Randwick International of Social Sciences (RISS) Journal
Vol. 7, No.4, October 2026 | Page: 268-276
ISSN Online: 2722-5674 - **ISSN Print**: 2722-5666
https://www.randwickresearch.com/index.php/rissj

Participatory Learning Through Floating Rice and Fish Integration in Lubuk Bayas Indonesia

DOI: *https://doi.org/10.47175/rissj.v7i4.1348*

| Sri Fajar Ayu[1,*] | Meiriani[2] | Revandy Iskandar Muda Damanik[3] |
| Nahrisa Rahmadhani[4] | Atmadinata Aviantara[5] |Sukmawati Utami[6] |
| Patricia Srisere Ikaria Situmorang[7] |

[1]*Study Program of Agribusiness, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia*

[2,3,4]*Study Program of Agrotechnology, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia*

[5]*Study Program of Aquatic Resources Management, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia*

[6]*Study Program of Animal Husbandry, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia*

[7]*Department of Agribusiness, Faculty of Agriculture, University of HKBP Nommensen, Indonesia*

[*]*sfa@usu.ac.id*

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

ABSTRACT
Persistent inundation limits conventional farming and creates a need for locally manageable alternatives in rural communities. This article examines the initial implementation of a community engagement programme introducing organic-oriented floating rice, Nile tilapia integration, and locally available feed resources in Lubuk Bayas Village, North Sumatra, Indonesia. A descriptive case study was developed through retrospective review of a programme progress report, instructional presentations, photographic records, and a draft educational book. The analysis distinguished completed activities from proposed evaluations and interpreted the intervention through participatory learning and collective management. Documented activities included community discussions, construction of floating platforms, preparation of planting media, rice transplanting, and instruction on fish management and alternative feed ingredients. The principal outputs were an operational demonstration setting, opportunities for practical participation, educational materials, and reported public dissemination. These records support the establishment of a local learning infrastructure, but do not establish measured improvements in knowledge, income, feed efficiency, or household food security. Differences between planning and implementation documents also indicate the need for a consistent technical record. The case illustrates how an environmental constraint can become a focus for collaborative learning while highlighting the importance of maintenance responsibilities, transparent cost records, and continued monitoring. Further evaluation should assess independent management, completed production cycles, and the distribution of benefits before wider replication.

KEYWORDS
Participatory learning; community engagement; floating rice; integrated farming; rural livelihoods.

INTRODUCTION

Agricultural adaptation involves decisions about livelihoods, labour, shared resources, and acceptable risk as well as technical changes in production. For a rural community, a cultivation method must be understandable, maintainable, and compatible with available materials if it is to continue beyond a demonstration. Land that remains inundated can restrict conventional rice cultivation and reduce the range of activities available to farmers. At the same time, standing water creates a setting in which alternative arrangements of crops and aquatic production may be explored. The relevant question is therefore how

communities can evaluate a possible use of these resources and develop the practical arrangements needed to manage it. An intervention addressing this question should document the learning process and its limits, rather than infer improved livelihoods from the installation of equipment alone.

Floating cultivation provides a useful international precedent. Irfanullah, Adrika, Ghani, Khan, and Rashid (2008) described the introduction of floating gardening in wetland communities in Bangladesh, linking cultivation with group organisation and livelihood opportunities. That experience concerned vegetable production on organic platforms and cannot establish the performance of rice grown on bamboo structures in Indonesia. It nevertheless demonstrates the value of examining floating agriculture as a relationship between an environmental setting and community organisation. The Food and Agriculture Organization of the United Nations (FAO, 2015) also documented floating gardens as an example of locally developed farming in flooded environments. In Lubuk Bayas, this precedent motivates a context-specific inquiry into the introduction of floating rice rather than a claim that the local programme reproduces the outcomes of an established system elsewhere.

