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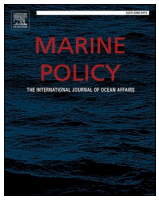

Full length article

Results-based management in practice: Lessons learnt and policy recommendations from the implementation of RBM in European fisheries outside Europe

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ABSTRACT

This paper summarizes the lessons learnt from the implementation of a practical approach to Results-based Management (RBM) within the EU H2020 FarFish project, where RBM is conceptualized as a contract situation. From these lessons a set of policy recommendations for the improvement of the fisheries management through the adoption of RBM for EU vessels fishing in international- and Sustainable Fisheries Partnership Agreements (SFPA) waters were put forward. The policy recommendations are based on key project outputs and additional semi-structured interviews on the experiences of project partners. This exercise revealed advancements and shortcomings for the broader implementation of a more participatory, inclusive, and responsive approach to fisheries governance. Meaningful and effective participation was a pivotal factor for the success of the process. Absence of relevant bodies, sectors and fleet segments proved detrimental throughout all cases. The importance of scoping, goal setting and timing of the actions, as well as managing realistic expectations within the RBM, were highlighted. Data availability and accountability was pivotal, as in cases were cooperation succeeded, data was made available, and knowledge was expanded and enriched. The implementation of this approach to RBM showed great potential when extended to other aspects of fisheries' management, fishing categories and fleets. This structured approach to RBM provides a promising alternative to current fisheries management systems across the world.

1. Introduction

Results-based management is largely a response to the failure to manage fisheries effectively. In 2009, the European Commission stated in a Green Paper on the reform of the Common Fisheries Policy that "overfishing, fleet overcapacity, heavy subsidies, low economic resilience and decline in the volume of fish caught by European fishermen" are realities from a fisheries policy that did not work well to prevent such problems [14]. In the paper, this malfunctioning is partly attributed to the implementation of a top-down approach to fisheries management, giving few incentives for the fisheries industry to act "as a responsible actor accountable for the sustainable use of a public resource" [14]. Prior to this, during the revision of the Common Fisheries Policy in 2002, the European Commission introduced the concept of a co-management as "a resource management partnership in which local users and other stakeholders share power and responsibility with

Abbreviations: RBM, Results-based Management; MR, Management Recommendation; CS, Case Study; OT, Outcome Target; SFPA, Sustainable Fisheries Partnership Agreement.

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government agencies" [3,16]. Back in the Green paper from 2009, the European Commission strengthened this concept and defined the result-based management approach to "relieve both the industry and policy-makers of part of the burden of detailed management of technical issues". The Commission considered that this approach would have to be linked to a reversal of the burden of proof, where "it would be up to the industry to demonstrate that it operates responsibly in return for access to fishing" [14]. This approach could therefore "contribute to better management by making the policy considerably simpler and removing the current incentives for providing false or incomplete information." [14]. However, the RBM concept has never been implemented in EU fisheries management policy.

In response, a practical framework to RBM was developed in the FP7 project EcoFishMan, where the RBM was conceptualized as a contract situation[1] [27,28] where the relevant authorities set specific and measurable objectives to be achieved, leaving resource users to propose ways to achieve them and document their achievement [32]. The process attempts to reduce micromanagement and increase the degree of co-management by transferring part of the responsibility for fisheries management to resource users. This approach was initially conceptualized for European fisheries within European waters but first tested within the EU H2020 project FarFish in six European fisheries outside EU waters, involving two high seas cases in the Southwest and Southeast Atlantic and four Sustainable Fisheries Partnership Agreements (SFPA) in Cape Verde, Senegal, Mauritania, and Seychelles. Relevant institutions in partner countries and operators' representatives were involved in the implementation of the RBM approach in a period of four years, extended by six months due to the Covid-19 pandemic. This exercise rendered interesting results for each of the cases but also revealed shortcomings for a broader and more concrete implementation of a participatory, inclusive, and responsive approach to fisheries governance.

This paper summarizes the lessons learnt from the implementation of this approach to RBM within the EU H2020 FarFish project and puts forward a set of policy recommendations for the improvement of the fisheries management through the adoption of RBM for EU vessels fishing in international- and SFPA waters. This is based on key project outputs and additional semi-structured interviews with representatives from partner countries and EU operators about their experiences within the process.

2. A practical framework to Results-based Management

Results-based Management (RBM) involves a principled shift in the division of responsibility between public authorities and industry partners in management issues, where public authorities decide overall objectives, whilst decisions on the means to achieve them are left to the industry [28]. By enabling operators to set objectives according to the authorities' goals and elaborate how they can meet them, RBM reverses the burden of proof by placing responsibilities on the operators' shoulders to document their performance [28]. Data gathering thus becomes a task for which resource users are responsible, allowing for less expensive and higher coverage of data points.

In practice, RBM can be operationalized as a contract between the "authority" and one or more "operators", where both parties agree on a Management Recommendation (MR), outlining strategies to achieve management objectives set through the RBM process [26]. These objectives should be specific and measurable requirements that reflect the policy goals in terms of biology, environment, social and economic aspects [35]. The MR should be subject to an evaluation by a third, independent party designated by the two parties in the RBM contract as the 'auditor'.[2] The three parties involved should meet specific requirements to adhere to the RBM contract. The authority should be a democratically accountable entity entrusted with the resource management. The operator should be an organised group of resource users, e.g. fishermen associations with access rights to the fishery. Finally, the auditor must be an independent agent with capacity to audit the implementation and performance of the MR. The RBM process and responsibility flow is depicted in Fig. 1.

