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18

H Index

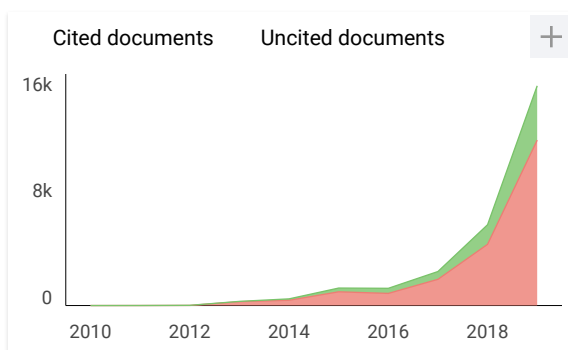
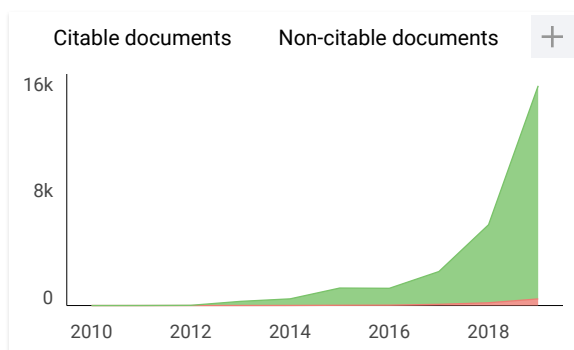
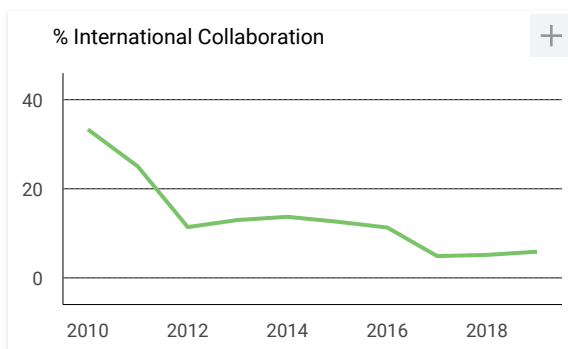
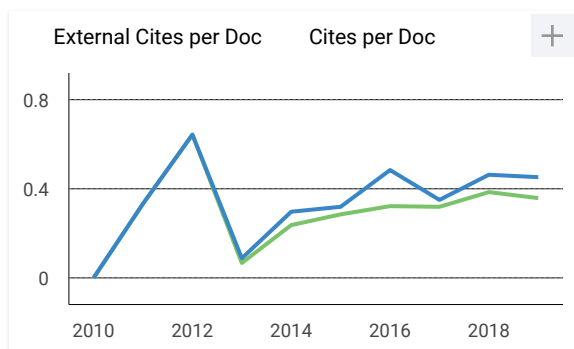
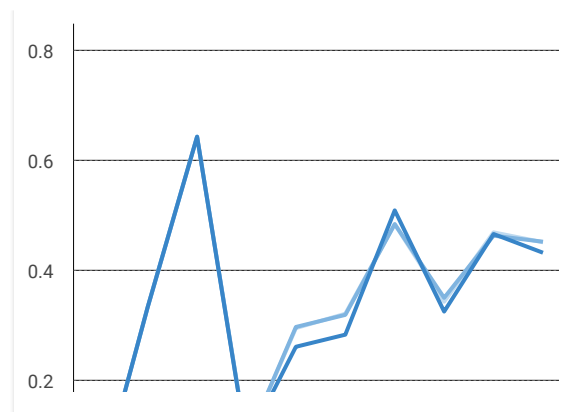
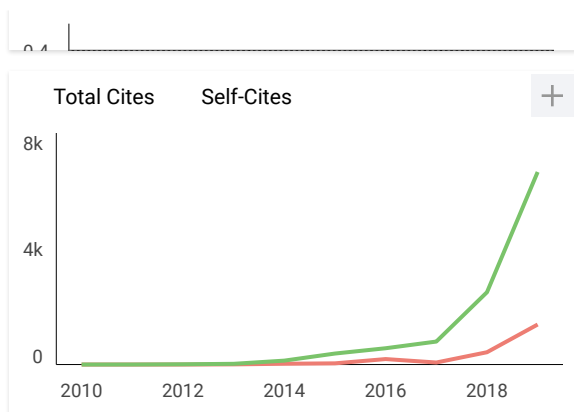
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[Earth and Planetary Sciences \(miscellaneous\)](#)
[Environmental Science](#)
[Environmental Science \(miscellaneous\)](#)**Publisher** [IOP Publishing Ltd.](#)**Publication type** [Conferences and Proceedings](#)**ISSN** [17551315](#), [17551307](#)**Coverage** [2010-2020](#)**Scope** The open access IOP Conference Series: Earth and Environmental Science (EES) provides a fast, versatile and cost-effective proceedings publication service.[Homepage](#)[How to publish in this journal](#)[Contact](#)[Join the conversation about this journal](#)

