



**KOPERASI TORANI JAYA**  
**SEKOLAH TINGGI PERIKANAN**  
No.1748/B.H/I/1983

Jl. AUP Pasar Minggu Jakarta 12520 PO.BOX 7239/PSM  
Telp. (021) 7805030. Fax. (021) 7805030. Email: [toranijaya\\_koperasi@yahoo.co.id](mailto:toranijaya_koperasi@yahoo.co.id)  
Website: <http://www.koperasitoranijaya.blogspot.com>

**SURAT PERJANJIAN PELAKSANAAN PENELITIAN**  
**KOPERASI TORANI JAYA**  
Nomor : 018/KTJ-STP/IX/2014

Pada hari ini **Selasa**, tanggal Satu bulan **September**, tahun **Dua Ribu Empat Belas**, yang bertanda tangan di bawah ini:

1. **Aman Saputra, A.Pi., M.S.T.Pi.** : Ketua Koperasi Torani Jaya yang selanjutnya disebut sebagai **PIHAK PERTAMA**
2. **Dr. Aef Permadi, M.Si.** : Ketua Tim Peneliti dengan Nomor Induk Dosen Negeri (NIDN) : 3901036101, No KTP : 3276050103610010, Komplek Bukit Cengkeh Berbunga Blok B6 No 16 Kelurahan Baktijaya Kecamatan Sukmajaya, Depok , 16418, disebut sebagai **PIHAK KEDUA..**

**PIHAK PERTAMA** dan **PIHAK KEDUA** selanjutnya secara bersama-sama disebut **PARAPIHAK**, masing-masing dalam kedudukan dan kewenangannya sepakat untuk mengikatkan diri satu kepada yang lain untuk melaksanakan perjanjian tentang penyelenggaraan Penelitian dengan syarat-syarat dan ketentuan sebagai berikut:

**Pasal 1**  
**MAKSUD DAN TUJUAN**

Maksud dan tujuan Perjanjian ini dalam rangka pemberian dana penelitian United Nations Industrial Development Organization (UNIDO) dari **PIHAK PERTAMA** kepada **PIHAK KEDUA** sesuai ketentuan yang berlaku untuk menyelenggarakan penelitian yang berjudul **"COMPREHENSIVE MARKET STUDY ON SUPPLY AND DEMAND FOR QUALITY AND PRODUCTIVITY SERVICE FOR THE FISHERIES SECTOR IN INDONESIA"** dengan jangka waktu penelitian selama 9 (sembilan) minggu..

**Pasal 2**  
**HAK DAN KEWAJIBAN**

- (1) **PIHAK PERTAMA**, berhak untuk:
  - a. Melakukan supervisi dan evaluasi terhadap perkembangan penelitian yang dilaksanakan oleh **PIHAK KEDUA**;
  - b. memperoleh laporan kemajuan hasil penelitian dari **PIHAK KEDUA**;
  - c. menghentikan dana penelitian apabila **PIHAK KEDUA** :
    - 1) tidak memenuhi ketentuan dalam Term of Reference (TOR);
    - 2) dihukum penjara atau kurungan berdasarkan putusan pengadilan yang memperoleh kekuatan hukum tetap karena melakukan suatu tindak pidana;
    - 3) dengan sengaja memberikan keterangan atau bukti yang tidak benar, yang seharusnya tidak memenuhi syarat sebagai penerima dana penelitian;
    - 4) dengan sengaja tidak menyelesaikan kegiatan penelitian sesuai dengan waktu yang ditetapkan.
- (2) **PIHAK PERTAMA** berkewajiban melakukan pembayaran dana penelitian tepat waktu terhadap kepada **PIHAK KEDUA**.
- (3) **PIHAK KEDUA** berhak menerima pembayaran dana penelitian tepat waktu dari **PIHAK PERTAMA**.
- (4) **PIHAK KEDUA** berkewajiban untuk:
  - a. melaporkan progres pelaksanaan penelitian, sesuai dengan jadwal pelaporan yang disepakati;
  - b. berkewajiban untuk menyelesaikan penulisan Laporan Akhir.

**Pasal 3**  
**BANTUAN DANA**

- (1) Bantuan Dana yang dimaksud dalam perjanjian ini adalah biaya untuk penyelenggaraan penelitian terapan **PIHAK KEDUA**, yang diberikan dari **PIHAK PERTAMA**, sesuai hasil penilaian proposal yang telah diajukan oleh **PIHAK KEDUA** sebesar Rp 170.762.000,- (Seratus tujuh puluh juta tujuh ratus enam puluh dua ribu rupiah).
- (2) **PIHAK KEDUA** akan menerima pencairan dana penelitian secara langsung, dari Koperasi Torani Jaya yang telah disepakati.
- (3) **PIHAK PERTAMA** mencairkan dana penelitian sesuai dengan permohonan **PIHAK KEDUA** dalam 3 tahap, dengan persentase sebesar 25% pada Tahap I, 25% pada Tahap II dan 50% pada Tahap III.
- (4) **PIHAK PERTAMA** tidak bertanggung jawab untuk menanggung biaya-biaya lain selain biaya yang disepakati kedua belah pihak sebagaimana tercantum dalam Pasal 3 ayat 1.

**Pasal 4**  
**PELAPORAN HASIL PENELITIAN**

- (1) **PIHAK KEDUA** berkewajiban memberikan laporan hasil perkembangan atau kemajuan hasil penelitian dan pertanggungjawaban keuangan kepada Koperasi Torani Jaya.
- (2) **PIHAK KEDUA** berkewajiban untuk melaporkan hasil akhir penelitian yang dijalaninya kepada **PIHAK PERTAMA** selambat-lambatnya 1 (satu) minggu setelah selesai pelaksanaan workshop Laporan Akhir..

**Pasal 5**  
**SANKSI**

- (1) **PIHAK PERTAMA** dapat menjatuhkan sanksi kepada **PIHAK KEDUA** berupa **pemberhentian** sebagai penerima Dana Penelitian, jika **PIHAK KEDUA** memenuhi salah satu keadaan berdasarkan Pasal 2 ayat (1) huruf c.
- (2) **PIHAK PERTAMA** dapat menjatuhkan sanksi kepada **PIHAK KEDUA** berupa pengembalian dana penelitian terapan yang telah dikeluarkan **PIHAK PERTAMA** dan/atau sanksi-sanksi lainnya, jika **PIHAK KEDUA** memenuhi keadaan:
  - a) tidak memberikan Laporan Hasil Penelitian dan Pertanggungjawaban Keuangan;
  - b) menyalahgunakan penggunaan dana untuk kepentingan lain;

**Pasal 6**  
**FORCE MAJEURE**

- (1) Keadaan darurat (*force majeure*) adalah keadaan yang terjadi di luar kekuasaan **PIHAK PERTAMA** dan **PIHAK KEDUA** yang mengakibatkan **PIHAK PERTAMA** dan **PIHAK KEDUA** tidak dapat memenuhi kewajiban yang telah ditetapkan dalam perjanjian kerjasama ini.
- (2) Yang termasuk *force majeure* yaitu keadaan akibat bencana alam seperti banjir bandang, gempa bumi, gunung meletus, dan atau perang yang tidak memungkinkan kontrak perjanjian kerja ini dilaksanakan oleh kedua belah pihak.
- (3) **PIHAK PERTAMA** dan **PIHAK KEDUA** sepakat untuk dapat menunda atau membebaskan kewajibannya masing-masing bila terjadi hal-hal di luar kemampuan manusia (*force majeure*) dan harus memberitahukan secara tertulis selambat-lambatnya 1 (satu) bulan setelah terjadinya *force majeure* dan dibuktikan dengan keterangan dari pejabat yang berwenang.

**Pasal 7**  
**PERSELISIHAN**

Jika di kemudian hari terjadi perselisihan yang bersumber dari Perjanjian ini, maka **PIHAK PERTAMA** dan **PIHAK KEDUA** sepakat untuk menyelesaikannya secara musyawarah untuk mufakat berdasarkan asas kekeluargaan.

**Pasal 8**  
**KETENTUAN LAIN**


Setiap perubahan pada perjanjian ini akan dibuat dalam sebuah addendum yang disepakati dan ditandatangani di atas meterai yang cukup oleh **PARA PIHAK**, dan mempunyai kekuatan hukum yang sama dan menjadi satu kesatuan yang tidak terpisahkan dari perjanjian ini.

**Pasal 9**  
**KETENTUAN PENUTUP**

Perjanjian Kerjasama ini dibuat rangkap 2 (dua) bermeterai cukup, masing-masing sama bunyinya dan mempunyai kekuatan hukum yang sama, 1 (satu) rangkap untuk **PIHAK PERTAMA** dan 1 (satu) rangkap untuk **PIHAK KEDUA**.




**PIHAK PERTAMA,**

  
Adrian Saputra, A.Pi., M.S.T.Pi  
NIP. 197405301999031005

**PIHAK KEDUA,**



  
Dr. Aef Permadi, M.Si.  
NIP. 196103011986031004

CONTRACT NO. 3000023042

between the

**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)**

Located at

Vienna International Centre, PO Box 300, A-1400 Vienna, Austria  
Telephone: +43 1-26026, Telefax: +43 1-26026/6840

and the

**Koperasi Torani Jaya**

Located at

Jalan AUP, Pasar Minggu, PO Box 7239/PSM, Jakarta 12520, Indonesia  
Tel. +62 (021)780 50-30  
Fax. +62 (021)780-50-30  
e-mail: toranijaya\_koperasi@yahoo.co.id

for the provision of services relating to the

**"COMPREHENSIVE MARKET STUDY ON SUPPLY AND DEMAND FOR QUALITY  
AND PRODUCTIVITY SERVICE FOR THE FISHERIES SECTOR IN INDONESIA"**

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Project No.: SAP Item 120110, Grant 200002479

UNIDO  
PTC/TCB/QSC

**1. Contractor's Responsibilities**

In accordance with the terms and conditions stated herein and in the Annexes hereto the "Koperasi Torani Jaya", hereinafter referred to as "the Contractor", shall provide for the full and proper performance of its obligations under this Contract, all the services described in the Terms of Reference dated 07/2014 and in the Contractor's Proposal dated 2<sup>nd</sup> September 2014. A copy of the Terms of Reference is enclosed and made a part hereof. All work required under this Contract shall be completed no later than 15/11/2014 incl. submission of demand study no longer than three weeks upon signature of contract.

It is understood that in the event of a conflict between the provisions in the Terms of Reference, in the Contractor's Proposal and in the present Contract and its other Annexes, the provisions in the Contractor's Proposal shall be subject to those in the Terms of Reference or in the Contract and its other Annexes, and the provisions in the Terms of Reference shall be subject to those in the Contract and its other Annexes.

**2. Contract Price and Payment**

UNIDO shall pay the Contractor for the full and proper performance of all obligations hereunder the sum of IDR 170,762,000 (One hundred and seventy million seven hundred and sixty two thousand Indonesian rupiah). This sum shall cover all expenses incurred by the Contractor including, but not limited to, salaries, indemnities, social charges, overheads, travel, technical assistance and supervision costs. The Contractor shall not do any work which may result in any charges to UNIDO over and above the sum of IDR 170,762,000 (One hundred and seventy million seven hundred and sixty two thousand Indonesian rupiah) without prior written consent of UNIDO and a formal amendment to this Contract.

**3. Entry into Effect of the Contract**

This Contract shall be deemed to be effective from the date of its signature by both Parties.

**4. Reports**

The Contractor shall submit to UNIDO, Vienna, in accordance with Annex B hereto entitled "Instructions to Contractors for the Dispatch of Reports", the following report, in English language:

**1 intermediate report & 1 final report.**

**5. Progress Payments**

Payments on account of the Contract price set forth in paragraph 2 hereinbefore shall be made, on the basis of the Contractor's invoices sent to UNIDO, Vienna, as follows:

	IDR
a) 25% of total amount upon UNIDO's receipt of signed contract by UNIDO and the Contractor, the sum of	42,690,500
b) 25% of total amount upon receipt and acceptance of demand analysis, the sum of	42,690,500
c) 50% of total amount upon completion of the work (receipt and acceptance of the final report), the sum of	85,381,000
<b>TOTAL IDR</b>	<b>170,762,000</b>

The payments will be processed in IDR currency throughout Field Office Indonesia (ref. 3000023042) upon receipt of original invoices indicating respective installments.

UNIDO is exempt from all direct taxes, duties and charges except charges for public utility services (see also paragraph 23 of the UNIDO General Conditions of Contract, Annex A). Accordingly, the Contractor must not include in its invoice any amounts representing such taxes, duties and charges without prior consultation with UNIDO.

The making of any payment hereunder by UNIDO shall not be construed as an unconditional acceptance by UNIDO of the work accomplished by the Contractor up to the time of such payment.

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6. **Submission of Invoices**

The Contractor shall submit to Mr. Steffen KAESER, SIDO, PTC/TCB/QSC, UNIDO HQ, P.O. Box 300, A-1400 Vienna, Austria, its invoices in one (1) original.

7. **Contract Amendment**

No modification of, or change in, this Contract, or waiver of any of its provisions, or additional contractual relationship with the Contractor shall be valid unless approved in the form of a written amendment to this Contract, signed by the authorized representatives of the Contractor and UNIDO.

8. **Transmission of Reports, Invoices and Notices**

All reports, invoices and notices submitted or given hereunder shall be addressed to Mr. Steffen KAESER, SIDO, UNIDO HQ, P.O. Box 300, A-1400 Vienna (s.kaeser@unido.org), Austria with copy to Ms. Christiane SCHIMECK (c.schimeck@unido.org).

9. **Covenant against Contingent Fees**

The Contractor warrants that:

- a) no person or selling agency has been employed or retained by him to solicit or secure this Contract upon an agreement or understanding for a commission, percentage, brokerage, contingent fee or retainer, except regular employees or bona fide and officially established commercial or selling agencies maintained by the Contractor for the purpose of securing business;
- b) no official or servant or retired employee of UNIDO, the United Nations, the UNDP and the Participating and Executing Agencies of the UNDP or the Government and/or its co-operating Agency(ies), who is not a *bona fide* employee of the Contractor, has been or shall be admitted by the Contractor to any direct or indirect benefit arising from this Contract or the award thereof.

For breach of these warranties, UNIDO shall have the right to deduct from the Contract price, or otherwise recover from the Contractor, the full amount of any such commission, percentage, brokerage, contingent fee or retainer so paid.

10. **Default by the Contractor**

In case the Contractor fails to fulfill his obligations and responsibilities under this Contract, and provided the Contractor has not remedied such failure(s) within thirty (30) days of having been given UNIDO's express written notification of the nature of the failure(s), UNIDO may, at its sole option and without prejudice to its right to withhold payment(s) as hereinbefore provided, hold the Contractor in default under this Contract. When the Contractor is thus in default, UNIDO may, by giving written notice to the Contractor, terminate the Contract as a whole or such part or parts thereof in respect of which the Contractor is in default. Upon such notice, UNIDO shall have the right to seek completion, at the Contractor's expense, of that part or those parts of the contract with respect to which the Contractor is in default. The Contractor shall, in this case, be solely responsible for any reasonable costs of completion, including such costs which are incurred by UNIDO over and above the originally agreed Contract price stipulated hereinbefore.

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**11. General Conditions**

The Parties hereto agree to be bound by the UNIDO General Conditions of Contract, a copy of which is attached hereto as Annex A and made a part hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contract.

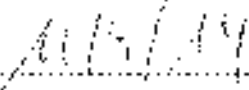
**UNITED NATIONS INDUSTRIAL DEVELOPMENT  
ORGANIZATION**

By: .....

By: ..... 

**Mr. Steffen KAISER  
SIDO, PTC/TCR/QSC  
UNIDO P.O. Box 300  
A-1400 Vienna (Austria)**

Date: .....

Date: ..... 

Enclosures: Annex A: UNIDO General Conditions of Contract  
Annex B: Instructions for the Dispatch of Reports  
Enclosure: Terms of Reference dated 07/2014



# UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

## Annex A

### GENERAL CONDITIONS OF CONTRACT

#### Article 1 - Confidential Nature of Documents

All maps, drawings, photographs, mosaics, plans, reports, recommendations, estimates, documents and all other data compiled by or received by the Contractor under this Contract shall be the property of UNIDO, shall be treated as confidential and shall be delivered only to UNIDO's authorized officials on completion of the work under this Contract; their contents shall not be made known by the Contractor, without the written consent of UNIDO, to any person other than the personnel of the Contractor performing services under this Contract. The obligations of this paragraph do not lapse upon satisfactory completion of the work under this Contract or termination of this Contract, including termination by UNIDO.

#### Article 2 - Independent Contractor

The Contractor shall have the legal status of an independent contractor. Any person assigned by the Contractor to perform services under this Contract shall remain in the employment of the Contractor. The Contractor's personnel and sub-contractors shall not be considered in any respect as being the employees or agents of UNIDO or the United Nations. Without restricting the generality of the foregoing, UNIDO shall not be liable for any claims and demands, loss, costs, damages, actions, suit or other proceedings, brought or prosecuted, in any manner based upon, occasioned by or attributable to the employment relationship between any person assigned by the Contractor to perform services under this Contract and the Contractor, unless otherwise provided for in this Contract. UNIDO shall not be liable for claims of any kind in connection with the performance of such services. The Contractor and his employees shall conform to all applicable laws, regulations and ordinances promulgated by legally constituted authorities of the Government.

#### Article 3 - The Contractor's Responsibility for Employees

The Contractor shall supervise and be fully responsible for the work performed by and the professional and technical competence of his employees and shall select, for work under this Contract, reliable individuals who will perform effectively in the implementation of the Contract, comply with the laws of the Government, respect the local customs and conform to a high standard of moral and ethical conduct.

#### Article 4 - Assignment of Personnel

The Contractor shall not assign any personnel other than those referred to in this Contract for the performance of work in the field without the prior written approval of UNIDO. Prior to assigning any other personnel for the performance of work in the field, the Contractor shall submit to UNIDO for its consideration, the curriculum vitae of any person the Contractor proposes to assign for such service.

#### Article 5 - Removal of Personnel

Upon written request by UNIDO, the Contractor shall withdraw from the field any personnel provided under this Contract and shall replace such personnel by other acceptable to UNIDO, if UNIDO so requests. All costs and additional expenses resulting from the replacement, for whatever reason, of any of the Contractor's personnel shall be for the account of the Contractor. Such withdrawal shall not be considered as termination in part or in total of this Contract under the provisions of paragraph 12 "Termination" hereafter.

#### Article 6 - Assignment

The Contractor shall not assign, transfer, pledge or make other disposition of this Contract or any part thereof or of any of the Contractor's rights, claims or obligations under this Contract except with the prior written consent of UNIDO.

#### Article 7 - Sub-Contracting

In the event the Contractor requires the services of sub-contractors, the Contractor shall obtain the prior written approval and clearance of UNIDO for all sub-contractors. UNIDO's approval of a sub-contractor shall not relieve the Contractor of any of his obligations under this Contract, and the terms of any sub-contract shall be subject to and in conformity with the provisions of this Contract.

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### **Article 8 - UNIDO Privileges and Immunities**

Nothing in or relating to this Contract shall be deemed a waiver of any of the privileges and immunities of UNIDO.

### **Article 9 - Non-employment of UNIDO Staff Members**

The Contractor shall not, while this Contract is in effect, employ or consider the employment of UNIDO staff members without the prior written approval of UNIDO.

### **Article 10 - Language, Weights and Measures**

Unless otherwise specified in the Contract, the English language shall be used by the Contractor in all written communications to UNIDO with respect to the services to be rendered and all documents prepared or prepared by the Contractor pertaining to the work. The metric system of weights and measures shall be used by the Contractor and estimates of quantities involved shall be made and recorded in metric units, except when otherwise specified in the Contract.

### **Article 11 - Force Majeure**

Force Majeure as used herein shall mean acts of God, laws or regulations, industrial disturbances, acts of the public enemy, civil disturbances, explosions and any other similar event of equivalent force not caused by nor within the control of either party and which neither party is able to overcome. As soon as possible after the occurrence of any event constituting Force Majeure, and if the Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under this Contract, the Contractor shall give notice and full particulars thereof in writing to UNIDO. In this event, the following provisions shall apply:

- (a) The obligations and responsibilities of the Contractor under this Contract shall be suspended to the extent of its inability to perform them and for as long as such inability continues. During such suspension and in respect of work suspended, the Contractor shall be entitled only to reimbursement by UNIDO, against appropriate vouchers, of the essential costs of maintenance of any of the Contractor's equipment and of per diem of the Contractor's personnel rendered idle by such suspension.
- (b) The Contractor shall, within fifteen (15) days of the occurrence of the Force Majeure, submit a statement to UNIDO of estimated expenditures for the duration of the period of suspension.
- (c) The term of this Contract shall be extended for a period equal to the period of suspension taking, however, into account any special conditions which may cause the time for completion of the work to be different from the period of suspension.
- (d) If the Contractor is rendered permanently unable, wholly or in part, by reason of Force Majeure, to perform its obligations and meet its responsibilities under this Contract, UNIDO shall have the right to terminate this Contract on the same terms and conditions as are provided for in paragraph 12, "Termination" except that the period of notice may be seven (7) days instead of thirty (30) days.
- (e) For the purpose of the preceding sub-paragraph (d), UNIDO may consider the Contractor permanently unable to perform in case of any period of suspension in excess of ninety (90) days. Any such period of ninety (90) days or less shall be deemed temporary inability to perform.

### **Article 12 - Termination**

UNIDO may terminate this Contract in whole or in part and at any time, upon thirty (30) days' notice of termination to the Contractor. The initiation of arbitral proceedings in accordance with paragraph 16, "Arbitration", below shall not be deemed a termination of this Contract. In the event such termination is not caused by the Contractor's negligence or fault, UNIDO shall be liable to the Contractor for payment in respect of work already accomplished, for the cost of repatriation of the Contractor's personnel, for necessary terminal expenses of the Contractor, and for the cost of such urgent work as is essential and as the Contractor is asked by UNIDO to complete. The Contractor shall keep expenses at a minimum and shall not undertake any forward commitment from the date of receipt of UNIDO's notice of termination.

### **Article 13 - Bankruptcy**

Should the Contractor be adjudged bankrupt or be liquidated or become insolvent, or should the Contractor make a general assignment for the benefit of its creditors, or should a receiver be appointed on account of the Contractor's insolvency, UNIDO may, without prejudice to any other right or remedy it may have under the terms of this Contract, terminate this Contract forthwith by giving the Contractor written notice of such termination. The Contractor shall immediately inform UNIDO of the occurrence of any of the above events.

#### **Article 14 - Insurance and Liabilities to Third Parties**

- (a) The Contractor shall provide and thereafter maintain insurance against all risks in respect of its property and any equipment used for the execution of this Contract.
- (b) The Contractor shall provide and thereafter maintain all appropriate workmen's compensation insurance, or its equivalent, with respect to its employees to cover claims for personal injury or death in connection with this Contract.
- (c) The Contractor shall also provide and thereafter maintain liability insurance in an adequate amount to cover third party claims for death or bodily injury, or loss of or damage to property, arising from or in connection with the provision of services under this Contract or the operation of any vehicles, boats, airplanes or other equipment owned or leased by the Contractor or its agents, servants, employees or sub-contractors performing work or services in connection with this Contract.
- (d) Except for the workmen's compensation insurance, the insurance policies under this Article shall:
- (i) Name UNIDO as additional insured;
  - (ii) Include a waiver of subrogation of the Contractor's rights to the insurance carrier against UNIDO;
  - (iii) Provide that UNIDO shall receive thirty (30) days written notice from the insurers prior to any cancellation or change of coverage.
- (e) The Contractor shall, upon request, provide UNIDO with satisfactory evidence of the insurance required under this Article.
- (f) Any amounts not insured or not recovered from the insurers shall be borne by the Contractor.
- (g) If the Contractor fails to effect and keep in force any of the insurances required under the Contract, then and in any such case UNIDO may, at its option, hold the Contractor in default in accordance with the Contract, or effect and keep in force any such insurances and pay any premium as may be necessary for that purpose and from time to time deduct the amount so paid from any monies due to the Contractor, or recover the same as a debt due from the Contractor.

#### **Article 15 - Indemnification**

The Contractor shall indemnify, hold and save harmless and defend at its own expense UNIDO, its officers, agents, servants and employees from and against all suits, claims, demands and liability of any nature or kind, including costs and expenses, arising out of acts, omissions, negligence or misconduct of the Contractor or its officers, agents, servants, representatives, employees, or sub-contractors in the performance of this Contract. This requirement shall extend to claims or liabilities in the nature of workmen's compensation and to claims or liabilities arising out of the use of patented inventions or devices. The obligations under this paragraph do not lapse upon termination of this Contract.

#### **Article 16 - Settlement of Disputes**

##### **(a) Amicable Settlement**

The Parties shall use their best efforts to settle amicably any dispute, controversy or claim arising out of, or relating to this Contract or the breach, termination or invalidity thereof. Where the parties wish to seek such an amicable settlement through conciliation, the conciliation shall take place in accordance with the UNCITRAL Conciliation Rules then obtaining, or according to such other procedure as may be agreed between the parties.

##### **(b) Arbitration**

Unless any such dispute, controversy or claim between the Parties arising out of or relating to this Contract or the breach, termination or invalidity thereof is settled amicably under the preceding paragraph of this Article within sixty (60) days after receipt by one Party of the other Party's request for such amicable settlement, such dispute, controversy or claim shall be referred by either Party to arbitration in accordance with the UNCITRAL Arbitration Rules then obtaining, including its provisions on applicable law. The arbitral tribunal shall have no authority to award punitive damages. The parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of any such dispute. It is understood, however, that the provisions of this paragraph shall not constitute nor imply the waiver by UNIDO of its privileges and immunities.

#### **Article 17 - Conflict of Interest**

No employee of the Contractor assigned to perform work under this Contract shall engage, directly or indirectly, either in his own name or through the agency of another person, in any business, profession or occupation in the country of the Government; nor shall he make loans to or investments in any business, profession, or occupation in the said country.

#### **Article 18 – Obligations**

In connection with the performance of its services under this Contract, the Contractor shall neither seek nor accept instructions from any authority external to UNIDO. The Contractor shall refrain from any action which may adversely affect UNIDO and shall fulfil its commitments with full regard for the interests of UNIDO. Unless authorized in writing by UNIDO, the Contractor shall not advertise or otherwise make public the fact that it is performing or has performed services for UNIDO. Also, the Contractor shall not, in any manner whatsoever, use the name, emblem or official seal of the United Nations or of UNIDO or any abbreviation of the name of the United Nations in connection with its business or otherwise. The Contractor is required to exercise utmost discretion in all matters relating to this Contract. Unless required in connection with the performance of its work under this Contract or where specifically authorized by UNIDO, the Contractor shall not communicate at any time to any person, government or authority external to UNIDO any information which has not been made public and which is known to it by reason of its association with UNIDO. The Contractor shall not, at any time, use such information to private advantage. These obligations do not lapse upon satisfactory completion of the work under this Contract or termination of this Contract, including termination by UNIDO.

#### **Article 19 – Title Rights**

- (a) The United Nations or UNIDO, as the case may be, shall be entitled to all property rights including but not limited to patents, copyrights and trademarks, with regard to material which bears a direct relation to, or results from the services provided to the United Nations or UNIDO by the Contractor under this Contract. At the request of UNIDO, the Contractor shall take all necessary steps, prepare and process all necessary documents and assist in securing such property rights and transferring them to the United Nations and UNIDO in compliance with the requirements of the applicable law.
- (b) Title to any equipment and supplies which may be furnished by UNIDO shall rest with the United Nations or UNIDO as the case may be and any such equipment and supplies shall be returned to UNIDO at the conclusion of this Contract or when no longer needed by the Contractor. Such equipment and supplies, when returned to UNIDO, shall be in the same condition as when delivered by UNIDO to the Contractor, subject to normal wear and tear.

#### **Article 20 – Facilities, Privileges and Immunities of Contractor and Contractor's Personnel**

UNIDO agrees to use its best efforts to obtain for the Contractor and his personnel (except Government nationals employed locally), to the extent granted by the Government to UNIDO staff members, such facilities, privileges and immunities as the Government has agreed to grant to contractors and to their personnel performing services for the United Nations Development Programme within the country. Such facilities, privileges and immunities shall include exemption from or reimbursement of the cost of any taxes, duties, fees or levies which may be imposed in the country on salaries or wages earned by the Contractor's foreign personnel in connection with the execution of the work under this Contract and on any equipment, materials and supplies which the Contractor may bring into the country in connection with the work under this Contract or which, after having been brought into the country, may be subsequently withdrawn there from. A copy of the relevant provisions concerning facilities, privileges and immunities which UNIDO shall seek to obtain, is attached to and made a part of this Contract (Annex B).

