IRRI). In October 2015, the alliance released the world's first standard for sustainable rice, which sets new and more efficient standards for rice cultivation [14].

The concept of sustainable food value chains, developed by the Food and Agriculture Organization of the United Nations (FAO) [15], can serve as a framework to upgrade the sector. Sustainable food value chains are defined by FAO [15] (p. 6) as 'the full range of farms and firms and their successive coordinated value-adding activities that produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad-based benefits for society and does not permanently deplete natural resources'. The goal of sustainable value chains is combining economic sustainability (i.e., creating added value) with social (i.e., facilitating equitable distribution of added value among stakeholders) and environmental sustainability (i.e., reducing the ecological footprint).

FAO [15] puts forward ten principles in sustainable food value chain development, divided in three phases. The first phase focuses on measuring performance and investigates the economic, social and environmental outcomes the value chain actually can deliver compared to the traditional way of working. The second phase focuses on the understanding of the performance including linkages between value chain stakeholders, behaviour of the stakeholders, and value determination in the end market. The third phase looks at improving performance. This phase is focused on investigating the vision of a value chain and selecting activities to upgrade as well as the multilateral partnerships that can support the strategy and scale out the activities.

As mentioned above, SRP has developed a standard and performance indicators for sustainable rice cultivation. This standard and its performance indicators use the framework of economic, social, and environmental sustainability as its core (Figure 1). Profitability, labor productivity, and yield fall under economic sustainability; appropriate pesticide use and greenhouse gas mitigation fall under environmental sustainability; worker health and safety, child labor, and women empowerment fall under social sustainability. Water productivity and nitrogen and phosphorus-use efficiency can be situated both under economic and environmental sustainability and food safety under social and environmental sustainability.

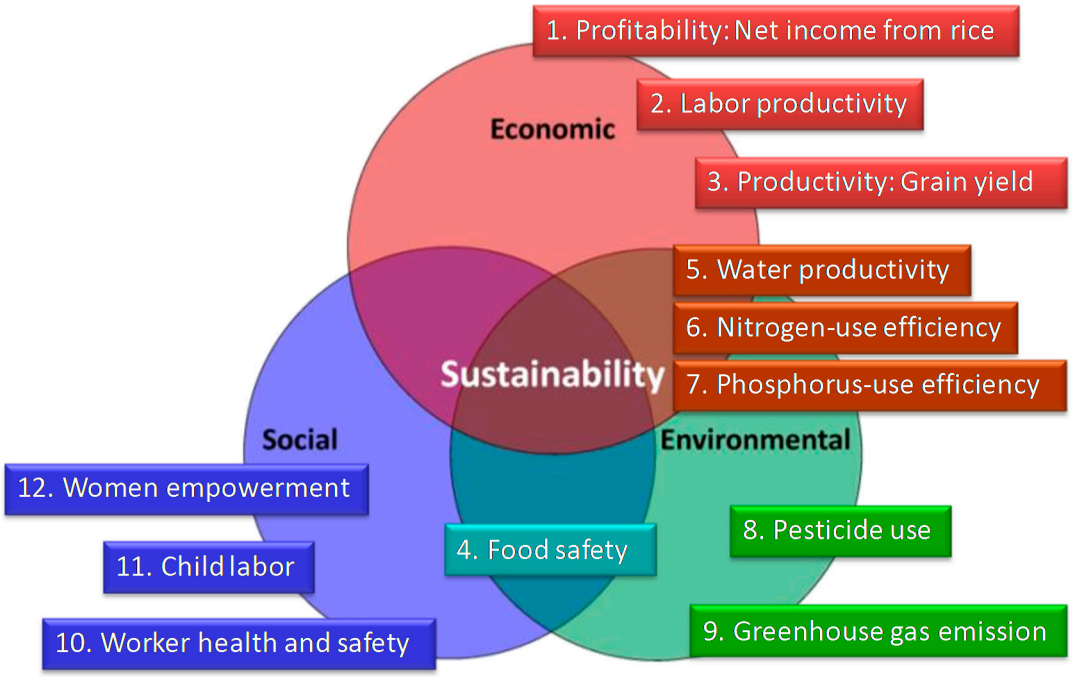

Figure 1. Principles for sustainable rice production as defined by the Sustainable Rice Platform (SRP) [13].

The goal of the study is to support the development of a future strategy for the rice value chain in the MKD, Vietnam, to become more sustainable. The first objective of this study is to map the different rice value chains in the Mekong delta. Secondly, the study aims to provide strategies for sustainable development based on multi-stakeholder discussion. The analysis was framed around the first phase of the sustainable food value chain development framework [15] where economic, social, and environmental outcomes are investigated.