Research on rice and fish coculture provides a complementary ecological rationale. Xie et al. (2011) examined interactions between rice and fish in a long-established agricultural system in China. Such work supports investigation of resource complementarity, but its findings cannot simply be transferred to a floating platform whose planting medium is retained by a liner. The extent of contact between roots, water, and fish-derived nutrients must be established for the actual construction. Accordingly, fish integration in this article is treated as a programme component requiring local validation. It is not assumed that every rice platform automatically delivers nutrient recycling, pest control, or improved water quality. This distinction is relevant to community learning because farmers need to understand which functions have been demonstrated and which remain hypotheses.

Participatory approaches offer a way to connect technical instruction with local experience. Reed (2008) emphasised that stakeholder involvement requires attention to how decisions are made, rather than merely the presence of stakeholders. For an agricultural demonstration, participation can take several forms: identifying a problem, contributing materials, carrying out a task, monitoring performance, or deciding how results will be used. These forms should be distinguished when interpreting a programme. A participant who helps construct a platform has practical exposure, but that fact alone does not establish authority over its management or a durable increase in capability. Describing the specific activities undertaken makes the intervention more transparent and gives subsequent evaluation a clear basis. A related study published in RISS examined participatory focus group discussions and international collaboration to strengthen farmers' understanding of organic rice–fish farming in North Sumatra, while identifying challenges involving farmer institutions and market access (Sinaga et al., 2026).

Evidence on farmer field schools is also relevant. Waddington et al. (2014) reviewed learning-oriented agricultural interventions and found that outcomes depend on programme implementation and the quality of evaluation. Their review supports the use of experiential learning as a rationale for field-based instruction, while cautioning against assuming that effects persist or spread automatically. The Lubuk Bayas programme is not classified here as a formal farmer field school because its records do not establish all features of that model. Instead, field-school research provides an analytical comparison for an intervention combining discussion, demonstration, practice, and follow-up. The local contribution is a documented account of how this combination was introduced under conditions of persistent inundation.

The community engagement programme in Lubuk Bayas Village, Perbaungan Subdistrict, Serdang Bedagai Regency, North Sumatra, introduced floating rice alongside instruction on Nile tilapia and alternative feed resources. Its progress report identified inundated agricultural land, limited familiarity with floating cultivation, and dependence on purchased fish feed as programme concerns. The implementing team engaged farmers and village stakeholders through discussions and practical activities. Because the available record covers an implementation stage rather than a completed impact evaluation, the most defensible contribution is to examine the establishment of the demonstration and its learning arrangements. The article does not claim priority for floating agriculture or integrated rice and fish production. Its context-specific contribution concerns their introduction as a community learning setting in this village.

The purpose of this article is to describe the documented implementation of the programme, interpret its learning and participation mechanisms, and identify the conditions needed for continued collective management. Three questions guide the account. What activities and outputs were established during the documented stage? How did community members participate in the demonstration and associated instruction? What evidence and organisational arrangements are still required before improved livelihoods or food security can be evaluated? These questions place the intervention within rural education and community development while retaining enough technical description to make the case intelligible. They also separate the immediate production of a learning opportunity from the longer process through which that opportunity may contribute to household benefits.

RESEARCH METHODS

Case setting and analytical design

The article uses a descriptive case-study approach based on retrospective document review. The unit of analysis is the initial implementation of the community engagement programme in Lubuk Bayas, rather than the biological response of individual rice plants or fish. The progress report places programme activities in 2026 and describes initial surveys, discussions, instruction, demonstration, and assistance. Its methods section gives an April-to-July period, while its front matter is dated August. The precise dates of each field activity require reconciliation with original attendance sheets and activity logs. The present account therefore uses the year and implementation stage without assigning an unverified date to a specific event. It does not introduce a new survey, interview dataset, or controlled experiment.

The programme setting involved a farmer community and village stakeholders, with an educational book identifying Kelompok Tani Subur as an associated organisation. Activities addressed agricultural areas affected by standing water. This description is based on programme records rather than an independent hydrological assessment. The term underutilised inundated land is used descriptively; it does not assign a legal abandoned-land status. Likewise, organic-oriented cultivation refers to the programme's use of organic media and inputs. It does not establish that the floating production unit or any future harvest has been certified organic. These definitions keep the case description consistent with what the available records can support.

