

1 **APPENDIX**

2 **APPENDIX 1. LIST OF INTERVIEWS**

Stakeholders	Position/Occupancy	Number of Interviewees		
		Men	Women	Total
Governments' representatives	Representative of Ministry Marine and Fisheries, Indonesia	4		4
	Representative of Provincial Government in Marine and Fisheries, West Nusa Tenggara		1	1
	Representative of Local Government in Marine and Fisheries, West and East Lombok	4	2	6
	Representative of Local Government in Public Works, West Lombok	2		2
	Representative of Local Government in Agriculture, West Lombok	1		1
POKLINAs	Head of POKLINAs in Lembar, Sekotong, Jerowaru, and Sambelia	4		4
PITAP participants	Aquaculture owner/farmers/caretakers or salt farmers	75		75
Community leaders	Village leaders in Lembar, Sekotong, Jerowaru, and Sambelia	10		10
	Head of community water management group (Pekasih and P3A) in West and East Lombok	3		3
Others	Academician/Lecturer in Universitas Mataram	1	1	2
	Fish seeds supplier		1	1
	Youth in the village	1	1	2
	Total	105	6	111

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5 **APPENDIX 2A. INTERVIEW GUIDELINES: POKLINAS / PITAP PARTICIPANTS /**

6 **COMMUNITY LEADERS**

7 **Strategy:**

- 8 1. Researchers introduce their self and provide brief explanations on:
- 9 • The overview of research
- 10 • The duration of interview – approximately 1 hour
- 11 • The duration of research – approximately 6 months in 2021 with dissemination activities in
- 12 2023
- 13 • The data protection – the interview will be recorded and uploaded to ZMT database
- 14 • The goal of research – scientific article and policy brief for local and national government to
- 15 improve PPIM program
- 16 2. Researchers ask for the participants' availability for interview, or reschedule for another meeting
- 17 if the participants are not available
- 18 3. Researchers ask for the participants' verbal consent to conduct the data collection and record the
- 19 interview using a voice recorder
- 20 4. Researchers offer open space and face masks (if needed) to reduce the risk of COVID-19
- 21 transmission
- 22

- 23 **A. Demographic profile**
- 24 1. What is your name?
- 25 2. What is your gender?
- 26 3. What is your ethnicity?
- 27 4. In which sub-village do you live?
- 28 5. If you live in this sub-village, how long you have been living here?
- 29 6. What is your main occupation?
- 30 7. What is your side job(s)?
- 31 8. Are you an aquaculture farmer or care taker of pond aquaculture? (ownership status)
- 32 9. How long you have been working as an aquaculture farmer or care taker of pond aquaculture?
- 33 10. How big is the pond aquaculture?
- 34
- 35 **B. Participation in collective activities**
- 36 11. Are you involved in a community group (e.g. aquaculture group, farmer group, etc.) in this sub-
- 37 village?
- 38 12. Are you part of irrigation group (POKLINA)?
- 39 13. Do you frequently attend the discussion or deliberation or gathering with community and/or
- 40 aquaculture farmers and/or government in this village?
- 41
- 42 **C. Opening questions**
- 43 1. What do you think about the aquaculture development in your village?
- 44 2. Are there any changes in regards to aquaculture development in your village over the last 10 years?
- 45 3. What are the challenges/problems on irrigation system for aquaculture?
- 46 4. What do you think about the implementation of the irrigation rehabilitation program (PITAP)?
- 47 5. What are the contributions from PITAP program to the social-economy and environment?
- 48 6. What needs to be improved from PITAP program?
- 49
- 50 **D. Social-ecological system framework (SESF)**
- 51 1. Resource Systems (RS)
- 52 • Researchers ask about aquaculture system in the visited village using second tier SESF variable
- 53 related to RS
- 54 • Researchers ask about irrigation system using in the visited village using second tier SESF
- 55 variable related to RS
- 56 2. Resource Units (RU)
- 57 • Researchers ask about aquaculture system in the visited village using second tier SESF variable
- 58 related to RU
- 59 • Researchers ask about irrigation system in the visited village using second tier SESF variable
- 60 related to RU
- 61 3. Interactions (I)
- 62 • Researchers ask about interactions among farmers to maintain the irrigation canals for
- 63 aquaculture system in the visited village (pre-existing collective action) using second tier SESF
- 64 variable related to I
- 65 4. Governance Systems (GS)
- 66 • Researchers ask about governance and management systems during PITAP program in the
- 67 visited village using second tier SESF variable related to GS