2. Material and Methods

Analogously to Demont and Rizzotto [16], data was collected through mixed methods including literature reviews, focus group discussions (FGDs) with farmers, stacked surveys with different rice value chain stakeholders, and a participatory workshop bringing several value chain actors together.

2.1. Rapid Appraisal through Stacked Value Chain Survey

A rapid appraisal was conducted through 'stacked surveys' [17] with actors along the MKD rice value chain in July 2013 (In a 'stacked' survey, a questionnaire is designed for different layers of vertically related actors within the value chain (farmers, traders, millers, food and export companies, wholesalers, supermarkets and retailers) [17]. It enables the value chain to be mapped out and trends in vertical coordination and integration between vertically related actors to be uncovered). The stacked survey was administered to 43 value chain stakeholders (farmers, millers, small and big traders, food and export companies, wholesalers, retailers, and supermarkets) through a combination of FGDs and face-to-face interviews in Ho Chi Minh City, Can Tho, and An Giang province. Purposive sampling was done by the Department of Agriculture and Rural Development (DARD) in Can Tho and An Giang, so as to capture to the maximum extent possible the geographic and functional diversity of actors and channels in the MKD rice value chain. The goal of the surveys and FGDs was to gain a rapid understanding of (i) quality preferences; (ii) vertical coordination and integration trends; and (iii) incentive mechanisms for the adoption of sustainable production practices throughout the rice value chain.

2.2. Multi-Stakeholder Workshop

2.2.1. Participants

Key stakeholders of the Vietnamese rice sector gathered to discuss strategies towards a sustainable rice value chain in the MKD on 5–6 June 2014 in Ho Chi Minh City, Vietnam. The two-day workshop engaged a multi-stakeholder discussion about the future of the Vietnamese rice industry. From our literature review and survey findings, we learned that rice value chains in Vietnam are driven by a strong partnership between the government and the private sector [2]. Therefore, purposive sampling was used to obtain a balanced sample of representatives from the public and the private sector. Public sector participants (n = 14) included representatives from the Department of Agriculture and Rural Development and research institutes and universities, while private sector participants (n = 10) included representatives from export companies, farmer cooperatives, and the food industry.

2.2.2. Method

The data collection was performed using the mixed sequential design of Van Wezemael et al. [18]. Data collection and analysis were executed in two stages. The first stage consisted of listing SWOT components. The second stage consisted of scoring a SWOT matrix and performing a quantitative analysis through a Strategic Orientation Round (SOR).

Qualitative Research Stage

The evaluation of the MKD rice sector is based on a SWOT-analysis (i.e., an analysis of Strengths, Weaknesses, Opportunities, and Threats), a strategic planning tool used to evaluate in a systematic way the external threats and opportunities and the internal weaknesses and strengths of a business or sector [19]. A SWOT analysis is a stepwise method, consisting of specifying the sector's objectives, i.e., becoming more sustainable as a sector, and identifying the internal and external factors that support or hinder achieving the specified objective. The SWOT analysis does not only evaluate the sector itself; it provides insights into the future opportunities for the sector as well as the emerging threats. This step allows the identification of the main points of interest for future strategy development [20]. SWOT analysis is typically done by so-called 'prime witnesses', i.e., people who are well familiarized with the topic. In the present study, these were different stakeholders in the Vietnamese rice sector. The diversity in backgrounds of participants ensured variability in the obtained SWOT components.

The first day of the workshop, the stakeholders were divided in three randomly selected groups and were asked to list all possible internal strengths and weaknesses and external opportunities and threats to the Vietnamese rice sector in becoming more sustainable. To arrive

at a common understanding of the concept of sustainability within the context of food value chains, the discussion was framed around an introductory session in which the concept was explained to the participants. After the aggregation, those lists were filtered from repeated and overlapping answers. Misclassifications of internal (strengths and weaknesses) and external (opportunities and threats) characteristics were relocated by the animators. Based on the complete list, the stakeholders were asked to select the five most important strengths, weaknesses, opportunities, and threats. This task was first executed in different smaller groups and then consensus was reached through a final group discussion.