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PREFACE

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PREFACE

The 2nd International Conference on Global Issue for infrastructure, environment & socio-economic development (IC-GIESED 2018) was held in Makassar, Indonesia on September 11, 2019. IC-GIESED 2019 is dedicated to address issues related to renewable energy technologies, grid interactions, energy efficiency, green environment, sustainable agriculture, data analytics, economics and finance, environmental and social impact as well as policy and climate change implications, hosted by Post Graduate School of Hasanuddin University and Publication Management Centre (PMC), Hasanuddin University.

The global use of renewable energy has been triggered by a wide range of application including improving energy security and access, advancing economic development and increasing concern on global warming. These issues are critical to progress toward global concern in the area of poverty reduction, agriculture, industrialization and economic development, environment, health and education. The conferences aims to accommodate the latest issue in modern renewable energy sources, technology in renewable energy utilization, energy efficiency, social, legal and economic framework, energy policy, environmental effect, health and education and global warming concern. Professors from Japan and Australia are invited to deliver keynote speeches, together with invited speakers from Malaysia and Indonesia. Their presence indicates the concern and role of the researchers, scientists and practitioners which are significant in keeping Global Issue for infrastructure, environment & socio-economic development.

We would like to appreciate all authors who have contributed to this proceedings, the conference committee, speakers, attendees, organizing committee and sponsors who have made the 2nd GIESED 2019 a success. We wish the conference will have significant contribution in field of global issue for infrastructure, environment & socio-economic development. We are also expecting that this conference proceeding contributes in looking at a new paradigm for global Issue for infrastructure, environment & socio-economic development.

Herman Parung
Chair of Organizing Committee GIESED 2019.

Muhammad Arsyad
Director of Publication Management Centre
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Table of contents

Volume 473

2020

[◀ Previous issue](#) [Next issue ▶](#)

The 2nd International Conference on Global Issue for infrastructure, environment & socio-economic development 12-13 September 2019, South Sulawesi, Indonesia

Accepted papers received: 06 March 2020

Published online: 13 May 2020

[Open all abstracts](#)

Preface

OPEN ACCESS	011001
--------------------	--------

PREFACE

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	011002
--------------------	--------

Conference Committee

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	011003
--------------------	--------

Peer review statement

[+ Open abstract](#) [View article](#) [PDF](#)

Agriculture system

OPEN ACCESS	012001
--------------------	--------

Bycatch sea cucumber *Holothuria scabra* processing and the quality characteristics

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012002

Socio-economics factors affecting the non-paddy farm income of paddy households in East Kalimantan, Indonesia

Karmini and Karyati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012003

Effect of seed storage methods on germination growth of *Pericopsis mooniana* thw. through in-vitro technique

C Andriyani Prasetyawati, Nursyamsi and Didin Alfaizin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012004

Inanco a local wisdom in endemic fish species conservation in lake Poso

Theophilus, Shadiq Maubu, Jihad and Andi Faisal Alwi

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012005

Impact of credit on agriculture and industrial processing

A I Anwar, Kurniaty, A Nurlita and Y A K Fil'ardy

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012006

Biological analysis of adult rabbitfish (*Siganus guttatus* bloch, 1787) in seagrass and coral reef ecosystems at laikang bay, takalar regency

B S Parawansa, S A Ali, N Nessa, R A Rappe and Y N Indar

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012007

Field cultivation of *Kappaphycus alvarezii* (DOTY) doty ex silva using tissue-cultured seedlings at bungin permai costal waters, south konawe, Southeast (SE) Sulawesi: the third year of seaweed growth monitoring