- 68 • Researchers ask about governance and management systems of aquaculture production after
69 PITAP program in the visited village using second tier SESF variable related to GS
70
- 71 5. Actors (A)
72 • Researchers ask about the profile of different actor or stakeholders who are relevant in
73 aquaculture production in the visited village using second tier SESF variable related to A
74 • Researchers ask about the profile of different actor or stakeholders who are relevant in PITAP
75 program in the visited village using second tier SESF variable related to A
76
- 77 6. Related Ecosystems (RE)
78 • Researchers ask about the influence of aquaculture system to the ecosystems (and the other way
79 around) in the visited village using second tier SESF variable related to RE
80
- 81 7. Social, Economic, and Political Settings (S)
82 • Researchers ask about the social, economic, and political conditions that influence the
83 aquaculture systems in the visited village using second tier SESF variable related to S
84
- 85 8. Outcomes (O)
86 • Researchers ask about the outcome of PITAP program in the visited village using second tier
87 SESF variable related to A
88

85 E. Post PITAP program questionnaire

- 86 1. What are the positive and negative outcomes of PITAP program based on your opinion?
87 2. Would you conduct rehabilitation of irrigation canals without monetary incentives from the
88 government? If no, what are the reasons?
89 3. What do you think about Gotong-Royong? Does people in this village still conduct it regularly?
90 If yes, what are the activities with Gotong-Royong spirit? If no, why Gotong-Royong is fading
91 in this village?
92 4. What are direct benefits of canal rehabilitation (non-PITAP program) for you?
93 5. Did you and other farmers conduct any canal rehabilitation or maintenance after PITAP
94 program?
95 6. Did you and other farmers discuss any plans for self-organizing activities related to canal
96 rehabilitation or maintenance without monetary incentives from the government?
97 7. What would you recommend to improve PITAP program in the future?
98 8. What are the biggest challenges to maintain irrigation canals regularly?
99 9. In your opinion, how often that irrigation canals needs to be rehabilitated?
100 10. Who do you think that needs to be involved in the irrigation canals rehabilitation?
101

102 APPENDIX 2B. INTERVIEW GUIDELINES – GOVERNMENT REPRESENTATIVES AND 103 OTHERS

104 Strategy:

- 105 1. Researchers introduce their self and provide brief explanation on:
106 • The overview of research
107 • The duration of interview – approximately 1 hour
108 • The duration of research – approximately 6 months in 2021 with dissemination activities in
109 2023
110 • The data protection – the interview will be recorded and uploaded to ZMT database
111 • The goal of research – scientific article and policy brief for local and national government to
112 improve PPIM program

- 113 2. Researchers ask for the participants' availability for interview, or reschedule for another meeting
114 if the participants are not available at the moment
115 3. Researchers ask for the participants' verbal consent to conduct the data collection and record the
116 interview using a voice recorder
117 4. Researchers offer open space and face masks (if needed) to reduce the risk of COVID-19
118 transmission
119

120 **A. Demographic profile**

- 121 1. What is your name?
122 2. What is your occupation?
123 3. What is the institution that you represent?
124

125 **B. Opening questions**

- 126 1. What do you think about the aquaculture development in West/East Lombok?
127 2. What are the challenges/problems on irrigation system for aquaculture in West/East Lombok?
128 3. What do you think about the implementation of the irrigation rehabilitation program (PITAP)?
129 4. What are the contributions from PITAP program to the social-economy and environment?
130 5. What needs to be improved from PITAP program?
131

132 **C. Social-ecological system framework (SESF)**

- 133 9. Resource Systems (RS)
134 • Researchers ask about aquaculture system in West/East Lombok using second tier SESF
135 variable related to RS
136 • Researchers ask about irrigation system using in West/East Lombok using second tier SESF
137 variable related to RS
138 10. Resource Units (RU)
139 • Researchers ask about aquaculture system in West/East Lombok using second tier SESF
140 variable related to RU
141 • Researchers ask about irrigation system in West/East Lombok using second tier SESF variable
142 related to RU
143 11. Interactions (I)
144 • Researchers ask about interactions among key stakeholders to maintain the irrigation canals for
145 aquaculture system in West/East Lombok using second tier SESF variable related to I
146 12. Governance Systems (GS)
147 • Researchers ask about governance and management systems during PITAP program in
148 West/East Lombok using second tier SESF variable related to GS
149 • Researchers ask about governance and management systems of aquaculture production after
150 PITAP program in West/East Lombok using second tier SESF variable related to GS
151 13. Actors (A)
152 • Researchers ask about the profile of different actor or stakeholders who are relevant in
153 aquaculture production in West/East Lombok using second tier SESF variable related to A
154 • Researchers ask about the profile of different actor or stakeholders who are relevant in PITAP
155 program in West/East Lombok using second tier SESF variable related to A
156 14. Related Ecosystems (RE)
157 • Researchers ask about the influence of aquaculture system to the ecosystems (and the other way
158 around) in West/East Lombok using second tier SESF variable related to RE