Quantitative Research Stage

In the second stage of the study, a quantitative analysis was performed in order to translate the statements in the SWOT analysis into more practical strategic objectives. The SWOT-analysis is mainly a descriptive and synthesizing instrument. Within the analysis, no hierarchy between the components is established, and therefore there is no solid base from which to define a strategy. However, based on the qualitative SWOT method, variations have been developed that make the step to a quantitative strategic approach [21]. One such variation is the Strategic Orientation Round (SOR) method [18,22]. The SOR analysis relies on the outcome of the SWOT analysis. The SOR is a planning instrument that is used to define strategic objectives. While the SWOT analysis makes a situation analysis, the SOR analysis is used to make the step from analysis to strategy. The advantage of strategic orientation is that it explicitly links diagnosis and assessment to strategic decisions and action planning, while the connection between analysis and planning is often implicit.

The identified SWOT components were combined in a matrix in which the rows were filled with the internal strengths and weaknesses and the columns with the external opportunities and threats. In this matrix, each of the internal components was confronted with each of the external components. The stakeholders were asked individually to attribute scores to every single cell of the matrix. These scores represented their answers on four questions related to the quadrant encompassing the cell (see Table 1). Scores were attributed according to two guidelines; firstly, a maximum of 12 points could be attributed to each column; and secondly, each single cell score had to be within the range of 0 to 3, indicating points of no (0), low (1), medium (2), and high (3) importance. A complete overview of the method is summarized in a YouTube video [23].

Table 1. Meaning of the quadrants of the Strengths, Weaknesses, Opportunities, and Threats (SWOT) matrix.

	Opportunities	**Threats**
Strengths	To what degree does the strength facilitate to benefit from the opportunity?	To what degree does the strength allow to cope with the threat?
Weaknesses	To what degree does the weakness prevent to benefit from the opportunity?	To what degree does the weakness prevent to cope with the threat?

3. Results

3.1. Stacked Value Chain Surveys

The stacked value chain surveys uncovered some important trends in vertical coordination and integration in the Vietnamese rice sector. Figure 2 depicts the traditional structure and the new trends in Vietnamese rice value chains. Flows of paddy are depicted through double arrows, while flows of milled rice are represented by single arrows. In traditional rice value chains, paddy traders are the first link between farmers and buyers as they collect small lots of paddy from individual farmers or farmer cooperatives. Afterwards, paddy traders sell the paddy to millers. Some millers are engaged only in de-husking or polishing activities, while other processors incorporate all activities. Afterwards, rice is sold to wholesalers and/or exporters. Subsequently, wholesalers distribute the rice to retailers

or supermarkets, which distribute the final product to consumers. In case of the exporters, the rice is sold to foreign countries.