This conceptual framework was tested in the EU H2020 FarFish project. Within this research and innovation framework, the authorities' leading role was taken by scientific institute Matís in consultation with national and regional entities[3] relevant within fisheries management in the six case studies (CS). These entities included Regional Fisheries Managament Organization (RFMO), National Fisheries Departments, Research institutes, as well as the Directorate-General for Maritime Affairs and Fisheries EU commission – DG MARE. The operators were represented by the Long Distance Advisory Council (LDAC) with participation of relevant associations of Europeran operators active in the CS areas.[4]

The RBM implementation began by conducting pre-invitation dialogues, where authorities' and operators' representatives within the project set the ground for initiating the RBM process, discussing costs and benefits, potential obstacles and their roles and responsibilities in it. Then, the authority sent an invitation to the operators to develop a MR providing measurable goals to achieve [34]. The operators responded with a MR proposal, describing how these could be achieved through suggested management measures called Outcome Targets (OTs) [25]. For developing the OTs, the operators cooperated with scientific institutes, to increase the effectiveness and robustness of the MR. The authorities then requested revisions and clarifications before approval. The approval should be preceded by a public hearing to promote transparency and public awareness, yet this step was not taken within FarFish, due to the research nature of the action. The first MR was approved, implemented by the operators involved and audited to verify whether the documentation system fulfilled the requirements stipulated within the RBM contract [2]. A second iteration was conducted to implement audit results and apply responsive and adaptive principles to the first MR version [36]. The second MR was audited on performance effectiveness and compliance [1]. The final audit results were implemented into a final MR presented at the end of the project [4]. Due to the nature of the action, implementing the results from the final MR is not mandatory. However, they could serve as a blueprint for the actual uptake of this management framework.

3. Operationalizing the principles of RBM in FarFish case studies

In FarFish, RBM was operationalized in six case studies,[5] first characterized in Erzini et al. [10]. Within this project, a pool of research organizations implemented RBM in collaboration with relevant fisheries institutes at national and regional level, as well as European fisheries associations actively operating in the CS areas. This experience allowed for the involved parties to experience, in a structured manner, what sharing power and responsibility for managing the resource would look

[1] This framework was initially named Responsive Fisheries Management System (RFMS) within the EcoFishMan project [26], however this term has not been further utilized to describe it.

[2] A broader description of the RBM concepts can be found in [20]

[3] Detailed information about the involved partners can be found in Viðarsson, Fridríksdottir, et al. [34]

[4] ORPAGU (Organization of Longliners Guardenses of A Guarda, Pontevedra), OPAGAC (Organisation of associated producers of large tuna freezer vessels, representing the purse seine fleet), OPROMAR (Organization of Fresh Fish Producers of the Port and Ría de Mar, Spain), ANFACO (National Association of Fish and Seafood Canning Manufactures)

[5] A detailed description of the six Case Studies and their main results within the H2020 FarFish project can be found at https://farfish-summary.shinyapps.io/FarFish/

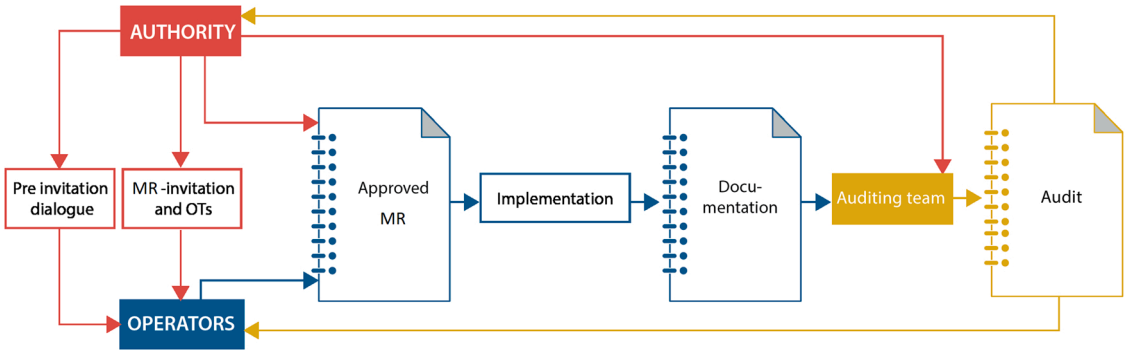

Fig. 1. Conceptual framework to RBM adapted from Nielsen et al. [27]. Responsibilities of the three entities in different colours. Authority in red, operators in blue and auditor in yellow. (For interpretation of the references to colour in this figure, the reader is referred to the web version of this article.)

like. Extensive dialogues added trust and accountability to a result-oriented process. Due to the nature of this action, the project results were not formally adopted within the local or regional management framework, but serve to advance towards implementing RBM in the fisheries outside EU waters.

3.1. The role of the Authorities

Within the project, the entities representing the "authority" for each case, identified relevant issues to solve together with the participating operators. In line with the main topics established within the SFPAs, the authorities were most interested in improving the scientific knowledge base for fisheries management through data collection, supporting the fight against illegal, unreported and unregulated (IUU) fishing by improving Monitoring, Control, and Surveillance (MCS) through latest available systems and, building knowledge in value chain conditions [33,36]. The identified issues correspond to sectoral support target areas from the SFPAs, intended to contribute towards efficient data collection schemes and improving MCS measures, as well as supporting research institutions and capacity building towards sustainable fisheries policies [15,23]. Authorities' representatives also identified barriers to achieve the local fisheries management and SFPA's goals. These barriers were assessed through PESTLE analysis, which analyses Political, Economic, Social, Technological, Legal and Environmental factors impacting an organization or an industry.