#### **Article 21 – Waiver of Facilities, Privileges and Immunities**

Any provision, whether in an Agreement, Plan of Operation or any other instrument, to which the recipient Government is a party and by which the recipient Government confers benefits upon the Contractor and his personnel in the form of facilities, privileges, immunities, or exemptions by reason of his performance of services for UNIDO under this Contract may be waived by the UNIDO where, in its opinion, the facility, privilege or immunity would impede the course of justice and can be waived without prejudice to the successful completion of the work under this Contract or to the interest of the United Nations Development Programme or UNIDO.

#### **Article 22 – Encumbrances/Liens**

The Contractor shall not cause or permit any lien, attachment or other encumbrance by any person to be placed on file or to remain on file in any public office or on file with UNIDO against any monies due or to become due for any work done or materials furnished under this Contract, or by reason of any other claim or demand against the Contractor.

#### **Article 23 – Tax Exemption**

- (a) In accordance with Section 7 of the Convention on the Privileges and Immunities of the United Nations and Section 9 of the Convention on the Privileges and Immunities of Specialized Agencies which are applicable to UNIDO by virtue of Article 21 of its Constitution, UNIDO is exempt from all direct taxes, except charges for public utility services, and is exempt from customs duties and charges of a similar nature on respect of articles imported or exported for its official use. In the event any governmental authority refuses to recognize UNIDO's exemption from such taxes, duties or charges, the Contractor shall immediately consult with UNIDO to determine a mutually acceptable procedure.

(b) Accordingly, the Contractor authorizes UNIDO to deduct from the Contractor's invoice any amount representing such taxes, duties or charges, unless the Contractor has consulted with UNIDO before the payment thereof and UNIDO has, in each instance, specifically authorized the Contractor to pay such taxes, duties or charges under protest. In that event, the Contractor shall provide UNIDO with written evidence (but payment) of such taxes, duties or charges has been made and appropriately authorized.

#### Article 24 - Child Labor

(a) The Contractor represents and warrants that neither him, nor any of his suppliers, is engaged in any practice inconsistent with the rights set forth in the Convention on the Rights of the Child, including Article 32 thereof, which, inter alia, requires that a child shall be protected from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development.

(b) Any breach of this representation and warranty shall entitle UNIDO to terminate this Contract immediately upon notice to the Contractor, without any liability for termination charges or any other liability of any kind of UNIDO.

#### Article 25 - Mines

(a) The Contractor represents and warrants that neither him, nor any of his suppliers is actively and directly engaged in patent activities, development, assembly, production, trade or manufacture of mines or in such activities in respect of components primarily utilized in the manufacture of Mines. The term "Mines" means those devices defined in Article 2, Paragraphs 1, 4 and 5 of Protocol II annexed to the Convention on Prohibitions and Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects of 1980.

(b) Any breach of this representation and warranty shall entitle UNIDO to terminate this Contract immediately upon notice to the Contractor, without any liability for termination charges or any other liability of any kind of UNIDO.

## ANNEX B

### INSTRUCTIONS FOR THE DISPATCH OF REPORTS

#### PLEASE NOTE COMPLIANCE WITH THE FOLLOWING INSTRUCTIONS IS MANDATORY

1. The Contractor shall send electronic copies of his draft standards and final reports to the addresses stipulated in the Contract. If the reports consist of several volumes, and are bulky and of considerable weights, the Contractor shall obtain appropriate instructions from UNIDO prior to effecting shipment.
2. In all instances, reports shall be packed in suitable containers, which shall be carefully marked with the following information:
  - Name(s) and address (es) of the consignee(s) as stipulated in the Contract
  - Description of Contents (i.e. interim, preliminary, draft final or final report)
  - Project No. And Title
  - UNIDO Contract No.
3. An envelope shall be securely fastened to the outside of the container(s) which shall enclose a detailed list of the contents specifying:
  - No. of copies of the reports contained in the package
  - Volume(s) number(s) (when the reports consist of more than one volume)
  - Language(s) of the report.
4. **The Contractor shall ensure that the recipient(s) of the reports is (are) notified in advance of the shipment by airmail letter accompanied by copies of the above-mentioned list(s) and shipping documents if any.**
5. **When the Contractor is required to ship his reports to a recipient other than UNIDO Headquarters, he shall ensure that copies of the correspondence relating to and the shipping documents covering such shipments are sent, for information, to UNIDO Headquarters.**



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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DRAFT

TERMS OF REFERENCE

**A COMPREHENSIVE MARKET STUDY ON SUPPLY AND DEMAND FOR QUALITY &  
PRODUCTIVITY SERVICES FOR THE FISHERIES SECTOR IN INDONESIA**

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## 1. Objective

The objective of this subcontract is to undertake a supply and demand study on quality, sustainability and productivity services in the fisheries sector in Indonesia with a particular focus on tuna, pangasius and seaweed. This study will ultimately identify the gaps between what are the fisheries sector needs in the areas of quality, sustainability and productivity aspects which are not being met by services currently offered by the existing public and private institutions.

In a second step, a service portfolio for the VALCAPFISH Centre at Sekolah Tinggi Perikanan (STP) should be derived from the identified gaps that would allow the Centre to become technically and economically viable in the mid-term (2-3 years)

The output of the study is a report covering the following aspects:

Demand analysis from the fishery industry on needed productivity, sustainability and quality services in order to improve its competitiveness in the global market. Different actors (including fish farmers, fishermen, input suppliers, processors, collectors, transporters, storage service providers, wholesale distributors, exporters/importers/marketers and retailers) in the tuna, pangasius and seaweed value chains should be considered either directly or through associations representing them. ;

Supply analysis on fisheries productivity, sustainability and quality services offered by existing public and private institutions;

Gap analysis of the identified demand and supply;

- Identification of a potential service portfolio suitable for the VALCAPFISH Centre.

The consultant should use both primary (surveys, interviews, focus groups, etc. – tools to be proposed and developed by the subcontractor) and secondary data to carry out the analysis.

## 2. Scope of services to be provided

### **Demand-Supply Analysis**

The study on supply and demand on productivity, sustainability and quality shall comprise the following areas:

- 1 First hand information on the demand from actors in the fisheries sector;
- 2 A comprehensive review of the public and private institutions offering their services on productivity, sustainability and quality of fisheries sector in Indonesia;
- 3 Gap analysis of the identified demand and supply;
- 4 A matching analysis and recommendations for a service portfolio for the VALCAPFISH centre.

### **Validation of Findings**

To ensure a strong support from main stakeholders, UNIDO will organize a validation workshop for the consultant to present and discuss the findings of the study and to confirm the viability and practicality of the recommendations. Comments from the workshops should be incorporated in the final report of the study.

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### 3. Duration of the assignment

The time frame needed for completion of the tasks will be agreed upon, but will under no circumstances be longer than three (2) months.

### 4. Description of tasks and deliverables

**1) Analysis of the demand for services related to productivity, sustainability and quality aspects of fisheries in Indonesia (based on primary and secondary data):** Demand from various actors along the supply chains of fisheries should be collected and analyzed with a particular focus on the tuna, pangasius and seaweed supply chain. Priority should be given to export oriented fisheries particularly the SME industry.

#### **Expected results (Deliverables)**

The demand analysis will contain the following:

1. Demand analysis for services to improve productivity within the industry
2. Demand analysis for services to improve product quality
3. Demand analysis for sustainability services to ensure sustainable fisheries management and to ensure long-term market access

**2) Analysis of the supply for services related to productivity, sustainability and quality aspects of fisheries in Indonesia (based on primary and secondary data)** The analysis will outline and analyze both public and private institutions offering services on productivity, sustainability and quality in the fisheries sector. The analysis should focus on export oriented fisheries industry in Indonesia. Mapping of services being offers should be clearly stated for each institution either offering all aspects and/or only one such as productivity, sustainability or quality only.

#### **Expected results (Deliverables)**

The analysis will contain the following:

1. List of institutions offering services on productivity, sustainability and quality for fisheries industry in Indonesia
2. Analysis of services being offered
3. Easy to read mapping of institutions and their services

**3) Gap analysis between demand and supply based on the findings of point's no. 1 and 2 on:**

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- Productivity
- Sustainability
- Quality
- 

### **Expected results (Deliverables)**

Based on the demand and supply analysis, the consultant should :

1. Identify gaps in supply-demand along the value chains (with a particular focus on tuna, pangasius and seaweed); Identification of services which are potentially viable ;
2. Recommendations for areas to be focused by VALCAFISH – recommendations for a services portfolio;
- 3.

### **5. General Requirements**

#### **1. Personnel in the Field**

Key Qualifications of the supplier (institute, company or center of research):

- Practical experience in conducting service analysis/screening related to quality, productivity and sustainability in Asian countries;
- Operational in the last 5 years;
- Strong network of international and national experts;
- Previous work with an International Organization is an asset;

The team of experts should gather the following qualifications:

- Strong background in economics and trade, fisheries, food safety and sustainability standards / certification;
- Experience in conducting studies or research in Indonesia;
- Previous experiences in service analysis/screening;
- Deep knowledge of the Institutional and private stakeholders involved in:
  - Fishing activities development;
  - Trends and market developments in fisheries;
- Previous experience in working with an International Organization an asset.

A complete CV of the experts involved should be attached.

#### **2. Language Requirements**

The supplier is allowed to use personnel without a working knowledge of English, but expert(s) in charge of communicating with UNIDO shall be fluent in English. The report (deliverable of this contract) shall be written in English.

#### **3. Deliverables and time frame**

The deliverables consists of a report containing all the analyses listed in point no. 4 above. All deliverables should be written in English.

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lis

Suggested time frame:

Deliverables	Duration / Deadline
1) Demand analysis	3 weeks
2) Supply analysis	3 weeks
3) Gaps analysis and recommendations	2 week
5) Submission of final report	One week after the completion of the workshop

The supplier should provide UNIDO with a detailed time frame.

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UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

# FINAL REPORT

## SUPPLY-DEMAND ANALYSIS ON PRODUCTIVITY, QUALITY AND SUSTAINABILITY SERVICES IN FISHERIES SECTOR



TORANI JAYA  
JAKARTA FISHERIES UNIVERSITY  
2014

## EXECUTIVE SUMMARY

Indonesia fisheries production is increasing, and fisheries sector provides a new business opportunity, both in aquaculture and capture fisheries. To be competitive in international markets, keeping the quality, sustainability and productivity of fisheries products is substantially important. Hence, all of actors of fisheries sectors both government and private sector have a responsibility to produce fish products by keeping the fisheries resources in a sustainable, good quality and safe condition.

The objective of supply and demand study on quality, sustainability and productivity services in the fisheries sector (the marine capture, aquaculture and fish processing industry) in Indonesia is to identify the gaps between what are the fisheries sector needs in the areas of quality, sustainability and productivity aspects which are not being met by services currently offered by the existing public and private institutions.

The sampling method to collect the primary and secondary data was carried using purposive sampling in Jakarta, West Java, East Java, Jambi, Maluku, South Sulawesi and North Sulawesi Provinces. The primary data were gathered by field survey using 3 (three) structured questionnaires namely fisheries capture, processing and aquaculture. Focus Group Discussion (FGD) was also conducted in order to verify the finding from survey. The participants of FGD are STP lecturers, association and officials of the Ministry of Marine Affairs and Fisheries (MMAF).

The respondents in the selected provinces consists of capture fisheries companies, fish processing companies, fish processing groups, *Pangasius* farmers and seed producers, seaweed farmers, and fish products and seaweed middlemen. Respondents of capture fisheries namely covers skipjack, tuna, and shrimp companies where their bases of location are in Ambon, Bitung and East Java. Respondents of fish processing are both big and small scales enterprises which produces loin/steak tuna, *Pangasius* fillet, fish jelly products, Alkali Treated Carrageenan (ATC), Agar-agar, Frozen shrimps, canned Skipjack/tuna, fish crackers and red snapper fillet. Respondents of *Pangasius* farmers are the farmers who cultivate *Pangasius* both grow out in the pond or cages and hatchery. The location of *Pangasius* farmers respondents are in the West Java, East Java and Jambi. Respondents of seaweed farmers consist of *Gracilaria* seaweed farmers in East Java, and *Eucheuma* sp. seaweed farmers in South Sulawesi. Respondents of fish products and seaweed middlemen are *Gracilaria/Eucheuma* seaweed middlemen/traders in East Java and South Sulawesi, fish products middlemen/traders in West Java, DKI Jakarta and Jambi

The main problems in capture fisheries especially in the three study regions (Ambon, North Sulawesi and East Java) include the high cost for fishing operations because the price of fuel, illegal tax by certain informal elements at harbor base, low skilled of purse seine fishermen, unstable price of fish, lack of certified crews (ANKAPIN/ATKAPIN), and most of fishermen have no basic safety training.

There are also problems in aquaculture endeavours. *Pangasius* culture problems include lack of capital, fish diseases (occasionally), inconsistent supply of home-made feed raw material, marketing, high price of commercial feed, and climate particularly minimum water supply in dry season. Seaweed culture problems include The problem of *Gracilaria* culture in brackishwater ponds include minimal water supply especially during prolonged low tide level (gantung karang) that impacts water temperature and decreases the growth of the *Gracilaria*, diseases problem in bad weather, floods during extreme fullmoon periods (West Java, North sea shore). Whereas the main problems of *Eucheuma* culture in Ujung Pandang are lack of high quality seeds, water quality and diseases in bad seasons (and might be some impact from the Electrical Power Plant in Takalar), and low income for farmers.

The main problems in seaweeds processing industry include, lack of raw material (*Gracilaria*) availability for agar-agar processing industries (in Surabaya) caused by many dried *Gracilaria* seaweed being exported, low quality of dried seaweed, less availability of experienced workers, inefficiency in the pressing process, no agarose processing that has higher price than agar-agar product, low utility of *Gracilaria* seaweed processing, lack of technology/skill to produce various grades of refined carrageenan, less solid and NaOH liquor waste product utilization.

Whereas the main problems in *Pangasius* processing include, some (a few) units of SME's fish processing companies have not had a Pre-requisite (GMP and SSOP) and HACCP certificates, market of patin is still limited only for local market, utilization of Patin processing plants are relatively low, and the existence of illegal imported patin in the domestic markets.

Based on the identified problems, there are demand of productivity, quality and sustainability services of capture industry, aquaculture and fish processing such as Training of local fishing master on-board in purse-seine vessels especially for large scale companies; Research of friendly FAD and FAD management; Training on production of high quality cheaper pellet, fish diseases, and marketing for Patin farming; Rehabilitation of irrigation system for some farm location; Regulate/control dried-seaweed distribution for domestic and export by government; Improvement in the technique of harvest of seaweed; training on agarose and carrageenan extraction technology, utilization of solid and liquor waste (slurry, diatomic filter, meal and NaOH liquor), seafood product marketing (packaging, promoting, market intelligence, exporting procedure), utilization of intestine of patin (*Pangasius*) waste, GMP-SSOP, fish oil processing from tuna waste and Training on improvement of value added processing of Patin.

On the other hand, there are many programs and activities from the government and some supports from other institutions that provide the development of fisheries industries either in productivity, quality, as well as sustainability. Supply on productivity aspects for capture fisheries include technical training for fishermen, procurement of fishing vessels, development of fishing port and its equipments, etc. Supply on productivity technical training for fish farmers, development of fish culture facilities, capital (include subsidies) for fish farmer program, etc. Supply on productivity aspects for fish processing such as technical training for fish processing workers, technical assistant of good processing technique, development of Fish Processing Centers, development of fish marketing and packaging, Training on product development of Patin, seaweed (ATC, chip), tuna/skipjack, etc. Supply of quality aspects for fish capture such as

training on fish handling, etc. Supply quality aspect for aquaculture such as production of high quality broodstock and fish/seaweed seeds, handling of post harvest, etc. Supply of quality for fish culture such as certification of fish farms and hatcheries, certification of seed produced, etc. Supply of quality aspects for fish processing such as infrastructure of cold chain process, basic HACCP training, quality controller on fish exporter and fish processing company, technical assistances of inline inspection on fish traders and exporters, regulation of quality fishery product, quality control and safety of fish product and the entrance into the Republic of Indonesia, etc. Supply on sustainability services for capture fisheries such as regulation on FAD, regulation on fishing operation, etc. Supply on sustainability for aquaculture such as development of fish health management system, water quality monitoring system, etc. Supply on sustainability aspects for fish processing such as monitoring of raw materials availability for large scale fish processors, catch certificate, traceability regulation, etc.

From the analysis, there are gaps of services identified. The gaps services on productivity, quality and sustainability for capture fisheries, aquaculture as well as for fish processing and marketing are illustrated through the underneath table.

Component	Capture Fisheries	Aquaculture	Processing and Marketing
<b>Productivity</b>	Training on purse seine fishing master especially for local crews	Training on capital management for farmers (and its need of capital support for seaweed farmers).	Technical assistance in the adjusting of processing technique from various quality seaweed
	Training for small scale fishermen to improve their skill about navigation equipment, such as GPS, Chart, Radar	Training on the production of cheaper but good quality of feed for <i>Pangasius</i>	Training on improvement motivation of worker of fish processing
	Training on vessel engines repairing and maintenance	Training on fish/seaweed disease management	Technical assistance on an efficient pressing machine of agar-agar processing
	Technical assistance on vessel engine modification (for small scale fisheries).	Training on probiotic production technique and its application for <i>Pangasius</i> farming	Training on agarose extraction technology
	Technical assistance on freezer installation	Training on redworm	Training on product development of Patin,

	on-board for fishing trip >1 month	( <i>Tubifex</i> ) mass culture	seaweed, tuna/skipjack
		Technical assistance on intensifying the distribution of high quality (F1) seaweed seeds ( <i>Eucheuma</i> sp. and <i>Gracilaria</i> sp.)	Training on improving productivity of fish processing
		Training on post harvest handling of seaweeds	Training on seafood product marketing (packaging, promoting, market intelligence, exporting procedure)
		Technical assistance in initiating regular water quality monitoring in ( <i>open system</i> ) aquaculture farming areas and develop its system and socialization..	Training on utilization of solid and liquor waste (slurry, diatomic filter, meal and NaOH liquor)
			Training on fish oil processing from tuna waste
<b>Quality</b>	Training on fish handling and fish inspection on-board and fishing port	Training on the production technique of larger size <i>Pangasius</i>	Training on GMP and SSOP of fish processing worker
		Socialization of certified (patin) seed and methods for providing the awareness and importance of the certification to fish culture society, and technical assistance in accelerating the	



		certification of seed production unit	
<b>Sustainability</b>	Dissemination of friendly fishing gear, such as information about appropriate mesh size, enviromently friendly FAD, vessel monitoring system, Government regulations, etc	Training on effective and sustainable feed production techniques (in line with Blue Economy Concepts)	Technical assistance to fish processing companies on getting eco-labelling certificate
		Capacity building on good farming practices, zoning for seaweed farming etc.	

From identification of demands, supply and gap analysis, we conclude that some potential productivity, quality and sustainability services that might be potentially offered by Valcapfish Centre for development of capture, aquaculture (patin and seaweed) business, processing and middlemen are several training for capacity building of stakeholder, as presented in underneath table.

<b>Component</b>	<b>Capture Fisheries</b>	<b>Aquaculture</b>	<b>Processing and Marketing</b>
<b>Productivity</b>	purse seine fishing master especially for local crews	fish desease diagnosis and management	agarose extraction technology
	operational and maintance navigation equipment	probiotic production technique and its application to <i>Pangasius</i> farming	product development of Patin, seaweed, tuna/skipjack
	repairing and maintenance of vessel engines	marketing strategies, to make the farmers' bargaining position higher	seafood product marketing (packaging, promoting, market intellgence, exporting procedure)
	vessel engine	redworm's ( <i>Tubifex</i> )	improving productivity

	modification for small scale fisheries	mass culture	of fish processing
	freezer installation on board for fishing trip > 1 month	spreading the F1 seaweed seeds ( <i>Eucheuma</i> sp. and <i>Gracilaria</i> sp.) to every seaweed culture zones	utilization of solid and liquor waste (slurry, diatomic filter, meal and NaOH liquor)
	purse seine fishing master especially for local crews	good farming practices	fish oil processing from tuna waste
	operational and maintenance navigation equipment		
<b>Quality</b>	fish handling and fish inspection on board and fishing port	on the production technique of larger size <i>Pangasius</i>	GMP and SSOP of fish processing workers
		acceleration of certification of seed production units program	
<b>Sustainability</b>	friendly fishing gear, such as information about appropriate mesh size, Fish Aggregating Device, Monitoring vessel, Government regulations, etc.	effective and sustainable feed production technique (in line with Blue Economy Concepts)	on getting eco-labelling certificate for fish processing companies

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# 1. Introduction

Fisheries production of Indonesia increased about 26.2% in 2013 (19.56 million ton) than 2012 (15.5 million ton). In 2013, the production of aquaculture reached 13.7 million ton and capture fisheries about 5.86 million ton. The number of fish farmers and fishermen in 2013 are 1,679,064 and 2,857,627 respectively. The fisheries sector provides a new business opportunity, both in aquaculture and capture fisheries. It is very important to keep the quality, sustainability and productivity of fisheries products in order to be competitive in international markets. All of actors of fisheries sectors both government and private sector have a responsibility to produce fish products by keeping the fisheries resources in a sustainable, good quality and safe condition.

Quality and safety of fish and fisheries products are important in order to meet international standards and consumers demand. Some regulations related to the quality and safety were issued by government. In terms of sustainability, there is an increasing global demand for seafood produced in sustainable way. Sustainability of marine resources is very important in order to maintain continuity of fisheries business in the future, therefore there are some private certifications related to sustainability such as MSC (Marine Stewardship Council), Friend of the Sea and Dolphin safe label. Productivity in fisheries sector is a part of industrialization for increasing output and improving competitiveness by improving human resources, technology and others. These aspects play an important role for optimalization of fisheries resources capacity of fisheries industries.

However, there are many problems related to quality, sustainability and productivity in the fisheries industry. At the same time, however there is still room for improvements by providing better services on the quality, sustainability and productivity to the industry players and other stakeholders. Therefore, it is important to identify what kinds of services should be given by conducting gap analysis on supply and demand for quality and productivity in the fisheries industry.

**The objective** of the supply and demand study on quality, sustainability and productivity services in the fisheries sector (the marine capture, aquaculture and fish processing industry) in Indonesia is to identify the gaps between the fisheries sector needs in the areas of quality, sustainability and productivity aspects and the availability of such services offered by the existing public and private institutions.



The scope of the study covered upstream and downstream industry of fisheries sector which are categorized into 3 (three) subsectors, as follows; (1) **Fishing Industry**, of Tuna/Skipjack products from Pole & Line fishing, shrimp products from trawl fishing and small pelagic products from purse seine fishing in North Sulawesi, Maluku, Jakarta, West Java and South Sulawesi; (2) **Aquaculture Industry**, of fresh water, brackish water, and marine products (limited to *Pangasius* sp. and seaweeds) in West Java, East Java, Jambi and South Sulawesi; and (3) **Fish Processing Industry**, of frozen, canned, fish jelly, seaweed and traditional products in Jakarta, West Java, East Java, Jambi, North Sulawesi, Maluku, and South Sulawesi.

## 2. Methodology

Based on the objectives and scope of study mentioned above, the methodological approach was carried on this study are as follows:

### 2.1. Sampling

The sampling method to collect the primary and secondary data was carried out using purposive sampling in several provinces in Indonesia. Figure 1 shows the sampling frame of this study. According to the sampling frame, Table 1 shows the areas for field assessment.

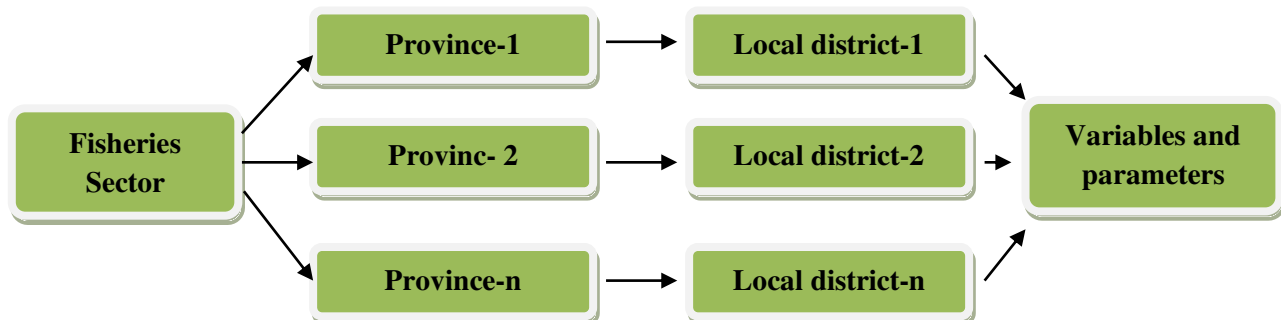


Figure 1. Purposive Sampling Frame

**Table 1. Locations of the study**

No.	Sub Sector	Commodities	Locations
1	Fishing Industry	Shrimp, small pelagic and Skipjack (pole and line, hand Line, purse seine fishing)	<ul style="list-style-type: none"> <li>• North Sulawesi</li> <li>• Maluku</li> <li>• West Java</li> <li>• South Sulawesi</li> <li>• Jakarta</li> </ul>
2	Aquaculture Industry	Fresh water, brackish water, Seaweed products	<ul style="list-style-type: none"> <li>• Jambi</li> <li>• West Java</li> <li>• South Sulawesi</li> <li>• East Java</li> </ul>
3	Fish Processing Industry	Frozen, canned, fish jelly, seaweed and traditional products	<ul style="list-style-type: none"> <li>• West Java</li> <li>• East Java</li> <li>• South Sulawesi</li> <li>• North Sulawesi</li> <li>• Maluku</li> <li>• Jakarta</li> </ul>

## 2.2. Primary data collection

Primary data were gathered by field survey using 3 (three) structured questionnaires for capture fisheries, processing and aquaculture. (attachment 1). The components, domain and variable in the questionnaires are shown in Table 2.

**Table 2. Questionnaire's variables and parameters**

No.	Components	Domain	Variables
1	Contextual Analysis of the quality, sustainability and productivity in fisheries sector	<ul style="list-style-type: none"> <li>• Fishing</li> <li>• Processing</li> <li>• Aquaculture</li> </ul>	<ul style="list-style-type: none"> <li>• Economic value</li> <li>• National contribution both in economic stream as well as human resources.</li> <li>• Trend of production</li> <li>• Export data</li> <li>• Regulations</li> </ul>
2	Demand Analysis	Quality and Food Safety	<ul style="list-style-type: none"> <li>• HR</li> <li>• Technology</li> <li>• Regulation</li> <li>• Certification</li> </ul>
		Sustainability	<ul style="list-style-type: none"> <li>• Regulation</li> <li>• Certification</li> </ul>

			<ul style="list-style-type: none"> <li>• HR</li> </ul>
		Productivity	<ul style="list-style-type: none"> <li>• market Potential</li> <li>• HR</li> <li>• Regulation</li> <li>• Technology (Machinery, IT, equipment)</li> <li>• Fisheries resources</li> </ul>
3.	Supply Analysis	Quality and Food Safety	<ul style="list-style-type: none"> <li>• HR</li> <li>• Technology</li> <li>• Regulation</li> <li>• Certification</li> <li>• Distribution</li> </ul>
		Sustainability	<ul style="list-style-type: none"> <li>• Regulation</li> <li>• Certification</li> <li>• HR</li> <li>• Distribution</li> </ul>
		Productivity	<ul style="list-style-type: none"> <li>• market Potential</li> <li>• HR</li> <li>• Regulation</li> <li>• Technology</li> <li>• Fisheries resources</li> </ul>

### 2.3 Focus Group Discussion

Focus Group Discussion (FGD) was carried out to verify findings from the primary data collection. The participants of FGD were lecturers of Jakarta Fisheries University (JFU), fish processors/exporters, Indonesian Tuna Association (ASTUIN, AP2HI), Fish Farmers, *Pangasius* sp. Association, Directorate General (DG) of Fish Processing and Marketing, Fish Quarantine Inspection Agency (FQIA), DG of Capture Fisheries and DG of Aquaculture, Agency of Marine and Fisheries Human Resource Development (AMFHRD).

### 2.4. Secondary Data Collection

The data were gathered from published data and information from public (related ministries) and private sector related in productivity and quality of fisheries commodities.