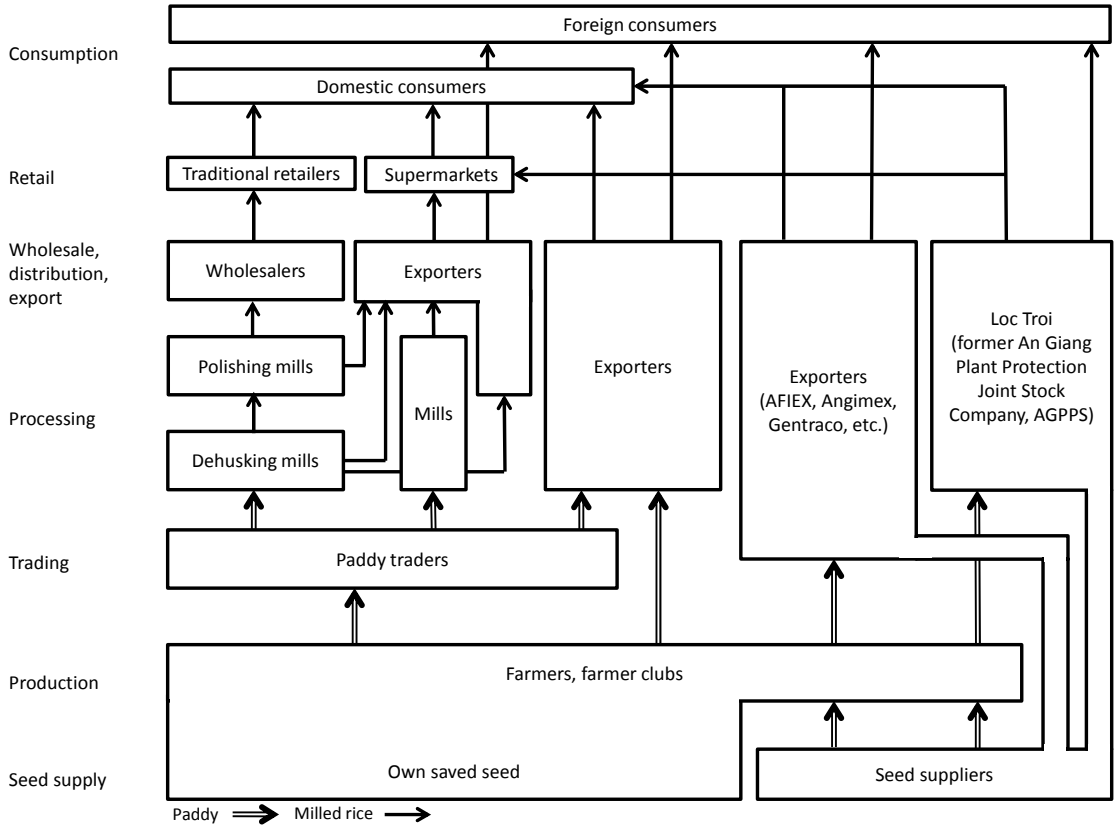

Figure 2. Value chain map of the rice sector in the Mekong Delta (MKD), Vietnam.

Increasingly, Vietnamese rice value chains are evolving from traditional procurement to modernized procurement, with a rise in direct sales from farmers to exporters ('disintermediation' as termed by Reardon et al. [17]). In the traditional chain, a labor division between dehusking and polishing mills can still be observed, due to the coexistence of markets for brown (dehusked) and white (polished) rice. However, in order to capture a larger share of the value, milling companies are increasingly upgrading their equipment and incorporating both stages into their operations, while exporters are increasingly integrating upstream by investing in complete processing infrastructure (dryers, dehuskers, polishers, color-sorters, and packaging equipment).

Exporters are now increasingly looking for efficient ways to source high-quality raw produce or govern the production of it. Since 2011, An Giang Plant Protection Joint-Stock Company (AGPPS), recently renamed Loc Troi, is engaging in close monitoring of production processes, providing farmers with certified seeds and control of their input use. AGPPS started as a leading agricultural services supplier and recently integrated downstream by incorporating processing and wholesale into their business model. The company provides seed to farmers and buys paddy rice through outgrower contracts; this vertical coordination is depicted in Figure 2 by connecting their business to seed supply. This model soon inspired major exporters like AFIEX, Angimex, Gentraco, etc. that have recently started similar outgrower contracts. Hence, we see that increased coordination may come from traditional upstream firms like AGPPS, but also from downstream firms such as exporters. Production contracts and the provision of seed allows these firms to better govern rice quality and volumes tailored to their customers' needs. This form of governance has important implications for entry points for varietal adoption and diffusion strategies.

3.2. Multi-Stakeholder Workshop

3.2.1. Qualitative Research Stage

The five most important strengths, weaknesses, opportunities, and threats to the MKD rice sector in becoming more sustainable, according to the participants of the workshop, are presented in Table 2. According to the participants, the strengths of the MKD include characteristics of the farmers, the local infrastructure, and the environmental conditions. High yields are mentioned as an important strength as well as strong government support and extension for farmers. The critical weaknesses of the MKD rice sector are linked to post-harvest equipment, value chain development and linkages, and the size of farmer fields, according to the participants.

Table 2. Most important strengths, weaknesses, opportunities, and threats according to stakeholders.

Strengths	**Weaknesses**
• Experienced farmers • Suitable environmental conditions (for multiple cropping) • Good infrastructure for rice production (irrigation) • High yield • Government support and extension	• Insufficient branding, market development and strategy • Small-sized farms • No strong linkages in the value chain • Inadequate postharvest infrastructure leading to quality and quantity losses • Insufficient investment in agricultural machinery
Opportunities	**Threats**
• Growing export market due to population growth • Big domestic market • Adoption of advanced technologies • Diversification and by-products • Increasing focus on agricultural investment	• Climate change • Increasing global competition on world market • Requirements and demands for food safety • National rice self-sufficiency strategies in importing countries • Diminishing natural resources

Growing national as well as international markets are perceived as very important opportunities for the sustainable development of the sector. Other important opportunities are the development and adoption of advanced farming technologies as well as the strong focus on agricultural investment. The fifth opportunity mentioned by the stakeholders is increasing the focus on the diversification of quality and by-products of rice, such as straw for mushroom production, energy, industrial and other uses, and husk for energy production [24]. Threats for the MKD rice sector include both worldwide threats, such as climate change and diminishing natural resources, and more specific threats that are linked to Vietnam's export policy such as increasing global competition, increasingly stringent requirements and demands for food safety, and national rice self-sufficiency strategies in importing countries.