Sources and evidence boundaries

Four source groups were reviewed: the 2026 programme progress report; two instructional presentations covering floating rice and fish management; photographs of community activities and construction stages; and a draft educational book discussing the local demonstration. The progress report was the principal source for completed activities. The presentations were used to identify instructional content and intended technical procedures.

Photographs provided visual corroboration of identifiable tasks and the existence of a field setting, but were not used to estimate participant totals or changes in capability. The draft book supplied supplementary information and identified unresolved issues in measurement and cost records. Scientific publications were used for interpretation and comparison, not as evidence that a particular outcome occurred locally.

The source review distinguished implementation evidence, instructional content, supplementary numerical descriptions, and future plans. Statements in the progress report's results section were used to describe the recorded implementation, whereas proposals in its methods and follow-up sections were not treated as completed experiments. This distinction was necessary because the document's earlier technical description discussed several fish species and a feed-manufacturing mixture, while its results section focused on Nile tilapia, Azolla, and black soldier fly larvae. The manuscript follows the latter account for the implemented programme. It avoids claiming that all earlier specifications were applied. Exact stocking, feed allocation, and water-quality measurements remain matters for verification against primary field records.

Programme components examined

The programme sequence described in the records began with site assessment and discussion of local needs. Instruction introduced floating rice as an alternative way of arranging production on inundated land. Participants then engaged in constructing platforms, fitting liners, preparing planting media, adding organic inputs, and transplanting rice seedlings. Instruction on fish integration addressed seed selection, acclimatisation, feeding, water conditions, and growth monitoring. Alternative feed materials included Azolla microphylla and black soldier fly larvae. These components were examined together as an intervention intended to connect available resources with practical learning. The account reports their role in the programme without presenting a fully reproducible agronomic experiment, for which additional specifications and primary observations would be necessary.

RESULTS AND DISCUSSION

Establishment of a local demonstration and learning setting

The clearest documented result was the establishment of a floating rice demonstration and associated educational activities. The progress report described direct involvement of community members in preparing the site, building platforms, arranging growing media, and planting seedlings. The photographs corroborate bamboo construction, installation of liners, placement of planting media, and field activity around the demonstration. Together, these records show that floating cultivation was moved from explanation to a setting in which participants could observe and practise tasks. This is an implementation output with educational significance. It does not, by itself, demonstrate that the resulting system completed a productive cycle or could be maintained without programme assistance.

The platform was important because it made an unfamiliar arrangement visible. Farmers could examine how the structure held planting media and how cultivation was positioned above standing water. The connection between an explanation and a physical example is relevant where adoption requires understanding construction as well as crop management. The local case suggests a practical pathway from discussion to supervised activity: a problem is identified, an arrangement is demonstrated, and participants engage with its components. Whether this pathway produces reliable independent competence still requires assessment. A suitable follow-up would ask participants to perform specified tasks without prompting and record where additional help is needed.

The demonstration also created a reference point for subsequent discussion. Instead of debating floating rice only in general terms, farmers and facilitators could refer to a particular platform, its materials, and its maintenance needs. Such a setting can help reveal practical questions that are difficult to anticipate during a presentation. These may include balancing loads, obtaining replacement materials, or organising access for routine care. These examples are implications for future facilitation rather than additional observed findings. The available documentation does not contain a coded discussion transcript showing their frequency or participants' priorities. A subsequent evaluation should therefore record the issues raised and how decisions were reached.

Construction stages as practical learning opportunities

Seven construction and cultivation stages were documented: bamboo platform preparation, liner installation, mud placement, addition of composted animal manure, addition of microbial inputs, incorporation of kiambang, and rice transplanting. These stages involved different practical competencies. Construction required attention to stability and connections; medium preparation required handling and distributing materials; transplanting required positioning seedlings within the prepared bed. Describing the stages separately clarifies what participants had the opportunity to practise. It also provides a basis for a later skills checklist. However, the programme records do not contain individual competency scores, so the article cannot state how many participants mastered each task.

