

Factsheet final findings Applied Research Fund Call 2



The application of Lemna and biodigestate to enhance profitability of sustainable integrated farming in Indonesia (PROFARM)

Summary

Animal feed contributes substantially to the production cost of livestock. However, imported feed is still predominant in the Indonesian livestock sector. The PROFARM project supported the application of bio-slurry, an organic fertilizer that retains all nutrient originally present in feeding materials and is produced by a household based biogas reactor. It thereby supported the production of Lemna sp. (duckweed) as livestock fodder to enhance the practice and profitability of sustainable integrated farming in Indonesia. The project was able to pioneer a research project on Lemna ranging from lab scale to the field. Through the applied research activities in Indonesia and the Netherlands, the project has generated insights into the nutrient content, cultivation and growth behaviour of Lemna sp. and the application of Lemna sp. as an organic fodder for fish, poultry, pigs and cattle. The project succeeded in assisting 1,685 farmers (39% women) in utilizing Lemna for their agriculture activities and facilitated the construction of 25 demonstration plots and 694 aquaculture ponds at farmer level. Upscaling of the original planned outputs has been made possible by leveraging more funds through the Millennium Challenge Corporation (MCC) funded GADING project implemented by Hivos.

Research findings

The research findings indicated that based on its digestibility and protein content, Lemna can be valued as a high quality, high protein grass component. The outcome of the research showed that on average the protein content of Lemna ranges from 34-39%. Other nutritional components are also present. Lemna also contains a very good ratio of omega-6:omega-3 and relatively high levels of carotenoids and vitamin E, which results in high quality duck eggs when ducks are fed on Lemna. For cows, sheep and goats, Lemna can be used as a protein component of the feed composition.

Bio-slurry can safely be used as a nutrient source to maximally grow Lemna under the prevailing environmental conditions. Furthermore, the bioslurry-grown duckweed showed to have a higher protein content, a (slightly) higher carbohydrate/starch content and a lower fiber content. However, to obtain higher savings from the production of Lemna, a certain surface area size (minimum 25 m²) is required so that a sufficiently high amount of biomass can be harvested daily from the ponds.

Outcomes achieved

The PROFARM project blended practical field experience and academic knowledge into accessible learning modules which are disseminated through various media (training, meeting, workshop, website). Through capacity building for farmers and construction of demonstration plots and aquaculture ponds, the project has been able to initiate up-scaled application of Lemna cultivation in Indonesia. The economic benefit gained by replacing the chemical fertilizer with bio-slurry could reach up to 100% of the fertilizer cost. The project has also brought positive changes to the enabling environment for sustainable agriculture and aquaculture as it was able to increase awareness and mobilise support from several local government agencies to support the activities, including promotion and provision of equipment to the beneficiaries. Capacity building provided by the project increased producer's knowledge, skill and motivation to apply sustainable production practices as it also brings the economic benefit for producers. Several

lead framers have now become 'change agents' who actively share their knowledge and experience on the benefits of sustainable integrated farming to others.

Project messages to	<p>A) Actors from private sector:</p> <ul style="list-style-type: none">• The optimized use of bio-slurry and Lemna provides a business opportunity as a substitute for chemical fertilizer and can reduce the use of imported livestock fodder. A more detailed assessment on the economies of scale of the Lemna business is required for upscaling. <p>B) Civil society and practitioners' organizations:</p> <ul style="list-style-type: none">• Civil society and practitioners' organizations should promote sustainable integrated farming and waste management systems based on the optimized use of bio-slurry and high-nutrient Lemna. It provides a real potential since both resources are available at farm level and are currently under-utilized. <p>C) Policy makers:</p> <ul style="list-style-type: none">• Policy makers should create an enabling (policy) environment for upscaling bio-slurry and Lemna application to support integrated farming in Indonesia, for example by supporting Lemna production initiatives by providing business incentives.
Knowledge products	<ul style="list-style-type: none">• A set of research reports (in Indonesian), used as educational material by university partners and shared with Ministry of Agriculture and Ministry of Marine Affairs and Fisheries. March 2019.• Project video. YouTube, March 2018.• Learning modules (in Indonesian), used as training materials for farmers (2016).
Knowledge networks	<p>Hivos is part of the AgriProFocus network, an international network with Dutch roots that promotes and drives farmer entrepreneurship, and connects farmers, traders, suppliers, processors and exporters - both nationally and internationally.</p>
Knowledge co-creation	<p>The collaboration between research institutions and Hivos as civil society organization in the PROFARM project has brought new insights through the applied research on the benefits of bio-slurry and Lemna. The learning events held were attended by representatives from the private sector, rural business, the Indonesian Feedmills Association, academic institutions and government agencies. They became a medium for sharing and discussing the potential and challenges of bio-slurry and Lemna application in Indonesia. It was as well a way to gain feedback from relevant stakeholder for future development and potential collaboration. During the implementation of the project, the university partners adopted the knowledge on bio-slurry and Lemna into their teaching curriculum. Yayasan Rumah Energi (YRE) is currently exploring potential collaborations with several beneficiaries who have started the bio-slurry business for a Business-to-Business cooperation in marketing bio-slurry based fertilizer and has obtained funding from two state-owned enterprises to develop bioslurry businesses with farmers.</p>
Consortium Partners	<ul style="list-style-type: none">• Hivos – Green Society• Wageningen UR, Plant Research International, Business Unit Bioscience• Yayasan Rumah Energi• VEDCA – Vocational Education Development Center for Agriculture
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