In Cape Verde and Seychelles, both referring to tuna agreements, the main barriers identified for adequate fisheries management were technological and political. Political factors refer to the existence of three or more management regimes for tuna fisheries, from the RFMO,[6] the coastal state, the flag state, imposing different documentation requirements to the operators, creating a wealth of data with little consistency in data transfer, processing, and treatment [25]. Technological issues refer to local systems compatibility with foreign fleet systems and stable internet access needed for receiving and processing Vessel Monitoring System (VMS) data [25,36] to ensure compliance. These technological and political factors impede achieving goals related to data collection and MCS. In accordance, in both cases, the goals defined within the RBM were to ensure reception of Automatic Identification System (AIS) and/or VMS signals from all vessels and develop a method for harmonizing data protocols and reporting of the fleets.

For Mauritania, the authorities's representatives highlighted the complexities of these mixed fisheries throughout the process. Political, technological, environmental, social, and economic factors associated with the management of the stocks were highlighted. Short-term trade-offs between profitability and biological sustainability seem to be favouring the former, which has led to overexploitation of resources [10]. In small pelagic and demersal fisheries, social and environmental challenges related to overexploited stocks emerged, as the cohabitation between industrial fisheries for fish meal processing and artisanal fishers for human consumption seem to favour the former for employment creation, to the detriment of food security and sustainability of the stocks [37]. Authorities' representatives within the project emphasized that scientific knowledge needs to increase, improve, and be incorporated into management decisions [5]. From the operators' side, the lack of regional coordination for pelagic and demersal stocks was highlighted [29]. These issues were included in the RBM goals, focusing on improving scientific knowledge through data collection, increase observer coverage and knowledge on market and trade flows, to provide a socio-economic dimension to the current assessment models to facilitate decision making [10].

In Senegal's mixed fisheries, the main challenge is environmental, with diminishing resources due to overexploitation. Political and technological challenges result in insufficient capacity to monitor and surveil to different fishing segments and their bycatch. Economic challenges are associated to limited contribution from fisheries other than tuna to the local economy. The RBM focused then on black hake fisheries aiming to improve stock assessment, data collection for MCS and knowledge in trade flows.

In the two high seas, the RBM implementation was atypical in contrast to the SFPA cases. The two cases faced important challenges prior to starting the RBM process. In the South-West Atlantic (SWA), lack of a RFMO constituted a major challenge due to the absence of a competent authority over the Areas Beyond National Jurisdiction (ABNJ) in the area FAO 41, where several international fleets including the EU are active. In the South-East Atlantic (SEA), in contrast, the fisheries activity by the EU fleet was insignificant in recent years, although a competent RFMO[7] is in place.

3.2. The role of the Operators

The operators' representatives involved in collaboration with research institutes, developed the MR documents. They proposed strategies to accomplish the goals set, by developing OTs and setting specific, measurable, assignable, relevant, and timely (SMART) indicators for each of them. Within the RBM contract, the operators committed to provide documentation to facilitate the audit of the MR, reversing the burden of proof and increasing their own accountability. The operators identified needs for more detailed data reporting and harmonization of existing reporting systems. In Seychelles and Cape Verde, the operators conducted a data flow gap analysis to overcome bottlenecks in catch data reporting and transmission. To increase the scientific knowledge

[6] In both cases the International Commission for the Conservation of Atlantic Tunas (ICCAT)

[7] Southeast Atlantic Fisheries Organization (SEAFO)

available in Mauritania and Senegal, the operators adhered to conduct science-industry initiatives, such as the self-sampling programme [12], for species identification onboard their vessels. Towards supporting the fight against IUU, operators developed OTs focused on providing AIS or VMS data for compliance assessment, supported the increase of observer coverage through capacity building and lastly, supported the goal to increase trade flow data for better knowledge on value chain conditions. These activities were executed within a framework of voluntary adoption within the RBM test done in H2020 FarFish project.

The OTs developed reflected the results of multiple dialogues between the parties, yet some challenges remained. According to the operators' representatives, the RBM process needs to acknowledge their limited capacity for achieving the OTs. Further, they considered the RBM as a theoretical framework which was challenging to adjust to their needs and expectations in the context of international fisheries [29]. Furthermore, it was highlighted that the existence of multilevel governance structures made by national and international authorities managing their fisheries and the lack of participation of non-EU fleets competing in the same fishing grounds need to be acknowledged [29]. Finally, involving scientific institutions was considered useful, as it allowed expanding the knowledge range and served as a bridge between science, local and resource users' expertise.