The use of locally accessible materials is relevant to the potential repeatability of the activity. A construction can be demonstrated successfully yet remain difficult to reproduce if replacement components are unavailable or too expensive. Conversely, local availability does not guarantee structural safety or a low lifetime cost. In this case, the results establish an initial construction process; they do not establish material durability across multiple seasons. Continued observation should record damage, repair time, and replacement expenditure. This would connect the practical learning component with decisions about whether the design remains manageable under local conditions.

Figure 1 illustrates platform construction, while Figure 2 shows the planted field setting. These photographs provide evidence of implementation rather than a comparison of alternative designs. The identity of the plant described locally as kiambang also requires botanical confirmation. It should not automatically be equated with Azolla microphylla, which was named separately in the fish-feed instruction. Maintaining this distinction prevents the rice-medium component from being confused with the feed component. Recording material identity, quantities, and preparation procedures would strengthen both reproducibility and future discussion of resource use.



Figure 1. Bamboo platform construction for the floating rice demonstration.



Figure 2. Documented field setting with planted floating platforms.

Community involvement and the limits of participation evidence

The report described community involvement in discussion, site preparation, material handling, construction, planting, and early maintenance. These are specific forms of practical participation. They indicate that the intervention included activities beyond receiving a lecture. Photographs of group instruction and field work support the existence of shared activity, but do not identify the full membership of the participant group or establish how responsibilities were distributed. No verified attendance dataset, gender breakdown, or record of individual task performance accompanied the materials. Consequently, participation is described in terms of documented roles rather than a calculated participation rate.

A further distinction concerns participation in tasks and participation in decisions. Contributing labour can expose members to a technology, yet control over assets, expenses, and harvest distribution may remain elsewhere. The present records do not establish who made those decisions or how disagreements were handled. The implication is that continuation requires explicit arrangements for management as well as technical instruction. An operational next step would be to agree on responsibility for platform inspection, plant care, fish feeding, record keeping, and communication with facilitators. These proposed arrangements are not reported as completed outcomes.

The programme report used the language of improved knowledge and early skills. Given the absence of baseline scores, post-training measurements, or a documented assessment rubric, these statements are interpreted here as the team's qualitative description of the learning process. The stronger supported claim is that opportunities for learning and practice were provided. This wording does not discount the possible educational value of the activity; it locates the conclusion at the level of evidence available. A short knowledge assessment combined with observation of practical tasks would help establish whether participants can explain the system and perform its maintenance independently.

Instruction on Nile tilapia and local feed resources

The implementation account identified Nile tilapia as the fish component. Instruction covered healthy seed selection, acclimatisation, feeding in relation to fish biomass, observation of fish behaviour, and attention to water conditions. The materials also introduced Azolla microphylla and black soldier fly larvae as alternative feed resources. The documented educational objective was to explore reduced dependence on commercial pellets. The records do not provide verified fish growth, survival, feed conversion, or harvest results. Thus, the fish component is reported as an introduced management topic and initial integration activity, with its production performance still requiring measurement.

The feed-training materials listed five formulations: a commercial-pellet reference, two mixtures combining pellets with larvae at different proportions, and two mixtures combining pellets with Azolla. These were introduced as possible comparisons rather than established optimal diets. Their interpretation depends on whether percentages refer to fresh mass, dry matter, or another basis. Moisture differences make equal fresh weights nutritionally unequal, and the records do not resolve this issue. Accordingly, the listed proportions should not be promoted as a validated recommendation. A future feeding assessment should document actual ingredient masses, preparation methods, nutritional basis, fish allocation, and consistent recording of growth and feed consumption.

Devic, Leschen, Murray, and Little (2018) tested black soldier fly larvae meal in formulated Nile tilapia diets under defined feeding conditions. Their findings support investigating this ingredient, not assuming that unprocessed larvae and pellets mixed in a village demonstration will have equivalent effects. Refaey et al. (2023) examined fresh Azolla pinnata in Nile tilapia feeding and reported responses that varied with replacement level. That study involved a different Azolla species from the one named in Lubuk Bayas. Both references therefore provide a rationale for controlled local assessment while reinforcing the need to distinguish ingredient potential from a proven village-level formulation.

