Safeguarding Livelihood Gains in Small-scale Shrimp Aquaculture in Andhra Pradesh, India – Suggestions for a Way Forward

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ABSTRACT

The present article is an outcome of the research project entitled "Socio-economic Baseline Study of the Shrimp Farming Communities in Andhra Pradesh, India" with an objective to understand the dynamics of the industry and their socio-economic structures and conditions. The major findings are used as a way forward to safeguard livelihoods in the shrimp industry in Andhra Pradesh. The findings were grouped into 6 themes namely**,** Economic Impact, Social Conditions, Environmental Impact, Challenges Faced by them, Government Initiatives and Support, and Future Prospects for ensuring sustainable farming practices. While the shrimp farming in Andhra Pradesh plays a vital role in the state's economy, it also brings with it a whole range of socio-economic challenges. Against this background a descriptive research design with a mixed methodology framework which included qualitative and quantitative approaches was adopted on 200 sample respondents by using snowball sampling method which included 100 shrimp farmers and 100 shrimp farm workers, participating in the survey component of the study to know how to safeguard livelihood gains in small-scale shrimp aquaculture. The study not only focused primarily on small-scale farms but also included information from respondents associated with large scale shrimp farms in four districts of Andhra Pradesh namely East Godavari, West Godavari, Guntur and Krishna. In addition, the study included Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) with other farming community members: Farmers' wives, young people, retired farmers and their spouses, community leaders, and education and health providers. The positive aspect of it is that it offers livelihood opportunities, the industry needs to address socio-economic and environmental concerns to ensure its long-term sustainability and improve their well-being. It is evident that along with the socioeconomic benefits, there are also negative consequences that require immediate attention as suggested in this paper.

Keywords: Livelihood Gains, Small-scale Shrimp Aquaculture, Socio-Economic Conditions, Environmental Impact, Challenges.

INTRODUCTION

The socio-economic conditions of shrimp farming communities in Andhra Pradesh are shaped by a variety of factors, including economic, social, and environmental aspects. Shrimp farming has become one of the most significant industries in the state, especially in coastal districts like West Godavari, East Godavari, Krishna, and Prakasam. Shrimp farming in Andhra Pradesh plays a significant role in the state's economy, but it also brings with it a range of socio-economic challenges. While it offers livelihood opportunities, the industry needs to

address environmental concerns and social inequalities to ensure its long-term sustainability and improve the well-being of shrimp farming communities. Since the industry started evolving in the 1990 ties, it has come under scrutiny for a range of issues relating to environmental degradation and pollution, working conditions and poor livelihoods, especially for small-scale farmers, farming one or two ponds of 1-2 acres and for farm workers. The sector is extremely diverse, including both large-scale farms with multiple employees, mid-size farms with just a couple of workers, working alongside the farmer, and very small-scale farms operated by the farmer, possibly with the help of family members. Farm ownership is complex too as some farmers own the land they farm while others are tenant farmers, operating on leased land. The farming operations themselves are heavily male-dominated, but women, especially small-scale farmers' wives, work "behind the scenes", preparing inputs, sorting and packaging and performing household and community work that enables farming.

To better understand the dynamics of the industry and the socio-economic structures and conditions in the shrimp farming communities, the Department of Sociology and Social Work, Acharya Nagarjuna University and the Monterey Bay Aquarium conducted a socio-economic baseline study in shrimp farming communities in Andhra Pradesh. This article uses the baseline findings to present recommendations for a way forward to safeguard livelihoods in the shrimp industry in Andhra Pradesh. The study and its findings were grouped into themes:

1. **Economic Impact,** covering topics such as livelihoods, economic disparities and earnings from production of shrimp for export.

2. **Social Conditions**, analysing community structures, cultural impact and gender roles.

3. Environmental Impact, looking at strains on natural resources, including coastal erosion and biodiversity loss, and pollution

4. Challenges Faced by Shrimp Farming Communities, in relation to financial struggles, health and safety issues, and climate change impacts.

5. Government Initiatives and Support, especially for training and skills development for farmers, financial assistance, farming regulations and policies.

6. Future Prospects for ensuring sustainable farming practices, technological advancements and market diversification.

Shrimp farming in Andhra Pradesh plays a significant role in the state's economy, but it also brings with it a range of socio-economic challenges. While it offers livelihood opportunities, the industry needs to address environmental concerns and social inequalities to ensure its long-term sustainability and improve the well-being of shrimp farming communities.