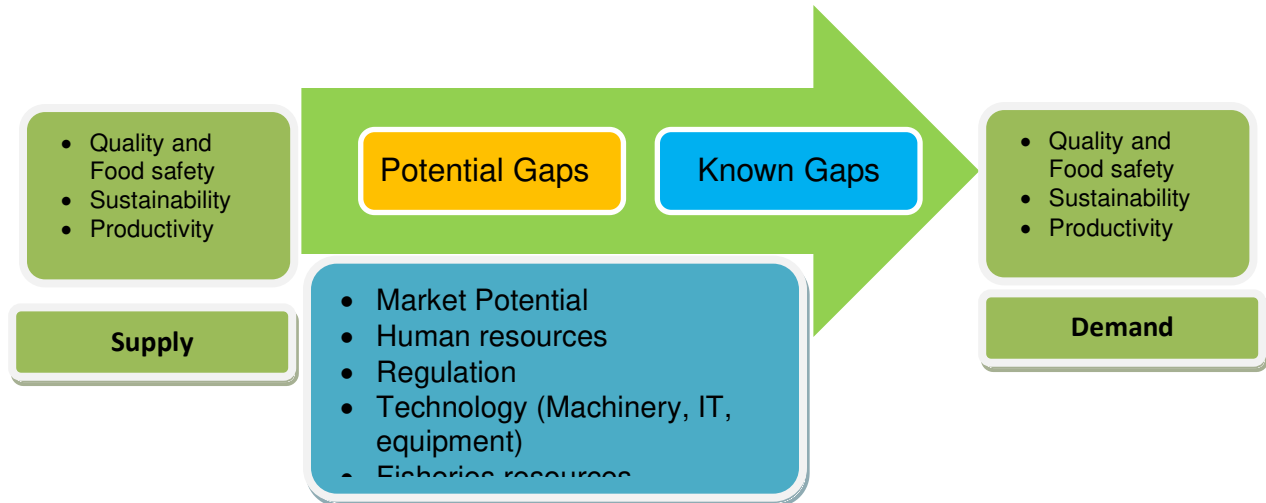


Figure 2. The gap analysis proposed in this Study

### 3. Findings

#### 3.1. Current Status of Fisheries Production in the Selected Provinces

##### 3.1.1 Jambi

Jambi Province fisheries production in 2012 increased by 6% compared to 2011, reaching 91,359 tons compared to the previous year at 86,209 tons. Trend of Jambi Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) and the last 2 years (2011-2012) amounted to +/-6% (Figure 3).

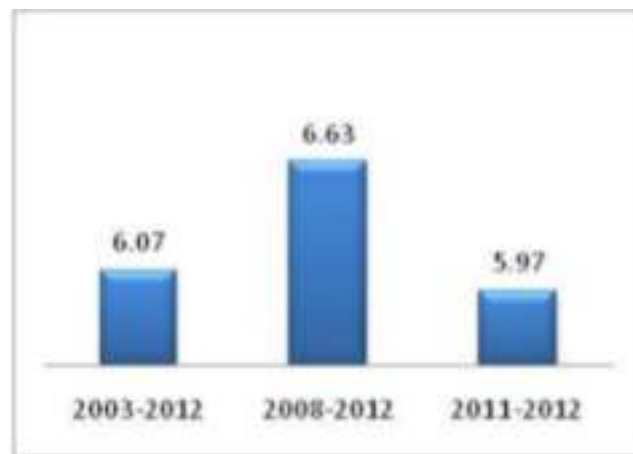
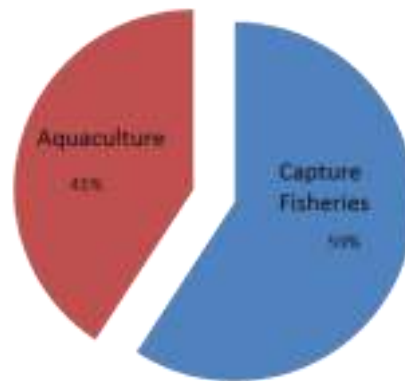


Figure 3. Trend of fisheries production of Jambi Province

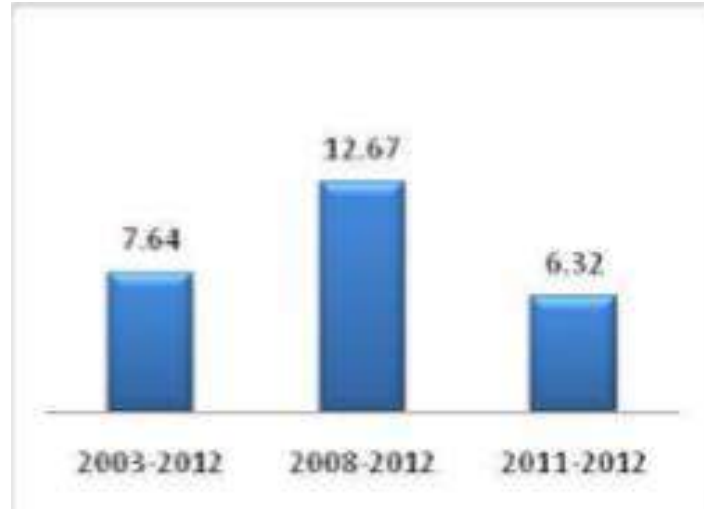
The contribution of capture fisheries production amounted to 54,091 tons (59%), while aquaculture production amounted to 37,268 tons (41%) (Figure 4). Trend of capture fisheries production increased significantly since 2003 with an average increase of 2% in 2003-2012 and 2011-2012 by 4%. Trend of aquaculture production has increased significantly since 2003 with an average increase in 2003-2012 by 17% and by 8% in 2011-2012. The largest commodity for Jambi Province capture fisheries in 2012 were shrimps (7,149 tons), blood clams (4,368 tons), white shrimps (3,541 tons) and black pomfret (2,958 tons). The largest Jambi Province aquaculture commodities in 2012 were *Pangasius* (16,701 tons), tilapia (14,384 tons), catfish (3,021 tons) and carp (884 tons).



**Figure 4. Contribution of capture fisheries and aquaculture production in Jambi Province**

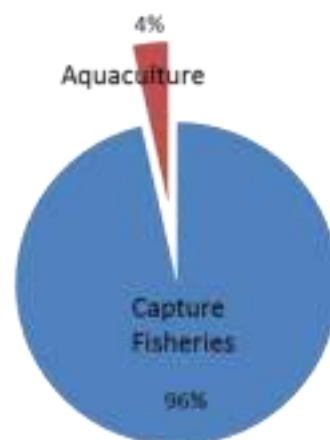
### 3.1.2 DKI Jakarta

DKI Jakarta Province fisheries production in 2012 increased by 6.3% compared to 2011, reaching 227,889 tons compared to the previous year at 214,340 tons. Trend of DKI Jakarta Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) by 7.6% and the last 2 years (2011-2012) amounted to 6.3% (Figure 5).



**Figure 5. Trend of fisheries production of DKI Jakarta Province.**

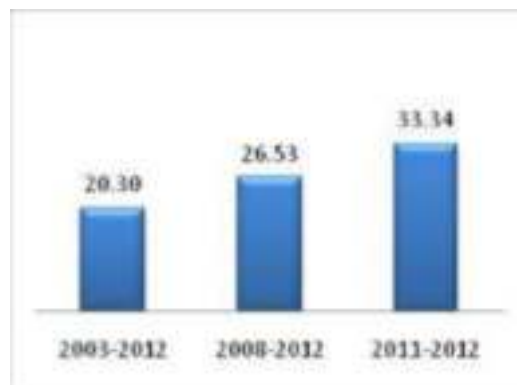
The contribution of capture fisheries production amounted to 219,836 tons (96%), while aquaculture production amounted to 8,054 tons (4%) (Figure 6). Trend of capture fisheries production increased significantly since 2003 with an average annual increase of 7% in 2003-2012 and 2011-2012 by 22%. Trend of aquaculture production has increased significantly since 2003 with an average annual increase in 2003-2012 by 172% and decreased by 76% in 2011-2012. The largest commodity for DKI Jakarta Province capture fisheries in 2012 were squids (58,359 tons), skipjack (30,553 tons), shortfin scad (23,670 tons) and yellowfin tuna (13,661 tons). The largest DKI Jakarta Province aquaculture commodities in 2012 were clams (2,292 tons), catfish (2,087 tons), and tilapia (1,101 tons).



**Figure 6. Contribution of capture fisheries and aquaculture production DKI Jakarta Province.**

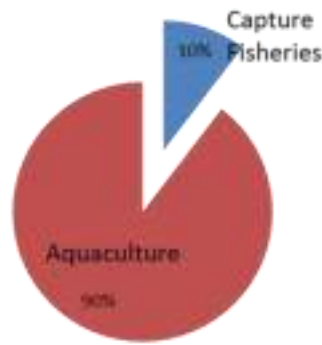
### 3.1.3 South Sulawesi

South Sulawesi Province fisheries production in 2012 increased by 33% compared to 2011, reaching 2,494,890 tons compared to the previous year at 1,871,082 tons. Trend of South Sulawesi Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) by 20% and the last 2 years (2011-2012) amounted to 33% (Figure 7).



**Figure 7. Trend of fisheries production of South Sulawesi Province**

The contribution of capture fisheries production amounted to 259,883 tons (10%), while aquaculture production amounted to 2,235,007 tons (90%) (Figure 8). Trend of capture fisheries production increased since 2008 with an average annual increase of 1% in 2008-2012 and has increased by 9% from 2011 to 2012. Trend of aquaculture production has increased significantly since 2003 with an average increase in 2003-2012 by 40% and 37% in 2011-2012. The largest commodities for South Sulawesi Province capture fisheries in 2012 was skipjack (20,271 tons), shortfin scad (19,542 tons), striped mackerel (12,841 tons) and short bodied mackerel (12,022 tons). The largest South Sulawesi Province aquaculture commodities in 2012 were seaweeds (2,104,446 tons), milkfish (89,708.1 tons), and black tiger shrimp (14,785.6 tons).



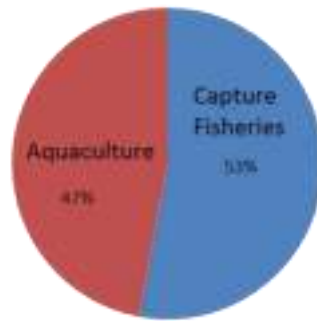
**Figure 8. Contribution of capture fisheries and aquaculture production South Sulawesi Province**

### 3.1.4 Maluku

Maluku Province fisheries production in 2012 decreased by 14% compared to 2011, reaching 1,014,755 tons compared to the previous year at 1,180,468 tons. Trend of Maluku Province fisheries production has increased since 2003, the average annual increased in the last 10 years (2003-2012) was 17% and in the last 2 years (2011-2012) decreased amounted to 14%.

The contribution of capture fisheries production amounted to 537,271 tons (53%), while aquaculture production amounted to 477,484 tons (47%). Trend of capture fisheries production increased significantly since 2003 with an average annual increase of 7% in 2003-2012 and decreased in 2011-2012 by 5%. Trend of aquaculture production has increased significantly since 2003 with an average annual increase in 2003-2012 by 495% but decrease by 22% in 2011-2012. The largest commodity for Maluku Province capture fisheries in 2012 were skipjack (51,319 tons), shortfin scad (35,125 tons), eastern little tuna (34,289 tons) and short bodied mackerel (29,351 tons). The largest Maluku Province aquaculture commodity in 2012 was seaweeds (474,166.75 tons).

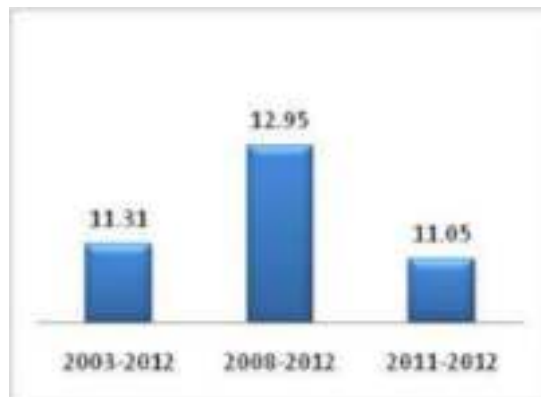




**Figure 9. Contribution of capture fisheries and aquaculture production Maluku Province**

### 3.1.5 West Java

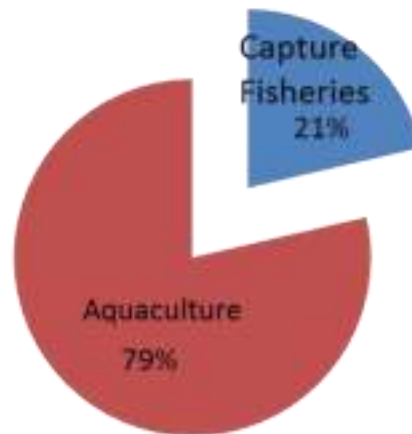
West Java Province fisheries production in 2012 increased by 11% compared to 2011, reaching 990,710 tons compared to the previous year at 892,097 tons. Trend of West Java Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) and the last 2 years (2011-2012) amounted to 11% (Figure 10).



**Figure 10. Trend of fisheries production of West Java Province**

The contribution of capture fisheries production amounted to 211,711 tons (21%), while aquaculture production amounted to 778,999 tons (79%)(Figure 11). Trend of capture fisheries production increased since 2003 with an average increase of 4% in 2003-2012 and by 7% in 2011-2012. Trend of aquaculture production has increased significantly since 2003 with an average increase in 2003-2012 by 15% and by 12% in 2011-2012. The largest commodities for West Java Province capture fisheries in 2012 were large-tooth ponyfish (25,431 tons), eastern

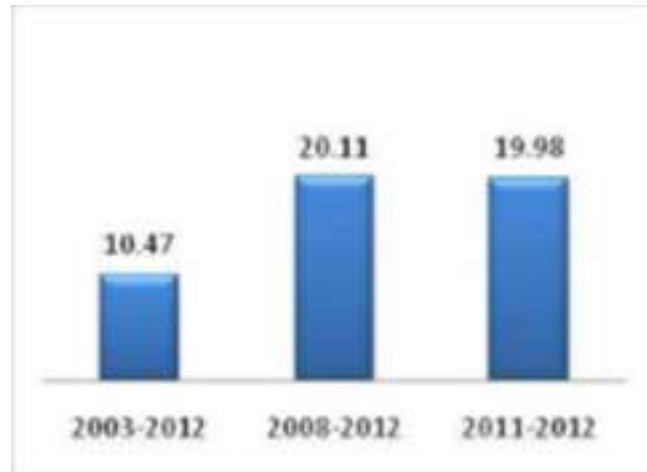
little tuna (21,731 tons), sardine (11,957 tons) and ariid catfish (8,475 tons). The largest West Java Province aquaculture commodities in 2012 were carp (160,297 tons), tilapia (147,857 tons), catfish (145,659 tons) and milkfish (74,680 tons ). Total production of *Pangasius* in 2012 was 19,040 tons.



**Figure 11. Contribution of capture fisheries and aquaculture production of West Java Province**

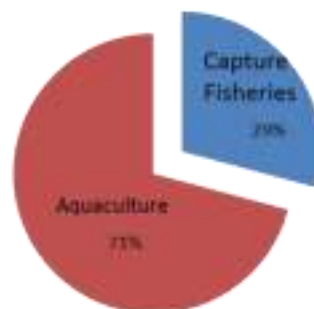
### 3.1.6 East Java

East Java Province fisheries production in 2012 increased by 20% compared to 2011, reaching 1,309,779 tons compared to the previous year at 1,091,692 tons. Trend of East Java Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) was 10% and the last 2 years (2011-2012) amounted to 20% (Figure 12).



**Figure 12. Trend of fisheries production of East Java Province**

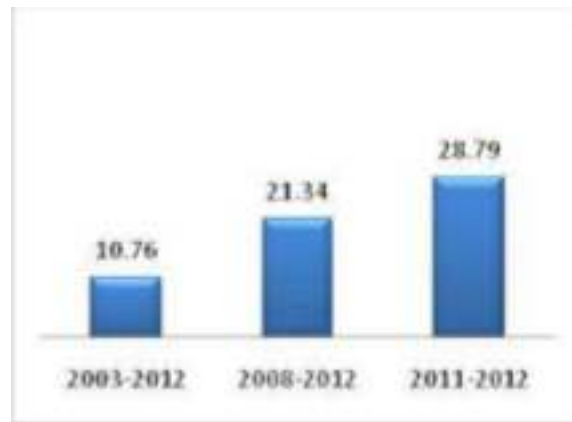
The contribution of capture fisheries production amounted to 381,805 tons (29%), while aquaculture production amounted to 927,974 tons (71%) (Figure13). Trend of capture fisheries production decreased since 2003 with an average decrease of 1% in 2003-2012 and increase by 2% in 2011-2012. Trend of aquaculture production has increased significantly since 2003 with an average increase in 2003-2012 by 27% and by 29% in 2011-2012. The largest commodities for East Java Province capture fisheries in 2012 were shortfin scad (59,890 tons), frigate tuna (32,419 tons) and gold- band goatfish (20,435 tons). The largest East Java Province aquaculture commodities in 2012 were seaweeds (572,538 tons), milkfish (108,385 tons), catfish (62,799 tons) and white shrimps (45,383 tons). Total production of *Pangasius* in 2012 was 6,839 tons in which 4,948.65 tons or 72,36 % came from Tulung Agung District as a production centre of *Pangasius* in East Java.



**Figure 13. Contribution of Capture fisheries and aquaculture production East Java Province**

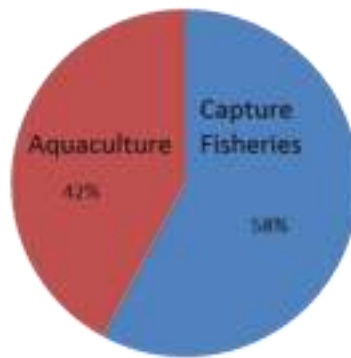
### 3.1.7 North Sulawesi

North Sulawesi Province fisheries production in 2012 increased by 29% compared to 2011, reaching 493,509 tons compared to the previous year at 383,200. Trend of North Sulawesi Province fisheries production has increased since 2003, the average annual increase in the last 10 years (2003-2012) was 11% and the last 2 years (2011-2012) amounted to 29% (Figure 14).



**Figure 14. Trend of fisheries production of North Sulawesi Province**

The contribution of capture fisheries production amounted to 291,439 tons (58%), while aquaculture production amounted to 212,160 tons (42%)(Figure 15). Trend of capture fisheries production increased since 2008 with an average annual increase of 5% in 2003-2012 and increase by 22% in 2011-2012. Trend of aquaculture production has increased significantly since 2003 with an average annual increase in 2003-2012 and in 2011-2012 amounted 40%. The largest commodities for North Sulawesi Province capture fisheries in 2012 were skipjack (103,901 tons), shortfin scad (50,508 tons), yellowfin tuna (42,931 tons) and longtail tuna (24,571 tons). The largest North Sulawesi Province aquaculture commodities in 2012 were seaweeds (159,099.4 tons), tilapia (32,214.68 tons) and carp (6,585.33 tons).



**Figure 15. Contribution of capture fisheries and aquaculture production North Sulawesi Province**

## 3.2 Respondents

The respondents in the selected provinces consists of capture fisheries companies, fish processing companies, fish processing groups, *Pangasius* farmers and seed producers, seaweed farmers, and fish products and seaweed middlemen. Respondents of capture fisheries namely covers skipjack, tuna, and shrimp companies where their bases of location are in Ambon, Bitung and East Java. Respondents of fish processing are both big and small scales enterprises which produces loin/steak tuna, *Pangasius* fillet, fish jelly products, Alkali Treated Carrageenan (ATC), Agar-agar, Frozen shrimps, canned Skipjack/tuna, fish crackers and red snapper fillet. Respondents of *Pangasius* farmers are the farmers who cultivate *Pangasius* both grow out (table fish production) in the pond or cages and hatchery. The location of *Pangasius* farmers respondents are in the West Java, East Java and Jambi. Respondents of seaweed farmers consist of *Gracilaria* seaweed farmers in East Java, and *Eucheuma* sp. seaweed farmers in South Sulawesi. Respondents of fish products and seaweed middlemen are *Gracilaria/Eucheuma* seaweed middlemen/traders in East Java and South Sulawesi, fish products middlemen/traders in West Java, DKI Jakarta and Jambi.

### 3.2.1 Fishermen

In this study, we chose three regions representing Indonesia's capture fisheries:

1. Ambon, Maluku Province, Eastern part of Indonesia

2. North Sulawesi Province, Middle part of Indonesia
3. East Java, Western part of Indonesia

There are many companies survive in these regions because of the abundance of fish resources, especially for tuna. We visited to the companies to ask the respondents to fill the questionnaires and to conduct an interview.

The profile of fishermen respondents on Productivity aspects covers the average capacity of the hold of the ships belonging to each company (Average Capacity), the average production per trip for each ship (Average Total Production), percentage between average of catch per trip and hold capacity (utilization rate %), and the number of days per trip (Fishing Trip) are presented in Table 3.

**Table 3. Profile of respondents in selected areas on productivity aspects**

No	Name of Respondent	Average Capacity	Avg Total Production (trip/vessel)	Productivity rate (%)	Fishing Trip (days)
A	B	C	D	E	F
1	KUB Abdul Payapo	1100 kg/trip	500 kg	45	3
2	KUB Armstrong Louputty	1000 kg/trip	500 kg	50	3
3	KUB Freezel Borel	1000 kg/trip	500 kg	50	3
4	KUB Ibrahim Suneth	1000 kg/trip	500 kg	50	3
5	PT. Arabikatama Fishing Industries (Tuna Purse seine)	25 ton/trip	22 ton	88	75
6	PT. Dwi Kristalin Lestari (shrimp trawler)	60 ton/trip	56 ton	93	90
7	PT. Hadidgo (Tuna Purse seine)	150 ton/trip	135 ton	90	90
8	PT. Jaring Mas (Tuna Purse seine)	100 ton/trip	90 ton	90	90
9	PT. Sinar Abadi Cemerlang (shrimp trawler)	25 ton/trip	22 ton	92	60

10	PT. Tanggul Mina Nusantara (Tuna Purse seine)	150 ton/trip	135 ton	90	90
1	PT. Anekaloka Indo Tuna (hand line tuna)	8 ton/trip	8 ton	100	10
2	PT. Bina Sejahtera Indah (Mini purse seine tuna)	27 ton/trip	27 ton	100	45
3	PT. Etmico Sarana Laut (purse seine tuna)	200 ton/trip	200 ton	100	30
4	PT. Ivanda Mardy Jaya (pole and line tuna)	40 ton/trip	39 ton	98	40
5	PT. Mentari Prima Bahari (mini fish net)	7 ton/trip	6 ton	86	10
6	PT. Sari Melalugis (pole and line tuna)	35 ton/trip	34 ton	97	45
7	PT. Virgo Internusa (Purse seine tuna)	70 ton/trip	70 ton	100	60
1	KMN Putri Sofia	1100 kg/trip	1000 kg	91	14
2	KMN Sriwijaya	1300 kg/trip	1125 kg	96	14
3	KMN Wahyu Ilahi I	1000 kg/trip	800 kg	80	14
4	KMN. Andi Jaya	1200 kg/trip	1000 kg	83	14
Average				83	

Based on the data collected from questionnaires, there were some problems found related productivity:

- High cost for fishing operations because the price of fuel (in Ambon, North Sulawesi and East Java).

- Illegal tax by certain informal elements when the vessels back into harbor base, thus make some vessel owners' to pay extra costs. (in Ambon, North Sulawesi and East Java)
- Low skilled of purse seine fishermen
- Unstable price of fish
- Difficult to get workers to work on the vessel with special need skill and certified crews (AN/ATKAPIN) at the three regions
- Most of fishermen in the three regions haven't had basic safety training.

The profile fishermen respondents on Quality aspects covers productivity, quality controller working on-board, and the catch preservation (icing) system are presented in Table 4.

**Table 4. Profile of respondents in selected areas on quality aspects**

No.	Name of Respondent	Average Capacity	Average Total Production (/trip/vessel)	Ice Loaded on-board	Quality Controller (on-board)	Icing System
A	B	C	D	E	F	G
	<b>Ambon</b>					
1	KUB Abdul Payapo (mini purse seine)	1,100 kg/trip	500 kg	1,000 kg	No	Icing box
2	KUB AmstrongLouputty (mini purse seine)	1,000 kg/trip	500 kg	1,000 kg	No	Icing box
3	KUB Freezel Borel (mini purse seine)	1000 kg/trip	500 kg	1,000 kg	No	Icing box
4	KUB Ibrahim Suneth (mini purse seine)	1,000 kg/trip	500 kg	1,000 kg	No	Icing box
5	PT. Arabikatama Fishing Industries (Tuna Purse seine)	25 ton/trip	22 ton	Nil	No	Refrigerated Fish Hold
6	PT. DwiKristalin Lestari (shrimp trawler)	60 ton/trip	56 ton	Nil	No	Refrigerated Fish Hold
7	PT. Hadidgo (Tuna Purse seine)	150 ton/trip	135 ton	Nil	No	Refrigerated Fish Hold



8	PT. Jaring Mas (Tuna Purse seine)	100 ton/trip	90 ton	Nil	No	Refrigerated Fish Hold
9	PT. SinarAbadiCemerlang (shrimp trawler)	2500 ton/year	22 ton	Nil	No	Refrigerated Fish Hold
10	PT. Tanggul Mina Nusantara (Tuna Purseseine)	150 ton/trip	135 ton	Nil	No	Refrigerated Fish Hold
<b>North Sulawesi</b>						
1	PT. Anekaloka Indo Tuna (pole and line tuna)	8 ton/trip	8 ton	8 ton	No	Ice
2	PT. Bina Sejahtera Indah (Mini purse seine tuna)	27 ton/trip	27 ton	27 ton	No	Ice
3	PT. EtmicoSaranaLaut (purse seine tuna)	200 ton/trip	200 ton	Nil	No	Refrigerated Fish Hold
4	PT. IvandaMardy Jaya (pole and line tuna)	40 ton/trip	39 ton	40 ton	No	Ice
5	PT. Mentari Prima Bahari (mini fish net)	7 ton/trip	6 ton	7 ton	No	Ice
6	PT. Sari Melalugis (pole and line tuna)	35 ton/trip	34 ton	35 ton	No	Ice
7	PT. Virgo Internusa (Purse seine tuna)	70 ton/trip	70 ton	Nil	No	Refrigerated Fish Hold
<b>East Java</b>						
1	KMN Putri Sofia (mini purse seine)	1100 kg/trip	1000 kg	1,000 kg	No	Ice
2	KMN Sriwijaya (mini purse seine)	1,300 kg/trip	1,125 kg	1,200 kg	No	Ice
3	KMN Wahyu Ilahi (mini purse seine)	1,000 kg/trip	800 kg	1,000 kg	No	Ice
4	KMN. Andi Jaya (mini purse seine)	1,200 kg/trip	1,000 kg	1,200 kg	No	Ice

Based on the data collected from questionnaires there are some challenges and problem faced by fishermen related to quality services, especially in East Java:

- Because of the low quality fish landed. The decreasing qualities of the catch are caused during loaded to the vessel until unloaded to the fishing port, and also during handling at the fishing port. The former cases are caused by improper handling/icing (lack of ice and less awareness of fishermen on quality and seafood safety). The latter are caused by improper handling during unloading and during auction, that there are no cold-chain method.
- Commonly small fishing boats (one day fishing) are not equipped with cold storage only cool box with icing system, hence when the fishing boat land their fish captured there is need immediate handling (cooling process) to maintain the quality of fish. However, some fishing port has limited capacity of cold storage.
- Low standard of fish product could decrease the price (it is about 30% in low quality) therefore need more training in good handling process on-board to maintain the quality of fish especially on icing system.
- Lack of the latest information related to the quality standard of fish captured especially for market export.

The profile of fishermen respondents on Sustainability aspects covers productivity, mesh size which affected to the size of fish caught, and fish observer (on-board) – a government/MMAFS's officers - who collect data of the vessels' activities conforming to regulations, are presented in Table 5.