L O M Aslan, H Cahyani, H Hardianti, D P Kurnia, A Febriani, N A Prity, Ariskanti, H Anastasia, Disnawati, W Iba, Ruslaini and E Sulistiani

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	012008
Identifying sustainable agricultural commodities in Wajo regency	
Jusni and A Aswan	
+ Open abstract	View article PDF
OPEN ACCESS	012009
Cultivation of seaweed <i>Kappaphycus alvarezii</i> (Doty) doty ex silva using tissue–cultured seedlings in encircling tank culture system	
H Cahyani, Hardianti, D P Kurnia and L O M Aslan	
+ Open abstract	View article PDF
OPEN ACCESS	012010
MIC (<i>Minimum Inhibition Concentration</i>) test of metanol extract on <i>rhizophora stylosa</i> and chloroform <i>Avicennia marina</i> against <i>vibriosis</i> in mangrove crab larvae (<i>Scylla serrata</i> forsskal)	
Burhanuddin, A Saru, A Rantetondok and E N Zainuddin	
+ Open abstract	View article PDF
OPEN ACCESS	012011
Asexual propagation of two sea anemone taxa for Banggai cardinalfish microhabitat enhancement	
A M Moore, I Yasir, R A-Rappe, S Ndobe and J Jompa	
+ Open abstract	View article PDF
OPEN ACCESS	012012
Nomei fish (<i>Harpadon nehereus</i> , Ham. 1822) reproduction biology in Tarakan waters	
A Taqwa, A I Burhanuddin, A Niartiningsih and M N Nessa	
+ Open abstract	View article PDF
OPEN ACCESS	012013
Effect of double rows plant system on plant growth, yield components and grain yield in prolific and non-prolific hybrid maize	
S Alimuddin, Y Musa, M Azrai and L Asrul	
+ Open abstract	View article PDF
OPEN ACCESS	012014
The potency of medicinal plants in production forest of Bantaeng, South Sulawesi	
H Latifah, Y Yusuf, S Paembonan and D Sanusi	
+ Open abstract	View article PDF

Structural model design of the role of institutions in the development of cayenne agribusiness systems

A Sutrisno, M Arsyad, Rayhana, Khaerunnisa, A Sulistyo, S Inten, Nurlela, Zulhafandi, G Y Rahajeng and A Adi

[+ Open abstract](#) [View article](#) [PDF](#)

Determination of the lowest unit price through the value-added approach for Arabica Coffee Commodities in North Toraja Regency

Rico, R Darma and L Asrul

[+ Open abstract](#) [View article](#) [PDF](#)

Young farmers and parents' perception for the future of agriculture: socio-spatial integration of Coffee Farmers in Jeneponto Regency

I Junais, Samsuar, Daniel, H M Ali, Yusran, A Syarif and M H Mansyur

[+ Open abstract](#) [View article](#) [PDF](#)

Selecting livelihood model of community in North Tuppabiring District, Pangkep Regency

Sitti Fakhriyyah, Nuddin Harahab and Pudji Purwanti

[+ Open abstract](#) [View article](#) [PDF](#)

Competitiveness and SMEs production sustainability through the cleaner production (case study: SMEs of fish processing unit in Pinrang Regency, Indonesia)

M Karim, D Salman, J Genisa and Rahmadanih

[+ Open abstract](#) [View article](#) [PDF](#)

Social, economic and ecological benefits and farmers' perception of agricultural waste processing in Banyuasin Regency

M Yazid, W Pusfasari and E Wildayana

[+ Open abstract](#) [View article](#) [PDF](#)

The development of integrated agricultural system in improving the local community in Papua