- 159 15. Social, Economic, and Political Settings (S)
160 • Researchers ask about the social, economic, and political conditions that influence the
161 aquaculture systems West/East Lombok using second tier SESF variable related to S
162 16. Outcomes (O)
163 • Researchers ask about the outcome of PITAP program in West/East Lombok using second tier
164 SESF variable related to A
165

APPENDIX 3. SECONDARY DATA USED

No.	Document's Title	Published by	Length of Documents
1	Buku Profil Kelautan dan Perikanan Provinsi NTB Tahun 2019 (Marine and Fisheries Profile in West Nusa Tenggara Province Year 2019)	DKP Provinsi Nusa Tenggara Barat (West Nusa Tenggara Province in Marine and Fisheries Department)	94 pages
2	Data Pelaksanaan Kegiatan PITAP (Data of PITAP Pogram Implementation)	DKP Provinsi Lombok Barat (West Lombok District Government in Marine and Fisheries Department)	1 page
3	Kontrak PITAP Desa Lembar Tahun 2021 (PITAP Contract in Lembar Village Year 2021)	DKP Provinsi Lombok Barat (West Lombok District Government in Marine and Fisheries Department)	31 pages
4	Kontrak PITAP Desa Sekotong Tahun 2021 (PITAP Contract in Sekotong Village Year 2021)	DKP Provinsi Lombok Barat (West Lombok District Government in Marine and Fisheries Department)	31 pages
5	Surat Keputusan Kepala DKP Lombok Barat No. 800/690/Dislutkan/2021 tentang Penunjukan Fasilitator Pembangunan/Saluran Irigasi Perikanan. (Decree No. 800/690/Dislutkan/2021 by Head of West Lombok District Government in Marine and Fisheries Department regarding the appointment of facilitator for irrigation canals rehabilitation)	DKP Provinsi Lombok Barat (West Lombok District Government in Marine and Fisheries Department)	4 pages
6	Peraturan Menteri KKP No. 75/Permen-KP/2016 tentang Pedoman Umum Pembesaran Udang Windu (<i>Penaeus Monodon</i>) dan Udang Vaname (<i>Litopenaeus Vannamei</i>). Decree No. 75/Permen-KP/2016 by Ministry of Marine Affairs and Fisheries of Indonesia regarding cultivation guideline for <i>Penaeus Monodon</i> and <i>Litopenaeus Vannamei</i>)	Kementerian Kelautan dan Perikanan Republik Indonesia (Ministry of Marine Affairs and Fisheries of Indonesia)	43 pages
7	Laporan Tahunan DKP Lombok Barat 2020. (Yearly Report of West Lombok District Government in Marine and Fisheries Department).	DKP Provinsi Lombok Barat (West Lombok District Government in Marine and Fisheries Department)	39 pages
8	Laporan Tahunan KKP 2020. (Yearly Report of Ministry of Marine Affairs and Fisheries of Indonesia Year 2020)	Kementerian Kelautan dan Perikanan Republik Indonesia (Ministry of Marine Affairs and Fisheries of Indonesia)	171 pages
9	Peraturan Dirjen Budidaya KKP No. 31/PER-DJPB/2021 tentang Petunjuk Teknis PITAP 2021. (Decree No. 31/PER-DJPB/2021 by the Director General of Aquaculture Department regarding technical guidelines of PITAP Program Year 2021)	Kementerian Kelautan dan Perikanan Republik Indonesia (Ministry of Marine Affairs and Fisheries of Indonesia).	63 pages
10	Undang-Undang Republik Indonesia No. 17/2019 tentang Sumber Daya Air (Indonesian Law No. 17/2019 regarding Water Resource)	The President of The Republic Of Indonesia And The People's Representative Council of The Republic of Indonesia	90 pages