**Table 5. Profile of respondents in selected areas on sustainability aspect**

No.	Name of Respondent	Average Capacity	Average Production (ton/trip/vessel)	Mess sizing	Fish Observer (onboard)
A	B	C	D	G	H
1	KUB Abdul Payapo (mini purse seine)	1,100 kg/trip	500 kg	No	No
2	KUB AmstrongLouputty (mini purse seine)	1,000 kg/trip	500 kg	No	No
3	KUB Freezel Borel (mini purse seine)	1,000 kg/trip	500 kg	No	No
4	KUB Ibrahim Suneth (mini purse seine)	1,000 kg/trip	500 kg	No	No

5	PT. Arabikatama Fishing Industries (Tuna Purse seine)	25 ton/trip	22 ton	No	Occasional
6	PT. DwiKristalin Lestari (shrimp trawler)	60 ton/trip	56 ton	Yes	Occasional
7	PT. Hadidgo (Tuna Purse seine)	150 ton/trip	135 ton	Yes	Occasional
8	PT. Jaring Mas (Tuna Purse seine)	100 ton/trip	90 ton	No	Occasional
9	PT. SinarAbadiCemerlang (shrimp trawler)	25 ton/year	22 ton	Yes	Occasional
10	PT. Tanggul Mina Nusantara (Tuna Purseseine)	150 ton/trip	135 ton	No	Occasional
1	PT. Anekaloka Indo Tuna (pole and line tuna)	8 ton/trip	8 ton	No	No
2	PT. Bina Sejahtera Indah (Mini purse seine tuna)	27 ton/trip	27 ton	No	No
3	PT. EtmicoSaranaLaut (purse seine tuna)	200 ton/trip	200	Yes	Occasional
4	PT. IvandaMardy Jaya (pole and line tuna)	40 ton/trip	39 ton	No	No
5	PT. Mentari Prima Bahari (mini fish net)	7 ton/trip	6 ton	No	
6	PT. Sari Melalugis (pole and line tuna)	35 ton/trip	34 ton	No	No
7	PT. Virgo Internusa (Purse seine tuna)	70 ton/trip	70 ton	Yes	Occasional
1	KMN Putri Sofia (mini purse seine)	1,100 kg/trip	1,000 kg	No	No
2	KMN Sriwijaya (mini purse seine)	1,300 kg/trip	1,125 kg	No	No

3	KMN Wahyu Ilahi (mini purse seine)	1,000 kg/trip	800 kg	No	No
4	KMN. Andi Jaya (mini purse seine)	1,200 kg/trip	1,000 kg	No	No

Based on the data collected from questionnaires there are some problems found in in Ambon, North Sulawesi and East Java related to sustainability services:

- The shortage of raw material with the smaller size which cause the fishing ground are farther and fuel is limited
- Based on information from respondents of Tuna and Red Snapper processing industries are facing shortage of raw materials with the size getting smaller. This conditions made the fish processing companies can't reach their maximum capacities, yet they still can survive..
- Lack of technical assistant from government related to regulation and guideline for responsible and sustainable fisheries, especially in East Java (small scale fisheries)
- Lack of awareness on CCRF
- Lack of monitoring, control, and surveillance
- Lack of technical assistance or information about pollution prevention at sea from related government and local agency

### 3.2.2 Fish Farmers

#### 3.2.2.1 *Pangasius* farming

1) *Pangasius hypophthalmus* Culture in Jambi :

##### a. Characteristics

There are number of *Pangasius* farmer groups in Jambi. Some farmers have hatchery, some others have grow-out ponds only, and some others have both. Most of them have started their business (in group) since the last decades. General profiles of the group are described in Tabel 6.

**Table 6. General characteristics of farmer groups in Muaro Jambi, Jambi**

No.	Respondent	Number of group member (group)	Number of worker (persons)	Business	Certificate

1.	Tunas Baru (Pokdakan; head: Timan)	8-10	4	Hatchery; Grow-out	CBIB
2.	Kenidai Jaya (head: Yuslin)	8-10	5	Grow-out	CBIB
3.	Swadaya (head: Sutrisno)	8-10	4	Grow-out	CBIB
4.	Mina Handayani (head: Trinarto)	10	3		CBIB
5.	Mina Teladan (head: Surpianto)	8-10	4	Hatchery Grow-out	CBIB
6.	Usaho Kito	8-10	5	Hatchery	MPM (Quality Control Manager)

A group of *Pangasius* farmer has 8-10 members. The head of a larger farmer group (Pokdakan), is a prominent farmer owned a large farm of 48 ponds and a *Pangasius* hatchery. He has an inspiring motto “be a best aquaculture entrepreneur in Jambi”. Most of the groups have already had CBIB (Good Aquaculture Practices or GAP) certificate, issued by Jambi Province Fisheries Service, and one farmer has already had MPM (Quality Control Manager) Certificate.

Problems concerning their *Pangasius hypophthalmus* culture business include lack of capital, fish diseases, feed raw material, marketing, high price of feed, difficulty in removing sludge, and climate (higher water temperature) particularly dry season. Some farmers who owned many ponds don not operate all their ponds since there are lacks of capital for the last three month feeding that at that time the amount of feed so high as the fish biomass higher. According to Association, farmer reluctant to take money from the banks to operate more ponds because of marketing problem that the demand of *Pangasius* is limited (local consumption only).

Some farmers have problem on fish diseases. To minimize diseases, they apply salts and probiotics on their farms, vaccination on seed, as well as better pond preparation. Some farmers asked help to Jambi Freshwater Fish Culture Station (Balai Budidaya Air Tawar or BBAT).

Most farmers in Jambi produce their own feed for the last three months of the culture period to cope with high price of commercial feed. One significant problem is the availability of feed raw

materials, especially low value of salted fish. Salted fish is one of protein source materials for their pellet production, beside other protein source materials from non animal sources such as rice bran, corn meal, etc. Marketing problem is that there is no fixed price of their products. Sometimes, some farmers lowering their price of their products because they need money. Some respondents proposed that there is a “one-gate system” (a group of farmers’ marketing system, having a marketing outlet, and the harvesting of cultured fish are scheduled) that would be stabilized the sales price of their product.

Climate is one of significant problem that interfere the success of *Pangasius* culture in Jambi. Lack of water during dry season make the depth of pond water decrease, water temperature increase, and in turn make the culture period longer because of lower growth ratio. Some farmers anticipate it by using some ponds for emergency reservoir some farmers operate only some of their ponds. Additional pumps are needed for transferring the water. Some farmers do not have enough capital to acquire the additional pumps.

Most farmers have small amount of ponds. Only the chief of Tunas Baru Group has 24 ponds that make him has better production schedule, as well as able to harvest monthly. The second position is Kenidai Jaya that owned 12 ponds. These two farmers’ facilities have production capacity of 96 and 80 ton/cycle respectively, while the others are significantly lower. Two farmers have *Pangasius* hatchery. Most farms have good water quality spring water as water source for their ponds make the operation of culture possible during all seasons. Some others have only run-off water that suspected as polluted by urban activities. Some farmers support the water supply with well pump especially for hatcheries. The information of grow-out farm facilities is described on Table 7.

**Table 7. Profiles of grow-out farms**

No.	Description	Tunas Baru	Kenidai Jaya	Swadaya	Mina Handayani	Mina Teladan
<b>1</b>	Ponds					
	• number (unit)	24	12	9		
	• average size (m <sup>2</sup> )	400	400	240	200-500	300
	• capacity, total (ton/cycle)	96	80	10.8		
	• capacity per pond (ton/cycle)	4	4	1.5	1.5 – 4	2

2	Machineries: • slugde pump	Yes	Yes			
	• pellet machine	Yes	Yes	Yes	Yes	Yes
3	General problems:	- Capital	- Flood	- Sludge pump - Capital	Sludge pump	Sludge pump

The culture ponds are of stagnant water pond system. One characteristic of such a type of pond is relatively low productivity (compared to flow through, running water, and intensive pond systems).

All *Pangasius* farmers in Jambi used home made pellets that are far cheaper than commercial feed, i.e. Rp.4.200.- only, with about 20-22% crude protein content. Commercial feed (crude protein 30-32%) are used only for the first two months of culture, mainly because of its higher price (Rp.15.600/kg for live fish). However, higher quality commercial feed basically is needed for the earlier stage of cultured fish.

The problems of *Pangasius* culture in Jambi include lower productivity or longer culture period in dry seasons, inconsistent supply of feed raw materials especially of the low price (below standard or BS) salted fish, difficulty in taking-out sludge from some ponds, and one respondent said there was theft. The descriptions of the first two were described above.

Productivity of the farms are lower in dry seasons. Generally, average production of a pond (+/- 400 m<sup>2</sup>) is 4 ton/cycle, but it decrease to about +/- 2 tons (50%) in dry seasons. During drought, some farmers used part of their ponds as reservoir, and pump the water to other ponds as water supply and/or as water exchange.

Problem on the difficulty of removing sludge from their ponds is because of the inappropriate irrigation system and/or its bad/unsuitable pond location. Some farmers even do not have sludge pump.

#### *b. Production Technique*

The production technique of *Pangasius hypophthalmus* quite simple. Preparations of ponds include drying the pond, application of fertilizer, and filling the water. Some farmer pumping out sludge and used dolomit for disinfection. The description of culture procedure and materials are presented in Table 8.

Table 8. Farming practices

Description	Tunas Baru	Kenidai Jaya	Swadaya	Mina Handayani	Mina Teladan
<b>Preparation</b>					
- drying (day)	4 (depend on season)	4 (depend on season)	4 (depend on season)	4 (depend on season)	4 (depend on season)
- liming					
- fertizing (material; doses)	Manure; 60-7 Kg/pond (0.15-0.175 kg/m <sup>2</sup> )				
- salt	Yes	Yes	Yes	Yes	Yes
- cek pH	Yes	Yes	Yes	Yes	Yes
- vaccination	Yes		Yes	Yes	
- probiotics	Yes				
<b>Seed</b>					
- size	2"	2"	2"	2"	2"
- density	20 fish/m <sup>2</sup>	20 fish/m <sup>2</sup>	20 fish/m <sup>2</sup>	20 fish/m <sup>2</sup>	20 fish/m <sup>2</sup>
<b>Feeding</b>					
- first two months	Commercial feed (protein 30-40%; Rp.15.600/kg)	Commercial feed (protein 30-40%; Rp.15.600/kg)	Commercial feed (protein 30-40%; Rp.15.600/kg)	Commercial feed (protein 30-40%; Rp.15.600/kg)	Commercial feed (protein 30-40%; Rp.15.600/kg)
- Last 3-6 months	Home made pellet)	Home made pellet)	Home made pellet)	Home made pellet)	Home made pellet)
- technique	Adlibitum;	Adlibitum;	Adlibitum;	Adlibitum;	Adlibitum;
- draining water	to a ditch	To a ditch, river	To a ditch (un-suit condition)	to a ditch	to a ditch
- period/cycle	6 months	6 months	6 months	6 months	6 months
<b>Problems:</b>	- competitor fish	- predator	- diseases	- diseases	- sludge removal



There are some sources of *Pangasius hypophthalmus* seed for culture. Some farmers have their own seed produced (even had not sufficient for their own grow-out ponds) while some others have not. Some farmers bought their seeds from Bogor (by order it to local Fisheries Service). Some farmers bought their seed to other UPR (small scale hatchery unit) in Jambi, one of them buys from a hatchery that produced certified seed 300,000-500,000 fish/cycle. Most farmers used 2" size seed for culture. Generally, smaller size of seed ( $\frac{3}{4}$ " ) is weaker that could not stand to new environment as well as exposed to bad weather. Description of seed that commonly used by the farmers presented in Table 9.

**Table 9. Description of seed used by Jambi farmers.**

Description	Tunas Baru	Kenidai Jaya	Swadaya	Mina Handayani	Mina Teladan
<b>Source</b>	Mainly owned produced	Order to Fisheries Service	- UPR - BBAT	- UPR - Owned produced	UPR
<b>Quality</b>	Good; 2"	Standard	Good	Good	Larvae; $\frac{3}{4}$ "
<b>Continuity</b>	+ From BBAT Gelam (when necessary)	Good	Good	Sortage (seasonal; 3 months)	
<b>Transportation time</b>	1 hour (from BBAT Gelam)	45 min (from Quarantine station)	45 min (from BBAT)	Directly transferred	45 min
<b>Mortality rate</b>	3%			30-40% (bad season); normal 5%	Normal 5%
<b>Price/fish seed; size</b>	Rp.200.- (2")	Rp.250-300	Rp.200.- (2")	Rp.80.- (3/4")	Rp.200.- (2")

Seeds are released after the water quality is neutral and natural feed has grown well. Acclimation required letting the seeds fit to new environment. Before releasing the seed, salt is applied to the water. Some farmers check the water pH to make certain that the water quality is neutral. Some farmers use probiotics to enhance pond water quality and provide fish health.

Industrial feed are applied during the first two months, continued with home-made pellet for the next 4 month periode. They make the pellet themselves to reduce operational cost. The main

raw materials are low price fish, rice bran, corn meal, etc. The crude protein content of the home-made pellet is 20-22%, far lower compared to commercial feed protein content (30-40%), but far lower do the price (Rp.4,200.-). Feeding system is *ad libitum* (are applied until full), applied two times daily.

Water temperature and pH are regularly monitored. General procedure to maintain water quality is done by exchanging water regularly, and because of its low elevation of pond areas (generally a levy), water exchange are done by pumping. Some farmers have applied probiotics. Harvesting is done by seining. Sold life, the harvesting are to be done carefully, and filled in container for transportation.

Some government policies have impacted to aquaculture business, some of them are legal aspects such as Sub Diustric's master plan, and some others are of increasing fuel oil price, etc. Sustainability is one of important issues that should be concerned by farmers and all stakeholders. One key point to realize sustainable aquaculture is to raise the farmers' awareness of the importance of sustainability. Unaware and irresponsible attitude might impact negatively to their own business entity and to others. The Ministry Marine Affairs and Fisheries or MMAF's CBIB (or Good Aquaculture Practices) certificate is one prerequisite of aquaculture business entity. This certificate issued by the MMAF through local Province Fisheries Services.

However only some fish culture unit have already had this certificate. Acquiring of the certificate and other things related to certification of the respondents' culture unit is presented in Table 10.

**Table 10. Sustainability certification for farmers groups**

No.	Respondents	Certificate on Sustainability	Pre-audit in sustainability	Problems
1.	Tunas Baru	CBIB (GAP)	X	In cleanliness
2	Kenidai Jaya	CBIB (GAP)	X	X
3	Swadaya	CBIB (GAP)	X	X
4	Mina Handayani	X	X	X
5	Mina Teladan	CBIB (GAP)	X	X

## 2). *Pangasius* Culture in East Java (Tulungagung):

East Java is the third rank among the study areas in *Pangasius* production, i.e. 6,839 ton/year (2012), but the productivity of fish ponds (all kinds of freshwater fish) is the highest, i.e. 52.12 ton/ha/year. This highest productivity is achieved because of the type of ponds (regular ponds) and its water supply (irrigation and tributaries), that some ponds are flow through (running) water system, and combined to the use of commercial feed that make higher growth ratio and higher carrying capacity of the ponds.

The location of the survey is Ngantu Sub district, Tulungagung District. There are two species of *Pangasius*, i.e. *Pangasius hypophthalmus* and *Pangasius* sp. - a cross hybrid from *Pangasius hypophthalmus* and *Pangasius jambal*. The former species is the common species that are cultured by East Java farmers, whereas the latter is in the stage of trial production, a collaboration with Sukamandi Freshwater Seed Production Centre (BPIAT). The *Pangasius* sp has superior quality that this hybrid is better flesh color (more white), and it has shorter period of culture. However, some problems still encountered the development of mass production of this species because of limited availability of high quality seed, and need better water quality for grow-out.

### a. Farmers

One farmer, a head of group of farmer in Ngantu Sub District, Tulungagung culture two species i.e. *Pangasius hypophthalmus* and *Pangasius* sp. This farmer also cultures many kind of fishes such as ornamental fishes. Number of his group of farmer is 10 persons. Some of them farm *Pangasius hypophthalmus* and some others rare ornamental fish. He has already had Quality Control Manager (MPM) certificate, and a well known head of group of farmer that actively participating in Fisheries Sub-District's rural development program and activities.

### b. Facilities

The type of *Pangasius* ponds are generally a stagnant water pond of 200 - 500 m<sup>2</sup> area and are of +/- 80 cm depth. The water sources are surface water from small irrigation and some others are from tributaries. The pond used for rearing *Pangasius* sp. is treated so special that the water keep flowing (*flow-through system*) to maintain enough oxygen supply. This is done to conform the Standard Operating Procedures (SOP) from Sukamandi Freshwater Research Station (Balai Perekayasa Ikan Air Tawar or BPIAT) as a guidance of *Pangasius* sp. culture technique.

### c. Workers

There are 6 regular workers and 8 non regular workers in the Group of Fish Farmer. The regular workers have already worked for 6-10 years that make them relatively stated as skilled workers. Some of them has joined some training or have acquired certificates such as Culture Technique Certificate, Fish Processing Certificate, and Feed Processing Certificate.

The group has 7 hour working time for their workers. Bonus and good relationships are among motivations applied by the head of the group.

### d. Farming practices

There are some sources of seed for culture; *Pangasius hypophthalmus* from West Java, whereas *Pangasius* sp. – still a trial production - from Sukamandi Freshwater Research Station (BPIAT Sukamandi). Most farmers used 2” size seed for culture other than ¾” size seeds. For smaller size of seed (¾”) that is weaker and could not stand to new environment as well as bad weather, are being reared to fingerling ponds for 1-2 months.

The production technique of *Pangasius hypophthalmus* is more or less the same to the technique being practiced by Jambi farmers. Preparation of ponds includes drying the ponds, taking out sludge, applying dolomit, fertilizer, and filling the water. Most of them use strainers in the inlet of the ponds to prevent the predators and competitors enter to the ponds through the incoming water. Some of the farmers apply probiotics to increase the water quality and the health of fish.

For the first two months, higher quality commercial feed (crude protein > 35%) is used to make certain that they get good and healthy fingerlings. For the grow-out, from the third month of culture, commercial feed of 30-32 protein content then to be used. Culture maintenance include exchanging water regularly, apply medicines when a sign of disease showed up, control the predator and competitor during culture period, decrease the feed portion when there are bad wheather, etc. Marketable sizes (+/- 500 g) are generally attained after 6 months culture period.

Main problem of *Pangasius* culture in Tulungagung is marketing, since there is a cheaper import product from Vietnam (*Pangasius* fillet Rp.40.000/kg). Sales price is Rp.14,500 for +/-500 g size of fish, and some respondents said it is nearly just break-even.

### 3) *Pangasius* Culture in West Java :

West Java is the first rank among the study areas in *Pangasius* production, i.e. 19,040 ton/year (2012), and the productivity of fish ponds (all kinds of freshwater fish) is the second rank, i.e. 29.58 ton/ha/year. This medium productivity is supposed because of its variety in the type of ponds, the water source and its feeding system. The description of the first two factors will be presented in the following paragraphs, and the last factor will be described in culture technique paragraph.

#### a. Farmers

There are many types of fish farming units/systems for *Pangasius* in West Java. Some farmers apply policulture system of *Pangasius* with other fishes such as carp (*Cyprinus carpio*), tilapia (*Nile tilapia*), freshwater pomfret (*Colossoma macropomum*), etc, and some others are specialized in *Pangasius* (monoculture). Some farmers rear Gourami (*Osphronemus gourami*), some farmers rear *Pangasius hypophthalmus*. Some farmers are specialized in seed production and some others in grow-out. Here are some respondent of fish farmers in West Java (Table 11).

**Table 11. Some respondent of fish farmers in West Java**

No.	Responden; location	Business segment	Average Production	Culture facilities	Certificate
1	Sadar; Cikarang, Bekasi	Grow-out	120 ton/cycle	Ex sand-excavated ponds; 4 ha farm (nett pond area 2 ha, size 1,000-7,000 m <sup>2</sup> )	x (no certificate); but a trainer
2	Ahmad; Krukut, Depok	Grow-out	4,800 kg/cycle	4 Ponds (@ 200 m <sup>2</sup> )	X
3	Bowo; Cirata, Cianjur	Grow-out	Production: 4.5 ton/unit (2.9 kg/m <sup>3</sup> ,  ( <i>Pangasius</i> + <i>Nile tilapia</i> or <i>C. macropomum</i> )	Net cages; 8 unit (size 14x14x8 m = 1,568 m <sup>3</sup> )	X

Among the farmers who culture *Pangasius hypophthalmus*, a head of fish farmer group in Bekasi is the prominent farmer. Number of his group of farmer is 10 persons (real fact is more than 10 persons). Even though he hasn't had MPM certificate, he is a well known head of group of farmer, a trainer that actively participates in Fisheries District's rural development program and activities. Other farmers are regular farmers in Depok, having 4 unit of ponds size +/- 200 m<sup>2</sup> each. Whereas one floating net cages farmer at Cirata who had ever cultured *Pangasius* in policulture system, is now stop culturing *Pangasius* because of not enough margin (loss). The main reason is of the high mortality in the early days perode of culture. Survival rate was 70% for *Pangasius hypophthalmus*, and the feed conversion ratio was more than 1.4. This rate of production even far lower in bad seasons i.e. upwelling and in cold weather.

#### b. Facilities

There are many types of ponds/culture facilities, i.e. regular type of ponds with restricted flow-through system, stagnant water system, ex sand-mining ponds, and net cages. The characteristics of the ponds/impoundments are presented in Table 12.

**Table 12. Characteristics of ponds/impoundments in West Java**

No.	Locations; Farmer	Type of Pond/impoundment	Number and Size	Water sources
1	Cikarang; Sadar	Ex sand-minig (stagnant water system)	5 units; 1,000 – 7,000 m <sup>2</sup>	Tributaries
2	Depok; Ahmad	Regular type (limited flow-through system)	4 units; @ 200 m <sup>2</sup>	Tributaries
3	Cirata lake; Bowo	Net cages	8 units of 14x14x8 m net cages (plus inner cage of 14x7 m in each unit)	Lakes Cirata

Ex sand-mining ponds in Bekasi are irregular ponds having irregular shapes and depth. The soil is of relatively high percentage of clay that make it broken in dry condition. The sources of water are vary; some of them are from tributaries of an irrigation system, and some others are tributaries from canals that are polluted by industries and human activities in upper lands. The water source of Cikarang ponds is a tributary from irrigation system of relatively normal, even it

supplies is minor in dry seasons. In this case, the farmer then transferring the water from one pond to another to maintain the water quality.

#### c. Workers

Among the above farmers, the head of group of farmer at Cikarang, Bekasi has the highest number of workers i.e. 15 regular workers. Despite the salaries being lower than Regional Minimum Wages (UMR), and no bonus is given except during festival season, they do their tasks well. This might berelated to the limited working time i.e. just 4 hours daily (except in harvesting), that it is po.ssible for them to have another works or make another income. Some of them have joined some training or have acquired certificates such as Culture Technique Certificate, Fish Processing Certificate, and Feed Processing Certificate.

#### d. Farming practices

The production technique of *Pangasius hypophthalmus* more or less the same to the technique being practiced by Jambi farmers, except for ex sand-excavated ponds and net cages. In ex sand-excavated ponds, the culture period is longer (8 months) and most of them use organic waste materials or combined with commercial feed to reduce production cost. Whereas in net cages there is no pond preparations except checking the net to make certain that the condition is ready to use. The only process is webbing the broken part of the net, drying and cleaning from dirt or other materials. The culture system is polyculture with Carp (*Cyprinus carpio*) or Bawal (*Colossoma macropomum*) as the main species in the inner cages and *Pangasius hypophthalmus* as second species in the second layer. The basic culture techniques for each type of impoundments are presented in Table 13.

**Table 13. The farming practices and production**

No.	Type of Impoundments	Water System	Culture density (fish seeds/m <sup>2</sup> )	Feeding	Production (normal condition)
1	Ex sand-mining ponds (monoculture); exp. 20,000 m <sup>2</sup>	Stagnant water system	10-15	Commercial feed (first 2 months); Waste materials (last 4 months)	120,000 kg; size 500-1,000 g (6 kg/m <sup>2</sup> ); (8 months)
2	Net cages (policulture);	Basically flow-through	+/- 10-15 fish/m <sup>3</sup>	Commercial	2.9 kg/m <sup>3</sup> ; size

	14x14x8 m	water system (depend on the water current of the lake)	(+/- 80-120 fish/m <sup>2</sup> )  ( <i>Pangasius</i> + other (main) fish; density for <i>Pangasius</i> is lower)	feed	2-4 fish/kg)  (23.2 kg/m <sup>2</sup> );  (3 months for Carp; 6 months for <i>Pangasius</i> )
3	Regular ponds (monoculture; policulture); exp. 400 m <sup>2</sup>	Stagnant to flow-through water system	15-20	Commercial feed (pellet);  Combination (pellet+waste)	3,800 kg; size 2 fish/kg  (9.5 kg/m <sup>2</sup> );  (6 months)

Preparation of regular ponds include drying the ponds, taking out deteriorating sludge, applying dolomit and/or salt for disinfection, fertilizer, and filling the water. There is no removing the sludge from ex sand-mining ponds. Some of them use strainers in the inlet of the ponds to prevent the predators and competitors enter to the ponds through the incoming water. The ponds are ready when natural feed are grown well. The preparation of net cages is simple, i.e. drying and cleaning from dirt, control and repairing the broken part of the nets, and fixing to the cage.

Most farmers use 2" size of *Pangasius* seeds, with some various degree of density i.e. 10-15 fish/m<sup>2</sup> for ex sand-mining ponds, +/- 15 fish/m<sup>3</sup> for net cages, and 15-20 fish for regular ponds. The relatively high density of regular ponds is because of its relatively better water system – some of them are flow-through water system that normally higher supply of dissolved oxygen. The density of net cage is about regular – +/- 15 fish/m<sup>3</sup> – but it is very high in square meter (+/- 125 fish/m<sup>2</sup>) for common type of net cages in Cirata with 8 m depth of net cages. .

There are the same feed used for the first two months feeding i.e. using higher quality commercial feed (crude protein > 35%), and relatively lower protein content for the last four month culture period.

There are different West Java's feeding practices from the third month of culture. Some of them use commercial feed (protein content 30-32%), some of them use commercial feed plus waste (from markets), and some of them use waste materials only (from factories/ex workers' meals). The first feeding practice is done by net cages' farmers. To compensate the feed cost, generally the cages' farmers place *Pangasius* in the second layer of the cage net, and they give priority to



feed other fishes (*Cyprinus carpio*, *Nile tilapia*, *Colossoma macropomum*), etc. in the upper net cages. No ransum/portion of feed calculated for *Pangasius*, that this fish will get the uneaten feed from fishes of upper net cages – because of this that the density of *Pangasius* is lower than the other (main) cultured fishes. Few of the net cages farmers do rear *Pangasius*, and this is caused mainly by its high mortality rate. Recently, this even followed by its decrease in feed efficiency for all kind of cultured fish. The farmers do not know whether this comes from the lower feed quality, or the lower water quality of the lake.

The second and the third feeding practices (using organic waste materials) are more prevalent in West Java. Interesting fact is observed from the third practice in Bekasi, that using organic waste material from meals of factory workers is very efficient – the head of the group of farmer pointed out that the cost of feed is only little bit more than 50%, whereas the other practices are about 70%. The head of the group of farmer's success history of this feeding technique come from their two years tough experience.

Culture maintenance include exchanging water regularly, apply medicines when a sign of disease showed up, control the predators and competitors during culture period, decrease the feed portion when there are bad weather, etc. Some of them have difficulty in exchanging water especially in dry seasons, especially for the ex sand-mining ponds. The only longer culture period is for ex sand-mining ponds i.e. 8 months, and its size of harvested fish are 500-1,000 g – bigger than the other type of ponds.

The productions of regular type of ponds are higher than that of ex sand-excavated type of ponds, i.e. +/- 9.5 kg/m<sup>2</sup> for the former and 6 kg/m<sup>2</sup> for the latter. There are also different culture period – 6 months for regular ponds and 8 months for ex sand-excavated ponds. It means that the rate of productivity would be higher for regular type of ponds, and it is make sense as the regular ponds are mostly flow-through system. On the other hand, the average productivity of net cages is the lowest in cubic meter (2.9 kg/m<sup>3</sup>), but it is so high in square meter (23.2 kg/m<sup>2</sup>). It then might be that lakes are of potential areas as production centres for *Pangasius* when an industry of *Pangasius* processing plant would be initiated.

The head of the group of farmer, one of the owner of such type of farm in Bekasi also as Mitra/partner (as nucleus) for his member of group and other farmers. He supplies all culture inputs (seeds, feed, etc.) to his farmer/partners and then buy the harvested fish. Most of harvested fish are handed to middlemen on farm, and only some orders are directly delivered by the head of the group of farmer. It seems that such a type of business (farmer and also a

supplier and trader) is a prospective business. One more positive point is – as he is also a trainer.

There are some problems in *Pangasius* culture in West Java, i.e.: (1) high production cost when merely commercial feed to be used; (2) high mortality rate in net cages especially during the early days of culture; (3) minor water supply in dry seasons especially for ex sand-mining ponds; (4) need of higher attention/care on using organic waste materials as feed.

#### 4) *Pangasius* hatchery :

There are some units of *Pangasius hypophthalmus* seed production centres in Jambi and West Java, with specific distribution of their production. Hatcheries in Jambi sale their *Pangasius* seeds to local grow-out farmers, whereas hatcheries in West Java sale their seeds mainly to Sumatera and Kalimantan (via middlemen), East Java, and a few to local grow-out farmers. The characteristics of some hatcheries in Jambi and in West Java are presented in Table 14.