B A M Rahawarin, D Salman and E B Demmallino

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	012022
The role of youth in developing village	
K A Rivai, A S Alam and A L Irwan	
+ Open abstract	View article
PDF	
OPEN ACCESS	012023
The prospect of sea cucumber (<i>Holothuroidea sp</i>) agribusiness development in south Sulawesi Province	
Asriani, S Made and H Tahang	
+ Open abstract	View article
PDF	
OPEN ACCESS	012024
Analysis effect the price of the demand for chicken eggs in Biringkanaya district	
P Astaman, A R Siregar and S U Nurbayani	
+ Open abstract	View article
PDF	
OPEN ACCESS	012025
Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia	
R Indriani, R Darma, Y Musa, A N Tenriawaru and Mahyuddin	
+ Open abstract	View article
PDF	
OPEN ACCESS	012026
Fight for the green earth: The existence of local knowledge in agriculture	
H Halim, S Bahri, R Zainuddin, S A Kamaruddin and H B Anriani	
+ Open abstract	View article
PDF	
OPEN ACCESS	012027
Comparative study on rituals in highland farming areas In North Sumatera and in Tohoku	
Ferdinand C Situmorang, Nina Maksimiliana Ginting, Merry Dawapa and A Amiruddin	
+ Open abstract	View article
PDF	
OPEN ACCESS	012028
The effect of product quality and service quality on customer satisfaction in crocodile skin crafts industry	
I W Muafa, M Awal, C A Wahyudhi, S Waas, E Noer and Jusni	
+ Open abstract	View article
PDF	
OPEN ACCESS	012029

Government expenditure and investment on economic growth in Merauke Regency

Asrudi, A S Ulita, W Meilvidiri, M A I Nahumury, F Y Manuhutu and Jusni

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012030

Influence of fiscal decentralization on the economic growth of public welfare and poverty between regions of Province of Papua

K Hiktaop, A S Ulita, W Meilvidiri, M V I Herdjiono and P P Hayon

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012031

The allocation of special autonomy funds and their impact on regional economic inequality in Papua Province

Y W Tamberan, M A Tawakal, S Betaubun, F Lamalewa, E L R Kore and A I Anwar

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012032

Village authority and position in realizing village autonomy

A J Silubun, J J J Kalalo, A B Inggit, C N Kalalo and E B Rahail

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012033

Policy to increase revenue of fishermen community

P A Moento, A P Yusuf, A F Adam, E E Maturbongs, A P Tljlien and M Yunus

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012034

Effect of the type of transport packaging against the occurrence rate of rot disease on the Salak's taper tip

Jamaludin and P Betaubun

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012035

Supply chain and gender relations in ornamental plants business CV. Malino Florist in South Sulawesi

V Febrianti, D Salman and M E Fachri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012036

Carrying capacity of horticulture intensive farming land in Enrekang Regency (study: Anggeraja District)

Z Laga, K Mustari and U Arsyad

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012037

Development strategy of apparatuses performance in the management of conservation area of South Sulawesi natural resource conservation

F Mujahid, Y Yusuf and M Yunus

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012038

The development of *kacang* goat based on the feed of Metroxylon sago pulp

R P Nogo, R Darma and S A Syaiful

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012039

The development strategy of ruminant cattle slaughterhouse (rph-r) of Mopah, Merauke Regency

M M Udiata, D Rukmana and A N Tanriwaru

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012040

The slaughter control on the productive cows on animal health division in food security, animal husbandry, and animal health service in Merauke Regency

M S Rianto, E B Demmallino and Amrawaty

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012041

Strategies for strengthening various models of cocoa marketing partnerships among farmers in the Polewali Mandar Regency, Western Sulawesi Province

B Setiawan, D Rukmana and Mahyuddin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012042

The utility of cocoa pods husk M45 (*Theobroma cocoa*) as adsorbent of heavy metals, iron (Fe) and copper in the laboratory wastewater

Pabbenteng, F W Samawi and Maming

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	012043
Strategy to increase selling price of organic Toraja Arabica coffee at farmers levels in International Markets	
Y Musa, R Darma and Y B S Panggabean	
+ Open abstract View article PDF	
OPEN ACCESS	012044
Survival and morphological performance of Black Tiger Shrimp larvae (<i>Penaeus monodon</i>) after immersion with extract of <i>Sargum duplicatum</i>	
C S Pakidi, H Anshary, E N Zainuddin, G Latama and B R Tampangallo	
+ Open abstract View article PDF	
OPEN ACCESS	012045
Relationship Between Institutional Sustainability and SMEs Production Sustainability(Case Study: SMEs of Fish Processing Unit, in Pinrang Regency, Indonesia)	
D Salman, M Karim, J Genisa and Rahmadanih	
+ Open abstract View article PDF	
OPEN ACCESS	012046
Analysis of Total Quality Management (TQM) of vegetable and fruit products at PanenMart Makassar company	
Nurliah, Mayuddin and M Munizu	
+ Open abstract View article PDF	
OPEN ACCESS	012047
Impact of contract farming on price: a case study of red chili farmers in Magelang regency	
D Angreheni, R Darma and L Asrul	
+ Open abstract View article PDF	
OPEN ACCESS	012048
Increased value-added marning corn products	
A A Haidi, R Latief and I Sudirman	
+ Open abstract View article PDF	
OPEN ACCESS	012049
The potential development of diversification of food products from sago	
E Humaerah, R Darma and Rahmadanih	
+ Open abstract View article PDF	