RESEARCH METHODOLOGY

A mixed methodology framework was adopted for the socio-economic baseline study, applying desk review, quantitative and qualitative methods. Descriptive research design was adopted to describe the variables under study. The study focuses primarily on small scale farms but also includes information from respondents associated with large scale shrimp farms in Andhra Pradesh. The primary data was collected from four districts of Andhra Pradesh namely East Godavari, West Godavari, Guntur and Krishna. By using snowball sampling method, the sample respondents were drawn. The sample respondents included 100 Shrimp farmers and 100 shrimp farm workers, participating in the survey component of the study. In addition, the study included Focus group Discussions (FGDs) and Key informant interviews (KIIs) with other farming community members: Farmers' wives, young people, retired farmers and their spouses, community leaders, and education and health providers. A total of 81 respondents participated in the FGDs and 12 in the KIIs. In addition, the study included 7 individual life story cases with farmers, farmers wives, migrant workers and intermediaries. By adopting Surveys, FGDs and KIIs the primary data was collected from the respondents. Data from the FGDs and KIIs was used to build a more in-depth understanding of the issues that were brought lout in the surveys and to ensure a wider perspective through inclusion of other groups of respondents than farmers and farm workers alone. A

separate research module on the role of intermediaries in shrimp supply chains was added to the research project. This module used structured interviews, open-ended direct follow-up questions, free listings and observations with 30 farmers, six intermediaries and 6 other supply chain actors, in addition to those included in the main baseline study.

MAJOR FINDINGS

Shrimp farming in Andhra Pradesh has had clear socioeconomic benefits within their communities, alongside some negative consequences. Overall, the study illustrates an industry where farmers are becoming progressively more vulnerable with input costs increasing and highly volatile market prices, which can drop significantly in a short time.

Economic Impact

The vast majority of smallholder farmers have no permanent workers and maintain one or two small ponds. Smallholder farmers may hire day laborers, for example, for harvest, but contract and permanent workers usually work on medium and larger farms. Permanent and contract workers interviewed in this study are mostly from the state of Andhra Pradesh, but approximately one-third of workers are migrant workers from other, usually poorer, states. Farmers may farm on their own land or leased land, regardless of the size of the farm.

Findings from this study indicate that farmers and their families experienced significant increases in income during the early shrimp farming years in the 1990s and 2000s. The increase in income translated into higher standards of living, for example, through the construction of new, more durable homes that are better able to withstand adverse weather conditions.

Social Conditions

Shrimp farming in Andhra Pradesh is a male-dominated industry. Farmers tend to be middle-aged men with resident families (most commonly a wife and two children) and workers tend to be young men, either married or unmarried. Married migrant workers usually migrate on their own, leaving their families in their home state. Women rarely work in farming operations, but often help prepare inputs from home.

Educational levels among farmers and workers vary but tend to be low. Importantly, there are a significant number of farmers and workers who are illiterate. The income increases also contributed to an increase in educational participation among children in shrimp farming communities. Increased education participation was also driven by Government efforts to increase access to quality education and general development in the attitudes around education. The study also found that children are unlikely to work full-time on shrimp farms, but they may help on the farm or at home after school and during holidays. This means that it is important to ensure that children helping out are protected against hazards and that they do not miss school, rest, or time for homework on account of helping out – situations where helping out at home or in family-run fishing and aquaculture operations is a common global concern.[1]

The increases in education levels are a clear change from the parent generations' relatively lower education levels. This also means that young people are more likely to migrate to urban areas and aspire to better-paid jobs.

Environmental Impact

Some of the socioeconomic challenges are directly linked to farming practices. This includes, for example, the health impact of unsafe handling of farming inputs, and the salination of wells which study participants associate with shrimp farming inputs and with increased flooding levels, which can also be linked to climate change.

[1] FAO, Tackling child labour in fisheries and aquaculture. Background paper, 2021, https://doi.org/10.4060/cb7159en.

Challenges Faced by Shrimp Farming Communities

The study found that young people show very limited interest in continuing their family's shrimp farming business. The limited interest in continuing the family business could undermine the long-term stability of the shrimp farming industry in Andhra Pradesh. If young people in the community are uninterested in the industry it will be challenging to sustain production in smallholder farms.

Although shrimp farming has created employment opportunities both on farms and outside the farm which led to shrimp farming communities becoming highly dependent on shrimp farming for their livelihoods and well-being. This can be problematic when shrimp market prices plunge, as was seen after the COVID-19 pandemic.

The study found, that price instability, combined with increasing costs, has led to clear losses in income among shrimp farmers in recent years. This impacts families' well-being and this study found that farmers' wives often work in unskilled, low pay, hazardous work to augment family income. This means that women in shrimp farming families shoulder a triple work burden, often contributing to the farming operation through preparing inputs, earning an income off the farm, and performing household chores for the family.[2] Combined with poorer nutritional status than male family members and the effect of pregnancies, the workload means that farmers' wives tend to suffer poorer health overall, according to KII participants from health care facilities. Nutritional data from Andhra Pradesh does indicate that women, especially of child-bearing age, frequently suffer anemia.[3] It is important to note here, however, that men working in shrimp farming also face specific and common health issues.