**Table14. Profiles of some *Pangasius hypophthalmus* hatcheries in Jambi and West Java**

No.	Responden; location; facility	Start from	Average Production; marketing	Main problem	Certificate
1	Pokdakan Tunas Baru, Jambi; 1 unit	2004	100,000 seeds/cycle (For his own grow-out ponds)	<ul style="list-style-type: none"> <li>• Diseases</li> <li>• high mortality (lack of <i>Tubifex</i>)</li> </ul>	CBIB
2	Mina Handayani, Jambi; 1 unit	2006	100,000 seeds/cycle; (Local areas)	<ul style="list-style-type: none"> <li>• Diseases (weather)</li> <li>• sales price</li> </ul>	CBIB
3	Usaho Kito, Jambi; 2 units	1998	300,000-500,000/cycle; (Local areas)	<ul style="list-style-type: none"> <li>• Minor water supply in dry seasons</li> <li>• mortality 30-40%(weather), normal 5-10%</li> </ul>	MPM (Quality Control Manager)
4	Boan; Depok; Hatchery 2 units; Breeder ponds 4 units	1980	600,000 seeds/cycle; (Mainly Sumatera and Kalimantan)	Low demand during prolonged dry seasons	No Certificate (but a trainer, and a non-regular)

					extension worker)
5	Husin; Depok (group member of Boan);  4 units	2000	1,000,000 seeds/cycle;  (Mainly Sumatera and Kalimantan)	Low demand during prolonged dry seasons	X

Hatchery facilities in the two areas basically are the same, i.e. indoor building completed with electric, aeration and water installations, and aquariums some hatchery use water heater or kerosene stoves, and some of them use only electric bulbs to increase the water temperature, as temperature is one of critical parameter for fish hatcheries.

One farmer in Jambi, the head of larger group of farmer (Pokdakan) have their own seed production or hatchery for his grow-out ponds, another farmer sale the produced seeds to local grow-out farmers as well as for his grow-out ponds, whereas another farmer purely in *Pangasius hypophthalmus* seed production and sell all seeds produced to local grow-out farmers. The production can be categorized as small (100,000-500,000 seeds/cycle).

There are different ways in motivating their workers. The head of group of farmer applies bonus and festival day, while another farmers' bonus policy is based on attaining the target of production, or both.

One head of farmer in Depok, West java has two units of hatcheries in his house and some brood ponds for his broodstock. The only worker is his wife, and therefore there are no wages. He has a long experience in fish culture and *Pangasius hypophthalmus* seed production, as well as other freshwater fishes. He also one of an extension agent for Depok Fisheries District. The average production is +/- 600,000 seeds/cycle and its survival rate +/- 70%. Good production technique and experience make the duration of culture relatively short, i.e. 3 weeks for ¾" seeds. To produce 2" seeds he rear the seeds in out-door ponds.

Another *Pangasius hypophthalmus* seed producer is his member of the group of farmer, having 4 units of hatcheries with average production +/- 1,000,000 seeds/cycle. He has regular four workers and the salaries are under Regional Minimum Wages (UMR) plus bonus when the production targets are attained. Both farmers sell the seeds produced to Sumatera and Kalimantan – the prominent *Pangasius hypophthalmus* grow-out farmers in Indonesia. It seems

that there is no seed certificate for their seed produced. As an interinsular trading, the middlemen process Certificate of Origin (SKA) for the seeds to Fisheries Quarantine Office.

Most of the *Pangasius hypophthalmus* hatcheries have already had CBIB Certificate, and one of them has already had Quality Control Manager (MPM) Certificate, whereas both two hatcheries in West Java – prominent hatcheries - have not had CBIB Certificate as well as MPM Certificate. Yet, its success of the seeds marketing from the two hatcheries might be evolved from its relatively long success history of the hatchery units, and not merely because of having CBIB (GAP) and MPM Certificates.

Working hours in hatcheries are 8-18 hours a day – a tough type of work. The hardest schedule is during the early stages of larvae that have to be fed every 2-3 hours. Not only do tough work in feeding, but also in preparing the feeds, cleaning the aquariums and the working tools, and in exchanging water daily.

The hatching and larval culture techniques and procedures are same for all hatcheries either in Jambi as well as in West Java. The breeding technique is induced breeding. Selected mature males and females are induced using ovaprim (Gonadal Maturing Hormone) at day time (both males and females) and evening (female only). Aquarium waters are treated with *Methylene Blue* for disinfection, and pour +/- 3 ppt of salt. *Artemia salina* - the first natural feed - are hatched in conical tanks or ex mineral water bowls. Eggs and sperm milt then taken out from the breeders the next morning, are ovulated carefully and hatched directly in the rearing aquarium or in conical tanks. First feeding is carried out just before the yolk-sac totally absorb (day 3), using *Artemia salina*. The next feed is *Tubifex* – also a natural feed - and the last feed is high quality commercial feed for the later days of culture. Culture maintenance includes preparing the feeds, exchanging the culture water (siphoning), cleaning the aquariums, controlling water quality, and monitoring the health condition of the larvae/seeds. There is no tight procedure for other personnels entering the hatchery units.

Problems in *Pangasius hypophthalmus* seed production of hatcheries in Jambi are: (1) unstable or too vary survival rate (30-40%) in bad condition (weather and lack of *Tubifex*); (2) diseases, that some time the survival rate is zero. Whereas seed producers in West Java have no technical problems, but usually there are lower demand in prolonged dry seasons as there are minor supply of water for *Pangasius hypophthalmus* grow-out culture areas in Sumatera and Kalimantan. In these areas, most *Pangasius hypophthalmus* culture system are cages system in open waters.

### 3.2.2.2 Seaweed Farming

Seaweeds is an important commodity of fisheries in Indonesia. In the three study areas i.e. West Java, East Java and South Sulawesi, the production were increased by 66.7% each year and the export were increased by 18.3% each year (2008-2012). The highest producer of this commodity is South Sulawesi (77.9%), followed by East Java (21.2%), and DKI Jakarta/West Java is the smallest (9%). Seaweeds production also covers 23.7% from the total production of fisheries in the three study areas.

Main types of seaweeds cultured by Indonesian farmers are *Gracilaria* sp. and *Eucheuma* sp. *Gracilaria* sp. commonly cultured in brackishwater ponds, while *Eucheuma* sp. mainly cultured in seashores; only some places do *Eucheuma* sp. cultured in brackishwater ponds.

#### 1). *Gracilaria* sp. in East Java, West Java

As an aquaculture product, *Gracilaria* now tends to have a highly prospectus farm product especially for brackish water ponds because of its higher price and increasing demand especially for export. There are some *Gracilaria* farmers in East Java and West Java that use their brackishwater ponds for the culture facilities.

The culture process is simple. After minimum pond preparation - just drying the pond bottom – and filling the sea-water, the seed are distributed evenly. The farmers acquire *Gracillaria* seeds from local farmers. The amount of seed is 1,000 kg or a ha of pond area. The maintenance includes maintaining water depth (30-60 cm in he flat bottom area or plataran), and regularly cleaning the seaweeds from dirt. Normally, first harvest can be done at month 4, and the successive harvests are every 40-45 days. From this methodes, minimum harvest is 6 tons of dry *Gracilaria* in a year.

Some farmers got good quality *Gracilaria* seeds from Banten; the brown colour *Gracilaria* seeds are the earlier vegetative seeds of F1 seeds produced by Maros Bracksihwater Aquaculture Centre, South Sulawesi. The seeds classified as good quality; the colour of the thalli are shiny brown, slimmy, sharp edge, fresh, no mucus, fresh smell, healthy and clean, the tekstur are elastic and not easy to be taken apart. The growth rate are classified as good (sample of 1 month culture period). However, one farmer said that some good quality farmed *Gracilaria* might continued to be used as seeds vegetatively, when there is no special *Gracilaria* seed farm in that area.

Assuming a typical unit of 1 ha tambak for monoculture farming, no salary for farmer operator but profit sharing system, i.e the workers will earn 20% of the sales. When the production of dry *Gracilaria* is +/- 6 ton/ha/year or Rp.42,000,000./ha/year (sales price Rp.7,000/Kg-), the cost for production is Rp.9,000,000 (seeds Rp.3,000,000.-; seedlings Rp.3,000,000.-; harvesting and drying Rp.3,000,000.-) and the farmer operator's profit sharing is 20%, then the return from operation would be about 27,600,000/ha/year.

From this figure, the pond's owner income is about Rp.2,300,000/ha/month. There are common that minimum areas owned by a farmer owner is 3 ha, and even wider. It could be seen that the income of the farmer owners are categorized moderate, and may be some of them have high income level. While the income of the farmer operator per year is only about Rp.9,200,000.- (Rp.7,200,000 from 20% of the profit, and Rp.2,000,000 from 1/3<sup>rd</sup> of the cost of seedlings + harvesting and drying), and this is categorized as low income.

The productivity of the farm would be even higher when *Gracilaria* is farmed as the second product of polyculture system with milkfish or/and shrimp, Furthermore, there is a potential that the productivity of *Gracilaria* in South Sulawesi and East Java could be higher as the tide level are better (+/- 3 m) than that of West Java.

The problem of *Gracilaria* culture in brackishwater ponds are (1) sometimes there is minimal water supply especially during prolonged low tide level (gantung karang) that impacts water temperature and decreases the growth of the *Gracilaria*; (2) diseases, generally in bad weather; (3) floods during extreme fullmoon periods (West Java, North sea shore).

## 2). *Eucheuma* sp. in South Sulawesi

*Eucheumacottonii* and *Eucheuma spinosum* have long been a seaweed type widely cultured by farmers. The most culture area is at the sea shore, and in brackishwater ponds in some areas mainly in South Sulawesi. The natural habitat of this seaweed is in relatively clean salt waters with moderately strong water current.

*Eucheuma* culture generally takes place in wide areas (zone) in the sea shore that relatively has the same characteristics, i.e. relatively save from high wave and too strong water current, clean waters, relatively high salinity (normal sea water salinity), relatively flat seashore bottom. *Eucheuma* culture is one of a true community business, that the workers of a (some) unit of *Eucheuma* culture are the family member of a farmer. Some characteristics of *Eucheuma* farmers in South Sulawesi are presented in Table 15.

**Table 15. Profiles of *Eucheuma* farmers (respondents) in South Sulawesi**

No.	Responden; location; facility	Start from	Average Production; marketing	Worker (persons)	Problems
1	<b>UD. Anoer Mega Tama; Ujung Pandang, South Sulawedsi (a trader)</b>	2013	x	14-20	Vary dried <i>Eucheuma</i> quality
2	<b>Rahmat Beta, Ujung Pandang, South Sulawedsi</b>	2013	500 kg/cycle	6* (some have technical certificates)	- Weather water quality) - diseases (virus) - low income
3	<b>Maskur; Takalar, South Sulawesi</b>	1998	700 kg/cycle	7*	- PLTU - water quality - sand - price - low income

Note: \* family member

The culture technique is classified as moderate – simple but needing regular (daily) maintenance. The culture system applied by South Sulawesi farmers is *longline system*. The farmers acquire the *Eucheuma* seeds from local farmers (colleagues). A unit of long line consists of 30 pieces of 25 m long Poly Ethylene rope (Φ5 mm) as main line. 125 bundles of 100 g *Eucheuma* seeds then are inserted and loosely tightened to each main line using 3 mm PE ropes. About 6 pieces 1 liter mineral bottles then are fixed to each main line as buoy to let the *Eucheuma* stands in the surface of the sea waters. Finally, all the main lines are fix to a pair of pole (from a hard type of wood) that are fixed to the sea-shore bottom for each main line in the culture locations. All the tasks are done by whole family of a farmer.

The culture maintenance includes cleaning the seaweed from dirt, and refixing bundles of seaweeds that are lost (carried through by water current). Harvesting is done after 45 days of culture, conforming to the Standard of Operating Procedure of *Eucheuma* culture. Nevertheless, some farmers harvest their seaweed earlier, mainly because of need of money. This of course impacts to the quality of their seaweeds negatively.

Productivity. Assuming a typical unit of longline and when there are 7 cycles in a year, the average production of dry *Eucheuma* is +/- 4.2 ton/unit/year or Rp.54,600,000.-/unit/year (current sales price Rp.13,000/Kg of dried seaweed.-). When culture operation and

maintenance cost is +/- Rp.25,000,000.- in a year, then the return from the operation would be about Rp.29,600,000.-.

Main problems of *Eucheuma* culture in Ujung Pandang are (1) lack of high quality seeds, (2) water quality and diseases in bad seasons; the existence of the Electrical Power Plant (PLTU) in Takalar might also impact the water quality when the waste products of the coal are not treated carefully, and (3) low income for farmers.

### 3.2.3 Middlemen

Dried-seaweed (*Gracilaria* sp) traders in Sidoarjo, East Java, are located near main streets and centre of sea-weed farming sites. Meanwhile processed seafood product traders in Jambi are located in city of Jambi. Shop-based traders buy products from fish processors i.e.: Shredded cat fish, *Pangasius* crackers, shrimp crackers etc.

Dried-seaweed traders collect products from the seaweed farmers directly. The traders buy seaweed from farmer at Rp 7.000 – Rp 10.000 per kg. To make strong relationships between seaweed traders and seaweed farmers, the traders give money to seaweed farmer Rp 50.000.000/farmer.

Dried-seaweed (*Gracilaria* sp) will be re-dried on the field/floor and bamboo racks for 1-2 days by using sun drier. Then dried-seaweed (*Gracilaria* sp) are cleaned from dirty (sands, soils,) manually. Cleaned seaweed (*Gracilaria* sp) will be packed in plastic bags. The traders of seaweed *Gracillaria* sp. sell the seaweeds to agar-agar (jelly) processing companies, Rp 9,500 – Rp 12,000/kg and to a dried seaweed exporter, Rp 13,500 – Rp 14,000/kg. Similar treatment is applied to *E. Cottonii*. The traders of *E. Cottonii* sell the dried seaweeds to an exporter at Rp.12,500/kg.

*Pangasius* trader in Lemah Abang, Cikarang Sub District, buy *Pangasius* from Cikarang farmers consistently. Most of the fish are pack in ice (1:1) and send to Jakarta, Bandung, Bogor, etc. Only few fish to be transported alive. He bought the fish to farmers Rp.12,500/kg. He sell alive *Pangasius* to Jakarta Rp.16,000/kg. To make certain of getting products, he supplied *Pangasius* seeds and other inputs to some Cikarang farmers. So far, the business is good, and he already owned four fish transportation cars.

Middleman of Tuna had not been met during the survey in the three study areas; the persons who buy tuna from small fishermen are company's agents.



### 3.2.4 Processors and exporters

Bases on data from questionnaires, utilization rate of fish processing companies are shown in Table 16. The average of utilization rate is 63 %. It means that many industries do not meet their maximum capacity. There are some factors that caused fish processing companies not reach their production capacities such as the shortage of raw material supplies and the market demand.

**Table. 16 Utilities of fish processing units**

No	Company	Products	Capacity		Real Production		Utilization rate (%)
<b>East Java</b>							
1	PT. Indonusa Alga Emas Prima	ATC	6	ton/5 days	6	ton/5 days	100
2	PT. Alam Jaya	Frozen fish	20	ton/day	6	ton/day	30
3	PT. Jala Lautan Mulia	Frozen fish	5	ton/day	3,4	ton/day	68
4	PT Indomas	Fish jelly product	5	ton/day	3,5	ton/day	70
5	PT Dimas REZA Perwira	Frozen milk fish	20	ton/day	10	ton/day	50
6	PT Adib	Frozen fillet Patin	500	kg/day	500	kg/day	100
7	PT. Hasil Alam Tani Nelayan Indonesia	Frozen shrimp	20	ton/day	15	ton/day	75
8	PT. Satelit Sriti Agar-agar	Agar-agar	80	ton/day	50	ton/day	63
<b>Jakarta and West Java</b>							
9	PT. Lautan Niaga Jaya	Frozen Tuna	8	ton/day	2,5	ton/day	31
10	CV. Sakana	Fish jelly product	8	ton/day	4	ton/day	50
11	CV. Rizky Food	Fish jelly product	5	ton/day	2,5	ton/day	50
12	CV. Bening Food	Fish jelly product	4	ton/day	0,5	ton/day	13

13	CV. Laukan	Fish jelly product	1	ton/day	0,5	ton/day	50
14	PT. Awindo Internasional	Frozen Tuna	10	ton/day	7	ton/day	70
	<b>Jambi</b>						
15	KWT. Tunas Baru/Triwarni	Shredded Patin	200	kg/day	200	kg/day	100
16	Usaha Rizki/Besse Aisyah (KUM)	Tik-tik Patin	5	kg/day	4	kg/day	80
17	Sumber Rezeki Laut/Rokayah	Shrimp paste, Petis	4	ton/day	2	ton/day	50
18	Juwita	Fish cracker	125	kg/day	100	kg/day	80
	<b>Ambon</b>						
19	PT. Harta Samudera	Frozen fish	25	ton/day	3,5	ton/day	14
20	PT. Arabikatama Fishing Industry	Frozen fish	15	ton/day	13,5	ton/day	90
	<b>South Sulawesi</b>						
21	PT. Prima Bahari Inti Lestari	Frozen fish	3	ton/day	1,75	ton/day	58
22	CV. Buana Laut Nusantara	Frozen fish	2	ton/day	0,75	ton/day	38
23	CV. Prima Indo Tuna	Frozen Tuna	6	ton/day	4	ton/day	67
24	PT. Chen Woo Fishery	Frozen shrimp	5	ton/day	2	ton/day	40
25	CV. Eltisyah	Fish jelly product	200	kg/day	200	kg/day	100
26	PT. Kemilau Bintang Timur	Frozen fish, canned crab	25	ton/day	10	ton/day	40
	<b>North Sulawesi</b>						
27	PT. International Alliance Food Indonesia	Canned Tuna/Skipjack	80	ton/day	35	ton/day	44
28	PT. Samudera Mandiri Sentosa	Canned Tuna/Skipjack	100	ton/day	40	ton/day	40

29	PT. Anekaloka Indotuna	Frozen fish	20	ton/day	20	ton/day	100
30	PT. Celebes Minapratama	Katsuobushi	20	ton/day	15	ton/day	75
31	PT. Manadomina Citrataruna	Katsuobushi	30	ton/day	20	ton/day	67
32	PT. Bintang Mandiri Bersaudara	Frozen fish	20	ton/day	20	ton/day	100
						Average	63

Based on the data at Table 16, tuna and red snapper processing industries are facing shortages of raw materials. The respondents said that lack of raw materials caused by the declining catches.

Agar-agar processing industries in Surabaya that use *Gracilaria* seaweed as raw material, are also facing lack of raw material availability that threatens the production. This problem is caused by many dried *Gracilaria* seaweed being exported to China, Europe and others making the availability of dried *Gracilaria* seaweed in the domestic market is limited. Meanwhile, respondent of Alkali Treated Carrageenan (ATC) Company in the East Java said that they have no problem with raw material. The dried *Eucheuma cottonii* seaweed raw materials come from East Sumba Island waters in East Nusa Tenggara Province. The quality of agar-agar products is for domestic market that can compete with imported agar-agar products.

In technology aspect, mostly the companies have no problem in case of operation and maintenance. Types of machineries that are being used by fish processing industries depend on their products. For the fish frozen products companies (Tuna, *Pangasius* and Shrimps), the machineries include, freezers (Air Blast Freezer and Contact Plate Freezer) of 2-10 tons available capacity per day, cold storages of 100- 500 ton available capacity, chilling rooms and metal detectors.

Certificates of quality, safety and sustainability of fish processing units are listed in Table.18. Twenty five (25) fish processing companies or 81 % already have a Pre-requisite certificate (implementing GMP and SSOP) that are issued by DG of Fish Marketing and Processing and HACCP certificate that are issued by DG of Fish Quarantine and Quality Control, Ministry of Marine Affairs and Fisheries. It mean that the companies are implementing GMP, SSOP and HACCP programs. By implementing GMP, SSOP and HACCP programs, fish processed products have good quality and safety.

**Table 17. Certificates of quality, safety and sustainability of fish processing units ( all of fisheries products, including seaweed)**

No	Company	Certificates	Detention cases in importing countries (2013-2014)
	<b>East Java</b>		
1	PT. Indonusa Alga Emas Prima	Pre-requisite (GMP and SSOP), HACCP	No
	PT. Satelit Sriti Agar-agar	Pre-requisite (GMP and SSOP), HACCP	
2	PT. Alam Jaya	Pre-requisite (GMP and SSOP), HACCP, Catch certificate	No
3	PT. Jala Lautan Mulia	Pre-requisite (GMP and SSOP), HACCP	No
4	PT Indomas	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
5	PT Dimas REZA Perwira	In process of pre-requisite (GMP and SSOP) and HACCP	No
6	PT Adib	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
7	PT. Hasil Alam Tani Nelayan Indonesia	Pre-requisite (GMP and SSOP), HACCP	No
	<b>Jakarta and West Java</b>		
8	PT. Lautan Niaga Jaya	Pre-requisite (GMP and SSOP), HACCP	No
9	CV. Sakana	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
10	CV. Rizky Food	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
11	CV. Bening Food	Pre-requisite (GMP and SSOP)	Domestic market
12	CV. Laukan	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
13	PT. Awindo Internasional	Pre-requisite (GMP and SSOP), HACCP	No

	<b>Jambi</b>		
14	KWT. Tunas Baru/Triwarni	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
15	Usaha Rizki/Besse Aisyah (KUM)	No certificate of pre-requisite (GMP and SSOP) and HACCP	Domestic market
16	Sumber Rezeki Laut/Rokayah	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
17	Juwita	No certificate of pre-requisite (GMP and SSOP)and HACCP	Domestic market
	<b>Ambon</b>		
18	PT. Harta Samudera	Pre-requisite (GMP and SSOP), HACCP	No
19	PT. Arabikatama Fishing Industry	Pre-requisite (GMP and SSOP), HACCP	No
	<b>South Sulawesi</b>		
20	PT. Prima Bahari Inti Lestari	Pre-requisite (GMP and SSOP), HACCP	No
21	CV. Buana Laut Nusantara	Pre-requisite (GMP and SSOP), HACCP	No
22	CV. Prima Indo Tuna	Pre-requisite (GMP and SSOP), HACCP	No
23	PT. Chen Woo Fishery	Pre-requisite (GMP and SSOP), HACCP	No
24	CV. Eltisyah	No certificate of pre-requisite (GMP and SSOP) and HACCP	Domestic market
25	PT. Kemilau Bintang Timur	Pre-requisite (GMP and SSOP), HACCP, BRC, SGS, FAI, SEAFST	No
	<b>North Sulawesi</b>		
26	PT. International Alliance Food Indonesia	Pre-requisite (GMP and SSOP), HACCP, BRC, IFS, Dolphin Safe	No
27	PT. Samudera Mandiri Sentosa	Pre-requisite (GMP and SSOP), HACCP, BRC	No

28	PT. Anekaloka Indotuna	Pre-requisite (GMP and SSOP), HACCP	No
29	PT. Celebes Minapratama	Pre-requisite (GMP and SSOP), HACCP	No
30	PT. Manadomina Citrataruna	Pre-requisite (GMP and SSOP), HACCP	No
31	PT. Bintang Mandiri Bersaudara	Pre-requisite (GMP and SSOP), HACCP	No

Six (6) units of fish processing companies did not have a Pre-requisite (GMP and SSOP) and HACCP certificates. These companies are small and medium enterprise (SME's.) such as CV. Laukan and KWT. Tunas Baru/Triwarni. They sell the fish products to domestic markets.

There are 3 (three) companies or 10 % have internationally food safety certificate (British Retailer Council/BRC and IFS), 1 (one) company, i.e. PT. International Alliance Food Indonesia has a Dolphin Safe certificate which is an eco-labelling certificate and 1 (one) company, i.e. PT. Harta Samudra get certificate from Fair Trade USA which is the sustainability certificate.

All of companies participating in this study have no detention case by importing countries. It indicates that their products are already fulfilling seafood quality and safety standards of the importer countries.

Yield and waste utilization of several fish processing units are shown in Table 18. The yield of fish processing units in location of the study is from 10% to 63%. Most companies sell their waste or by-products to third parties. One company has a fish meal plant in their company to process their head, meat, and bone waste to become fish meal product.

**Table 18. Yield and waste utilization of fish processing units**

No	Company	Products	Yield (%)	Waste	Utilization by the company
1	PT. Indonusa Alga Emas Prima	ATC	33	dust of meal from milling	Sale
				Caustic liquor	no utilized
				Slurry	no utilized

				diatomic filter	no utilized
<b>2</b>	PT. Jala Lautan Mulia	Frozen Snapper Fillet	40	Skin	Sale USD 0,29/kg
				Instestine	no utilized
				Head	Sale USD 2,9/kg
				Trimiing meat	Sale
<b>3</b>	PT Adib	Frozen Pangasius Fillet	35	Skin	Sale USD 0,33/kg
				Instestine	no utilized
				Head	Sale
				Trimiing meat	Sale
<b>4</b>	PT. Lautan Niaga Jaya	Loin Tuna	63	Skin	Sale USD 0,13/kg
				Head	Sale USD 0,29/kg
				Trimiing meat	Sale
				Instestine	Sale USD 0,13/kg
<b>5</b>	PT. International Alliance Food Indonesia	Canned Tuna	56	skin, intestine, head, trimming meat	to process fish meal, USD 0,75/kg fish meal
<b>6</b>	PT. Satelit Sriti Agar-agar	Agar-agar	10	Slurry	No utilized
				Caustic liquor	no utilized

### 3.3 Demand on Productivity Services

#### 3.3.1 Producers (fishermen, fish farmers)

##### 3.3.1.1 Fishermen

Based on the fact findings in previous subject, there are several problems on demand of productivity services of capture industry, as described in Table 19.

**Table 19. Demand on productivity services of capture fisheries industry**

No	Fishing gears	Problems	Demand
<b>1</b>	<b>Purse seine Tuna</b>		
	Fuel	<ul style="list-style-type: none"> <li>The price is sometimes very high and hard to reach in reasonable price</li> <li>There is a limitation amount of fuel to the fishing vessel due to policy from government in order to prevent from illegal fuel smuggling</li> </ul>	Subsidized diesel fuel to be made easily available
	Fishing ground	<ul style="list-style-type: none"> <li>Fishing ground is increasingly far</li> </ul>	
		<ul style="list-style-type: none"> <li>Because of using Fish Aggregating Device (FAD) there occurred stealing fish from FAD</li> </ul>	<ul style="list-style-type: none"> <li>Awareness on FAD law and purse-seine related regulations.</li> </ul>
	Human Resources	<ul style="list-style-type: none"> <li>On purse seine vessels the Fishing master mostly from overseas</li> </ul>	<ul style="list-style-type: none"> <li>Training fishing master,</li> <li>policy of management level on tasking local Fishing Master</li> <li>more wages</li> </ul>
		<ul style="list-style-type: none"> <li>Lack of appropriate crews on purse seiners</li> <li>Low salary of the crews working on-board</li> </ul>	
	Capital	Accesibility to Capital loan in order to support the cost of production	Government support for working capital
	Operational Cost	Illegal tax always occurred	Government control
<b>2</b>	<b>Pole and Line Tuna</b>		
	Fuel	<ul style="list-style-type: none"> <li>The price is sometimes very high and hard to reach in reasonable price</li> <li>There is a limited amount of fuel oil to fishing vessels due to the government policies (in order to prevent from illegal fuel trading)</li> </ul>	Subsidized fuel oil
	Fishing ground	<ul style="list-style-type: none"> <li>The distance between fishing port base to the fishing ground is increasingly far.</li> <li>Because of using Fish Aggregating Device (FAD) there occurred stealing of FAD</li> </ul>	
	Human Resources	<ul style="list-style-type: none"> <li>Low availability of appropriate crews for pole and liner.</li> </ul>	Crew recruitment, more wages
		<ul style="list-style-type: none"> <li>Low wages of crew working on-board</li> </ul>	
	Capital	Accesibility to capital loan in order to support the cost of production	Government support for working capital
	Operation Cost	Illegal tax always occurred	Government control



From the table above there are several point that can be as a service for the valcapfish center in order to improve the productivity of company. These services bellow need big funding, so we must always discuss to the government about this. It is very important issue to improve the productivity and prevent IUU Fishing:

1. Training of local fishing master on-board of purse-seine vessels especially for large scale companies
2. Research of friendly FAD and FAD management.

### 3.3.1.2 Fish Farmers

Based on the existing conditions and problems described above, demands on productivity services are identified. Table 20 describes some demands for each problems that could improve productivity.