-
- OPEN ACCESS** 012050
- Strategy for developing the role of youth in agriculture of Soppeng district, South Sulawesi province
- Akbar, H Zubair and M H Jamil
- [+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012051
- Changes in land use and suitability of spatial planning on the paddy field in Gorontalo Regency
- M Ekafitrawan, M H Jamil and D Useng
- [+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012052
- The effectiveness of rice field expansion program in increasing rice product in Tanah Miring District, Merauke Regency
- E A Elision, M H Jamil and P Betaubun
- [+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012053
- Strategy management area coral viewed from threat level in tanah Bumbu regency South Kalimantan
- R Jamal, H Zubair, G Yanuarita, Budimawan, A Rasyid and M R Idrus
- [+ Open abstract](#) [View article](#) [PDF](#)
-

Green Environment

-
- OPEN ACCESS** 012054
- A note on Gobiidae from some rivers in Luwuk Banggai, Central Sulawesi, Indonesia
- A Gani, E Wuniarto, L D Khartiono, Srinurmahningsi, Y Mutalib, Nurjirana, M Herjayanto, D H Satria, M I Adam, Jusmanto, M I Bungalim, D T Adriany, A A Bakri, M Subarkah and A I Burhanuddin
- [+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012055
- Mangrove area and vegetation condition resulting from the planting of mangroves in the Wallacea Region, Bone Bay, South Sulawesi
- A Mursalim, N Nurdin, Supriad, Y La Nafie, B Selamat, J. Tresnati and A Tuwo
- [+ Open abstract](#) [View article](#) [PDF](#)
-

-
- OPEN ACCESS** 012056

Size at the maturity of sea cucumber *Holothuria scabra*. Is it an overfishing sign in Wallacea Region?

A Yanti, J Tresnati, I Yasir, Syafluiddin, P Y Rahmani, R Aprianto and A Tuwo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012057

Jellyfish in Makassar coastal waters, new challenges?

B A J Gosari, A Wahid, Firman and A S Cangara

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012058

Coral conditions and reef fish presence in the coral transplantation area on Kapoposang Island, Pangkep Regency, South Sulawesi

I Ulfah, S Yusuf, R A Rappe, A Bahar, A Haris, J. Tresnati and A Tuwo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012059

Multi years catch composition and abundance of Parrotfish landed at Makassar Fisheries Port

J Tresnati, I Yasir, A Yanti, P Y Rahmani, R Aprianto and A Tuwo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012060

Legal protection against forest areas to ensure habitat wildlife in the Wallacea region

Maskun, Naswar, Achmad, H Assidiq and J Raisman

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012061

Hunting in the seas: population status and community perspectives on giant clams (Tridacnidae) and Napoleon wrasse (*Cheilinus undulatus*), endangered marine taxa of the Wallacea Region, Indonesia

S Yusuf and A M Moore

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012062

Habitat, diversity, and abundance of waterbirds in lantebung mangrove ecotourism area, Makassar city

A Purify, N Nurdin, R I Maulany, A Achmad and M Lanuru

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS	012063
Utilization of orchids of Wallacea region and implication for conservation	
S Nurfadilah	
+ Open abstract	View article PDF
OPEN ACCESS	012064
Diversity and threats to endemic birds in the Wallacean region, Indonesia	
Dewi M. Prawiradilaga	
+ Open abstract	View article PDF
OPEN ACCESS	012065
Diversity of bird species at teon nila serua subdistrict seram island moluccas	
M R Sitanela, J CH Hitipeuw and L Latupapua	
+ Open abstract	View article PDF
OPEN ACCESS	012066
Young consumer preferences of the housing environment in Makassar City	
S A Yanti, S Trisutomo and M Arifin	
+ Open abstract	View article PDF
OPEN ACCESS	012067
Identification of bats on traditional market in dumoga district, North Sulawesi	
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Using a types of chainsaw efficiently	
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Youth potential in developing marine tourism and reducing destructive ecological changes on remote island	
Sukur Oda, Jamaluddin Jompa and Akin Duli	
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J Nurung, Rakhmat, H Tamsah, Burhanuddin and M Azis	

