ACTIVITY BASED RESOURCES ALLOCATION (ABRA) MODEL ON ASSESSING COST-EFFECTIVENESS OF IMTA INSTALLATIONS

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Introduction

For the purposes of IMPAQT project (H2020, GA 774109), the research team assigned to assess the cost effectiveness of Integrated Multi-Trophic Aquaculture (IMTA), exploring methodologies to evaluate IMTA against mono-culture installations, being the previous state on Marine Institute site, the leading project's pilot partner. Combining existing literature and actual day-to-day observations on the pilot site provided by both managerial and research executives, Harokopio University and Marine Institute research teams worked on the activity-based resources allocation (ABRA) model to assess the cost-effectiveness of IMTA. The model provides allocation by both activity and species on site, in order to provide a clear before/after comparison.

Literature review

According to Krishnan (2006), activity-based costing (ABC) is a system that reduces the level of random cost allocations associated with the traditional costing systems. ABC improves decisions making, involving resource allocation, product mix, pricing and marketing (e.g. Mishra et al., 2017; Homburg et al., 2018).

Kumar and Mahto (2013) suggest ABC as a costing methodology that identifies activities in an organization and assigns the cost of each activity to all products and services according to the actual consumption.Analysis usescost drivers, factors that relate to a change in the cost of every business activity. Due to this, a cost driver is a measure of the amount of resources consumed by an activity.

Porter (1985) suggests a cost driver can be used to optimize and coordinate the performance of activities. In Activity-Based Costing (ABC) a large number of diverse cost drivers may be used, between resources - activities and between activities - products. ABC allows an in-depth product analysis by explaining the relationships between the products and activities.

Methodological steps

ABRA model focuses on cost-effectiveness assessment on the finfish pilot Marine Institute, a research centered non-profit organization in Ireland, which added shellfish and seaweed to the existing Atlantic salmon in the framework of the IMPAQT project. After separating installation costs, MI focused on the day-to-day expenses and resources, before and after IMPAQT system, which includes both IMTA and the IADAS IT system providing real-time data, integral for production monitoring (refereed as "D" cost category and associated with two activities, namely "infrastructure maintenance" and "routine inspections", table 2).

The following tables present the results of the ABRA model application in Marine coastal site. For both conditions before and after the deployment of the new system, observations and measurements have been applied in order to estimate the allocation of labor's effort to the various activities. Specific activities, such as stock harvesting , that do not take place every month , have been converted on a monthly rate.

Table 1 - Allocation of labor's effort before the deployment of IMTA & IADAS system

PROCESS : HARVEST MONOCULTURE SPECIES : Atlantic Salmon		ACTIVITIES	Stock deployment	Fish feeding	Mortality removal and disposal	Stock Management	Stock harvesting	Environmental monitoring	Record keeping	Biosecurity	Routine inspections	Stock maintenance	Boat maintenanvce	Infrastructure maintenamce	total
RESOURCES	number	COST/month (€)	1,2%	27,2%	3,9%	3,6%	1,2%	4,9%	4,9%	9,7%	9,7%	4,8%	3,9%	25,1%	100%
Personnel	2	9000	107,62	2448,36	349,74	322,83	107,62	437,22	437,22	874,44	874,44	430,20	349,78	2260,09	9000

Table 2 - Allocation of labor's effort after the deployment of IMTA & IADAS system

PROCESS : HARVEST MULTI-TROPHIC (IMTA) + the IMPAQT platform SPECIES : A, B, C, D		ACTIVITIES	Stock deployment				Fish feeding				Mortality removal and disposal				Stock Management				Stock harvesting				Environmental monitoring			
RESOURCES	number	COST/month (€)	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Personnel	2	9470,32	1,1%	0,2%	0,6%	0,0%	25,9%	0,0%	0,0%	0,0%	3,7%	1,1%	0,0%	0,0%	3,4%	0,0%	0,0%	0,0%	1,1%	0,2%	0,6%	0,0%	0,0%	0,0%	0,0%	0,0%
			107,62	17,89	53,81	0,00	2446,44	0,00	0,00	0,00	349,78	107,62	0,00	0,00	322,86	0,00	0,00	0,00	107,62	17,89	53,81	0,00	0,00	0,00	0,00	0,00

Record keeping				Biosecurity				Routine inspections				Stock maintenance				Boat maintenanvce				Infrastructure maintenamce			
A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
3,0%	0,1%	0,0%	0,0%	9,2%	0,0%	0,0%	0,0%	9,2%	0,9%	0,9%	0,9%	4,5%	0,5%	0,5%	0,0%	3,7%	0,0%	0,0%	0,0%	23,9%	0,9%	0,9%	3,1%
279,82	6,73	0,00	0,00	874,44	0,00	0,00	0,00	874,44	87,44	87,44	87,44	430,47	43,72	43,72	0,00	349,78	0,00	0,00	0,00	2260,09	80,72	80,72	295,97

Results by applying ABRA on the project's pilots

ABRA model resulted the following total costs per species and platform maintenance.

A	B	C	D
89%	4%	3%	4%
8405	362	320	383

A -Salmon in an IMTA Scenario
B - Unfed species, Shellfish
C - Plants, Seaweed
D - IMPAQT Platform

Table 3 -Total cost per species (after)

It is noticeable, that although total labor cost increases, the cost allocated to species A is reduced by almost 7 % (from 9000 to 8,405). This is a very significant outcome that constitutes a part of the overall cost effectiveness analysis which further links cost of resources with the anticipated monetary benefits derived from the implementation of the new system. In other words ABRA model provides a first indication of the new system's prospects based on the expected savings due to the new nature of the activities engaged in IMTA operations. In addition, it identifies the real nature of cost behavior, allowing the monitoring of the resources used to the various activities, contributing to their effective re-engineering and continuous improvement.

References

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