3.2.2. Quantitative Research Stage

Table 3 presents the total score of the 24 participants. Firstly, the total scores attributed to the different SWOT components are compared. The most important strength of the MKD rice sector in relation to the presented opportunities and threats is the strong government support and extension (332). The most important weakness is the lack of strong linkages in the value chain (258). When comparing the scores of the opportunities, the adoption of advanced technologies (272) and the growing export market (261) have the highest scores. The adoption of advanced technologies mainly score highly because of the strengths of the MKD rice sector, while the growing export population also has a high score for weaknesses. The latter implies that, despite its strengths, Vietnam is currently perceived to be ill prepared to fully grasp this opportunity. The threats that stand out most are global competition (256) and stringent food safety and hygiene regulations (237). The high score for stringent food safety and hygiene regulations is mainly because of high scores in weaknesses.

Table 3. Aggregated SWOT scoring matrix for the public and private sector stakeholders (n = 24).

		Opportunities						Threats						
		Growing Export Market Due to Growing Population	**Big Domestic Markets**	**Adoption of Advanced Technologies**	**Diversification and By-Products**	**Increasing Focus on Agricultural Investment**	**Subtotal**	**Climate Change**	**Global Competition**	**Food Safety and Hygiene Regulation**	**Self-Sufficiency Strategies in Importing Countries**	**Diminishing Natural Resources**	**Subtotal**	**Sum**
		First quadrant						Second Quadrant						
Strengths	Experienced farmers	17	20	42	25	27	131	24	24	24	12	28	112	236
	Suitable environmental conditions	28	29	27	18	30	132	17	18	13	9	30	87	207
	Good infrastructure for rice production (irrigation)	21	21	25	15	27	109	28	16	10	6	20	80	187
	High yield	25	26	33	31	25	140	29	23	12	16	19	99	226
	Government support and extension	45	27	35	33	40	180	30	38	32	39	26	165	332
	Subtotal	136	123	162	122	149		128	119	91	82	123		
		Fourth quadrant						Third quadrant						
Weaknesses	Small-sized farms	19	12	20	14	13	78	18	29	24	12	28	111	180
	Insufficient branding, market development and strategy	35	26	14	14	11	100	14	34	41	31	11	131	215
	No strong linkages in the value chain	31	21	30	25	19	126	23	36	40	27	22	148	258
	Inadequate postharvest infrastructure leading to quality and quantity losses	18	24	21	24	12	99	20	17	20	14	15	86	180
	Insufficient investment in agricultural machinery	22	28	25	23	21	119	22	21	21	23	19	106	221
	Subtotal	125	111	110	100	76		97	137	146	107	95		
	Sum	261	234	272	222	225		225	256	237	189	218		

The aggregated cell scores in the first quadrant of the grid (confronting strengths and opportunities) indicate to what extent a specific strength from the MKD rice sector allows it to benefit from a specific opportunity. The high score for the adoption of advanced technologies (162) is mainly attributed to the experience level of the farmers (42) and the strong government support and extension (35). The latter strength also has a key contribution for grasping opportunities such as the growing export market (45) and an increasing focus on agricultural investment (40).

The aggregated cell scores in the second quadrant show whether a particular strength enables the rice sector to cope with a threat. Both the threats global competition (38) and self-sufficiency strategies in importing countries (39) can be mitigated by good government support and extension. Otherwise, there are no specific high scores for strengths of the MKD rice sector identified by the participants to adequately deal with the most important threats.

The aggregated cell scores in the third quadrant indicate whether a weakness prevents the sector from benefiting from a particular opportunity. The opportunity to benefit from a growing export market is mainly hampered by two weaknesses: insufficient branding, market development and strategy (35), and the lack of strong linkages in the value chain (31). The latter also prevents benefit from the adoption of advanced technologies (30). An overall strong weakness is the insufficient investment in agricultural machinery (119).

The aggregated cell scores in the fourth quadrant indicate whether a weakness of the rice sector prevents it from coping with a specific threat. Two weaknesses are fairly dominant in this area; insufficient branding, market development, and strategy (131) and the lack of strong linkages in the value chain (148). Both weaknesses have very high scores in relation to stringent food safety and hygiene regulations (respectively 41 and 40) and the threat of global competition (respectively 34 and 36).