Learning arrangements and collective management

The combination of discussion, demonstration, and supervised practice makes the programme relevant to rural learning. The available evidence establishes that these elements were present, although their educational effects were not measured. Waddington et al. (2014) offer a comparison showing why implementation quality and follow-up matter in learning-based agricultural programmes. For Lubuk Bayas, the practical implication is to organise repeated observation around a complete production cycle. Participants would then be able to connect preparation with subsequent plant condition, fish management, repair requirements, and eventual harvest. Such a sequence would provide more information for adoption decisions than a construction event alone.

Collective management requires a record of who does the work and who benefits. A demonstration supported by a university may operate while staff are present, yet face difficulties when assistance decreases. The records supplied for this case do not establish a functioning maintenance fund, a formal work roster, or an agreed distribution mechanism. These should therefore be treated as issues for programme continuation. A simple group register could record assigned tasks, their completion, cash expenditure, donated materials, and decisions about harvested products. Such information would permit evaluation of whether the activity is becoming locally managed rather than remaining dependent on external support.

The relationship between local experience and specialist instruction also merits attention. Farmers bring knowledge of water behaviour, available materials, and customary work arrangements. Facilitators contribute proposed construction and cultivation methods. The programme included opportunities for discussion, but the documents do not show in detail how local suggestions altered the design. Future reports should record those changes explicitly. This would help distinguish a technology presented to a community from one adapted through joint problem solving. It would also make the process useful to other villages whose material availability and water conditions differ.

Supplementary growth and expenditure records

The draft educational book contains numerical descriptions that extend beyond the progress report's main results. It describes five platforms of approximately 2 by 5 metres, early rice-height observations over six weeks, an initial allocation of 4,000 tilapia seed, and

programme expenditure. These figures are potentially useful, but primary measurement sheets and expenditure evidence were not included. The book itself notes issues requiring verification, including a decrease in the reported control-group mean height between successive weeks. These descriptions are therefore not used here to claim treatment superiority, stocking suitability, or profitability. They indicate the kinds of primary records that could strengthen a revised article.

Platform area is especially important when evaluating production or cost. Five platforms each measuring 2 by 5 metres would have a combined surface area of 50 square metres, equivalent to 0.005 hectares. This is an arithmetic conversion conditional on the dimensions being confirmed; it is not a verified measurement of planted area. Effective planting area may be smaller because of edges and construction components. Any later yield estimate must identify the denominator used. Likewise, expenditure for an educational demonstration should be separated into reusable assets, recurring production costs, and programme-specific teaching costs before commercial feasibility is assessed.

An economic evaluation should include more than the purchase price of feed. Preparing local ingredients requires labour, equipment, transport, and possible storage or processing. A cheaper ingredient may fail to lower cost per kilogram of fish if growth is reduced or mortality increases. Similarly, the value of rice and fish production must be assessed alongside platform maintenance and the labour required throughout the cycle. The present materials do not support a completed benefit-cost calculation. The contribution at this stage is to identify a transparent accounting structure for future monitoring and to prevent projected savings from being presented as realised income.

Implications for food security

Food security remains a programme objective rather than a demonstrated impact. FAO (2008) distinguishes availability, access, utilisation, and stability. Producing rice and fish could contribute to availability if a successful harvest occurs. Benefits for access would depend on who receives the harvest or sale proceeds; utilisation would involve the quality and use of food; stability would require continued performance over time. None of these dimensions can be inferred from platform construction alone. A follow-up household assessment should therefore examine actual consumption, sales, food expenditure, and seasonal continuity alongside production records.