Farmers and their families do, in general, have access to health care services but the study indicates that the services are mostly used by older people in the community and rarely by male shrimp farmers. When farmers do go to the health clinic, they often complain of skin rashes and other diseases that may be linked to their work, notably from handling potentially hazardous inputs (e.g. lime) used in farming activities without adequate personal protective equipment. An extensive study of occupational hazards among shrimp farmworkers in India found multiple common hazards, including exposure to substances that caused skin and respiratory reactions.[4] Improving work processes to prevent occupational diseases and supporting better access to health care for farmers and farmworkers, therefore, appears to be an important, immediate priority.

Perhaps the most severe challenge to smallholder farmers and their families is the debt cycles that farmers get caught in when prices crash, they face crop losses, or just simply need capital to start a crop cycle. There is no indication that farmers, or their family members, are trapped in debt bondage in this study. In general, the intermediaries, input providers, and processors play distinct roles in the supply chain and there is limited mixing of roles and loan giving with other services. This limits the risk of farmers getting bonded to buyers through debt and enables farmers to choose the suppliers that provide the most favorable conditions. Despite this, key informants in both studies raised concerns over the poor quality of supplies, particularly seed, obtained from unregistered providers operating without license and oversight. Moreover, and importantly, the debt cycles, even without the element of bondage to the loan giver, can have a significant negative impact on the well-being of farmer families and communities. This corresponds to findings in other research from smallholder food production in different parts of the world. For example, a global meta-study found that financial difficulties are one of four factors most likely to negatively impact farmers' mental health (the other four being pesticide

[2] For more on women's triple work burden and unpaid family work in India see Pushpendra Singh & Falguni Pattanaik, "Unfolding unpaid domestic work in India: Women's constraints, choices, and career," Palgrave Communications 6, no 1, (2020): 1–13, https://doi.org/10.1057/s41599-020-0488-2.

[3] POSHAN and International Food Policy Research Institute, State nutritional profile Andhra Pradesh, September 2021, https://www.niti.gov.in/sites/default/files/2023-02/State_Nutrition_Profile_Andhra_Pradesh.pdf; National Health Services Resource Centre, Health Dossier 2021. Reflections on Key health Indicators. Andhra Pradesh, 2021, https://nhsrcindia.org/sites/default/files/practice_image/HealthDossier2021/Andhra%20Pradesh.pdf.

[4] Arpita Sharma, et al., "Occupational hazards of Indian shrimp farmworkers". All Life, 16(1). https://doi.org/10.1080/26895293.2023.2225762

exposure, climate variability, and poor physical health or past injuries).[5] In another meta-study, on the impact of COVID-19 on smallholder farmers, it was concluded that COVID-19 had negative economic consequences for farmers which had, in turn, impacted their social well-being and quality of life.[6] Debt cycles among smallholder shrimp farmers, and their impact on livelihoods, are not unique to Andhra Pradesh as documented in the ILO and Monterey Bay Aquarium study on the role of intermediaries in shrimp and blue swimming crab supply chains in Indonesia and Vietnam.[7]

The major challenges identified cause different types of vulnerability among farmers in different locations or different farm sizes, and issues around debt are closely intertwined with production-related challenges, notably shrimp health, and climate change impacts. It is worth noting that farmers did not specifically identify climate change as a challenge. Rather, they identified severe weather and changing weather patterns as a major challenge.

For large-scale farmers, these interconnected challenges revolve around price stability and shrimp health, which link to the increasingly severe weather patterns. For smallholder farmers, the main challenges can be summed up as high levels of informality that tie very closely with limited access to credit through the formal banking system, though the study did find some use of formal credit options. Farmers mostly obtain semi-formal or informal loans from money lenders, from relatives, and friends, and to a limited extent, from intermediaries who also supply farm inputs like seed and feed.

Many smallholder farmers appear to be trapped in debt cycles spanning multiple harvests. The need to take up loans, which will then be repaid at harvest, diminishing income, and necessitating new loans. The perpetual indebtedness stems from a combination of factors. First, market prices for shrimp have declined significantly since the onset of the COVID-19 pandemic, leading to very slim profit margins for farmers. Prices have been unstable for several years, making it difficult for farmers to plan. In addition, flooding, low shrimp health, and high mortality may cause complete or partial crop loss, leaving farmers in severe economic and financial difficulties. It should be noted also that the farm infrastructure, in many cases, appears to be worn, or even dilapidated, and farmers lack access to credit for replacements or upgrades. Hence fluctuations, or increases, in the price of fuel, electricity, and spare parts can have a substantial impact on smallholder farmers' income. Smallholder farmers cannot be described as abjectly poor, but they are economically vulnerable, and many walk a thin line between sustaining themselves and their families and falling into poverty, or even destitution, when weather patterns, disease, market crashes, or other events erode their livelihood as exemplified in this statement:

"Shrimp farming should only be done by wealthy farmers," – a key informant in the baseline study.