4. Case-specific experiences from implementing RBM framework

Improving scientific knowledge in all the SFPA case studies, through data collection and data sharing processes, was a top priority. In Cape Verde, the goal was to improve data collection in conformity with ICCAT on catch and bycatch of swordfish and blue shark. This goal was set due to high uncertainty in ICCAT's data collection and/or processing for blue shark caught by the EU fleet in large volumes. Such uncertainty was acknowledged by ICCAT, to affect the quality of scientific data applied in stock assessment and hampered the practice of more sustainable fisheries for these species [21]. The need to harmonize data collection and processes between EU and ICCAT was also a concern of the operators. Finding this common challenge enabled the RBM process. The EU fleet operators proposed developing an operational method for harmonizing data protocols and reporting of swordfish and blue shark, including improved data recording in e-logbooks of all catches (target- and bycatches) [25]. The target was defined as "OT 3.1 harmonized catch data protocol in place that facilitates improved reporting of swordfish and blue shark commercial and biological data" [4]. For this, the EU operators committed to provide more detailed information in their e-logbooks to fill data gaps. Meanwhile, the authorities should increase their capacity to assess the data and implement the harmonized protocols, in coordination with other relevant bodies (RFMOs, flag-state, etc). To increase data processing capacity, authorities' representatives were supported by scientific partners to assess the stock of bycatch species, through a Data Limited Model for stock assessment (FarFish-DLM tool) developed and implemented within the project [31]. The implementation of harmonized protocols was not feasible as it needed coordination with international fisheries bodies. However, it was reported that ICCAT is working on harmonising data collection from tuna fisheries and towards implementing existing proposals in the long-term [4]. Benvindo Fonseca [18] from the Instituto do Mar – IMAR in Cape Verde, highlighted the importance of involving all relevant national bodies in the RBM process to ensure adequate implementation of defined actions.

In Mauritania and Senegal, the most relevant issue was the lack of data for stock assessment. In both cases, black hake fisheries were prioritised allowing for a regional perspective within the RBM, as this stock assessment is carried out in the Fishery Committee for the Eastern Central Atlantic (CECAF) [11]. In both cases, authorities set the goal of improving stock discrimination of two species of black hake, i.e. *Merluccius polli and Merluccius senegalensis* [36]. In response, the operators in collaboration with a scientific institute, suggested training the crew in visual identification of the two species and collecting fin samples onboard for molecular analysis to be verified at the scientific institute. The OT was approved in the MR as "Information on the proportion of the two species of black hake in catches provided" [4]. In these two cases, collaboration between operators and scientific partner enabled the implementation of the self-sampling method [12], proving it cost-effective for improving stock assessment quality [13]. In Senegal, the scope of the self-sampling method was extended to the artisanal fleet targeting small pelagics, to obtain data on black hake bycatch, possible due to the participation of the Centre de Recherches Océanographiques Dakar-Thiaroye de l'Institut Sénégalais de Recherches Agricoles (ISRA-CRODT) in the RBM process [7]. They successfully extended the action to other fleets, allowing for more data to improve knowledge on black hake fisheries and to separate the assessment of the two species [13]. In contrast, in Mauritania the involvement of other non-EU fleets was hampered by what was considered as mismanagement of the participatory approach within the RBM process. Khallahi Brahim, scientific advisor of the Mauritanian Institute of Oceanographic and Fisheries Research (IMROP) considered that the management of the participatory aspect of the RBM is pivotal for the success of the process. He considered that engaging representatives from other fleets' associations could have benefited the process. Failure to involve high representatives from the national fisheries association in Mauritania to relevant meetings within the RBM process, discouraged their participation, hampering the wider implementation of the self-sampling method [5]. Nevertheless, the RBM was fruitful in portraying the importance of adequate interaction between authorities, operators, and scientific institutes. In Mauritania, scientists' advice lack relevance within the fisheries management dialogue resulting in scientific advice not being followed to the detriment of sustainable fisheries [5]. He considered that the structured dialogues and participatory approach within RBM were fundamental to bring light to the role of research institutes in the fisheries management dialogue.

Actions towards improving MCS, were included by authorities' representatives as management goal in all four SFPA cases. The operators' representatives in collaboration with research institutes, proposed an OT to verify operators' compliance in transmitting VMS and/or AIS signals through a big data analysis. This analysis consisted in comparing reported VMS data with AIS data from Global Fishing Watch (GFW) using latest available satellite systems [31]. The data analysis[8] showed that comparing AIS and VMS signals was a useful method to verify compliance levels [9]. Yet, this task was not without challenges. In Cape Verde, issues with system compatibility for transmission and reception of VMS signals by the EU vessels and local authorities were identified. The active participation of the Cape Verdean fisheries authority, DGRM, enabled this issue to be solved within the project's lifetime [4]. Yet, the lack of involvement from the General Inspection of Fisheries (IGP), the entity in charge of data management, meant that VMS data was not obtained to conduct the data analysis.

Similarly, in Seychelles, improving MCS was fundamental for the authorities. Three out of six OTs aimed to support the fight against IUU fishing, whether by increasing observer coverage, verifying compliance in honouring marine protected areas (MPAs) and no-take zones and, within the Seychellois' EEZ. For these OTs, AIS and VMS data was required. Yet, legal restrictions affected the implementation of the actions, as the Seychelles Fisheries Authority (SFA) was unable to share VMS data unless for search and rescue purposes, reasonable grounds for believing that an offence is being or about to be committed, or for criminal investigations [4]. The data therefore was not available for the analysis, hampering the success of these three targets. This was attributed to overly ambitious management goals without adequate scoping

[8] Results from the data analysis available at https://farfish-summary.shinyapps.io/FarFish/

and lack of time to solve the restrictions identified for data sharing.

In contrast, in Senegal, adequate involvement of relevant partners resolved potential issues with data availability. In that instance, despite the fact that the VMS data was not provided by the compliance authority either, the issue was solved through cross-checking AIS signals via GFW with the list of vessels providing VMS signals facilitated by Senegalese research institute ISRA-CRODT [9]. This exercise showed that even with limited data available, data analysis was a useful method to achieve more transparency for MCS purposes [4].