APPENDIX 4. INDICATORS DEVELOPED FOR THE MEASUREMENT OF THE VARIABLES

SESF Variables	Collective action (CA) hypothesis of variable influence	References	Ordinal value description
I5 – Investment activities	Monetary incentives from the government (PITAP program) to improve the system can decrease the likelihood of collective action because it can crowd out intrinsic motivations of resource users by relying on the government to solve collective action problems	(Frey & Jegen, 2001; Vollan, 2008; Frey, 2012; Kerr et al., 2012; Rode et al., 2015)	High: Monetary incentives are fully provided by the government Moderate: Monetary incentives are partially provided, in addition to other intangible supports (e.g. market access, capacity building) by the government Low: Monetary incentives are minimally or null degree provided by the government
GS8 – Monitoring and sanctioning rules	(a) The existence of monitoring activities (monitoring by the DKP government during PITAP program) can decrease the likelihood of collective action because it can crowd out intrinsic motivations by overriding prosocial motivations	(Ostrom 1990; Frey, 1993; Frey & Oberholzer-Gee, 1997; Dickinson & Villeval, 2008; Rommel et al., 2015)	Presence: Constant efforts are taken to monitor POKLINA in the implementation of PITAP program (co-management, information sharing, participatory in decision making, transparency in the budget allocations) by the government. Absence: Minimal efforts are taken to monitor POKLINA in the implementation of PITAP program (co-management, information sharing, participatory in decision making, transparency in the budget allocations) by the government.
	(b) The existence of external sanctions (penalty in PITAP program) can decrease the likelihood of collective action because it can crowd out intrinsic motivations by overriding prosocial motivations	(Ostrom, 1990; Fehr & Rockenbach, 2003; Holmås et al., 2010; Underhill, 2016; Xu et al., 2022)	Presence: Enforcement, gradual sanctions, or penalty mechanisms are applied to POKLINA that disrespect rules/contracts/agreements by the government. Absence: Minimal efforts are taken to apply graduated enforcement, gradual sanctions, or penalty mechanism for assuring rule compliance of POKLINA in the implementation of PITAP program by the government.

APPENDIX 5. LIST OF VARIABLES IN THE SOCIAL-ECOLOGICAL SYSTEM FRAMEWORK (SESF) ADAPTED FROM (MCGINNIS & OSTROM, 2014)

Social, Economic, and Political Settings (S)		
S1 - Economic development, S2 - Demographic trends, S3 - Political stability, S4 - Other governance systems, S5 - Markets, S6 - Media organizations, S7 - Technology		
Resource systems (RS)	Interactions (I)	Actors (A)
RS1 - Sector	I1 - Harvesting	A1 - Number of relevant actors
RS2 - Clarity of system boundaries	I2 - Information sharing	A2 - Socioeconomic attributes
RS3 - Size of resource system	I3 - Deliberation processes	A3 - History or past experiences
RS4 - Human constructed facilities	I4 - Conflicts	A4 - Location
RS5 - Productivity of systems	I5 - Investment activities	A5 - Leadership/entrepreneurship
RS6 - Equilibrium properties	I6 - Lobbying activities	A6 - Norms/social capital
RS7 - Predictability of system dynamics	I7 - Self organizing activities	A7 - Knowledge of SES/mental models
RS8 - Storage characteristics	I8 - Networking activities	A8 - Importance of resource
RS9 - Location	I9 - Monitoring activities	A9 - Technologies available
	I10 - Evaluate activities	
Resource units (RU)	Governance systems (GS)	Outcomes (O)
RU1 - Resource unit mobility	GS1 - Government organizations	O1 - Social performance measures
RU2 - Growth or replacement rate	GS2 - Nongovernmental organizations	O2 - Ecological performance measures
RU3 - Interaction among resource units	GS2a - Co-management groups	O3 - Externalities to other SESs
RU4 - Economic value	GS3 - Network structure	
RU5 - Number of units	GS4 - Property rights systems	
RU6 - Distinctive characteristics	GS5 - Operational choice rules	
RU7 - Spatial and temporal distribution	GS6 - Collective choice rules	
	GS7 - Constitutional choice rules	
	GS8 - Monitoring and sanctioning rules	
Related Ecosystem (ECO)		
ECO1 - Climate patterns, ECO2 - Pollution patterns, ECO3 - Flows into and out of focal SES		