The case is useful as an account of how a community programme began addressing an environmental constraint through a shared demonstration. Its wider relevance lies in the proposed connection between learning, technical adaptation, and local management. This is an interpretation, not a tested causal model. For another village, the transferable element would be the process of assessing needs, documenting practical tasks, assigning responsibilities, and evaluating a complete cycle. The construction and feed specifications would still need local examination. Replication should therefore follow evidence of manageable costs and sustained operation, rather than the visibility of the demonstration alone.

CONCLUSION

The Lubuk Bayas programme established a floating rice demonstration, practical community involvement, instructional materials, and reported dissemination during its initial implementation stage. These outputs created a setting for learning about alternative use of inundated land and introduced fish management and local feed resources as associated topics. The records support a conclusion about the establishment of learning infrastructure, while measured changes in knowledge, autonomous management, production efficiency, income, and food security remain unestablished. Continuation

should combine a consistent technical record with shared maintenance responsibilities, transparent accounting, and assessment across completed production cycles. The programme's potential contribution to rural livelihoods depends on how these arrangements function beyond the initial demonstration.

Acknowledgments

The authors gratefully acknowledge the Institute forLPPMUniversitas Sumatera Utara, for supporting the 2026 Community Service Programme under the Desa Binaan Scheme. The authors also thank the village partners in Lubuk Bayas for their active participation and cooperation, and the community service team for their contributions to the planning and implementation of the programme.

REFERENCES

Devic, E., Leschen, W., Murray, F., & Little, D. C. (2018). Growth performance, feed utilization and body composition of advanced nursing Nile tilapia (Oreochromis niloticus) fed diets containing Black Soldier Fly (Hermetiaillucens) larvae meal. *Aquaculture Nutrition*, 24(1), 416–423. https://doi.org/10.1111/anu.12573

Food and Agriculture Organization of the United Nations. (2008). An introduction to the basic concepts of food security. Retrieved from https://www.fao.org/agrifood-economics/publications/detail/en/c/122386/

Food and Agriculture Organization of the United Nations. (2015, December 15). Sustainable farming systems in Bangladesh and Japan receive global recognition. Retrieved from https://www.fao.org/newsroom/detail/Sustainable-farming-systems-in-Bangladesh-and-Japan-receive-global-recognition/en

Irfanullah, H. M., Adrika, A., Ghani, A., Khan, Z. A., & Rashid, M. A. (2008). Introduction of floating gardening in the north-eastern wetlands of Bangladesh for nutritional security and sustainable livelihood. *Renewable Agriculture and Food Systems*, 23(2), 89–96. https://doi.org/10.1017/S1742170507002074

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation*, 141(10), 2417–2431. https://doi.org/10.1016/j.biocon.2008.07.014

Refaey, M. M., Mehrim, A. I., Zenhom, O. A., Areda, H. A., Ragaza, J. A., & Hassaan, M. S. (2023). Fresh Azolla, Azolla pinnata as a complementary feed for Oreochromis niloticus: Growth, digestive enzymes, intestinal morphology, physiological responses, and flesh quality. *Aquaculture Nutrition*, 2023, 1403704. https://doi.org/10.1155/2023/1403704

Sinaga, H., Nauly, M., Ayu, S. F., Aulia, D., Salmiah, S., & Situmorang, P. S. I. (2026). Strengthening organic rice–fish farming through participatory focus group discussions and international collaboration in North Sumatra, Indonesia. *Randwick International of Social Science Journal*, 7(3), 172–181. https://doi.org/10.47175/rissj.v7i3.1297

Waddington, H., Snilstveit, B., Hombrados, J., Vojtkova, M., Phillips, D., Davies, P., & White, H. (2014). Farmer field schools for improving farming practices and farmer outcomes: A systematic review. *Campbell Systematic Reviews*, 10(1), 1–335. https://doi.org/10.4073/csr.2014.6

Xie, J., Hu, L., Tang, J., Wu, X., Li, N., Yuan, Y., ... Chen, X. (2011). Ecological mechanisms underlying the sustainability of the agricultural heritage rice–fish coculture system. *Proceedings of the National Academy of Sciences*, 108(50), E1381–E1387. https://doi.org/10.1073/pnas.1111043108