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synergy between student and communities to manage waste in Makassar city Indonesia

Seniwati, Sutinah, Rahmatia and M Akbar

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012072

Land characteristics and suitability for tilapia culture at different seasons in brackish water ponds of Bontoa Subdistrict, Maros Regency, Indonesia

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Analysis of government development financing between Sukuk and Bonds

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The planning of median road park arrangement to support the city's green space (RTHK) at Brawijaya Highway City of Merauke

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Removal of Mn (II) from aqueous environment using *Eucheuma spinosum*

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012077

Youth participation in the creative economy and community empowerment

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Heavy metals Cd and Cr found in sponges (porifera) at spermonde archipelago Zone II	
L Melawaty, A Tahir and M Djonny	
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Fiscal decentralization and regional income: evidence from Papua province, Indonesia	
A N Romdioni, A S Ulita, K Hiktaop, M V I Herdjiono, P P Hayon and A R Kadir	
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Development of infrastructure related with community welfare	
R T P M Django, Y W Tamberan, M A Tawakal, P I M Risamasu, M A I Nahumury and A R Kadir	
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PDF	
OPEN ACCESS	012081
Factors that influencing income in Merauke District, Merauke Regency, Papua Province	
S Siman, M A Tawakal, P I M Risamasu, M A I Nahumury, F Y Manuhutu and A R Kadir	
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The role of religious <i>sasi</i> in environmental conservations	
T G R Hallatu, I D Palittin, Supriyadi, U Yampap, R Purwanty and A Ilyas	
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Utilization of <i>sar</i> culture as teaching material on environmental physic	
T G R Hallatu, I D Palittin, H A Kaikatui, A K Hermansyah, R Purwanty and A Duli	
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OPEN ACCESS	012084
Implementation of Green Construction on the Use of Formwork at St. Thomas Building Construction Project	
P L A Luthan, N Sitanggang, P Betaubun and J Prima	
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Towards a water-sensitive city: level of regional damage to floods in Makassar City (case study: Manggala District)

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Distribution of Manganese Heavy Metal (Mn) in Soil Around of Antang Landfill, Makassar City, Indonesia

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Empowering youth development and empowerment program (P3MD) in the District of Lappariaja, Bone Regency, South Sulawesi Province, Indonesia

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The role of the government, in the development of border areas, in North Sulawesi Province

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Village development in the millennial era: youth empowerment in Bana Kecamatan Bonto Cani district, Bone district

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Potential of palm fatty acid distillate as a feedstock in the synthesis of ethyl esters using solid $\text{SO}_4^{2-}/\text{TiO}_2\text{-SiO}_2$ catalysts

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Cacao leaf litter decomposition under different moisture and pH: Characteristic of soil N mineralization (NH_4^+ and NO_3^-) and Greenhouse gas CO_2 , CH_4 , N_2O flux emission

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Correlation of fixed carbon content and calorific value of South Sulawesi Coal, Indonesia

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Beneficiation of canary shell as a mixture of coal briquette

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Utilization of Solid Waste from Refined Sugar Industry (Filter Cake) as Biodegradable Foam (Biofoam)

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Utilization of fly ash waste power plant Bosowa energy Jeneponto South Sulawesi as concrete mixed material

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The utilizations of solid waste originating from super intensive shrimp farm as organic fertilizers for natural feed productions

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Mineralogy and quality of Banti Coal, Baraka District, Enrekang Regency, South Sulawesi Province, Indonesia.