In the South-East Atlantic (SEA), EU vessels have not been fishing in this area since 2017. Due to the low fishing effort, the European operators' representatives had no incentive to participate in the RBM process and therefore opted out from the outset. In this case, RBM served to demonstrate good practice recommendations, focusing on improving monitoring for sustainable fisheries. These recommendations could be adopted by SEAFO who was informed of these results.

In the South-West Atlantic (SWA) high seas, a RFMO is not possible due to the ongoing dispute between the UK and Argentina over the sovereignty of the Falkland Islands/ Islas Malvinas. This regulatory gap leads to overexploited resources [24], depleted stocks and less profitable and sustainable fisheries. Within the RBM process, the involved parties, identified a lack of level playing field for international fleets in the high seas' fisheries. The operators suggested, enabling a platform for dialogue in the form of an international conference that could contribute towards this challenge. It was also agreed that this conference could serve as a model for setting up a soft-law mechanism focused on sustainable management in ABNJ (FAO 41, subareas 41.3.1 and 41.3.2). The aim was to tackle the political constraint by giving priority to the environmental challenges affecting both the biological productivity and economic profitability of the fisheries. The conference hosted by the Long Distance Advisory Council - LDAC and the Centro Tecnológico del Mar - CETMAR in March 2021 was delivered online with the goals of understanding potential paths for scientific cooperation in the area, bringing together international experts to share their knowledge to a broader audience (managers, scientists, policy makers, fishing industry and NGOs) and lastly, supporting sustainable fisheries management, strengthening level playing field among international stakeholders [17]. The second issue in the SWA was the lack of sufficient MCS which was tackled though a big-data analysis, by combining two independent data sources (AIS and VIIRS-DNB[9]) to measure the degree of consistency of remote sensing. The results of this analysis provided evidence to support the value of remote sensing as a relevant tool to add transparency and support compliance of fishing activities in vast and distant regions of the ocean [30].

5. Policy recommendations for improved management through the adoption of RBM for EU vessels fishing in international- and SFPA waters

Based on the lessons learnt from the international experience and practical implementation of the RBM approach in European fisheries outside Europe waters, the following policy recommendation are proposed for improving fisheries management through the implementation of a conceptual framework of RBM.

5.1. Participation and stakeholder involvement

1. Involve the right actors: It is critical to identify and involve all relevant partners in RBM. The lack of participation of relevant bodies such as inspection authorities, compliance, data management entities and operators from other fleets limited the implementation and the extent to which the actions could be implemented. Involving the right partners can be achieved through adequate scoping and mapping of the national fisheries management framework. This facilitates understanding how the fishieries sector gathers, dialogues and works. In Senegal for example, participating research institute ISRA-CRODT was the right partner within RBM. They fulfill the crucial role of gathering national operators and directly advising the government over fisheries policy, ensuring the right pathway towards the implementation of RBM at the national level [8]. Differently in Cape Verde, not an institution but an event was the right platform to involve the right partners. There, the industry gathers annually in the National Fisheries Council, where fisheries management is discussed and decisions are published in the official journal. This event would also serve to proposing and adopting RBM in Cape Verde [19]. Other cases presented more complicated management structures, such as Mauritania, where decisions are more hierarchical. Therefore, RBM should be included in the national fisheries policy strategy, discussed annually [6]. However, this discussion does not effectively involve all relevant actors in the sector yet. In summary, involving all needed actors requires scoping and a mapping of the fisheries sector within the partner country.
2. Manage participation. In connection to the previous point, with diverse actors involved, it is fundamental to manage participation within RBM. This should be attained by a designated party dedicated to coordinate and enable effective communication and engagement of all actors. Participation management should be considered a core task which needs to be handled impartially considering cultural, social and political traits, protocols, and courtesies, and when working in an international setting, also language barriers. Everyone who should be invited, must be invited, and actively involved from the beginning, to ensure their participation is meaningful, valued and well understood. The case of Mauritania showed that not involving relevant partners discouraged further engagement in the RBM process and rendered less advancements towards improving fisheries management.
3. Ensure adaptive and responsive RBM through multiple iterations. Structured dialogues and multiple iterations within RBM empower and increase accountability of local administrative bodies. The constant interactions between operators, authorities and research institutes for developing, revising and adopting the MRs allow building trust among the actors through the identification and achievement of common goals. These planned iterations and dialogues also enable the identification of outstanding issues potentially overlooked in initial stages of the process, allowing for adaptability and responsiveness of the management process. Road mapping is a good exercise within RBM to visualize the required actions to achieve the management goals and targets, clearly defining timing of the actions and responsible parties.

5.2. Scoping the legal framework and the importance of inclusive dialogue

1. Scope the legal framework: Together with mapping the fisheries sector for involving the right partners, scoping the legal framework is necessary to set management goals and targets achievable within the RBM timeframe. Finding gaps in the legislation for implementing the management goals is fundamental at an early stage. This can be done within the pre-invitation dialogues in the RBM framework. In Far-Fish, management goals were set to advance towards provisions included in the SFPA, yet the national legislation did not support these provisions. Such was the case of Cape Verde, where provisions for an observer program in the national fisheries legislation are lacking, despite being required to EU vessels within the SFPA [4]. In Seychelles and Senegal, legal limitations to data sharing hindered the goal of verifying compliance and level playing field as defined with the MRs. Adequately scoping any limitations from the legal framework ensures that the management goals and targets within the RBM process are achievable.