**Tabel 20. Demand on productivity services of aquaculture industries**

No.	Description	Problems	Demand
1.	<i>Pangasius</i> , grow-out		
	- Capital (Jambi)	Lack of capital for the last period of culture	Training on accessibility to capital (low interest, ease requirement,etc.)
	- Fish Feed	- Too expensive - Unstable supply of raw material (low price salted fish)	Training on production of high quality cheaper pellet
	- Fish diseases	Lack of diagnosis and disease treatment skill	- Training on fish disease - More intensive supervision by fish disease professional - Application of probiotics more intensively
	- Dry seasons	lower productivity	Need reservoir system
	- Pond management (Jambi)	Sludge removal, caused by : - irrigation system, - not enough sludge pump	- Rehabilitation of irrigation system for some farm location - Longer time for drying the pond bottom

	- High mortality in net cages	The seeds are not stand enough to new environment	Need larger size of <i>Pangasius</i> seeds
	- Impoundment productivity	Relatively low productivity but one of potential are for <i>Pangasius</i> production	Need training for farmers in such a potential areas
	- Marketing	Price too low	- Empowerment of the group of the farmer - Training on marketing
<b>2.</b>	<i>Pangasius</i> , seed production		
	- Natural feed for larvae	Lack supply of <i>Tubifex (tiny redworm)</i> during flood season	- Need tubifex culture to be initiated
<b>3.</b>	Sea-weed		
	- Water salinity of brackishwater ponds	Too high in dry seasons	- Need proper reservoir
			- Better pond/site selection

From the observation in the study areas, there are some problems that have affected - in some degree - to the performances of the business both *Pangasius* as well as Seaweeds (*Eucheuma* as well as *Gracilaria*), as seen in Table 21. The description of the problems of demand services on quality are discussed in the following paragraphs.

### 1. *Pangasius*

#### a. Grow-out.

- 1) Lack of capital. There lack of capital for the last four month period of culture in Jambi is especially for feed supply as high quantity of feed is needed in this period. Highest portion of production cost is feed cost, and about 85% of it is for the last four month period as the biomass consistently increasing. As the capital is available, the production might increase. The consequence of higher production is the marketing of the product. Some strategy might be decided to have the marketing successful (conform to problem and demand no.7 below) and a demand on training related to the marketing including practical guidance for finding

buyers/markets. An effort to help the farmers for additional capital is of essential task for related institutions and stakeholders.

- 2) Lower productivity in dry seasons. It is common in fish culture. Less water supply in dry seasons make the depth of water lower, difficult in exchanging the pond water, and higher water temperature. All of these might affect the growth of cultured fish, lowering the efficiency of feed, and lowering the production. One way to anticipate this problem is by providing reservoir, and additional pump for transferring the water.
- 3) Fish diseases. Disease problems are common in fish culture, either in traditional system, semi intensive system or in intensive system. To anticipate this problem, many technique and procedures are applied by farmers either in pond and water preparation, maintenance during culture periods, as well as in post harvest handling especially for life table fish for distribution. However, disease problems still exist. Some farmers use chemicals for prevention and curative measures. Some chemicals are prohibited to be applied in fish culture for the health of the consumers. Herbal type medicine for fish culture is developing and this is a good technique in disease control. Application of probiotics by some farmers also provides better and healthier water quality, as well as other functions i.e. provides healthier cultured fish, and increment of feed efficiency.

Some training on fish disease management is needed for *Pangasius* farmers in all study areas. Monitoring and disease control on fish culture units also one of the task of related institutions under the DG of Aquaculture.

- 4) Pond management, especially on sludge removal. Deteriorated or toxic sludge would impact to culture water quality that in turn lowering the culture performance, such as lower growth ratio, and lowering feed efficiency. Other impact is lowering the bottom pond soil quality that affect to lower pond productivity.

To anticipate/correct the problem, the best way is rehabilitation of irrigation system when possible. Any other solution is to have longer time for drying the pond bottom. Better pond drying may have more effective pond bottom disinfection, as healthy pond is one of key factors that support the success of fish culture.

- 5) Higher mortality in net cages, especially in the early stage of culture. Supposed this problem is caused by relatively small size the seeds that could not stand to the environment, from (generally) indoor or controlled environment to a lake waters with might be significantly

different characteristics. Ordinary ponds used 2" size of *Pangasius* seeds and some farmers rear it to fingerling ponds or ask supplier to rear it to such a size. Nevertheless, it seems that for an open waters (lakes), need larger size of *Pangasius* seeds. Another side of this problem, there is a new business for farmers, i.e. production of larger size *Pangasius* fingerlings. However, it is wise that for *Pangasius* grow-out in net cages (in lakes), a special pilot project need to be executed.

It is seen in the previous discussion that the potential *Pangasius* productivity rate in lake is so high, and this is good news. When we succeed to culture *Pangasius* in lakes, it is of course another potential to develop *Pangasius* processing plant, and another chance of a business for farmers is fingerling production for net cages culture in lakes.

- 6) Relatively low productivity. It is another type of impoundment that potential for the development of *Pangasius* culture, i.e. ex sand-excavated ponds. Total production from typical 4 ha ex sand-excavated farm (net pond area 2 ha) in Bekasi is 120 tons/cycle (8 month culture period), or the pond productivity is 60 tons/ha/cycle or 6 kg/m<sup>2</sup>. The lowest from other type of ponds/impoundments.

Nevertheless, it is interesting that, even the productivity is the lowest, the margin is significantly higher than that of others, even the sales price is the cheapest (Rp.12,500/kg. Cost of feed is only +/- 53% of the sales price, while the others is +/- 73%. It is seen from this fact that impoundments ex other activities (ex sand-mining ponds, ex break-making ponds, and might be ex mining ponds) can be used for *Pangasius* production as there are water supply.

Special attention is the limited/poor water system combined with the application of organic materials directly to the ponds as feed. Improper pond and water quality management may cause fatal. However, when one acquires the technique, it might be a comparative advantage for him to have a benefit. A training for farmers whom there are such a potential areas might be provided to make them have capability to have a successful *Pangasius* farming business.

- 7) Marketing of the products either in Jambi, East Java and West Java.

From the observation and discussion in the study areas, the farmers' perceptions on sales price of their products (*Pangasius hypophthalmus*) are basically based on the rate of the production cost, especially the feed. Tulungagung farmers said that the sales price of

Rp.14.500/kg is just about break-even, while Cikarang farmers said that the sales price of Rp.12,600/kg is sufficient. This diverse perception basically related to the cost of feed (as the feed is the highest portion of production cost in aquaculture); Tulungagung farmers use high price commercial feed during the 6 month periode of culture, while Cikarang farmers use low price organic waste during the last 6 months periode of culture.

Basically, the prices of a product are functions of (a) supply and demand, and (b) quality of the product. Limited demand of *Pangasius* in some location is because of the consumer is only of local people. The only relatively high demand for *Pangasius hypophthalmus* are in Sumatera and Kalimantan. The second cause is of limited demand from fish processing industry. Actually there had been a contract between farmers and processing industries in Jambi as well as in East Java, that the farmers to supply *Pangasius hypophthalmus* in certain price. However, the businesses were not continued since the farmers could not sale their product at the contract price; the main reason was the increasing of feed price. It is not the case with the processing industry in Medan (North Sumatera) that the business of *Pangasius hypophthalmus* processing is running.

Concerning the quality of *Pangasius* as raw material for fish processing industry, it is identified that one of the problem of the farmers' *Pangasius* is too small the size. The good size for fillet is about 1 kg/fish whereas most of the farmers' *Pangasius* size is about 0.5 kg/fish. At present, most farmers have no idea to produce larger size of *Pangasius*, as it would need longer period of culture and it means need more capital. However, it is not impossible that the farmers eager to produce such size *Pangasius*, of course when they certain that would receive better price and margin for them. And this is the task of related government as well as the industry and stakeholders.

At present, it is known - from the fish processing industry sight - that producing just fillet from *Pangasius* is not profitable. This business might have profit only when the industry process the waste to produce other products, and it need technology and marketing the products.

There are some services that might suffice to have proper solutions, i.e. training in marketing and empowerment of the group of the farmer.

#### *b. Seed production*

There is problem in *Tubifex* supply in Jambi, especially during flood seasons. *Tubifex* (tiny redworm) is one of primary natural feed needed for *Pangasius* larvae. This high nutritious

natural feed is generally found in relatively high rate stream and rich in organic matter water rivers/canals. The habitats are generally in the downstream of human activities producing rich organic waste materials flowing in river/canal waters. The tiny worms are usually disappear during flood, and we will find there is no redworm anymore, and it takes time to let them grow. Fish seed production centres and hatcheries that have routine flood have problems on the essential natural feed for their larvae.

Main natural feed used by farmers for their *Pangasius* larvae are *Artemia salina* and *Tubifex*. These two natural feeds are good since the sizes are fit to the mouth size of the larvae, nutritious, and easy to be digested by the larvae. Other natural feed can be used are *Daphnia* and *Moina*, but the size are little bit larger than *Artemia salina*. *Artemia salina* is the best natural feed for first feeding for larva after the larvae's yolk sac nearly completely absorb. This natural feed also easier to be prepared in healthy (free pathogen) condition.

*Tubifex* is the second natural feed for *Pangasius* larvae, and the availability depend on the condition of rivers/canals where they grow and develop. *Tubifex* are flushed away when flood. Other alternative is using *Daphnia* and/ *Moina*, and the availability of these natural feed also basically depend on the condition of their habitat (lakes/swamps). Unlike *Artemia salina*, there is higher risk of pathogen in *Tubifex*, *Daphnia* and *Moina* application. Preparation of these three natural feed should be done carefully to minimize the risk of pathogen, and uncaredful preparation can be one of the disease outbreak and high mortality problem in *Pangasius* seed production.

Replacing *Tubifex* with *Artemia salina* will rise the cost. The best way to solve the problem is to let the farmers culture the worm, thus training in *Tubifex* culture is needed. Cultured *Tubifex* is better in health status or saver, and this will improve the availability or its supply.

## 2. Seaweeds

There is brackishwater salinity problem in East Java and in West Java, and too high water temperature in dry seasons. This problem is caused by limited water exchange, low depth of pond water, as well as the climate. When the three conditions exist, the pond water temperature may be extremely high. Too high water temperature affected negatively the growth rate of seaweeds cultured that in turn lowering the harvest.

Limited water exchanges generally occur when the tide level is relatively low that the quantity of supply water is limited. There are different characteristics among different

brackishwater pond locations, based on the site location and how far is the pond from the seashore. The former example are, roughly average tide level in South sea-shore of Central Java is the highest (+/- 4 m), East Java is the second higher (+/- 3 m), South Sulawesi and Jambi are more or less moderate (+/- 2 m), whereas in North sea-shore of Java is the lowest (+/- 1 m). The higher the average tide level of a location, the higher the potential capacity of supply water, the larger is the water exchange capacity. The latter case is, the farther the position of a pond site from the sea-shore, the smaller the potential capacity of supply water.

It could be concluded that, selection of pond location for seaweed culture is one of important factor to provide the success of seaweed culture. One of the solutions is having a reservoir to provide water supply when low potential supply seasons come.

### 3.3.2 Middlemen (fish traders, collectors, etc)

Dried-seaweed products still need improvement in post harvest handling from landing to packaging i.e drying machine, slicing and appropriate packing because its dryness and cleanliness still under standards. Furthermore, the drying capacity was limited and use traditional method.

There are two types of traders/middlemen, i.e. (a) one who continue to clean, dry, and pack the harvest from the farmers directly in farm locations, and (b) one who do the same process in their facilities out of farm locations. The latter traders/middlemen types have more complete facilities, and trade more products (higher capital). Some traders/middlemen lend some money to farmers to make certain that the farmers sell the product to them. Some traders from Ujung Pandang and East Java buy the dried *Eucheuma* from prominent *Eucheuma* farmers/producers at East Indonesia (Kupang, Sabu Islands, etc) by carrying essential feedstuffs (rice, sugar, etc.) in their ships. The other type of delivery business is one that doing the business by name of a factory/company (such as one in Takalar, South Sulawesi).

There are two types *Pangasius* traders in West java. i.e. (a) one who buy the product from fish farmers and sell to neighbouring cities (Jakarta, Bandung, etc.), and one who supply inputs for the farmers and buy the harvests. This latter type of business play an important role in *Pangasius* farming, i.e make the farmers run the fish culture without any capital. This type of trader also has competent supply of *Pangasius* for his buyers, make him a prominent trader (such as one from Lemah Abang viillage, Cikarang Sub District, Bekasi District).

Scale of business of traders to fulfill market demand and accessibility to producers and markets are still low. It needs improvement of business scale of seaweed trader which needs more capital.

### 3.3.3 Processors and Exporters

Based on the fact findings in previous subject, there are several problems on demand of productivity services of Fish Processors and Exporters, as described in Table 21.

**Table 21. Demand on productivity services of fish processing**

No.	Description	Problems	Demand
1	Seaweed processor		
	Raw material	<ul style="list-style-type: none"> <li>▪ Lack of supply, The company compete with dried-seaweed exporter to get raw material</li> <li>▪ Dried-seaweed trader/collector prefer to sell seaweed to exporter than to domestic seaweed processor because of better price</li> <li>▪ Low and various quality of dried seaweed caused by improper harvesting time, impurities (sand, others species of seaweed), seed quality</li> </ul>	<ul style="list-style-type: none"> <li>▪ Regulate/control dried-seaweed distribution for domestic and export by government</li> <li>▪ Improvement in the technique of harvest</li> <li>▪ Certification of seed of seaweed by government</li> <li>▪ Awareness of farmer for harvesting seaweed in the right or proper time</li> <li>▪ Awareness of farmer on the importance of quality of seaweed for getting higher yield of agar/carrageenan</li> <li>▪ Need personal that have capability in the adjusting of technique of processing from various quality of seaweed</li> </ul>
	Human resources	<ul style="list-style-type: none"> <li>• Less availability of experienced worker</li> <li>• Less motivation</li> </ul>	Training on improvement motivation of worker
	Technology of process	<ul style="list-style-type: none"> <li>• Inefficiency in the pressing process</li> <li>• The company only extract Gracilaria seaweed to produce agar-agar (jelly) meal whereas Gracilaria seaweed can be processed to get agarose product which has higher price than agar-agar product</li> </ul>	<ul style="list-style-type: none"> <li>• Need an efficient press machine</li> <li>• Training on agarose extraction technology</li> </ul>
	Utility	Utility of gracilaria seaweed processing still low	Training on improving productivity
	Waste	Less solid waste utilization such as slurry, diatomic filter,	Training on utilization of solid and liquor waste (slurry, diatomic filter,



		meal and NaOH liquour	meal and NaOH liquour)
<b>2</b>	Patin processor		
	Marketing	<ul style="list-style-type: none"> <li>▪ Current condition on processing or utilization of Patin are still limited for few products such as abon, smoked patinand frozen fillet), and the marketing is still limited to local market in Jambi, make the production can't be expand.</li> <li>▪ Many illegal patin import enter domestic market</li> </ul>	<ul style="list-style-type: none"> <li>▪ Training on seafood product marketing (packaging, promoting, market intellgence, exporting procedure)</li> <li>▪ Training on processing of value added products, waste/by products utilization/processing of Patin</li> <li>▪ More intensive and tight controlling of illegal imported patin products in the domestic market</li> </ul>
	Human resources	<ul style="list-style-type: none"> <li>• Less availability of experienced worker</li> <li>• Less motivation of worker for working hard and well</li> </ul>	<ul style="list-style-type: none"> <li>• Training on improvement motivation of worker</li> </ul>
	Waste	<ul style="list-style-type: none"> <li>▪ Less utilization of intestine waste</li> </ul>	Training on utilization of intestine of patin (Pangasius) waste
<b>3.</b>	Tuna Processor		
	Raw material	<ul style="list-style-type: none"> <li>• Lack of raw material</li> <li>• Unstable price of raw material</li> </ul>	Awareness on tuna sustainability (size, general overview of decreasing production/ stock, the needs of data collection, global market requirement on tuna, premium price for certified/ traceable tuna
	Human resources	<ul style="list-style-type: none"> <li>• Less availability of experienced worker</li> <li>• Less awareness on GMP and SSOP as a basic for implemetation of HACCP</li> <li>• Less motivation of worker for working hard and well</li> </ul>	<ul style="list-style-type: none"> <li>• Training on GMP and SSOP</li> <li>• Training on improvement motivation of workers</li> </ul>
	Technology	High investation for machineries	
	Waste	<ul style="list-style-type: none"> <li>• Less utilization of intestine waste</li> <li>• Less utilization of fish oil waste</li> </ul>	<ul style="list-style-type: none"> <li>• Training on utilization of intestine of tuna waste</li> <li>• Training on fish oil processing from tuna waste</li> </ul>

Based on identification of demand on productivity of fish processing as shown in table above, there are several potential productivity service for fish processing, as follow:

- 1) Because frequently the quality of raw material Gracillaria seaweed come to agar-agar processing companies aren't constant such as different content of water content, sand, age of seaweed, in its everyday process, so to keep the companies still process and still can maintain their quality end- products, the company (production unit) has to be having knowledges and skills to produce agar-agar from different quality of raw materials
- 2) Training on improvement motivation of workers
- 3) Need an efficient press machine
- 4) Training on agarose extraction technology
- 5) Training on improving productivity
- 6) Training on seafood product marketing (packaging, promoting, market intelligence, exporting procedure)
- 7) Training on utilization of solid and liquour waste (slurry, diatomic filter, meal and NaOH liquour)
- 8) Training on utilization of intestine of tuna waste
- 9) Training on fish oil processing from tuna waste
- 10) Training on utilization of intestine of *Pangasius* waste

### 3.4 Demand on quality services

#### 3.4.1 Producers (fishermen, fish farmers)

##### 3.4.1.1 Fishermen

Based on the fact findings in previous subject, there are potential demands of quality services of capture industry to solve the problems they face, as described in Table 22.

**Table 22. Problems and potential demand for services identified of capture fisheries industries**

No	Fishing gears	Problems	Demand
1	<b>Purse seine Tuna</b>		
	Sanitation and hygiene on-board	Still lack consideration on sanitation and hygiene by the crews, on the other hand the facility is sufficient	Training of sanitation and hygiene on-board
	Handling practices	In most companies where they	Training on good handling

		have mini purse-seiner fleet had bad practice which they using insufficient ice to maintain the fish captured	practices on-board;
	Human Resources	Mostly there is no quality controller on-board who responsible to the quality in the first hand	Training of quality controller on-board
<b>2</b>	<b>Pole and Line Tuna</b>		
	Sanitation and hygiene on-board	Currently still lack consideration on sanitation and hygiene by the crew however the facility is sufficient	Training of sanitation and hygiene on-board
	Handling practice	Mostly they have bad practice which they using insufficient ice to maintain the fish captured	<ul style="list-style-type: none"> <li>• Training of good handling practice on-board</li> <li>• Training on handling of live bait to reduce mortality</li> </ul>
	Human Resources	Mostly there is no quality controller on-board who responsible to the quality in the first hand	Training of quality controller on-board

From the Table 23 above there are several potential services that could be offered by Valcapfish Center in order to improve the quality of product. These services bellow need discussing not only to government but also to the buyers to support this service because the buyer need good quality of fish when buying (for traditional fishermen must be supported by government), these are:

- 1) Training of sanitation and hygiene for the crew members
- 2) Training of good handling practices for the crew members and companies
- 3) Training of quality controller especially for crew working on-board.

#### 3.4.1.2 Fish farmers

Based on the fact findings in previous subject, there are potential demands of quality services for fish farmers, as described in Table 23.

**Table 23. Problems occurred and demand**

No.	Description	Problems	Demand
<b>1.</b>	<i>Pangasius</i> , grow-out		
	- price and quality of feed	The price of commercial feed is so high, and inconsistent supply of home-made compound feed's raw material (low price salted fish)	Training on the production of cheap and good quality compound feed
	- dominant average size of harvested fish is 500 g	This size of fish is too small for fish processing industries	Training on <i>Pangasius</i> culture to produce +/- 1 kg size of fish.
	- water supply	Pollution from industry, and shortage supply in dry season (Bekasi)	Water treatment facility and reservoir for aquaculture
<b>2.</b>	<i>Pangasius</i> , seed production		
	- certified seed	There are uncertified seed distribution	- Develop higher awareness and empowerment to seed producers
			- Develop a built-in system in certification
			- Regular inspection to hatcheries
<b>3.</b>	Sea-weed		
	- Variety in quality of dried seaweeds	- Low quality seed (Non F1)	- Good quality seed availability
		- Too early harvesting, especially of <i>Eucheuma</i>	- Empowerment of group of farmers

The problems may have affected - to some degree - the performances of the business, especially on quality aspect. The description of the problems and demand are discussed in the following paragraphs.

#### 1) Price and quality of feed.

Available commercial feeds for *Pangasius* are good in quality but expensive. Solely using these feeds for *Pangasius* production makes the margins are so small. On the other hand, good quality compound feed is good for fish culture since there are potentials for low feed conversion ratio (FCR), high rate of growth rate, minimum waste culture materials, etc.

Low feed conversion ratio means that this may reduce the cost of production especially from feed. High rate of growth ratio means that this may reduce the culture period to attain targeted harvest size, and this may increase the turnover of the culture facilities especially the fish ponds. Minimum waste culture materials mean that it impacts positively to the quality of culture water and/or easier in water quality management, and also impacts positively to the quality of drained water that release to the environment.

From the above discussion, the demand that fit for this problem is to let the group of farmers produce cheap high quality feed, and training is needed.

## 2) Size of fish

Average size of *Pangasius* produced by farmers is 0.5 kg, and this size of fish is too small for fish processing industries; they need +/- 1 kg size of fish to produce *Pangasius* fillet. The possibility of the growth of *Pangasius* processing industries in Indonesia is high when *Pangasius* farmers succeed to produce such a size *Pangasius* at reasonable price. It is the responsibility of the government, fisheries industries, as well as all stakeholders.

## 3) Polluted water supply for *Pangasius* culture in some areas.

Some *Pangasius* farmers in Cikarang where larger size of *Pangasius* are produced, concern to the polluted water supply for their ponds. Not only do polluted water supply impact to the quality of culture water but also to the quality of fish produced. Mitigation of the source of the pollution and solve the problem i.e. stop/ significantly reduce the pollution is the best way to support the existence of fish culture in that area. This is the responsibility of local government and stakeholders to initiate the solution.

## 4) Uncertified *Pangasius* seed distribution.

It seems that some of Farmers Hatchery Unit or UPR (small and medium level) of *Pangasius* in West Java haven't had CPIB (Good Aquaculture Practices for hatchery) Certificate. Actually there two basic functions of CPIB, i.e. first is to make certain that the system and procedures executed by a hatchery conform to CPIB concepts, and produce high quality as well as certified seeds. One basic aspect that may be executed is biosecurity, a system and procedures to prevent diseases outbreak, and this is one of basic principles for a unit of hatchery having CPIB (GAP) Certificate.

The other side is for the benefit for grow-out farmers that they get good quality seeds, one of the key successes of their *Pangasius* culture. Generally grow-out farmers prefer to buy from a well known (certified) hatcheries. Moreover, they prefer to buy seeds even at (some degree) higher price. But it is the fact that the two prominent hatcheries in West Java haven't had CPIB (GAP) Certificate.

Some demand services that might provide for solutions are: (1) develop higher awareness and empowerment to seed producers, (2) develop a built-in system in certification, and (3) intensify regular inspection to hatcheries.

5) Low quality Seaweed (*Eucheuma* as well as *Gracilaria*) seeds.

It is known that the harvested seaweeds are so vary in quality. The causes of the problem are the low quality of the seeds and too earlier harvesting. The seeds for the farmers' seaweeds culture are come from other farmers – year to year - either bought from other locations or from local farmers. It is make sense that such a seed might be a vegetative seeds, and of course the quality are categorized as low. High quality generative seeds are yet difficult to find. Low quality of seaweed seeds might impact to lower growth rate, the quality of dried seaweds, etc.

Normal or according to the Indonesia National Standard (SNI), harvesting for *Eucheuma* and *Gracilaria* are the same, i.e. 45 days of culture. Nevertheless, some *Eucheuma* farmers harvest it so earlier such as at day 40, and it is of course lower the quality of their harvest. Some of the parameters of dried seaweeds quality standards are the degree of dryness, the cleanliness, and content of essential substances of each kind of seaweed (such as carrageenan for *Eucheuma*, and agar for *Gracilaria*).

A technical assistance on producing/spreading high quality seaweed seeds in every seaweed culture zones in cooperation with related institutions may be a solution to accelerate the availability of high quality seaweed seeds for farmers.

From the illustration of the present condition, problems and identification of demands that may provide the development of aquaculture (*Pangasius* and seaweed) business, hereby some potential demands that might be fit to Valcapfish Centre:

- 1) Training or capacity building on the production of better quality of home-made / compound feed feed.

- 2) Training or capacity building on the production of larger size *Pangasius*.
- 3) Technical assistance on developing the certification system, socialization of certified (*Pangasius*) seeds and methods for providing the awareness and importance of the certification to fisheries society.
- 4) Technical assistance to spread the F1 seaweed seeds from the three seaweed seed farms/centres to every seaweeds culture zones in Indonesia.

### 3.4.2 Middlemen (fish traders, collectors, etc)

Dried-seaweed products still need particular handling from landing to packaging i.e drying machine, slicing and appropriate packing because its dryness and cleanness still below standards. Furthermore, the drying capacity was limited and use traditional method

### 3.4.3 Processors and exporters

Based on the fact findings in previous subject, there are potential demands of quality services for fish processing industry based on identified problems faced, as described in Table 24

**Table 24. Identification of demand on quality service for fish processing companies**

No	Description	Problems	Demand
<b>1</b>	Seaweed processor		
	Raw material	<ul style="list-style-type: none"> <li>▪ Low quality of dried seaweed caused by improper harvesting time, impurities (sand, others species of seaweed), seed quality</li> </ul>	<ul style="list-style-type: none"> <li>▪ Need personal that have capability in the adjusting of technique of processing from various quality of seaweed</li> </ul>
	Human resources	<ul style="list-style-type: none"> <li>• Less awareness on GMP and SSOP</li> </ul>	Training on GMP and SSOP (as basic of implementing of HACCP)
<b>2</b>	<i>Pangasius</i> processor		
	Human resources	<ul style="list-style-type: none"> <li>• <i>Pangasius</i> processor in Jambi lack of knowledge and skill on GMP and SSOP</li> </ul>	Training on GMP and SSOP
<b>3.</b>	Tuna Processor		
	Raw material	Low quality of raw material caused by bad fish handling on board	Training on good handling practice on board

Based on identification of demand on quality of fish processing as shown in table above, there are several potential quality service for fish processing, as follow:

1. Technical assistance in the adjusting of technique of processing from various quality of seaweed
2. Training on GMP and SSOP
3. Training on good handling practice on board

### 3.5 Demand on sustainability services

#### 3.5.1 Producers (fishermen, fish farmers)

##### 3.5.1.1 Fishermen

Based on the fact findings in previous subject, there are potential demands on sustainability services for capture industry based on the problems identified, as described in Table 25.

**Table 25. Problems occurred and demands on sustainability services of capture fisheries**

No	Fishing gears	Problems	Demand
<b>1</b>	<b>Purse seine Tuna</b>		
	Mesh sizing	Small fishes captured and its unworthy size to sell in the market with reasonable price	Training on improving the fishing technique such as technical assistant to the crew members
	Human Resources	Lack of fish observer on-board.	- Increasing the number of fish observer on-board; - Additional training for fish observer.
	Certification	Some companies not considering on the Code of Conduct for Responsible Fisheries (CCRF)	Training on sustainability issues, traceability, FAD, and reporting/log book.
<b>2</b>	<b>Pole and Line Tuna</b>		
	Mesh sizing	Small fishes captured and its unworthy size to sell in the market with reasonable price	Training on improving the fishing technique such as technical assistant to the crew members
	Human Resources	Limited fish observer on-board used to sustain the fish captured on-board	Increasing the number of fish observer on-board



	Certification	Some companies not considering on the Code of Conduct for Responsible Fisheries	Training on sustainability issues, traceability, FAD, and reporting/log book.  Training to manage bait
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From the table above there are several point that can be potential services for the valcapfish center in order to develop the better sustainability of company. These services may be discussed to the government to support these services:

- 1) Training of CCRF or Fishing activities based on ecosystem
- 2) Training of observers on board and enumerators
- 3) Training of management plan of bait
- 4) Training of bait aquaculture.

### 3.5.1.2 Fish Farmers

Based on the fact findings in previous subject, there are potential demands of sustainability services from fish farmers based on identified problems, as described in Table 26.

**Tabel 26. Demands on sustainability services of fish farming industries**

No.	Description	Problems	Demand
<b>1.</b>	<i>Pangasius</i> , grow-out		
	- Raw material for feed production (Jambi)	Supply of low price salted fish seasonal	- Raw material substitution - More effective and sustainable feed production technology
<b>2.</b>	Sea-weed		
	- water quality	- Pollution from PLTU (in Takalar, Ujung Pandang)  - Common global season	- Intra-sectoral coordination on law enforcement in regulation  - Technical assistance on developing regular water quality monitoring system  - zoning for seaweed farming.

There are factors affecting the sustainability of fish farming, i.e. physical, biological, and chemical factors. Physical factors include irrigation system, arrangement of zoning system, etc. Biological factors include decreasing the quality of seeds as well as the products, disease outbreak especially caused by chronic environmental deterioration, etc. Chemical factors include water pollution, application of systemic pesticides and/or herbicides, prohibited antibiotics, etc.

From observation in the study areas, there are some problems that might have impacted - to some degree - the sustainability of fish culture business, as seen in Table 26 above. The description of the problems of demand services on sustainability are discussed in the following paragraphs.