Informality is underlying the dynamics that lead to debt cycles, as farmers have no access to crop or asset insurance and the study found that, farmers are, generally, not organized into cooperatives, or associations that may help secure financing and negotiate prices.

Some families have access to semi-formal savings and credit through women's self-help groups. The self-help group income is used purely for family needs, not for farming purposes, and access to finance is a major challenge. This also has implications for the viability of the industry as indebted farmers may be more likely to give up shrimp farming, particularly when old, dilapidated equipment cannot be replaced due to a lack of capital.

[5] Sahar Daghagh Yazd et al., "Key Risk Factors Affecting Farmers' Mental Health: A Systematic Review," International Journal of Environmental Research and Public Health 16, no. 23 (December, 2019):4849, https://doi.org/10.3390/ijerph16234849.

[6] Nurul Atiqah Binti Mohd Suib et al., "The economic well-being of smallholders and challenges during COVID-19 pandemic: A review," Agricultural Economics – Czech 69, (2023): 35–44. https://agricecon.agriculturejournals.cz/pdfs/age/2023/01/04.pdf

[7] Marine Change et al., Study of the impact of intermediaries on environmental and social outcomes and worker vulnerability in small-scale fishing and aquaculture in Indonesia and Vietnam.

Even when prices do not crash, the study found that price levels are unstable and it is difficult to predict what prices will be at harvest. This makes it harder for farmers to decide on how to farm and there is a real risk that families will suffer the consequences if incomes are insufficient. Farmers do help each other, for example, by sharing knowledge on farming techniques, but they are generally not organized into farmers' associations, cooperatives, or other bodies that could support them with access to credit, quality inputs, or other services.

Employed workers in shrimp farming fall into three broad groups: permanent staff, contract staff, and day laborers. Contract staff are often migrant workers from other states who return to their home states between growth cycles.

Results from this study show that workers are typically recruited through informal personal networks or agents, also operating informally. While this study found no direct evidence of forced labor in the shrimp farms, several risk indicators are present. These include informal recruitment and contracting (no contract or verbal agreements only); the widespread use of cash payments, though this is changing; and the report by a substantial minority of workers that they paid to get recruited. This pattern corresponds to the increased risk of forced labor in the Indian shrimp industry also documented elsewhere over the past year.[8]

Workers are generally satisfied with their work and think they experience the conditions promised at the time of recruitment, they believe they are treated with respect, and they do not hand over their ID papers to their employer. They also find the work to be manageable and report that they can take time off for medical treatment or family issues, among other reasons. This does depend largely on the employers' goodwill, however, as workers are not organized or covered by collective bargaining agreements in general.

The survey also showed that migrant workers do not seem to have equal access to social services and social protection as farmers and workers from Andhra Pradesh, as coverage is linked to their home state. Hence, they are highly dependent on the employer for, for example, access to medical care.

All workers have mixed opinions about their pay levels, but most report that their pay is somewhat sufficient. The general pay levels for shrimp farmworkers do fall below the living wage estimate for rural Andhra Pradesh, just as the income for most smallholder farmers falls below the living income[9] estimate for rural Andhra Pradesh.

Overall, therefore, shrimp farming as a sustainable livelihood seems to be under pressure, leading families to augment income through other sources. The high levels of informality in the industry pose risks to both workers and smallholder farmers, for example, the informal recruitment systems, and contracting of workers, and the lack of access to finance and insurance services for farmers.

As mentioned, it is not clear from this research whether these vulnerabilities will be, or are already, fueled further by climate change impacts. This will require further research, but it is quite clear that some of the main challenges reported by farmers, such as shrimp disease, and mortality, could be directly linked to climate change.

Many challenges and risks need to be addressed and mitigated to ensure that shrimp farming in Andhra Pradesh provides environmental, social, and economic stability. Addressing these challenges will require multistakeholder collaboration and partnerships that support the empowerment of farmers, workers, and communities.

[8] Monterey Bay Aquarium. 2024. "Warmwater Shrimp Social Risk Profile: India, Aquaculture and Processing," Monterey Bay Aquarium: Monterey, California, USA. https://www.seafoodwatch.org/globalassets/sfw/pdf/global/ssrt-2024-indi-wshrimp.pdf

[9] Mamkoottam, K and N. Nidhi (2022) Living income and living wage. Rural Andra Pradesh, India. December 2022. Anker Research Institute, Global Living Wage Coalition. Living Wage Benchmark Series No. 2022-01-02https://www.globallivingwage.org/wp-content/uploads/2023/07/India_AndhraPradesh_Rural_LivingIncomeLivingWage_2022-1.pdf

Suggestions for Different Stakeholders to stabilize and preserve livelihoods and the industry

Based on the findings discussed above, we now provide suggestions on how multiple stakeholders can jointly address the challenges and sustain the gains identified in this study. The study findings illustrate both positive outcomes for farmers, farmer families and communities as well as challenges. The challenges are complex and often inter-related. Therefore, they require comprehensive solutions implemented by different stakeholders. The proposed strategies presented in this section are thus premised on collaborative partnerships between multiple stakeholders working towards sustainable shrimp farming: Farmers, communities, industry actors, Government, academic and civil society organizations, etc. All of these stakeholders need to work together and contribute to stable, sustainable livelihoods in shrimp farming communities in Andhra Pradesh to ensure the sustainability of the shrimp farming industry on the whole.