[9] Visible Infrared Imaging Radiometer Suite (VIIRS) supports a Day-Night Band (DNB)

2. Find common goals through dialogue: Pre-invitation dialogues are also fundamental to understand current needs and challenges from the authorities that can be common to those of the operators. In this dialogue, authorities and relevant intitutions in charge of the fisheries policy, operators implementing it and research institutes supporting it, are able to expose the most relevant and current issues in a structured manner. When these challenges are identified as common and the parts consider it cost-beneficial to solving together, then the RBM is enabled and encouraged. Participation and effective engagement of the different partners in the dialogue process and public hearings should be managed to ensure effective engagement, as mentioned previously.
3. Manage expectations: The content of the RBM contract should tackle identified common challenges by setting realistic goals and targets that are achievable in the timeframe of the contract. The definition of the outcome targets should be evaluated through SMART analysis. For this, the role of an independent auditor is helpful to ensure the adequate implementation of the RBM framework. From the experience in the Seychelles case, it was important to adjust the expectations and ambitions. In this case, adjusting the scope and aiming for more realistic goals rather than setting too ambitious targets could have been more effective. Such situations can be identified through the audit process.

5.3. Give priority to transparency – Data management policy to enable secure data sharing for knowledge building

1. Prioritize reporting and data availability: A common challenge identified in the project was that despite a wealth of data reported by the EU fleet, the partner countries had insufficient capabilities to process the data. Through the RBM process, relevant tools for processing data efficiently were developed in collaboration with research institutes. Furthermore, tailored courses and trainings were developed to strengthen local capacity on stock assessment with data limited methods, self-sampling, and big-data analysis for assessing compliance. Another main challenge was the access of existing data due to limitations in data sharing. For this, although data should continue to be protected according to international standards, consideration should be given to a data management policy that enables secure data sharing for scientific purposes. Also, the post-harvest sector, including ports authorities and the processing sector should be accountable for data sharing as they are crucial for building knowledge on value chains and the business sector. Closer collaboration and involvement of these actors can facilitate data sharing, when sensitive market data protection methods, such as aggregation, indexing and anonymization, are ensured.
2. Ensure continuity through scientific collaboration. Some of the most successful actions implemented through the RBM process in FarFish were those that entailed scientific exchange of tools and knowledge. The FarFish-DLM tool, the self-sampling protocol, as well as training programs developed, will live beyond the life of the project. Hence, science-industry cooperation is a good way to ensure continuity and long-term effects of the actions. Within RBM, partners should favour management goals and targets that require continuous implementation, create accountability on the success through planned evaluations, and allocate resources to ensure adoption, utilization, revision and adaptation of developed tools and methods.
3. Broaden the scope: Extending actions from RBM to other fleets, fisheries categories and the post-harvest sector renders important advancements. This was seen in Senegal, where the self-sampling actions were extended from the EU industrial fleet to the Senegalese fleet, which was a result of adequate participation of national research institute ISRA-CRODT enabling engagement of relevant operators. By broadening the scope, the resources destined to develop this action were more efficiently utilised, as data coverage increased. In addition, fishers in the participating fleets obtained additional skills to contribute to stock assessment. Also, these results showed great potential to be extended to other cases, where other fleets are involved [13]. In contrast, the processing and commercialization sector remained fairly disengaged in the RBM process although in all case studies authorities's representatives were keen on building knowledge on the value chain and market aspects of the fisheries sector. Involving more actors along the value chain would unfold the potential of the RBM framework by opening collaboration channels, enriching knowledge exchange, and identifying common goals among a broader range of relevant actors in the fisheries sector. By doing so, management decisions will increase their legitimacy in a larger societal context [22,28].

6. Final remarks on the implementation of RBM in international fisheries

The policy recommendations drawn in the previous section build on lessons learned from the operationalization of RBM principles in European fisheries outside EU waters within the H2020 research and innovation project FarFish. After four and half years of collaboration, participating representatives from partner fisheries nations within the project had the opportunity to reflect on how the RBM framework could be implemented in their fisheries and also within the SFPAs.

Participation management was highlighted as a pivotal factor for the success of the RBM approach. The experience within FarFish showed that enabling full participation and engagement is a great challenge, with room for improvement in all case studies. Effective and meaningful participation and engagement are only possible when managed as a priority. Other lesson from this experience showed that the structured dialogue process, planned evaluations and multiple iterations planned within this RBM framework worked well to enable responsiveness, adaptation, and continuous improvement of the management process. Additional lessons were drawn on the importance of scoping, goal setting and timing of the actions, as well as how to manage the expectations of the goals set within RBM. Data availability and accountability were also a major highlight, considering that in cases where cooperation succeeded, data was made available, and knowledge was expanded and enriched.

The experiences from partners countries' representatives reflect on these lessons. Benvindo Fonseca, from Cape Verde stated "we are just grasping the extent to which this approach could serve to manage our fisheries" [18]. He also considered that "the tools developed during the FarFish project, such as the FarFish-DLM Tool, are a great contribution towards building our scientific capacities" [18]. From Senegal, Mamadou Diallo from COREWAM considered that "there is great potential in continuing implementing this approach and extending it to other aspects of fisheries' management, and other fishing categories and fleets. This approach should continue to be encouraged and supported" [7]. In addition, and further reflecting on the implementation of RBM in fisheries management, a common view was that the framework should be adopted first at the national level [6,8,19]. This could be facilitated and encouraged by extending collaborations such as those enabled through the FarFish project. They also manifested that the conditions to implement this framework at the national level are in place. Therefore, incorporating RBM in the international fisheries framework is a subsequent step, once the national adoption is achieved. For international fisheries, the partner country representatives all stressed that RBM should be included in the SFPAs, to ensure uptake by international operators [6,8,19]. Giving priority to the national adoption of the RBM framework, legitimates and validates the efficient uptake of this management framework, guaranteeing its effective extention to the international fisheries sector.