3.3. Comparison of Public and Private Sector Assessment

The overall scores of the SWOT analysis can be translated into strategic choices and related policy options, obtained by summing the scores per quadrant in the SOR. Strategy is hereby understood as the way the internal strengths and weaknesses are used to grasp the most important external opportunities and tackle the most important threats. The quadrant with the highest relative score implies the main strategy, which can be offensive (strength-opportunity), defensive (strength-threat), clean-up (weakness-opportunity), or crisis (weakness-threat) [18]. A comparison between the public and private sector scores based on the overall strategy is presented in Table 4. The total scores per quadrant are compared to the maximum possible quadrant score, taking into account the number of participants, the numbers of rows, and the maximum column score of 12. The result shows that, for both groups, an offensive strategy, i.e., exploiting strengths to take advantage of possible opportunities, is perceived as the most suitable strategy to increase the sustainability of the MKD rice sector. When the private sector is compared with the public sector, results indicate that the former features an increased reservation towards benefiting from opportunities as well as a slightly lower concern towards possible threats.

Table 4. The proportion of the maximum score per quadrant for public sector (n = 14) and private sector (n = 10) participants.

	Opportunities	**Threats**
Strengths	Strategic choice: ATTACK Public sector: 422/840 = 50% Private sector: 270/600 = 45%	Strategic choice: DEFEND Public sector: 308/840 = 36% Private sector: 235/600 = 39%
Weaknesses	Strategic choice: CLEAN UP Public sector: 299/840 = 34% Private sector: 231/600 = 39%	Strategic choice: CRISIS Public sector: 349/840 = 41% Private sector: 233/600 = 39%

4. Discussion

This study aims to contribute to development of a sustainable Mekong Delta rice value chain. Field interviews as well as a stakeholder consultation round have been used to explore the sector's vision on the future opportunities as well as upcoming challenges. As both the public and private sector play a key role in the sector's development, key stakeholders of both groups have been asked to share their vision. Overall perceptions of the weights of the strengths and weaknesses in grasping opportunities or coping with threats are remarkably consistent among private and public sector stakeholders. However, some discrepancies between both parties should be discussed in more detail. Secondly, as facilitators, we guided the participants through the exercise with limited interference on the discussion. Nevertheless, we noticed some trends in the participants' focus and direction of discussions. Third, we focus on potential pathways that can enhance sustainable rice production.

4.1. Public versus Private Sector

In contrast with the public sector, the private sector tends to be more pessimistic in how MKD rice value chains can tap into the expanding export market. Since this is essentially their responsibility, their pessimism should receive more weight in the overall strategic orientation. Moreover, they do not share the public sector's optimism about capturing advanced technological opportunities and opportunities stemming from diversification and by-products [24]. They are, however, less pessimistic about the threats of global competition [25] and the drive towards self-sufficiency in major importing countries [26,27]. Perhaps they implicitly anticipate that these effects will be cancelled out through their planned strategic repositioning of the MKD rice sector from cost towards quality-competitiveness, i.e., the markets in major importing countries tend to focus on low to medium quality rice and, hence, are going to play a decreasing role in Vietnam's future rice export sector anyway. However, there is a problem because we saw earlier that they do not feel quite prepared to capture the expanding market due to a lack of brand and value chain coordination. Hence, this brings brand development and value chain governance to the front of the priority agenda.

The public sector, on the other hand is more pessimistic about how the MKD rice sector can comply with increasingly stringent food safety and hygiene regulations and less optimistic about the threat from the reduction in natural resources. This is a crucial result and indicates that the private sector may have a tendency to underinvest in standards and sustainability. Here, there is a clear role for the government, and therefore, the public scores should receive more weight in the overall strategic orientation. Hence, the optimal strategic orientation should strike a balance between the private sector's pessimism in regards to the strategic repositioning of the MKD rice sector in the global market and the public sector's pessimism with respect to the private sector's willingness to adopt sustainable practices and comply with food standards.

4.2. Economic Sustainability as Priority

Sustainable food value chains aim at combining value addition with equal value distribution as well as reducing environmental footprint. Although these topics were elaborately introduced in the set-up of the workshop, private as well as public sector stakeholders seem to put economic sustainability at the centre of attention. When the full list of weaknesses was developed, topics like poor farmers or high input dependency were mentioned. In deciding which SWOT elements were deemed most important, the economic attributes were seen as most important. One farmer representative highlighted the poverty among farmers as a crucial working point. However, the majority prioritized economic factors as being more important for the whole value chain. The environmental factors were never discussed as a crucial element for the sector.