Below, we look at the identified risks and key challenges one by one and propose strategies and actions that different stakeholders may undertake to address the challenges. It is important to underscore that while different stakeholders have different responsibilities and ability to address certain issues, no one actor can solve these complex challenges in isolation. Hence, conversation, collaboration and coordination among different groups is an essential pre-condition for effective action to ensure the long term economic, social and environmental sustainability of the shrimp industry in Andhra Pradesh.

Preserving gains and protecting socio-economic well-being

First, it is important to stress that shrimp farming has had a positive impact on community prosperity, housing, and education historically. However, sustaining these gains in the face of more unstable incomes, resulting from a combination of factors, mostly price instability and rising input costs, will require efforts to preserve the gains and cushion farmers, their families and communities against negative impact.

Government support schemes for small-scale farmers and government social service and social protection schemes are essential in this regard. In Andhra Pradesh (and India more generally), Government agencies' roles are clearly defined through legislation and in Andhra Pradesh there are already a number of Government policies schemes that can support farmer families and communities. The Government therefore assumes primary responsibility to ensure implementation of policies and regulations that support shrimp farming communities and govern shrimp farming, for example, ensuring access to health care and licensing of farms.

Government alone cannot be expected, however, to solve all challenges and ensure that farmers are cushioned against the negative impact of price instability etc. Downstream supply chain actors (buyers) need to critically consider the long-term stability and sustainability of the industry that they are part of. This would entail engaging with suppliers to evaluate buying policies and ensuring that the costs of securing decent work and livelihoods are reflected in prices and systems. This also entails instituting robust human rights due diligence systems that allow downstream market actors to engage to prevent human rights infringements and practices that cause vulnerability among farmers, farm workers, and their families.

Civil society organizations can support other actors with contacts and coordination, knowledge, information, and analysis. Some civil society organizations, for example, workers' organizations, and farmers' associations can also provide direct support to empower farmers, workers, and their communities and community groups can provide support through savings, and credit systems, awareness raising, and other community-level initiatives.

Communication, dialogue, and coordination across the multiple stakeholders is essential, and area-based, multistakeholder projects can be a viable path for improved coordination and collaboration based on trust and dialogue.

Improving economic well-being in the context of informality and debt cycles

Informality characterizes the smallholder shrimp farming operations. This impacts farmers' access to finance and insurance. Smallholder farmers are challenged by debt cycles resulting from price instability in combination with this informality. Moreover, small-holder farmers are prone to economic shocks caused by the loss of crops and assets, for example in the event of severe weather or disease in the pond.

To address informality and crippling debt cycles, stakeholders could explore alternative modalities for credit, insurance, and other inputs. This could be done, for example, through increased establishment of farmers' associations that can set up or facilitate links to savings and credit schemes, rural banks, and more.

The positive impact of increased access to transparent and affordable finance may be increased if combined with capacity development initiatives to, for example, strengthen farmers' literacy and financial literacy to enable better price negotiations.

Mobilizing insurance companies to develop products for aquaculture could also increase the economic resilience of farmers. This may take the backing of the Government, multilateral investment banks, or others with financial capacity to underpin development and de-risk the insurance scheme investments. Notably, the Government may need to review the regulatory framework and, if needed, adopt and implement new or amended policies to govern and facilitate development of new financial and insurance products, responding to the needs of small-holder aquaculture farmers, and taking into account the importance of various intermediaries in the industry.

Farmers' associations are needed to allow farmers to coordinate and represent their interests and for practical purposes, such as group buying of inputs and group-based collateral and for the establishment of, e.g., savings and credit societies.

Non-governmental organizations (NGOs) may play a role in supporting the formation of associations and other community structures through knowledge sharing, training, facilitation of contacts, and coordination and amplifying the voices of community groups nationally and internationally.

Investment banks and insurance companies may support the establishment of fit-for-purpose finance and insurance products for smallholder farmers. They may also play a more indirect role by enforcing sound environmental, social, and corporate governance principles in their financing of processing, trading and end-buyer businesses.

Protecting labor rights in the context of informality

Informality also characterizes the industry with regard to employment and recruitment relations. This study identified risk indicators of forced labor, especially for migrant workers. Risks are associated primarily with the informal recruitment and contracting systems and the use of recruitment fees. Hence, dedicated activities are required to prevent labor rights infringement and protect all shrimp farm workers.