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CRediT authorship contribution statement

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Declaration of Interest

The authors declare no conflict of interest. The views of the authors may not neccesarily reflect the official position of their respective organizations. All authors confirm that this manuscript has not been published elsewhere and is not under consideration by another journal and that all authors have approved the manuscript and agree with its submission to Marine Policy.

References

[1] J. Arias-Hansen, I. Kvalvik, Ø. Hermansen, M. Svorken, G. Touron-Gardic, D. F. Vidal, M.M. Rincón, S. Agnarsson, U. Laksá, FarFish D5. 4 Audit Manag. Recomm. 2 (2021).
[2] J. Arias-Hansen, T.T. Nguyen, O. Gregersen, D.F. Vidal, R.C. Pérez, I. Kvalvik, FarFish D5. 1 Audit Manag. Recomm. 1 (2019), https://doi.org/10.5281/ZENODO.4555772.
[3] F. Berkes, Evolution of co-management: Role of knowledge generation, bridging organizations and social learning, J. Environ. Manag. 90 (5) (2009) 1692–1702, https://doi.org/10.1016/J.JENVMAN.2008.12.001.
[4] J.N. Boampong, K. Olsen, D. Jensen, A. Kochanska, A. Rodriguez, S.M. Doblado, R. Chapela, M. Ballesteros, D.F. Vidal, J. Ruiz, G. Navarro, M. Rincón, T. Francisco, J. Martin, K. Erzini, K. Stobberup, I. Kvalvik, T. Ndiaga, M. Herrera, V. Lucas, FarFish D4. 4 Manag. Recomm. 2 each case Study (2021).
[5] Brahim, K. (2021). *Personal interview with scientific advisor of the Mauritanian Institute of Oceanographic and Fisheries Research (IMROP) - recording available in French*.
[6] Brahim, K. (2022). *Interview with Mauritanian CS leader and scientific advisor of the Mauritanian Institute of Oceanographic and Fisheries Research (IMROP)* .
[7] Diallo, M. (2021). *Interview with Senegalese CS Leader and scientific advisor in COREWAM*.
[8] Diallo, M. (2022). *Interview with Senegalese CS Leader and scientific advisor in COREWAM*.
[9] Doblado, S., & Rodriguez, A. (2020). *Analysis of AIS and VMS data within the waters of Mauritania and Senegal by LDAC*. In prep.
[10] K. Erzini, J.M.S. Gonçalves, J.A. Galvão, E. Da Cruz, B. Khallahi, K. Elkalay, L. Grønnevet, L. Aodha, M. Diallo, M. Fall, J. Ruiz, M.M. Rincón, FarFish D2. 1. Case Study Character 1 (0) (2017), https://doi.org/10.5281/zenodo.1445512.
[11] K. Erzini, K. Stobberup, J. Galvão, V. Lucas, M. Diallo, K. Brahim, B. Fonseca, A. Staby, N. Thiam, FarFish D2. 5 Rev. Curr. Stock Assess. Models Use FarFish Case Stud. (2020), https://doi.org/10.5281/ZENODO.4555710.
[12] K. Erzini, K. Stobberup, V. Lucas, N. Mikkelsen, Templates Protoc. self-Sampl. (2018), https://doi.org/10.5281/ZENODO.3066162.
[13] K. Erzini, D.F. Vidal, G. Machado-Schiaffino, C.B. Fernández, T. Ndiaga, M. Diallo, K. Brahim, K. Stobberup, FarFish D2. 7 Rep. Success self-Sampl. Program. (Issue 2) (2020).
[14] European Commission. (2009). GREEN PAPER - Reform of the Common Fisheries Policy. ⟨https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0163:FIN:EN:PDF⟩.
[15] European Parliament, International fisheries relations | Fact Sheets on the European Union | European Parliament, European Parliament,, 2021, p. 6. ⟨https://www.europarl.europa.eu/factsheets/en/sheet/119/international-fisheries-relations⟩.
[16] European Parliament, The common fisheries policy: origins and development | Fact Sheets on the European Union | European Parliament, European Parliament,, 2021, p. 6. ⟨https://www.europarl.europa.eu/factsheets/en/sheet/114/the-common-fisheries-policy-origins-and-development⟩.
[17] FarFish. (2021). Sustainable Fisheries Management in SW Atlantic: A Scientific approach. Virtual Conference: Sustainable Fisheries Management in SW Atlantic: A Scientific Approach, 5. ⟨https://www.farfish.eu/international-conference/⟩.
[18] Fonseca, B. (2021). *Interview with Cape Verdean CS leader and technical advisor of the Instituto do Mar - IMar - recording available in English*.
[19] Fonseca, B. (2022). *Interview with Cape Verdean CS leader and technical advisor of the Instituto do Mar - IMar*.