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Coexistence mode of production based dairy cow supporting farming in producing biogas as renewable energy resources

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Potential of biogas production as renewable energy in smallholder dairy farming in Enrekang District, South Sulawesi

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Utilization of probiotic bacteria as an effort to handle liquid waste from the palm oil processing industry

Fatmawati, L R Winata and A Tahir

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Description of correlation between quantitative and qualitative assays on candlenut DNA

Gusmiaty, Nurhafidah and S.H. Larekeng

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Application of Error Correction Model (ECM) in stabilizing financial inclusion

A I Anwar, Kurniaty, N R S Wulandari and R Fitrianti

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Mode selection in transportation system: implications of quality function deployment

A R Kadir, N Kamariah, O R Ganna, M Pono and Yamar

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Consumption and *in vivo* digestibility of feed supplemented by *katuk* (*Sauropus androgynus*) and *gamal* (*Gliricidia sepium*) leaves in friesian holstein cattle

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Experimental study on stability of (ac-bc) made with asbuton modification (retona)

M T A Omer, M W Tjaronge and M Passra

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Greenway model as a support of Makassar smart city

Cahyani, B Hamzah and E Syarif

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Remediation of mine acid water using mangrove sediment

J Tandiarang, K Mustari and N L Nafie

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012123

Strength performance of sodium hydroxide-activated fly ash, rice straw ash, and laterite soil geopolymer mortar

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Climate forecasting uses backpropagation algorithm artificial neural network model for agricultural planning in Gowa regency

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012125

Application of SWOT-AHP in analyzing external and internal environment of youth empowerments

A P Syamsuddin, Ridwan and Supratman

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Removal of brilliant scarlet by MCM-48 materials

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The effect of traffic volume on noise of housing and shopping area of Manggala District

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Comparative of the application of combine harvester with the traditional harvest at Tanah Miring District, Merauke Regency

Yasin, R Darmal and A Nixiatenriawaru

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Organo-silica membrane for brine water pervaporation

M Elma, N L Sari, D A Pratomo, S Annadliyah, E L A Rampun, A Rahma and A E Pratiwi

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Experimental study of rubber particles from recycle tires as concrete aggregates

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Shear strength analysis of reduced beam section (RBS) on castellated beam

H Parung, N H Aswad and Tachrir

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Study of the relationship of asphalt modulus to the height of the laboratory LWD

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012133

Estimating the catchable size of orange-spotted grouper (*Epinephelus coioides*) in Kwandang Bay, Gorontalo Utara District, Indonesia

D S Achmad, Sudirman, J Jompa and M S Nurdin

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The development of infrastructure and the level of poverty in the eastern part of Indonesia

Wayrohi Meilvidiri, Rizka Jafar, Asrudi, Syahrudin, M A I Nahumury and M Akbar

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Heat exchanger in process of making sagu sep as papua's contextual science learning media

S Supriyadi, I D Palittin, A Reski, A M Fadlih, Mitra Rahayu and N Abdullah

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012136

The influence of POGIL learning model by mind mapping and summary assignment of salt hydrolysis outcomes

N B Sumanik, E Nurvitasari, R Z Maarebia, Y P Pasaribu, Y Buyang, A L Rettob and J Genisa

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A Henukh, M E Utomo, R F Nikat, A Reski, M Simbolon and S Asmal

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012138

Effectiveness testing of attitude (*Enhalus acoroides*) on lead (Pb) and copper (Cu) metals

Sardi, N L Nafi and R Ambo Rappe

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012139

Livestock business development of border areas in North Sulawesi Province

N M Santa, F N Sompie and W Waworundeng

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The Effect of the door opening on various channel type of flow velocity (Case Study: secondary channel of the Saddang Irrigation Area, Pinrang Regency)

G H Syamsuddin, F Maricar and R T Lopa

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Effect of ocean acidification and temperature on growth, survival, and shell performance of fluted giant clams (<i>Tridacna squamosa</i>)	
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Components of steel slag in acid-contaminated porous concrete	
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OPEN ACCESS	012143
Comparison of copper adsorption effectivity in acid mine drainage using natural zeolite and synthesized zeolite	
E Wulandari, A E Hidayat and S S Moersidik	
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Flexural behavior of double straight notch joint beam column exterior due to lateral cyclic load	
M T Palembang, H Parung, A. A. Amiruddin and R Simbolon	
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OPEN ACCESS	012145
Analysis of open spaces in flood-prone areas in small-medium cities: a Case study of Palangkaraya City	
I Permana and Y Ludang	
+ Open abstract View article PDF	
OPEN ACCESS	012146
Elasticity modulus concrete of abaca fiber	
R Tampi, H Parung, R Djamaluddin and A Amiruddin	
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OPEN ACCESS	012147
Shear strength of annealed wire fiber reinforced concrete coupling beam under cyclic loads	
C Kandou, H Parung, R Djamaluddin and A Amiruddin	
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Potential of n-hexane and chloroform extracts from *Melochia umbellata* (Houtt) Stapf var bark. Visenia as dengue antivirus