#### 1) Supply of low price salted fish seasonal

There is a problem in inconsistent supply of raw materials for the farmers' own pellet production, especially low price salted fish. As we know that capture fisheries is seasonal, that are generally less catch or landed fish during full moon periods; some places also less catch in certain season (exp. In West seasons in some places).

Generally, *Pangasius* culture businesses in Jambi are competitive, and this is caused especially by the production of compound feed by the farmers themselves. Using low price salted fish is important for reducing feed cost in *Pangasius* production. The lower protein (crude protein 20-22%) content does not have any problem to the growth of fish, even of course lower than fish fed with commercial feed. Six month period of culture to attain marketable size - average body weight +/- 500 using home made pellet is a good results (other farmer in West Java, using organic waste need 8 months of culture period to attain such size of harvest).

It is normal that lower quality (home-made) feed has affected to lower growth rate (and might be the quality) of cultured fish. However the farmers have chosen this to lower the cost of production. Lower growth rate mean that the size of harvested fish are smaller (average of 2 fish/kg), or need longer culture time to attain larger size. Their lowering the cost of production might be caused by really limited capital and might be caused by having higher margin.

The highest portion of the production cost is the feed. Generally, the average feed conversion ratio (FCR) is +/-1.2 – a good ratio. With the price of commercial feed Rp.8,500/kg, the feed cost would be Rp.10,200.-.

On the other hand, using fish as raw material for feed means that this is one of problem of aquaculture worldwide – and so does with livestock industry – as this would compete to human, and as one of blue economy issues.

However, using unprocessed feed for fish culture has serious risk especially to the health of the culture water and thus to the health of cultured fish. The critical point of this practice that might be given serious attention are (1) in selecting the true feed materials from non-feed materials, and (2) in maintaining the pond water quality.

Some solution of the problem, i.e. to find another/other substitutive raw materials, and applying more effective and sustainable feed production technology. There is a need on more effective and sustainable feed production technology for *Pangasius* farmers, especially for whom producing their own compound feed as well as for whom using organic waste materials for feed.

## 2) Pollution from PLTU in Takalar (South Sulawesi).

It is supposed that there is water pollution around South Sulawesi from Steam (coal) Electric Energy Plant (PLTU) at Jeneponto, Takalaar that might impact to the sustainability of the farmers' seaweed culture. The only solution is law enforcement, and coordination with related institutions is needed.

Water quality problem in seaweed culture areas also a common problem for aquaculture in open waters. Experience farmers supposed have already had knowledge/intuitions in climate changes that affected to water quality. Nevertheless, it is generally does not work in functioning the experience farmers concerning management pattern of the farmers' sustainability of their seaweed culture units. A scientific approach is needed, and a build-in system of water quality monitoring system supposed become the best solution. To accelerate the development of the system, a technical assistance to related institutions (the DGA) is needed.

## 3. Unsustainable practices in fish and seaweed farming:

### Potential Demands on Sustainability

- 1) Training on an effective and sustainable feed production technique (reducing fish as main source of animal protein, to support sustainable fisheries).

- 2) Technical assistance on initiating a build-in system of regular water quality monitoring in aquaculture farming areas.
- 3) Capacity building on good farming practices, zoning for seaweed farming etc..

### 3.5.2 Processors and exporters

Based on the fact findings in previous subject, there is problem on demand of sustainability services of capture industry, as described in Table 27.

**Table 27. Demands on sustainability services of fish processors and exporters**

No		Problems	Demand
1.	Tuna Processor		
	Eco-labeling	Most of companies have no eco-labelling certificate such as MSC, FOS dolphin safe	Technical assistance to the company how to get eco-labelling

Based on identification of demand on sustainability of fish processing as shown in table above, there is a potential sustainable service for fish processing, as follow:

- 1) Technical assistance to the company/fisheries how to get eco-labelling

### 3.6. Supply Analysis

Central government and local agencies as well as various NGOs provide services that contribute to improving productivity, quality and sustainability in fishing, fish farming as well as fish processing. The institutions of the central government, that directly responsible to the development of fisheries industries are Directorate General of Capture Fisheries (DGCF), Directorate General of Aquaculture (DGA), and Directorate of Fish Products Processing and Marketing (DGFPPM), while the *supporting institutions* are Marine and Fisheries Research Agency (MFRA), Marine and Fisheries Human Resouce Development Agency (MFHRDA), and Fish Quarantine Inspection Agency (FQIA). While NGOs also categorized as supporting institutions. Supply services from government are presented subsequently in Table 28, 29, and 30, while services from other (supporting) institutions in Table 31.

### 3.6.1 Supply services for fishermen.

Procurement of fishing vessels (pole and liner as well as purse seiner) for fishermen (especially for traditional fishermen) programs (amounted to 1,000 fishing vessels) in 2012-2013 aimed to increase the productivity and production of capture fisheries particularly for off shore fisheries, distributed to all regions in Indonesia.

Development of fishing port facilities. This program aimed to complete and modernize the facilities and infrastructure of fishing ports in Indonesia. The objectives are to provide the facilities that conformed to HACCP and support proper fish handling and proper facilities for fishing vessels.

Some training for fishermen or new workforce for fishing vessels are Basic Safety Training (BST), Engine Officer Certificate of Competency for Fishing Vessel (ATKAPIN) and Deck Officer Certificate of Competency for Fishing Vessel (ANKAPIN) based on STCW-F 1995.

Training of fishermen for improving of fishing technique (purse seine). The training is not regular and not systematic program designed to produced skillfull fishermen or fishing master especially for purse seiner.

Training of fishermen on maintenance of fishing vessel machineries. The objective of the training (for traditional fishing vessel crews) are let the fishermen skillfull in maintenance of their fishing vessel engine and able to repair some regular engine problems during fishing.

### 3.6.2 Supply services for fish farmers

It is shown from the Table 29-31 that in effort of have high quality aquaculture products, the DGA develop regulations on all aquaculture production process and facilities of the seed production, grow-out farming, and its post harvest handling, both live fish and fresh products. Wehereas the Ministry of Manpower support it through K5 programme to have the production process are save and healthy especially to the workers. Furthermore, Fish Quarantine Agency have regulation on live fish distribution either for intra-insular and export by applying Cerificate of Origin (SKA) and Fish Quarantine System and Procedures. The aims of those regulations, system and procedures are to minimize the spread as well as epidemic of fish diseases and also to support the realization of government regulations concerning endangered fishes.

Of the Development of Aquaculture Production, most of them have been for brackishwater aquaculture, especially for white shrimp (*Litopenaeus vannamei*) culture farms. Based on the

field survey in Jambi, East Java, West java and South Sulawesi, no information that the farmers got such a program.

Development of seaweed seeds farms (*Kappaphycus alvarezii*) and hatchery initiated in North Sulawesi, Lombok and Gorontalo. The F1 seeds produced are already distributed to some provinces, include South Sulawesi. Furthermore, there is information from DGA that F-1 *Gracilaria* sp. seed production has already been initiated in Maros (the Brackiswater Aquaculture Centre), South Sulawesi, and are already distributed to some provinces. Some Banten farmers have already farms the seeds successfully.

Development of investment and capital. There are many sources of fund that can be accessed by fish farmers, either conventional loan, special credit program for farmers that facilitated by DGA, Company Social Responsibility (CSR) programs from industries, etc. One of the DGA facilitated program is Food and Energy Food Security Credit (KKPA) Program. This credit scheme is a low interest capital and no asset guarantee. From the normal interest of the credit (+/- 14% depend on the policy of the Bank), some of them are subsidized and only 5.5% is the interest to farmers. This credit program can be accessed by individual fish farmer, and should be processed through Local Fisheries Districts, DGA, and the Bank. Other similar credit program is PUMP-DGA Program for group of fish farmers.

Development of aquaculture business services, i.e. business permit and aqua card identity. It is common that legal aspects are concerned by companies. However, an aqua card identity is a new programme and has not been realized yet. Basically this is a good program for the development of aquaculture.

Of the designing applied technology, there is information from the DGA that a deep pond technique is a good type of pond for *Pangasius* grow-out culture. The depth of the pond water is +/- 1.8 m that makes the productivity of the pond higher, as the culture density would be +/- 2 times (+/- 30 fish/m<sup>2</sup>) of the conventional system.

Fish health and environment programs and standardization. Executions of these activities are more or less good, those are supported with laboratories and qualified personnel. Nevertheless, there are thousands of fish culture units and areas that should be controlled by limited personnel. An effective system might be develop to make the program realized.

Feed production technique for grouper hatchery. It is conformed that for 2015, DGA concerned to Self Reliance Feed for farmers to anticipate the consistent price increament of commercial feed.

Raw model application of shrimp farming with probiotics. The programs are successful, and the basic reason is that the behaviors of the shrimp support that make the application of the technique are effective. Many shrimp farmers have already applied the technique. However, most *Pangasius* farmers have not applied the technique. Yet, the appropriateness and the benefit of probiotic application in *Pangasius* farming need to be approved.

There are also some MFHRDA-MMAF development programs for fish farm workers. Indonesia National Working Competency Certificate (SKKNI) of Aquaculture is one of software program that support the development of fish farmer workers' competency. The training of aquaculture competencies are executed through Aquaculture Training Centres, Local Fisheries Districts, as well as through Independent Community Training Centers (P2MKP) that are distributed in most provinces, especially for basic competencies, while the certification is under the authority of LSP (Proficiency Certification Agency).

Some information from Indonesia Aquaculture Society (Pangasius Association) includes, the inferiority of culture performances of the Pangasius farmers compared to Vietnam farmers. They apply intensive culture system and used commercial feed exclusively; the quality of the fish produced are better (i.e. more white flesh colour, bigger size), feed conversion rate are low (+/- 1:1). They market their Pangasius fillet to the United States, Europe, and other countries.

A good news comes from the trial production of *Pangasius* sp. in Tulungagung, that the average size reach 800 gr in 5 months only – it means that there is a possibility to have a size of +/- 1.0 kg/fish in 6-7 months culture period. The seeds size are larger, i.e. 10 cm fingerlings. The feed conversion ratio is 1,2, and survival rate +/- 90%. As already known that *Pangasius* sp. is a better (more white) flesh colour species that conform to the characteristics of the US and Europe buyers. DGA said, that the main problems for the development of *Pangasius* sp. mass culture are the broodstock and the seeds. Serious efforts are needed to develop this species to industrialized scales, and this is the tasks of the government (especially MMAF), the fisheries industries, and all stakeholders.

The development of fish health system and its aquaculture environment is applied either to fish culture units (seed production unit or hatcheries and grow-out farms) as well as the agencies

that responsible to succeed the programs. In this system, fish culture units should have biosecurity system as the basis of the production process for all the production subsystems i.e. the facilities, operating procedures, and the production management and administration. The aim of the system are to have high quality, healthy products, sustainability of the aquaculture endeavour, as well as its traceability (ISO 22000;2005) of the products. This management system also provide the satisfaction of the consumers/buyers and also protect the producers from unfair complain.

### **3.6.3 Supply services for fish processors**

Supply service for fish processor are many with different form of supply such as training, extention, regulation, technical guidance. In the institution aspect which suply service for fish processor are Directorate General of Fish Products Processing and Marketing (DGFPPM), Fish Quarantine and Inspection Agency (FQIA), Human Resources Development Agency of MAF (HRDAMAF), Agency for Marine and Fisheries Research and Development, Province quality control laboratory, Fisheries Province/District Fisheries Services, Independent Community Training Centre (P2MKP), National Seaweed Association, and Non-government Organization. Directorate General of Fish Products Processing and Marketing is working mainly in policies making level for national development fish processing and marketing such as issuing regulation and program on cold chain system program, development fish processing centre, Gemarikan program. The DG has a responsible for implementation of GMP and SSOP as basic for implementation HACCP by fish processing companies and also has an authority to issue Pre-requisite certificate (implementation of GMP and SSOP). Fish Quarantine Inspection Agency is working mainly in policies making level for national development related to quality, food safety and quarantine such as issuing regulation and program on quality assurance and safety of fish and fish product, issuing HACCP certificate for fish processing companies, regulate and control flow of fish and fish products which enter and exit Indonesia. Agency for Human Resources Development of Marine and Fisheries with their regional training which are distributed to 8 (eight) working areas entire Indonesia has many programs on capacity building for fishermen, fish farmers and fish processors.



**Table 28. Supply of Productivity services from the government provided to fishermen, fish farmers, and fish processors**

Supply services (Business player/ Directorate General)		
Fishermen/ DGCF	Fish Farmers/ DGA	Fish Processors/ DGFPPM and FQIA
<b>Assistance/Procurement to fishermen, fishing boat 10 – 30 GT</b>	Aquaculture Industrialization, commodity : shrimp, <i>Chanos-chanos</i> , patin, seaweed)	Development of Fish Processing Centers and maintenance; 7 locations in 2013  Development and maintenance of Fish Processing Centres
<b>Development of fishing port facilities.</b>	Aquaculture Pond Revitalization programe	Development of marketing and packaging
<b>Improving fish handling facilities from aboard to fishing port; Increase the fish handling method</b>	Cultivation of <i>Litopenaeus vannamei</i> with traditional plus pattern	Training on product development of Patin, seaweed (ATC, chip), tuna/skipjack
<b>Technical Assistant for safety on fishing vessel (BST). Certified about 240 fishermen in 2014</b>	Acceleration of high quality brood fish	
<b>Strengthening of fishermen skill through supporting of ratified Certification and Watchkeeping for Fishing Vessel Personnel (STCW) fishermen and about IDR 602 million</b>	Implementation of hatcheries standardization and certification (CPIB/GAP)	
<b>Training of fishermen for increasing fishing gear performance</b>	Development of large scale hatcheries	
<b>Training of fishermen for improving of fishing technique (purse seine)</b>	Development and empowering small scale hatcheries	
<b>Training of fishermen on maintenance of fishing vessel machineries</b>	Development of seaweed seeds farms ( <i>Kappaphycus alvarezii</i> ) hatchery, in North Sulawesi, Lombok and Gorontalo)	

<b>Training of fishermen for improving of fishing technique especially on bottom long line</b>	Development of seed production information and its distribution	
<b>Procurement of fish packaging machine to fishermen</b>	Development of land and waters for aquaculture	
	Development of brackishwater aquaculture facilities: <ul style="list-style-type: none"> <li>• Preparation of Detail Engineering Design or DED of fish pond zone; In 2013 reached about 6 districts in 6 provinces with an area of 4,200 ha;</li> <li>• Rehabilitation of irrigation, 20 districts, 4 provinces, with a channel length of 515,000 m)</li> </ul>	
	Development of Aquaculture Based Minapolitan Area: <ul style="list-style-type: none"> <li>• 85 Districts,</li> <li>• 10 priority commodity, some of them are <i>Pangasius</i> sp. and seaweeds)</li> </ul>	
	Development of investment and capital (Capital investment in fish farming: up to June 2014 has reached IDR 23.001 trillion)	
	Development and empowerment of aquaculture entrepreneurs, such as: <ul style="list-style-type: none"> <li>• PUMP-DGA or Empowerment of Rural Aquaculture of the Directorate General of Aquaculture, target 4,600 groups;</li> <li>• credit program, 300 billion)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Preparation of aquaculture workers database and information</li> </ul>	
	Enhancement of fish disease and environment laboratory capacity	

	Execution of predator and fish disease control	
	Execution of fish culture environment protection	
	Execution of chemical residue control	
	Execution of control on fish medicines, chemicals, and biological materials used for aquaculture	
	Execution of fish health and environment standardization.	
	Identification of aquaculture area development	
	Dissemination of adaptive technology: <ul style="list-style-type: none"> <li>• Feed production technique for grouper hatchery</li> <li>• Raw model application of shrimp farming with probiotics</li> </ul>	
	Fish health and aquaculture environment monitoring	
	Training of service officials to provide the enhancement of aquaculture production program	
	Seed quality monitoring	

**Table 29. Supply of Quality services from the government provided to fishermen, fish farmers, and fish processors**

Supply services (Business player/ Directorate General)		
Fishermen/ DGCF	Fish Farmers/ DGA	Fish Processors/ DGFPPM and DGFQ
<b>Persistence the quality handling on-board to protect the quality of fish products</b>	Technical assistances of post-harvest handling of fishery products through Quality Consciousness	Infrastructure of cold chain process

(Iakip 2013)	Program	
<b>Development of Industrialization for Tuna and Skipjack Tuna (a pilot project) through procurement of infrastructure</b>	Technical assistances on Biosecurity of Fish farming and Hatcheries	Basic HACCP training. Quality controller on fish exporter and fish processing company
<b>Regulation on requirement of sanitation and hygiene of fishing vessels</b>	Regulation of the quality of aquaculture products	Technical assistances of post-harvest handling of fishery products through program Quality Conscious. Fish trader and exporter, fish farmer communities, stakeholders
<b>Improving fish handling facilities from aboard to fishing port; Increase the fish handling method</b>	Certification of fish farming units (target 10,000 units)	Technical assistances of inline inspection. Fish trader and exporter, fish farmer communities, stakeholders
	Certification of fish seed production units (target 190 units)	Fish installation facilities on East Java. place or facility inspection of fishery products (20,000m <sup>2</sup> ) to improve fish quality.
		Regulation of quality fishery product. Quality Control and Safety of Fish product The Entrance into the Republic of Indonesia
		Certification of fish processor units (2,298 units in 2013), supported by Ministry of Marine Affair and Fisheries
		Large scale fish processor and nurtured on quality standard of fish product. 219 fish processors in 2013 (40 new and 179 advance)
		Appreciation* of 28 fish inspectors, i.e training on product quality and safety for fish inspector candidates  Refreshment of 25 fish inspectors i.e. training on product quality and safety for fish inspector.
		Appreciation for local quality inspector. Enhance of competency for 33 local agent in 2013

		Applied Assistance of integrated quality management (forming of GMP/ HACCP/SSOP). 10 provinces in 2013
		Pre-requisite (GMP and SSOP) certificate
		Hygienic Fish Market Program.  Development of Hygienic Fish Market Building, including providing supporting facilities in Yogyakarta, Mataram (West Nusa Tenggara), DKI Jakarta, Manado (North Sulawesi), Medan (North Sumatera), Denpasar (Bali), Bandung and Indramayu (West Java),

\* a training for inspector candidates

**Table 30. Supply of Sustainability services from the government provided to fishermen, fish farmers, and fish processors**

Supply services (Business player/ Directorate General)		
Fishermen/ DGCF	Fish Farmers/ DGA	Fish Processors/ DGPPM
<b>Development of rural entrepreneurships</b>	Development of fish health system and its aquaculture environment (labs, aquaculture centres with controlled and rehabilitated environment, etc.)	Monitoring of raw materials availability for large scale fish processors.
<b>Procurement of fish habitation</b>	Technical assistant on implementation of applied technology of aquaculture	Training of seaweed diversification products
<b>Catch certificate</b>		
<b>Traceability regulation</b>		
<b>Application of catamaran fishing boat in South of Java second section</b>		
<b>Application of oily water separator based on mechanical</b>		

and filtration of active carbon system		
Application of folding frame for fishnet fishing vessel in Lampung		
Application, identification and installation of gas converter kit for fishing boats		
Catch certificate regulation		
Fishing vessels monitoring		

**Table 31. Supply services from other institutions/agenices provided for fishermen, fish farmers, and fish processors.**

Institution/ Organization	Services on			Remark
	Productivity	Quality	Sustainability	
<b>Marine and Fisheries Human Resources Development Agency (MFHRDA) of MMAF</b>	Training for fishermen, aquaculture workers, fish processing workers (1,910 certificate of competency on fishing, aquaculture, and fish processing)			
	Basic training of fishing, aquaculture, and fish processing			Through Marine and Fisheries Independent Training Centres (P2MPK)
	Fisheries Extension	Fisheries Extension		
	Indonesia National Working Competency Certificate (SKKNI) on Fishing, Aquaculture, and			

	Fish processing			
<b>Marine and Fisheries Research Agency (MFRA) of MMAF</b>	<p>Research on capture fisheries, aquaculture, and fish processing, such as:</p> <ul style="list-style-type: none"> <li>• Fishing capacity and fishing effort</li> <li>• Development of <i>Pangasius</i> culture technique</li> <li>• Development of Tuna growth in Bali</li> <li>• Seaweed processing technology</li> </ul> <p>Program of Klinik Iptek Mina Bisnis or Kimbis (Clinic of Science and Technology for Fisheries Business). MFRA support Science and Technology for improving fisheries business of community groups in provinces or districts area, such as :</p> <p>- Klinik Iptek Mina Bisnis (Kimbis) Gunung Kidul distric, Yogyakarta has Improved production of feed for fish</p> <p>Kimbis Tegal distric has depeolved significantly growth of numbers of fish jelly products SME's in Tegal by facilitating expert of fish processing business and technology.</p>	<p>Research on capture fisheries, aquaculture, and fish processing, such as:</p> <ul style="list-style-type: none"> <li>• Non chemical medicines (Herbal) for aquaculture</li> </ul>	<p>Research on capture fisheries, aquaculture, and fish processing, such as:</p> <ul style="list-style-type: none"> <li>• Ecosystem Based Fisheries Management</li> <li>• Mesh size</li> <li>• Light fishing</li> <li>• FAD</li> <li>• By-catch and discard</li> <li>• Stock assessment</li> </ul>	
<b>Fish Quarantine Inspection Agency (FQIA) of the MMAF</b>		<p>Quarantine services, such as:</p> <ul style="list-style-type: none"> <li>• Certificate of Origin</li> <li>• Health Certificate</li> </ul>	<p>Quarantine services, such as:</p> <ul style="list-style-type: none"> <li>• Certificate of Origin</li> <li>• Fish</li> </ul>	

		<ul style="list-style-type: none"> <li>• Fish quarantine system and procedures</li> <li>• HACCP certificate</li> </ul>	quarantine system and procedures	
<b>WWF Indonesia, SFP Fisheries Division</b>			<ul style="list-style-type: none"> <li>• Tuna Research, FAD Research, Research on Environmentally friendly fishing gear</li> <li>• Joint work with MMAF, Association, and Fisheries Companies, developing programs and carried out activities toward the Marine Stewardship Council (MSC) Certification scheme</li> </ul>	Irregularly executed
<b>Indonesia Tuna Association (ASTUIN)</b>	Internship program for Tuna vessel crew dealing with program of fisheries vessel crew placement		Support Permen KP No.56 and 57 year 2014, concerning the ban of transshipment	
<b>Japan Tuna Association</b>	Produce (funding the training) tuna fishing officers for Japanese Tuna Fishing Vessels operating in Indonesian waters			
<b>Ministry of Industry</b>	Training on fish processing technology for new entrepreneurs			
<b>SUCOFINDO</b>		<ul style="list-style-type: none"> <li>• Quality fish product, testing service,</li> <li>• laboratory accreditation, and</li> <li>• laboratory</li> </ul>		



		equipment calibration service		
<b>Ministry of Trade</b>	<ul style="list-style-type: none"> <li>• Provide facilitation for promoting product of fisheries companies in the exhibition</li> <li>• Training on product packaging technique</li> <li>• Aid /assistance packaging equipments for SME's</li> </ul>			
<b>Ministry of Cooperatives and SME's</b>	<ul style="list-style-type: none"> <li>• Aid/assistance machineries and equipment for the fisheries cooperative and SME's</li> <li>• Provide assistance to SME's/cooperative in business development</li> <li>• Training on fish processing technology</li> </ul>			
<b>Surabaya Seafood Center</b>	Provide information on fish product markets and international prices information for seafood exporters as well as capacity building activities.			
<b>Indonesia Fisheries Community Foundation</b>	<ul style="list-style-type: none"> <li>• Provide information concerning capture fisheries data,</li> <li>• Fish' genetics,</li> <li>• Assessment of fisheries management,</li> </ul>		Develop Traceability of hand line tuna fisheries;  Obtain Fair Trade certified tuna	
<b>PT. Perikanan Nusantara</b>	<ul style="list-style-type: none"> <li>• Buy the fish cath from fishermen</li> <li>• Enhancement of the capacity of the fisheries industry's supporting facilities</li> </ul>			
<b>Association of Indonesian Purse-seine Fishermen</b>			Support Permen KP No.56 and 57 year 2014, concerning the ban of transshipment	

<b>Indonesia Aquaculture Society (MAI)</b>	<ul style="list-style-type: none"> <li>• Seminars, business meetings on aquaculture; and facilitate the member companies promote their products</li> <li>• Trainings on Aquaculture techniques</li> </ul>			
<b>IncuBie of LPPM-IPB</b>	<ul style="list-style-type: none"> <li>• Provide the development of SME's on agribisnis</li> </ul>			
<b>Centre for Marine and Coastal Research and Development</b>	<ul style="list-style-type: none"> <li>• Research and development to support coastal and marine development based on justice</li> <li>• Education and training for improving capability of stakeholders on coastal and ocean management</li> </ul>		Community, private sector, government, non-government organizations' capacity building and empowerment in order to increase welfare of the community and sustainable resource development	
<b>Indonesian Association Seaweed (ARLI-KADIN)</b>	<ul style="list-style-type: none"> <li>• In cooperation with the government: <ul style="list-style-type: none"> <li>- Developed the Seaweed Roadmap</li> <li>- Apply the seaweed certification</li> </ul> </li> <li>• Actively anticipating the MEA Era 2015 (in cooperation with ASEAN Seaweed Industry Club)</li> </ul>	Training Assistances on improving the seaweed quality (in cooperation with other counrties)		
<b>Indonesian Seaweed Industry Association (ASTRULI)</b>	<ul style="list-style-type: none"> <li>• In cooperation with government to facilitate and advocate seaweed industries development</li> </ul>			

### 3.7. Gap Analysis

#### 3.7.1 Capture Fisheries

In this study we found the gap between demand and supply analysis of marine capture fisheries. We conclude that the main demands of fishermen are improving their skill, the availability of cheap and easy technology, knowledge and skill of preserving fish catch.

Based on supply analysis, government and other institutions are not able to serve the whole desire of fishermen. All of the gaps identified are described in Table 32.

**Table 32. Demand gap for Services on productivity, quality and sustainability for Capture Fisheries**

No.	Demand services	Remarks
<b>A</b>	<b>Productivity</b>	
1	To train experienced fishermen to be purse seine fishing masters	By giving fishing master training, fishermen will be enthusiastic for fishing, improve their skill and give them chance to get higher salary.
2	Training for small scale fishermen to improve their skill about navigation equipment, such as GPS, Chart, Radar, etc	They are able to go fishing to farther areas. Training will be facilitated by local fisheries districts, training centres and others ( including equipments)
3	Training on vessel engines repairing and maintenance	Fishermen can handle their engines problems when they are on-board, so they won't have any engine problem when fishing.
4	Technical assistance on vessel engine modification (for small scale fisheries).	Vessel engine modification cheaper than new one.
5	Technical assistance on freezer installation on-board for fishing trip >1 month	To maintain the fish quality, usually they need cheaper freezer installation
<b>B</b>	<b>Quality</b>	
6	Training on fish handling and fish inspection on-board and fishing port	Proper fish handling both on-board and fishing ports will keep the catch higher quality and higher price.
<b>C</b>	<b>Sustainability</b>	
7	Dissemination of friendly fishing gear, such as information about appropriate mesh size, environmentally friendly FAD, vessel monitoring	The Illegal, Unregulated, and Unreported fishing will decrease, and support in maintaining the sustainability of fish resources.

	system, Government regulations, etc	
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### 3.7.2 Aquaculture

There are some policies, regulations and services to provide the development or aquaculture based on the vision and missions of the Directorate General of Aquaculture. Government and other institutions already made and implemented many programs on improvement of productivity, quality, as well as sustainability of aquaculture industries yet the program can't reach all of fish farmers especially SME's. Existing condition that there are problems of un-ideal condition and of high performance of aquaculture endeavour of both grow-out farmers as well as fish seed producers are because of limited manpower (technicians for execution the DGA programs and activities, extension workers, as well as Quarantine Services tasks and activities), facilities, as well as the condition of fish farmers themselves.

Based on the supply analysis of productivity, quality and sustainability of aquaculture industry as discussed previously, the gaps are describes in Table 33.