This will require dedicated efforts to empower workers and enable their employers to take appropriate action. A critical first step could be to ensure a solid general understanding of labor rights across the industry. Information and education activities with farm workers and farm owners (who employ workers, including day laborers), is a first step and could be combined with support to farmers to put in place recruitment and contracting processes that eliminate recruitment fees (including those demanded by recruitment intermediaries) and transparent contracts with clear agreements. Moreover, ensuring that all workers, including migrant workers, have access to safe and effective grievance and support mechanisms is an important element.

Multiple stakeholders need to collaborate to ensure these protections are in place. Workers organizations play a key role in organizing and representing workers, not least migrant workers, and negotiating collective bargaining agreements with employers that stipulate decent working conditions and protections against exploitation. Workers' organizations can also play an important role in raising awareness and sharing knowledge among workers and more broadly.

Farmers' organizations and (national) employers' organizations play an equally important role in representing farmers, including farmers as employers, and negotiating collective bargaining agreements. Farm owners are directly responsible for instituting good practices, but other downstream supply chain actors have a responsibility to engage and support farmers, through information sharing, contractual relations, buying practices, and pricing that allow decent working conditions on farms.

The government needs to ensure that legislation is up-to-date and complied with through, for example, labor inspection, information sharing, awareness raising, and through the provision of services that underpin decent working conditions (for example, vocational training frameworks).

Buyers, retail and food service businesses need to acknowledge their role in shaping conditions on the ground and implement robust human rights due diligence, including engagement throughout the supply chain to support protection measures for vulnerable workers. Hence, this will require a deeper engagement than merely checking compliance on the part of suppliers.

Stabilizing income and preventing poverty traps

Price instability leads to income fluctuations, that negatively impact family well-being and cause farmers to consider changing to other crops, especially with the current increases to input costs (such as electricity). Farmers' income has decreased on average since 2019 according to findings, and many smallholder farmers now have incomes that fall below the living income estimate for Andhra Pradesh.

Multiple strategies can be pursued to improve income levels and stability in an environment where prices are dictated by global market dynamics that farmers, and other stakeholders in Andhra Pradesh, have little to no sway over. These include increasing productivity and lowering costs for farmers and diversifying incomes for farming families.

A possible, immediate step could be to support the installation of solar panels, or other renewable energy sources, to decrease the electricity costs that make up a significant part of farming expenses, while at the same time contributing to upgrading dilapidated farm infrastructure and improving carbon footprints. Decreasing input costs may also be pursued through promoting and facilitating farmers' associations. Better organization of farmers may allow increased bulk buy of quality inputs at more competitive prices. Moreover, understanding how feed costs, weather patterns, shrimp disease, and other factors impact price and income among farmers and how addressing these issues helps stabilize prices may improve productivity, lower costs and improve income.

Support to alternative income options, such as other agricultural production, trading, etc., that allows farmers to augment income or transition to other more profitable activities may be a longer-term strategy to improve farmer income and decrease vulnerability to price drops in shrimp. Women in farming communities already work outside the farming operations, but often in hazardous and low paying jobs, for example in salt pans. Improving employment opportunities for women in farming communities, including self-employment, could therefore be an important contribution to improved income levels and stability in farming households. It is important to bear in mind, if pursuing this strategy, that women's workload is generally very high, also including domestic chores and support activities in the farm, and therefore alternative income options need to be time-limited (see below also).

It should be noted that some farmers expressed an interest in exiting the industry and transitioning to other farming operations, paid employment or retirement. Government social protection schemes, such as retirement benefits, can play a key role in facilitating exit where needed. Facilitating transition, while beneficial for farmers, their families, and communities, will potentially mean decreased shrimp supplies and hence, processors and buyers may have an interest in improving prices and their stability to prevent exit.

Multiple stakeholders will need to collaborate to stabilize income in farming families. Government is an essential partner. In the short term, Government can facilitate a transition to renewable energy sources in farms through enabling policies and regulations. Moreover, the Government's social protection and social services programs (described in the first part of this report) are essential to stabilizing income and livelihoods and preventing multi-dimensional poverty in shrimp farming communities. Ensuring that farmers and their families know of and access these schemes is therefore an important contribution to stable livelihoods. While the government provides social services and social protection benefits, other actors, such as different civil society organizations can underpin access through, for example, information sharing in communities.

NGOs, and other civil society organizations, can also support the establishment of farmers' associations through training, facilitation, and networking. Farmers' associations are important for improving efficiencies (as

discussed above) and to represent farmers' interests in policy development, price negotiations and other spheres that impact their operations and income.

NGOs can also play an important supporting role in longer term interventions to diversify livelihoods and facilitate alternative income sources for farming households, for example through training for farmers and their family members, informing about existing alternative income opportunities, etc.