[20] R. Fridríksdottir, J. Viðarsson, FarFish D3. 1 Gen. Guidel. Mak. MRs (2018), https://doi.org/10.5281/ZENODO.3073298.
[21] ICCAT. (2018). Report of the Interessional Meeting of the sharks species group. ⟨https://www.iccat.int/Documents/Meetings/Docs/2018/REPORTS/SHK_2018_ENG.pdf⟩.
[22] S. Jentoft, Legitimacy and disappointment in fisheries management, Mar. Policy 24 (2) (2000) 141–148, https://doi.org/10.1016/S0308-597X(99)00025-1.
[23] I. Kvalvik, M. Svorken, J. Arias-Hansen, D. Fernández Vidal, K. Nolde Nielsen, FarFish D3. 10 - Pay. Fish. Go Sustain. Fish. Partnersh. Agreem. – Anal. Dev. EU Fish. Access Agreem. (2021).
[24] M.C. Melnychuk, N. Baker, D. Hively, K. Mistry, M. Pons, C.E. Ashbrook, C. Minto, R. Hilborn, Y. Ye, Global trends in status and management of assessed stocks: achieving sustainable fisheries through effective management, FAO Fish. Aquac. Tech. Pap. (No. 665) (2020), https://doi.org/10.4060/cb1800en.
[25] N. Mikkelsen, K. Olsen, A. Rodriguez, S.D. Martín, D.F. Vidal, R.C. Pérez, M. Ballesteros, K. Stobberup, K. Erzini, M. Herrera, J. Morón, Y. Roucou, K. N. Nielsen, I. Kvalvik, A. Staby, K. Elkalay, F. Teijeria, J. Martin, J. Ruiz, J. R. Viðarsson, FarFish D4. 3 Manag. Recomm. 1 each case Study (2019), https://doi.org/10.5281/ZENODO.4555595.
[26] K.N. Nielsen, M. Aschan, M. Ballesteros, J.L. Santiago, R. Chapela, J.R. Viðarsson, EcoFishMan D4. 7 Doc. Test. RFMS Des. Revis. (2014).
[27] K.N. Nielsen, M.M. Aschan, S. Agnarsson, M. Ballesteros, A. Baudron, M. Borges, F. de, A. Campos, R. Chapela, A.K. Daníelsdóttir, K. Erzini, Ó. Gregersen, P. Holm, A. Lucchetti, S. Margeirsson, H.V. Mendes, P. Olsen, M. Rangel, A. Sala, J. L. Santiago, P.G. Fernandes, A framework for results-based management in fisheries, Fish Fish 19 (2) (2017) 363–376, https://doi.org/10.1111/faf.12257.
[28] K.N. Nielsen, P. Holm, M. Aschan, Results based management in fisheries: Delegating responsibility to resource users, Mar. Policy 51 (2015) 442–451, https://doi.org/10.1016/j.marpol.2014.10.007.
[29] Rodriguez, A. (2021). *Personal interview Executive Secretary of the Long Distance Advisory Board - LDAC*.
[30] J. Ruiz, I. Caballero, G. Navarro, remote sensing, Sens. Same Fish. Fleet AIS VIIRS: A Seven-.-. -Year Assess. Squid Jiggers FAO Major Fish. Area 41 (2019), https://doi.org/10.3390/rs12010032.
[31] J. Ruiz, M. Rincón Hidalgo, FarFish D6. 7 Rep. DSTs Use case Stud. Dev. MR1 (2020), https://doi.org/10.5281/ZENODO.4581958.
[32] J.L. Santiago, M.A. Ballesteros, R. Chapela, C. Silva, K.N. Nielsen, M. Rangel, K. Erzini, L. Wise, A. Campos, M.F. Borges, A. Sala, M. Virgili, J.R. Viðarsson, A. Baudron, P.G. Fernandes, Is Europe ready for a results-based approach to fisheries management? The voice of stakeholders, Mar. Policy 56 (2015) 86–97, https://doi.org/10.1016/j.marpol.2015.02.006.
[33] J. Viðarsson, R. Fridríksdottir, N. Mikkelsen, M. Aschan, A. Rodriguez, J.A. Galvão, M. Diallo, M. Fall, L. Grønnevet, B. Fonseca, K. Brahim, V. Lucas, FarFish D3. 2 First MR Invit. Submitt. case Stud. (2018), https://doi.org/10.5281/ZENODO.3073563.
[34] J. Viðarsson, R. Fridríksdottir, N. Mikkelsen, M. Aschan, A. Rodriguez, J.A. Galvão, M. Diallo, M. Fall, L. Grønnevet, B. Fonseca, K. Brahim, V. Lucas, FarFish Deliverable 3.2, First MR Invit. Submitt. case Stud. (2019) 1–68, https://doi.org/10.5281/zenodo.3073563.
[35] J. Viðarsson, R. Friðríksdóttir, S. Ragnarsson, FarFish D3. 5 Draft 2 Gen. Guidel. Mak. MRs (2019), https://doi.org/10.5281/ZENODO.4565727.
[36] J. Viðarsson, R. Friðríksdóttir, S.Ó. Ragnarsson, K. Olsen, N. Mikkelsen, M. Aschan, S.D. Martín, A. Rodriguez, D.F. Vidal, R.C. Pérez, M. Ballesteros, J. Galvão, L. Grønnevet, A. Staby, B. Fonseca, K. Brahim, E. Kane, M. Diallo, N. Thiam, K. Karima, FarFish D3. 6 Second Manag. Recomm. Invit. Submitt. case Stud. (2020), https://doi.org/10.5281/ZENODO.4580234.
[37] Pierre Failler, Grégoire Touron-Gardic, Juliana Arias, Alexandre Rodríguez, Sonia Martin Doblado, Øystein Hermansen, Report on potential return on investments: Cost-benefit analysis of potential EU fleet investments in selected Case Studies, Zenodo (2020), https://doi.org/10.5281/zenodo.4445981.