**Table 33. Demand gap for services on productivity, quality and sustainability for aquaculture industry**

No.	Demand services	Remarks
<b>A</b>	<b>Productivity</b>	
<b>1</b>	Training on capital management for farmers (and its need of capital support for seaweed farmers).	Acquiring additional capital will increase the farmers production; and to make seaweed farmers not to harvest too earlier that impact on lower quality and decrease the harvests
<b>2</b>	Training on the production of cheaper but good quality of feed for <i>Pangasius</i>	Acquiring the technique will reduce the dependency on low price salted fish (in Jambi), reduce the risk of disease outbreak (in using organic waste materials in Bekasi).
<b>3</b>	Training on fish/seaweed disease management	Good disease prevention and control will increase the survival rate as well as the fish quality
<b>4</b>	Training on probiotic production technique and its application for <i>Pangasius</i> farming	Local probiotics are the best. Appropriate its application will support the health of fish, increase feed efficiency

		and productivity
5	Training on redworm ( <i>Tubifex</i> ) mass culture	Some areas are lack of this natural feed. Continues supply of this natural feed will increase the productivity of <i>Pangasius</i> hatcheries
6	Technical assistance on intensifying the distribution of high quality (F1) seaweed seeds ( <i>Eucheuma</i> sp. and <i>Gracilaria</i> sp.)	Continues supply of high quality (F1) seaweeds will increase the growth ratio and the health of cultured seaweeds.
7	Training on post harvest handling of seaweeds	Proper harvest and post harvest handling will enhance the dried seaweed quality and may be better price
8	Technical assistance in initiating regular water quality monitoring in ( <i>open system</i> ) aquaculture farming areas and develop its system and socialization..	There are some water quality problems in open system aquaculture, and significant water quality changes may exist. Monitoring water quality is essential, and this may be carried out by government agencies.
<b>B</b>	<b>Quality</b>	
9	Training on the production technique of larger size <i>Pangasius</i>	Production of larger size of <i>Pangasius</i> (+/- 1 kg/fish) will support the development of fish ( <i>Pangasius</i> ) processing industries, and better marketing of the farmers production.
10	Technical assistance on certification system, socialization of certified (patin) seed and methods for providing the awareness and importance of the certification to fish culture society, and technical assistance in accelerating the certification of seed production unit	<ul style="list-style-type: none"> <li>• A certification system will provide the tasks of certification of aquaculture units effective.</li> <li>• More certified seed production units will increase the availability of high quality <i>Pangasius</i> seed, and in turn will support the success of <i>Pangasius</i> culture for grow-out farmers</li> </ul>
<b>C</b>	<b>Sustainability</b>	
11	Training on effective and sustainable feed production techniques (in line with Blue Economy Concepts)	Cheaper high quality compound feed with reducing raw material from animal's protein source and increasing digestibility of feed will reduce culture's waste materials to the environment.
12	Capacity building on good farming practices, zoning for seaweed farming etc.	Good farming practices of seaweeds and zoning of the farming areas will support the development and sustainability of the industry (farmers as well as processing industries)

### 3.7.3 Fish Processing

From the demand analysis, we found that the main demand of exporters/big fish processing companies (tuna, Snappers, seaweed) are the continuity, stability, and quality of raw material

supply and the availability of capital. Meanwhile for SME's (fillet patin, abon patin, and fish jelly product processors), the demand are mainly market expansion, training on GMP and SSOP, processing machines and equipment, improvement of packaging, capital availability, and improvement of fish processing technology.

Based on the supply analysis of productivity, quality and sustainability of fish processing industry as discussed previously, government and others institutions already made and implemented many program on improvement of productivity and quality of fish processing industries yet the program can't reach all of fish processor especially SME's. Supply services by government focus on the development of quality and safety and development of SME's. The identified gaps from supply and demand analysis are as follows:

**Table 34. Demand gap for services on productivity, quality and sustainability for fish processing**

No.	Demand services	Remarks
<b>A</b>	<b>Productivity</b>	
<b>1</b>	Technical assistance in the adjusting of processing technique from various quality seaweed	To process seaweed by raw material with various quality. The companies can maintain their production to maintain their income
<b>2</b>	Training on improvement motivation of worker of fish processing	To increase productivity of workers and revenues
<b>3</b>	Technical assistance on an efficient pressing machine of agar-agar processing	To increase a pressed product volume. It'll increase agar-agar end product volume
<b>4</b>	Training on agarose extraction technology	To produce agarose, a diversification product from dried <i>Gracilaria</i> seaweed which has higher value added product than agar-agar product and it'll increase profit
<b>5</b>	Training on product development of Patin, seaweed, tuna/skipjack	To produce various innovative fish and seaweed products from Patin, seaweed, tuna/skipjack that will generate income of fish processors
<b>6</b>	Training on improving productivity of fish processing	To give a knowledge and skill of management team on how to improve productivity that can reduce cost and increase revenue
<b>7</b>	Training on seafood product marketing (packaging, promoting, market intelligence, exporting procedure)	To expand markets and increase volume of selling products that it'll increase revenue

8	Training on utilization of solid and liquor waste (slurry, diatomic filter, meal and NaOH liquor)	To optimize waste utilization which has an economic value. It'll generate revenue
9	Training on fish oil processing from tuna waste	To optimize waste utilization which has an economic value. It'll generate revenue
B	<b>Quality</b>	
10	Training on GMP and SSOP of fish processing worker	To improve quality and safety of fish products, especially SME's of Patin and seaweed processors
C	<b>Sustainability</b>	
11	Technical assistance to fish processing companies on getting eco-labelling certificate	To get eco-labelling certificate in order to expand markets and fulfill international market requirements

## 4. Recommendation

From identification of demands, supply and gap analysis that may provide the development of capture, aquaculture (patin and seaweed) business, processing and middlemen hereby some potential services that might be potentially offered by Valcapfish Centre are presented in Table 35.

**Table 35. Recommended services to be offered by Valcapfish Centre on productivity, quality and sustainability of capture fisheries, aquaculture and fish processing**

No	Recommended services	Remarks	Potential partners
A	<b>Productivity</b>		
	<b>Capture fisheries</b>		
1	To train experienced fishermen to be purse seine fishing masters	By giving fishing master training, fishermen will enthusiastic for fishing, improve their skill and give them chance to get higher salary.	Directorate General of Capture Fisheries (DGCF), Province/District fisheries Services (Province), Fishing Companies.
2	Training for small scale fishermen to improve their skill about navigation equipment, such as GPS, Chart, Radar, etc	They are able to go fishing to farther areas. Training will be facilitated by local fisheries districts, training centres and others (including equipments)	DGCF, HRDA-MMAF (BPSDMKP), Province/District Fisheries Services (Province), Fishing Companies.

3	Training on vessel engines repairing and maintenance	Fishermen can handle their engines problems when they on board, so they won't have any engine problem when fishing.	DGCF, Province/Districts Fisheries Services, Fishing Companies.
4	Training on vessel engine modification (for small scale fisheries).	Vessel engine modification more cheaper than new one.	DGCF, Province/ Districts Fisheries Services, Fishing Companies.
5	Training on freezer installation on board for fishing trip > 1 month	To maintain the fish quality, usually they need cheaper freezer installation	DGCF, Province/districts fisheries offices, Capture Fisheries Companies.
	<b>Aquaculture</b>		
6	Training on acquiring capital from various capital resources	Acquiring additional capital will increase the farmers production	DG of Aquaculture (DGA), Province/Districts fisheries Services, Various capital resources
7	Training on fish disease diagnosis and management	Good disease prevention and control will increase the survival rate as well as the fish quality	Directorate of Fish Health and Environment -DGA
8	Training on probiotic production technique and its application to fish farming	Local probiotics are the best. Appropriate its application will support the health of fish and increase feed efficiency	Agency for Research and Development of Marine and Fisheries, MMAF
9	Training on marketing strategies, to make the farmers' bargaining position higher	Stronger farmers' organization and/or other marketing strategies in each area will increase their bargaining position (stabilizing the sale price of their products)	Fisheries Districts, Cooperatives and SME's District Services.
10	Training on redworm's ( <i>Tubifex</i> ) mass culture	Continues supply of this natural feed will increase the productivity of <i>Pangasius</i> hatcheries	Fresh Water Seed Production Centres (under the DGA), Fisheries Universities
11	Technical assistance on spreading the F1 seaweed seeds ( <i>Eucheuma</i> sp. and <i>Gracilaria</i> sp.) to every seaweed culture zones.	Continues supply of high quality (F1) seaweeds will increase the growth ratio and the health of cultured seaweeds.	Seaweed Seed Centres (under the Directorate of Production, the DGA)
12	Capacity building on good farming practices, zoning for seaweed farming etc.	Good farming practices of seaweeds and zoning of the farming areas will support the development and sustainability of the industry (farmers as well as processing industries)	DGA, Province/District Fisheries services.



	<b>Fish processing</b>		
13	Training on agarose extraction technology	To produce diversification product agarose from dried- <i>Gracilaria</i> seaweed which has higher value added product than agar-agar product and it'll increase profit	Agency for Research and Development of Marine and Fisheries (RDA-MMAF), University, HRDA-MMAF, Association of seaweed, NGO
14	Training on product development of Patin, seaweed, tuna/skipjack	To produce various innovative fish and seaweed products from Patin, seaweed, tuna/skipjack that will generate income of fish processor	Province/District Fisheries Services, RDA-MMAF, University, HRDA-MMAF, Association of seaweed, NGO, DGFPPM,
15	Training on improving productivity of fish processing	To give a knowledge and skill of management team on how to improve productivity that can reduce cost and increase revenue	University, Ministry of Manpower, Association, NGO
16	Training on seafood product marketing (packaging, promoting, market intelligence, exporting procedure)	To expand market and increase volume of selling product that it'll increase revenue	DGFPPM, University, , Province/District Fisheries Services
17	Training on utilization of solid and liquour waste (slurry, diatomic filter, meal and NaOH liquour)	To optimize waste which has an economic value. It'll generate revenue	Province/District Fisheries Services, RDA-MMAF, University, HRDA-MMAF,
18	Training on fish oil processing from tuna waste	To optimize waste which has an economic value. It'll generate revenue	Province/District Fisheries services, RDA-MMAF, University, HRDA-MMAF
B	<b>Quality</b>		
	<b>Capture fisheries</b>		
19	Training on fish handling and fish inspection on board and fishing port	Proper handling of cath on-board and fishing ports will keep cath high quality and higher price	DGFPPM, Province/District Fisheries Services, Fishing Companies.
	<b>Aquaculture</b>		
20	Training on the production technique of larger size <i>Pangasius</i>	Production of larger size of <i>Pangasius</i> (+/- 1 kg/fish) will support the development of fish ( <i>Pangasius</i> ) processing industries, and better marketing of the farmers production.	DGA-MMAF, HRDA-MMAF, local Fisheries Districts, and Fish ( <i>Pangasius</i> ) Processing Industries.
21	Technical assistance on the development of certification	• Certification System will make the certification tasks effective	Directorate of Seed Production (under DGA), Province/District

	system, socialization, and acceleration of certification of seed production units program	<ul style="list-style-type: none"> <li>• More certified seed production units will increase the availability of high quality <i>Pangasius</i> seed, and in turn will support the success of <i>Pangasius</i> culture</li> </ul>	Fisheries Services
	<b>Fish processing</b>		
22	Training on GMP and SSOP of fish processing workers	To improve the quality and safety of fish products, especially the SME's of Patin and seaweed processors	Province/District Fisheries services, University, HRDA-MMAF, Association of seaweed, NGO, DGFPPM, Fish Quarantine Inspection Agency (FQIA)
<b>C</b>	<b>Sustainability</b>		
	<b>Capture fisheries</b>		
23	Dissemination of environmentally friendly fishing gears, such as information about appropriate mesh size, Fish Aggregating Device, Monitoring vessel, Government regulations, etc	The Illegal, Unregulated, and Unreported Fishing will decrease, provide to maintain the sustainability of fish resources.	DGA-MMAF, Province/District Fisheries Services
	<b>Aquaculture</b>		
24	Training on effective and sustainable feed production technique (in line with Blue Economy Concepts)	Cheaper high quality (with reducing raw material from animal's protein source and increasing digestibility of feed will reduce culture's waste materials to the environment	DGA-MMAF, Local Fisheries Districts (PUMP-KP Program)
	<b>Fish processing</b>		
25	Technical assistance to fish processing companies on getting eco-labelling certificate	To get eco-labelling certificate in order to expand market and fulfill international market requirement	FQIA-MMAF, DGFPPM, Province/District Fisheries Services, Association

During the survey (interview) with stakeholders along the value chain, it is difficult to get information on how much private sector willing to pay for services. In Indonesia almost all services are provided by government agencies starting from building fishing vessels, providing infrastructures like fishing port, capacity building for fishermen and processors up to promotion

in the local and overseas market are given free. Many fisheries private consultants are survive by getting contracts from government and or donor's projects not from private companies.

## ANNEX A. REFERENCES

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ANNEX B. DOCUMENTATIONS



Figure1. H. Mustafa, Fish Farmer *Glacilaria* at Sidoarjo, East Java. 2014.



Figure 2. H. Sutaji, Fish Farmer *Pangasius* at Tulungagung, East Java.



Figure 3. H. Yasin, Fish Farmer (Shrimp dan *Chanos-chanos*) at Sidoarjo, East Java.



Figure 4. PT. Adib (*Pangasius* fillet), Tulungagung, East Java.



Figure 5. PT. Indonusa Alga Emas Prima (ATC), Malang, East Java.



Figure 6. Rokayah, Fish Processor, Tungkal Village, Kuala Tungkal, Jambi.



Figure 7. Trinarto's *Pangasius* Farm, Kumpeh Ulu, Muaro Jambi.



Figure 8. Juwita, Fish Processing, Desa Tungkal 1, Tanjung Barat, Jambi.



Figure 9. PT. Etmeco, Aertembaga, Bitung, North Sulawesi.



Figure 10. PT. Virgo Internusa, Fishing Company, Kadodoan, Bitung, North Sulawesi.



Figure 11. *Pangasius* Farm, Takalar, South Sulawesi.



Figure 12. Fish Processing, Jeneponto, South Sulawesi.



Figure 13. Bo'an, Pangasius Breeder, Krukut Village, Depok, West Java.





Figure14. Saa'dar *Pangasius* Farmer, Lemahabang Village, Cikarang, Bekasi, West Java.



Figure15. Floating net cages at Cirata, Cianjur, West Java.



Figure 16. Fish Processing, Ambon, North Maluku.



Figure 17. PT. Mabiru, Fishing Company, Ambon, North Maluku.

**ANNEX C. QUESTIONNAIRE FORM****Form 1. Questionnaire of Fish Processing**

<b>1. General</b>			
1.	Company Name	:	
2.	Company Established	:	
3.	Company Statement (if any)	:	
2.	Website (if any)	:	
3.	Location	:	
4.	Type of operation	:	
5.	Primary products and service offered	:	
6.	Number of employees	:	
7.	The company has a organisation chart (structure)	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	What are the 3 biggest challenges faced by the company in relation to production	:	
9.	Whether the company using high tech IT (computerization, website, internet)	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	How is safety at work prioritized in the company	:	

11.	How many safety incidents/issues have been reported in the last 12 month	:	
Fill <input type="checkbox"/> using “√”			
<b>2. Productivity</b>			
<b>2.1 Technology</b>			
1.	Type of machinery	:	
2.	Number of machinery	:	
3.	Production Capacity (per cycle)	:	
4.	Total production (per day) Tonnes fillet per day or cycle Yield fillet per day Quality fillet per day Reject rate per day	:	
5.	Number of worker on single machinery Work rate of machine per hours Work rate of worker per hour	:	
6.	Ideal worker on single machinery	:	
7.	Whether the machinery are up to date and meet with the regulation	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	Whether the machinery are having routine maintenance	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
9.	Whether the layout of machinery provide ease production	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	What is most problem occurred during	:	

<p>production affects on :</p> <ul style="list-style-type: none"> <li>• Yield</li> <li>• Line in motion efficiency</li> <li>• Line utilization</li> </ul>		
<p>11. How is productivity of machinery measured at your site</p>	:	
<p>12. Does the machinery meet with the requirement standardt (i.e out put per hour, planned)</p>	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
<p>13. How is the technology affected to the production cycle</p>		

**2.2 Labour**

1.	Ages of worker	:	< 18	:	
			18 – 25		
			25 – 35		
			35 – 45		
			> 45		
2.	Education level	:	Junior high school		:
			Senior high school		:
			Diploma		:
			Bachelor		:

3.	<p>Certification of employee</p> <ul style="list-style-type: none"> <li>• General Certificate</li> <li>• Task Specific Certificate</li> <li>• Job Specific Certificate</li> <li>• Required Pre-employment Certification (if any)</li> </ul>	:	
4	Training for workers	:	
5.	Last training of workers	:	
6.	Time of work hours	:	
7.	Over time per workers	:	
8.	Number of workers per cycle production	:	
9.	Health insurance	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Is the present productivity being affected to the quality of work environment	:	1. Much higher than normal <input type="checkbox"/> 2. Slightly higher than normal <input type="checkbox"/> 3. Normal <input type="checkbox"/>

		4. Slightly lower than normal	<input type="checkbox"/>
		5. Much lower than normal	<input type="checkbox"/>
<p>How is the productivity of workers are measured at your site</p> <ul style="list-style-type: none"> <li>• Work rate per person per hour</li> <li>• Work rate per shift per hour</li> <li>• Occupancy rate per shift per hour</li> <li>• Planned time versus actual time in shift</li> </ul>			
<p>What is the major problem occurred and affected to the productivity of workers</p>		1. Presence	<input type="checkbox"/>
		2. Skill	<input type="checkbox"/>
		3. Time	<input type="checkbox"/>
		4. Salary	<input type="checkbox"/>
		5. Job engagement	<input type="checkbox"/>
<p>Does the company provide performance bonuses</p>		Yes	<input type="checkbox"/> No <input type="checkbox"/>
10.	<p>How is the performance management system works on site</p> <p>What are the performance measures in use?</p>	:	
11.	<p>How the good communications are build on site</p>	:	
12.	<p>How motivation and discipline are build in the company</p>	:	

13	What is the company policy in order to encourage the creativity and innovation	:	
14.	Does the company provide a family meeting	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	If yes how often	:	
<b>2.3 Raw material</b>			
1.	Source of raw material	:	
2.	Handling process	:	
3.	Quality	:	
4.	Continuity	:	
5.	Delivery	:	
6.	How long the raw material processed take a time into product	:	
7.	How is the raw material handling process during pre production	:	
8.	How long the raw material take a time on transportation	:	
9	Expected yield per production process		
<b>2.4 Capital</b>			
1.	Current income (IDR)	:	
2.	Current revenue (IDR)	:	
3.	Cost of production (IDR)	:	Labour : <input type="checkbox"/>



			Maintenance	:	
			Other	:	
<b>2.5 External factor</b>					
1.	Whether is the government policy affected to the productivity	:	Yes	<input type="checkbox"/>	No <input type="checkbox"/>
2.	If yes what is the major policy affected	:			
3.	Whether is the globalization affected to the productivity	:	Yes	<input type="checkbox"/>	No <input type="checkbox"/>
4.	Whether the political situation affected to the productivity		Yes	<input type="checkbox"/>	No <input type="checkbox"/>
<b>2.6 Sustainability Service</b>					
1.	Has the company been given Certification advices.consultancy by public/private institution?	:	Yes	<input type="checkbox"/>	No <input type="checkbox"/>
2.	If yes, what is the name of the public/private institution and the name of certification				
3.	Does the company has pre audit inspection program	:	Yes	<input type="checkbox"/>	No <input type="checkbox"/>
4.	Who is the staff/team that has responsible doing pre audit inspection				
5.	What is the main problem in the pre audit inspection				
6.	Who are the groups/institution of certification scheme owner that ever given certificates to the company				

7	How groups/institution of certification scheme owner do inspection		
<b>2.7 Innovation</b>			
1.	Does the company has a Research and Development Unit?	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.	Is the company doing product developement ?	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.	Who is the staff/team that has responsible doing product developement ?	:	
4.	How many type of product have been developed ?	:	
5	Do the company make collaboration with others institution (research/university) in the product developement ?	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
6	What is the main problem in the product developement ?	:	

## Form 2. Questionnaire of Capture Fisheries

<b>1. General</b>			
1.	Company Name	:	
2.	Company Established	:	
3.	Company Statement (if any)	:	
2.	Website (if any)	:	
3.	Location	:	
4.	Type of operation	:	
5.	Primary products and service offered	:	Capture Fisheries Sector
6	Number of employees	:	
7.	Organisation chart (structure)	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	What is the most obstacle in company structure during production	:	
9.	Whether the company using high tech IT	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	Does the safety at work is the main concern of the company	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
<i>Fill <input type="checkbox"/> using "√"</i>			

<b>2. Productivity</b>	
<b>2.1 Technology</b>	
1.	Type of fishing vessel and :  
2.	Number of machinery on board vessel :  
3.	Production Capacity (per cycle) :  
4.	Total production (per day) <ul style="list-style-type: none"> <li>• Yield Fillet per day</li> <li>• Quality Fillet per day</li> <li>• Reject Rate per day</li> </ul> :
5.	Number of worker on single machinery <ul style="list-style-type: none"> <li>• Work rate of machine per hour</li> <li>• Work rate of worker per hour</li> </ul> :
6.	Ideal worker on single machinery :  
7.	Whether the machinery are up to date and meet with the regulation : Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	Whether the machinery are having routine maintenance : Yes <input type="checkbox"/> No <input type="checkbox"/>
9.	Whether the layout of machinery provide ease production : Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	What is most problem occurred during production <ul style="list-style-type: none"> <li>• Yield</li> <li>• Line in motion efficiency</li> <li>• Line utilization</li> </ul> :
11.	How is productivity of machinery measured :  

at your site			
12. Does the machinery meet with the requirement standart i.e. output per hour – planned		:	Yes <input type="checkbox"/> No <input type="checkbox"/>
13. How is the technology affected to the production cycle			
<b>2.2 Labour</b>			
1.	Ages of worker (vessel crew)	:	< 18 :
			18 – 25 :
			25 – 35 :
			35 – 45 :
			> 45 :
2.	Education level (vessel crew)	:	Junior high school :
			Senior high school :
			Diploma :
			Bachelor :
3.	Certification of employee  General Certificate  Task Specific Certificate	:	

	Job specific Certificate Required pre employment certification if any		
4	Training for workers	:	
5.	Last training of workers	:	
6.	Time of work hours	:	
7.	Over time per workers	:	
8.	Number of workers per cycle production	:	
9.	Health insurance	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Is the present productivity being affected to the quality of work environment :		1. Much higher than normal <input type="checkbox"/> 2. Slightly higher than normal <input type="checkbox"/> 3. Normal <input type="checkbox"/> 4. Slightly lower than normal <input type="checkbox"/> 5. Much lower than normal <input type="checkbox"/>

<p>How is the productivity of workers are measured at your site</p> <ul style="list-style-type: none"> <li>• Work rate per person per hour</li> <li>• Work rate per shift per hour</li> <li>• Occupancy rate per shift per hour</li> <li>• Planned time versus actual time in shift</li> </ul>		
<p>What is the major problem occurred and affected to the productivity of workers</p>		<p>1. Presence <input type="checkbox"/></p> <p>2. Skill <input type="checkbox"/></p> <p>3. Time <input type="checkbox"/></p> <p>4. Salary <input type="checkbox"/></p> <p>5. Job engagement <input type="checkbox"/></p>
<p>Does the company provide performance bonuses</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>
10.	<p>How is the performance management system works on site</p> <p>What are the performance measures in use?</p>	:
11.	<p>How the good communications are build on site (on board vessel)</p>	:
12.	<p>How motivation and discipline are build in the company</p>	:
13	<p>What is the company policy in order to encourage the creativity and innovation</p>	:

14.	Does the company provide a family meeting	:	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	If yes how often	:				
<b>2.3 Raw material processing (on board)</b>						
1.	Location of Fishing Ground	:				
2.	Handling process	:				
3.	Quality	:				
4.	Continuity	:				
5.	How long the raw material processed take a time into product (Frozen shrimp or tuna)	:				
6.	How is the fish handling process during pre production (pre-freezing process)	:				
7.	How long the raw material take a time on transportation (from fishing ground to harbor)	:				
8.	Expected yield per production process	:				
<b>2.4 Capital</b>						
1.	Current income (IDR)	:				
2.	Current revenue (IDR)	:				
3.	Cost of production (IDR)	:	Labour	:		
			Maintenance	:		
			Other	:		



<b>2.5</b>	<b>External factor</b>		
1.	Whether is the government policy affected to the productivity	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.	If yes what is the major policy affected	:	
3.	Whether is the globalization affected to the productivity	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
4.	Whether the political situation affected to the productivity	:	Yes <input type="checkbox"/> No <input type="checkbox"/>

### Form 3. Questionnaire of Aquaculture

1. General			
1.	Fish Farming Name	:	
2.	Fish Farming Established	:	
3.	Company Statement (if any)	:	
2.	Website (if any)	:	
3.	Location	:	
4.	Type of operation	:	
5.	Primary products and service offered	:	
6	Number of employees	:	
7.	Organisation chart (structure)	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	What is the most obstacle in Fish Farming structure during production	:	
9.	Whether the company using high tech IT	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	does the safety at work is the main concern of the Fish Farming	:	Yes <input type="checkbox"/> No <input type="checkbox"/>

11	How many working accidents is reported in the last 12 months		
Fill	<input type="text"/> sing “√”		
<b>2. Productivity</b>			
<b>2.1 Technology</b>			
1.	Type of machinery	:	
2.	Number of machinery	:	
3.	Production Capacity (per cycle)	:	
4.	Total production (per cycle) Quality fish per cycle Reject rate per cycle	:	
5.	Number of worker on single machinery Work rate of machine per hours Work rate of worker per hour	:	
6.	Ideal worker on single machinery	:	
7.	Whether the machinery are up to date and meet with the regulation	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	Whether the machinery are having routine maintenance	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
9.	Whether the layout of machinery provide ease production	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.	What is most problem occurred during farming	:	

	11. How is productivity of machinery measured at your site	:	
	12. Does the machinery meet with the requirement standart (out put per hour, planned)	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	13. How is the technology affected to the production cycle		
	14. What is the major problem occurred and affected to the productivity in the technology ?		
<b>2.2 Labour</b>			
1.	Ages of worker	:	< 18 :
			18 – 25 :
			25 – 35 :
			35 – 45 :
			> 45 :
2.	Education level	:	Junior high school :
			Senior high school :
			Diploma :
			Bachelor :
3.	Certification of employee • General Certificate	:	

	<ul style="list-style-type: none"> <li>• Task Specific Certificate</li> <li>• Job Specific Certificate</li> <li>• Required Pre-employment Certification (if any)</li> </ul>		
4	Training for workers	:	
5.	Last training of workers	:	
6.	Time of work hours	:	
7.	Over time per workers	:	
8.	Number of workers per cycle production	:	
9.	Health insurance	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Is the present productivity being affected to the quality of work environment	:	<p>1. Much higher than normal <input type="checkbox"/></p> <p>2. Slightly higher than normal <input type="checkbox"/></p> <p>3. Normal <input type="checkbox"/></p> <p>4. Slightly lower than normal <input type="checkbox"/></p> <p>5. Much lower than normal <input type="checkbox"/></p>

<p>How is the productivity of workers are measured at your site</p> <ul style="list-style-type: none"> <li>• Work rate per person per hour</li> <li>• Work rate per shift per hour</li> <li>• Occupancy rate per shift per hour</li> <li>• Planned time versus actual time in shift</li> </ul>		
<p>What is the major problem occurred and affected to the productivity of workers</p>		<p>1. Presence <input type="checkbox"/></p> <p>2. Skill <input type="checkbox"/></p> <p>3. Time <input type="checkbox"/></p> <p>4. Salary <input type="checkbox"/></p> <p>5. Job engagement <input type="checkbox"/></p>
<p>Does the company provide performance bonuses</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>
10.	<p>How is the performance management system works on site</p> <p>What are the performance measures in use?</p>	:
11.	<p>How the good communications are build on site</p>	:
12.	<p>How motivation and discipline are build in the company</p>	:
13	<p>What is the company policy in order to encourage the creativity and innovation</p>	:
14.	<p>Does the company provide a family gathering</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>

	If yes how often	:	
<b>2.3 Seed/Fingerling</b>			
1.	Source of seed/fingerling	:	
2.	Handling process of fingerling	:	
3.	Quality of fingerling	:	
4.	Continuity of fingerling	:	
5.	Delivery	:	
6.	How long the fingerling growth/farmed take a time into commercial/harvesting size	:	
7.	How is growth/farming technique of the fingerling/seed during farming/culture	:	
8.	How long the fingerling take a time on transportation to the farming/growth location	:	
9	Expected production per cycle of farming		
10	Mortality rate of seed/fingerling		
11	Price of of seed/fingerling (IRD per liter or per kg)		
<b>2.4 Capital</b>			
1.	Current income (IDR)	:	
2.	Current revenue (IDR)	:	
3.	Cost of production (IDR)	:	Labour
			:
			Maintenance
			:

			Other	:	
4.	What is the major problem occurred and affected to the productivity in the capital ?				
<b>2.5</b>	<b>External factor</b>				
1.	Whether is the government policy affected to the productivity	:	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
2.	If yes what is the major policy affected	:			
3.	Whether is the globalization affected to the productivity	:	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
4.	Whether the political situation affected to the productivity		Yes <input type="checkbox"/>	No <input type="checkbox"/>	