Investment companies and multilateral investment banks play a key role in financing Government policies and programs for social protection, renewable energy, and more. At the farm level, investment companies, community banks, government supported agricultural banks and savings- and credit groups can underpin the development of alternative income sources and upgrading farm equipment, with transparent and low-cost capital.

International development organizations can play a key role in supporting Government policy development, documenting, and sharing lessons and good practices, building capacity and amplifying messages

Addressing gender inequality and improving family well-being

Smallholder farmers' wives take on additional, often hazardous and poorly paid, labor to augment family income, leading to triple work burdens. In combination with poor nutrition status, it can negatively impact women's health. This is linked to a wider pattern of gender inequality, including structures, and gender roles that preclude women from the formal labor market and promote unpaid work. Possible strategies and action steps include:

- Community events and other initiatives to raise awareness of women's contributions to shrimp farming, their workloads, and gender roles and stereotypes.
- Decreasing women's workload, for example, through improving easy access to potable water. This will be context specific.
- Acknowledging women's role as wage workers and facilitating their organization as such (similar to that of farm workers).

Again, multiple stakeholders can partner to implement strategies to support women and families in shrimp farming communities. They include workers' organizations that can play a key role in outreach within communities to organize women workers, raise awareness. Local NGOs and community-based organizations can play a similar role while Government is an essential partner in the provision of basic social services, such as water, and sanitation.

International development agencies and NGOs can support and underpin activities, for example, through capacity development and facilitation of information sharing and learning.

Women's self-help groups seem to play a key role in cushioning families against income fluctuations through semi-formal savings and credit schemes. Self-help group funds are used exclusively to care for family needs and well-being, not for farming purposes. Expanding their coverage could be an important contribution to strengthening family resilience. Moreover, it could be explored whether the self-help group system can be replicated for farmers to finance farming operations and improvements.

The Government may need to underpin development of self-help groups through reviewing and, if needed, amend the regulatory framework underpinning the systems. Moreover, Government could play an important role in farmer capacity development through, for example, the already ongoing efforts to support establishment of farmers' associations in shrimp farming communities. Such farmers' associations, once established, could become key stakeholders in exploring community-based savings and credit systems. Civil society organizations and international partners can support and underpin these processes, for example, through information sharing and brokering links to appropriate partners.

Empowering farm workers and farmers

Workers' income varies, but a significant number of workers indicate that they consider their income only somewhat sufficient. If profits continue to decline this could negatively impact workers' remuneration and working conditions as well. This may be of particular concern where farmers lease land for farming as this adds extra costs, further eroding slim profit margins.

Addressing this requires both empowerment of workers and support for farmers to ensure profitability that allows for payment of decent wages. Hence, partners need to work together to promote fair and sufficient wages and to safeguard decent working conditions. Improving the profitability of shrimp farming to not undermine farmers' abilities to adequately remunerate workers and ensure decent working conditions is also a necessary condition. This could, for example, be pursued through decreasing costs, improving productivity and stabilizing prices, as discussed above, in combination with awareness raising on labor rights.

Organization of workers and farmers alike could significantly underpin both the protection of workers and ensuring sufficient earnings among farmers to ensure decent working conditions. However, neither farmers nor workers are organized. While farmers do help each other, for example, sharing knowledge, they have limited formal or semi-formal associations that can facilitate access to quality inputs, credit, or other services. Workers are not members of workers' organizations and therefore there are no or limited mechanisms for social dialogue and grievance handling.

Hence, workers organizations, relevant Government departments, civil society organizations and other partners need to undertake outreach work to inform farmers and workers about available options and benefits associated with organizing.

Addressing health impacts

Both farmers and farm workers experience negative health impacts that are likely associated with poorly managed occupational safety and health risks in the farms. Skin rashes appear to be common and could be linked to unsafe handling of farm inputs. This is linked with the environmental risks associated with unsafe use and handling of potentially hazardous inputs.

Building capacity to limit and control the use of farm inputs and educate farmers and workers on health risks could be an essential contribution to ensuring a safe working environment that does not negatively impact farmers' and farm workers' health. Again, this takes multiple stakeholders collaborating to ensure impact.

Governments (particularly health services) need to ensure implementation of appropriate regulations on the sale, distribution, and use of farm inputs. This could also include outreach and capacity development with farmers to handle farm inputs and undertake work processes in ways that minimize risks, for example, through the labor inspectorate and the agricultural extension services. Workers' and farmers' organizations can also play a key role in reaching out and strengthening capacity among workers and farmers and NGOs and international development organizations can support efforts through capacity development, facilitation, and financing of pilot interventions. Downstream supply chain actors can engage and support efforts on the ground as well and should ensure that robust due diligence on safe working conditions is part of their human rights due diligence framework.