Although our goal was to bring public and private stakeholders together, some groups such as farmer representatives or environmental specialists were respectively underrepresented or absent. This bias in representation might have skewed our results and highlighted the economic point of

view. Future workshops will need to attempt to obtain a larger sample and target a more balanced representation of stakeholders from a wider range of backgrounds to properly weigh the environmental and social issues in the overall sustainability question.

4.3. Different Roads towards Sustainable Production

A crucial pillar of Vietnam's repositioning strategy towards structural and quality-based competitiveness in international markets will be to increase the sustainability of current rice production systems in the Mekong Delta. In Vietnam, The Irrigated Rice Research Consortium (IRRC) in collaboration with the National Agricultural Research and Extension Systems (NARES) promoted the 'Three Reductions, Three Gains (3R3G)' and later the 'One Must Do, Five Reduction (1M5R)' integrated technology packages as a means to reduce production costs, improve farmers' health, and protect the environment in irrigated rice production [28]. The focus of the program is on 1 Must (use quality seed) and 5 Reductions (seed rate, water use, fertilizer use, insecticides use, and post-harvest losses).

It is often assumed that the implementation of more sustainable farming practices is costless for farmers when it is linked to the reduction of inputs. However, such calculation ignores the non-pecuniary costs (inconvenience, loss of flexibility, and loss of economies of scale) that farmers experience in implementing these practices and/or standards. Many of these costs are of a fixed nature, though, and can be considered as 'sunk' after a few years. The point is that farmers bear initial investment costs or risks in learning, and, after a few years, they are used to the practices to the extent that the incremental costs have declined sufficiently such that they no longer need substantial support. Since the private sector may have a tendency to underinvest in standards and sustainability, developing a market-driven system for sustainable farming practices is key to providing the well-needed resources for the promotion and support of these practices. Therefore, to help the private sector invest in sustainability, three different market-driven strategies are discussed for making rice value chains more sustainable: embodying, internalizing, and disembodying sustainability.

Rising incomes and fast urbanization are driving up the demand for high-value produce as well as heightening consumer concern for food safety [25,29]. There is an increasing attention to the food safety aspect in Vietnam. Such changes in consumer demand are creating new market opportunities, but also present novel challenges to small-scale farmers and traders, as new markets may have special requirements in terms of quality and delivery deadlines. Local markets are changing and supermarkets are taking a prominent place in most major cities in Southeast Asia [17,30,31]. Supermarkets play a first-mover role in labelling, food safety, and the certification of food [32]. Therefore, embodying sustainability in the product and credibly signalling production standards to consumers through certification can be seen as a first entry point and a market-driven incentive mechanism for sustainability in the rice value chain, under the condition that consumers are willing to pay for the label. Food labelling has become more important in supplying information for the consumers to make their buying decision [33]. The use of information on food labels is crucial to consumers since it helps consumers to make informed decisions when buying a safe and environmentally friendly product. However, it should be acknowledged that sustainability labels currently do not play a major role in consumers' food choices in Europe [34], and research is needed to assess which role they may potentially play in Vietnamese consumers' rice purchasing decisions. At the very least, sustainability labels should be accompanied by information campaigns on the benefits of sustainably produced rice. Hence, the development of a sustainable image should be part of national brand development, which was identified by the stakeholders in our study as a major weakness currently preventing Vietnam from fully benefiting from the growing export market. In order to credibly certify and claim that rice has been produced using sustainable production standards, rice value chains need to be reorganized, and more vertical coordination will be needed between farmers and mid-stream actors (millers, wholesalers, and exporters) in order to enable the latter to govern production practices from seed to milled rice. Therefore, embodying sustainability will probably work best if sustainable production standards are internalized through vertical coordination.

Value chain actors may have an interest in sustainable production practices if their business models benefits from them. Therefore, internalizing sustainability in the value chain through private governance is a second possible pathway towards sustainable rice production. The lack of strong linkages in the value chain was identified by the stakeholders in our study as a major impediment to the adoption of advanced technologies, including sustainable production practices. Fortunately, there is a strong tendency in the mid-stream segment of Vietnamese rice value chains towards vertical coordination and integration. The more the mid-stream segment (processors, wholesalers, exporters) of the rice value chain engages in vertical coordination and integration, the stronger the linkages become between farmers and buyers and the more governance of the value chain and market power shift downstream, i.e., towards mid-stream actors. AGPPS recently rebranded itself as Loc Troi ('God's Gift') with the aim of establishing a 'world-class sustainable value chain' with the 'mission of serving farmers' [35]. The latter example suggests that vertical coordination through contract farming may go hand in hand with the implementation of sustainable production standards. Furthermore, as mentioned before, internalizing sustainable production standards probably goes hand in hand with embodying sustainability in the product through certification, requiring similar investments in communications and branding mentioned above. As the development of a sustainable image through branding takes time and is costly, it is expected that it will be applied on premium rice first (e.g., Jasmine).