Mitigating climate change impact

Climate change was not listed as a major challenge by respondents, but respondents did list multiple challenges directly associated with climate change impact, for example, shrimp health, and mortality, flooding, and salination. Moreover, climate change impacts may further exacerbate current challenges, such as income declines, and debt cycles caused by climate change impact-induced economic shocks.

Hence, climate change mitigation is extremely complex and will require multiple cross-disciplinary interventions in a partnership-based approach. Further research, building increased knowledge and understanding of climate change impact and possible mitigation strategies is required to underpin action. Reviewing and adjusting

governance frameworks to better recognize and address climate change impact, such as flooding and generally wetter working conditions, may also be required. Sharing new learning and evidence through multiple channels (apps, farmers' associations, mass media etc.) is as important as generating the knowledge. Only shared information will allow farmers and other stakeholders to act upon the information.

Government, workers' and farmers' organizations, NGOs, international development organizations, processors and downstream supply chain actors, and input providers can all contribute to building the knowledge base, sharing information, and building capacity on effective climate change mitigation measures. This is by nature a cross-disciplinary field and cross-sectoral coordination of multiple stakeholders is of the essence.

Mitigating climate change impact will require many more specific interventions. Identifying these are beyond the scope of this study, however.

Ensuring long-term stability of the shrimp industry in Andhra Pradesh

The intergenerational stability of shrimp farming is challenged as young people do not wish to become shrimp farmers. They consider it an industry with very little reward in return for hard work and would prefer to pursue other occupations, mostly in urban centers. This means that farmers are not sure who will take over farms and this could jeopardize the long-term stability of the industry.

Moreover, the inability of debt-ridden farmers with poor access to capital to replace dilapidated equipment could decrease productivity in the years to come. Coupled with the potential climate change impact and the intergenerational instability, this could significantly jeopardize the overall stability of shrimp farming in Andhra Pradesh and hence the global supply of L. vannamei shrimp.

As discussed above, comprehensive partnership-based strategies are required to address these challenges. Possible strategies are very diverse and neither government, nor industry actors, can be expected to take on the challenges in isolation. They need to work together and join forces with civil society organizations and international partners that can support and amplify efforts.

Multi-partner strategies that may contribute to the long-term stability of the industry include, for example:

- Prioritizing the development of communal infrastructure and activities that increase the attractiveness of living in shrimp farming areas (e.g., sports facilities, internet connectivity).
- Improving access to education (including tertiary education) in shrimp farming areas to allow young people to remain in the areas while pursuing education.
- Further developing the qualifications frameworks and vocational training system associated with shrimp farming.
- Supporting stabilization of prices and income for shrimp farmers, for example through contract regimes that guarantee minimum prices (learning from Fair Trade models). This essentially means shifting some of the risks in the market from farmers and processors to buyers and retailers to stabilize the industry and ensure longer-term supplies.

While the Government has a responsibility to provide basic social services, such as education, infrastructure development, and good governance mechanisms, supply chain actors, such as processors and buyers, can support Government efforts through engagement and "paying back" to producer communities, for example, through donations, and projects that support education, and activities with young people. These activities need to be coupled with strategies to ensure that prices reflect the true costs of decent working conditions and that ensure stable livelihoods to have long-term impact.

Investment banks and companies can develop financial products that allow young people to enter the industry, support and invest in efforts by the Government (and others) to upgrade infrastructure in farming areas (for

example, renewable energy projects, upgrading internet connectivity, improving roads, and other means of access).

Downstream supply chain actors (global buyers, retailers, food service, and others) can review and adjust their buying policies toward more long-term contracts with stipulations around minimum prices for farmers. This would allow processors to increase prices paid to farmers and stipulate conditions with intermediaries buying from farmers.

CONCLUSION

Summing up, preserving historical livelihoods gains, protecting livelihoods and basic rights and ensuring the stability of the shrimp industry in Andhra Pradesh into the future go together. This complex scenario requires comprehensive solutions where multiple partners collaborate. While the Government has a responsibility to create an enabling policy and legal framework and deliver social services and social protection. The Andhra Pradesh State Government is indeed delivering already on several parameters, such as access to education, but may need to review and adjust in other spheres. Moreover, other stakeholders need to also contribute to the solutions. They include downstream supply chain actors that must carefully review HRDD and procurement practices and civil society organizations and international partners that can contribute positively through knowledge generation, awareness raising and capacity development. All these efforts need to be anchored in farming communities and address needs and priorities identified by farmers, farmer families and the wider communities. Therefore, supporting the organization of farmers, farm workers and communities and actively empowering farmer associations, worker organizations, women's groups and other structures in communities is an essential pre-condition for positive impact. Similarly, genuine partnership where stakeholders from communities, the industry and supply chains, the Government and supporting civil society organizations consult, collaborate and coordinate are essential for a thriving and socially, economically and environmentally sustainable shrimp industry in Andhra Pradesh.

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