Our stacked survey, however, suggests that first experiences with sustainable production practices are mixed. Due to limited demand, some exporters have recently stopped contracting rice under GlobalGAP and VietGAP (GlobalGAP sets voluntary standards for the certification of production processes of agricultural products around the globe, using the production method that minimizes the negative environmental impacts of farming operations, reducing the use of chemical inputs, and ensuring a responsible approach to worker health and safety as well as animal welfare. VietGAP (Vietnamese Good Agricultural Practices) is a standard issued by the Ministry of Agricultural and Rural Development. VietGAP consists of different criteria with respect to different agricultural products including vegetables, rice, fruit, etc. This is a food safety inspection program applicable from farm preparation to cultivation, harvesting, and post-harvest storage, taking into account the environment, chemicals, crop protection products, packaging, and working conditions as well as the welfare of the workers on the farm). Some small high-quality rice exporters are still interested in these standards since they claim to have access to certain niche markets (e.g., Hong Kong), where consumers would be willing to pay for them. Some exporters claim that they do not need external certification as they implement their own internal production standards. However, in the long run these companies will benefit from harmonizing their internal standards to international standards, and, hence, the success of the implementation of sustainable production practices will crucially hinge on consumer demand for sustainably produced rice and consumer awareness.

However, segregating rice value chains and preserving the identity of sustainably produced rice is costly in traditional rice value chains with weak linkages and scattered supply. Therefore, disembodying sustainability from the product would be a last resort, in case rice markets and value chains provide little incentives for embodying and internalizing sustainability. Book and claim certificate trading originated in the energy sector for the trade in electricity from renewable energy sources through renewable energy certificates. This system was primarily introduced in this sector because physical flows of electricity cannot be followed [36]. The idea is simple; consumers pay a premium for green electricity, which is electricity produced from renewable sources of energy such as wind and solar power, without directly expecting or demanding that they are also the ones who actually receive and make use of that particular green electricity. More recently, book and claim certificate trading has been adopted by the agricultural sector, starting with the trading in sustainable palm oil [37], but it has never been applied to the rice sector. The book and claim system would allow for the transfer of sustainable rice credits from the supply base to the end user, independent of the physical rice supply chain. A credit buyer acquires credits corresponding to sustainably produced rice.

The certified farmer/mill then sells its rice into its existing supply chain as conventionally produced rice. This requires little changes in vertical coordination between farmers and mid-stream actors; the third party basically carries out the governance.

Theoretically, this might seem a viable option. However, several challenges and barriers need to be highlighted. One needs to create a whole new credit market and ensure a demand for these credits. Secondly, it is necessary to know what exactly can be claimed through this book and claim certification. Lastly, consumers might not have any guarantee that the credit they pay for actually affects the safety or sustainability of the product they are buying. An internal assessment within the Sustainable Rice Platform showcased moderate interest among the stakeholders and brought forward many questions about and challenges to the feasibility.

5. Conclusions

Due to increasing production costs, the Vietnamese rice export sector can no longer rely on cost-competitiveness, a strategy it has successfully maintained for decades. This implies that the sector will increasingly need to move towards structural quality-based competitiveness. The SWOT analysis indicated that the sector's major weaknesses are the poor linkages in the value chain and the absence of a national brand and international reputation in international markets. The development of a national brand and its promotion through generic advertising are largely lacking. The analysis also indicated that the Vietnamese rice sector is insufficiently prepared to tackle global competition, increase standards of food safety and hygiene, and adapt to reduced international demands for imports from countries that are implementing ambitious national food self-sufficiency programs (e.g., several African countries, the Philippines, etc.). The absence of a national brand and image and insufficient horizontal and vertical coordination are key to Vietnam's ill preparedness to face global competition from other exporting countries such as Cambodia, India, and Myanmar. Developing a national brand and a stable reputation of being a quality exporter in international markets takes time. Horizontal and vertical coordination similarly is time-intensive, but these processes will be necessary for sustainable growth. Three different strategies are highlighted to support the process of sustainable growth; embodying, internalizing, and disembodying sustainability. However, the structure of the rice sector as well as the opportunity for value addition with a staple crop reveals that this is a challenging but necessary path of growth.

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