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Synthesis and characterization of stigmasterol imprinted polymers with precipitation polymerization method

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Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia

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Abstract

The research aims to examine the structure and performance of the cayenne pepper supply chain. The study was conducted in Gorontalo from January to March 2019. The research was using the survey method. Data analysis was using descriptive and marketing efficiency analysis. The results showed 1) The structure of the cayenne pepper supply chain in Gorontalo Province consists of seven distribution

channels. Sale of cayenne pepper by farmers through collectors (40 percent), wholesalers (26.67 percent), market traders (10 percent), and retailers (23.33 percent). The primary members of the cayenne supply chain consist of farmers, collectors, wholesalers, out-of-town traders, market traders, retailers, consumers, and agroindustries. The secondary members are farm shops, banks, transportation service providers, the Agriculture Service, and information media. 2) The most efficient distribution channel is channel six because the smallest marketing efficiency value is 3.17 percent. The cayenne pepper's market in Gorontalo runs inefficiently because it has a price transmission elasticity value of 1.11 ($E_t > 1$). It means the rate of change in prices at the consumer level is greater than the rate of change in prices at the farmer's level.

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Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia

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Cayenne pepper: structure and supply chain performance in Gorontalo Province, Indonesia

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Abstract. The research aims to examine the structure and performance of the cayenne pepper supply chain. The study was conducted in Gorontalo from January to March 2019. The research was using the survey method. Data analysis was using descriptive and marketing efficiency analysis. The results showed 1) The structure of the cayenne pepper supply chain in Gorontalo Province consists of seven distribution channels. Sale of cayenne pepper by farmers through collectors (40 percent), wholesalers (26.67 percent), market traders (10 percent), and retailers (23.33 percent). The primary members of the cayenne supply chain consist of farmers, collectors, wholesalers, out-of-town traders, market traders, retailers, consumers, and agroindustries. The secondary members are farm shops, banks, transportation service providers, the Agriculture Service, and information media. 2) The most efficient distribution channel is channel six because the smallest marketing efficiency value is 3.17 percent. The cayenne pepper's market in Gorontalo runs inefficiently because it has a price transmission elasticity value of 1.11 ($E_t > 1$). It means the rate of change in prices at the consumer level is greater than the rate of change in prices at the farmer's level.

1. Introduction

Gorontalo Province is the center of cayenne producing centers in Eastern Indonesia, with the harvested area of 1,928 ha, production of 11,942 tons, and productivity of 6.19 tons/hectare, in 2016 [1]. Cayenne pepper is the second leading commodity in Gorontalo province besides corn. Cayenne farming has a large prospect because it has a higher competitiveness than corn and rice [2]. Gorontalo people consume fresh cayenne pepper about 2,915 tons while Gorontalo production about 12,063 tons, so there is a surplus of 9,148 tons [3]. Cayenne pepper in Gorontalo has an LQ value of 1.15-1.83, which means that the area's production is a surplus of 1.15-1.83 times greater than its own needs [2], so that the marketing of cayenne is not only in within Gorontalo region but also sent to other regions [4].

In the last two years, cayenne pepper's price goes up and down in Gorontalo. The price of cayenne pepper in the traditional market is 60,000- 90,000 IDR a kg. The increase was due to the lack of supply of cayenne which was circulating in the market because it was disturbed by a number of things from the weather to the distribution process. Erratic weather factors can have implications for the uncertainty of the amount of production that will affect the supply of cayenne pepper, which results in uncertain selling prices of cayenne and generally follows the market mechanism [5].



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A supply chain is an approach that can be used to resolve cayenne commodity problems such as unpredictable chili supply, price fluctuations, uncertainty in production, extreme weather, distribution channels, and price stabilization. Supply chain success can be seen from the level of performance it has. Performance measurement is needed as an approach in order to optimize supply chain networks and determine the extent to which marketing activities are optimized by members of the supply chain. The objectives of the study are identifying the structure of cayenne supply chains and assessing the performance of cayenne supply chains in Gorontalo Province.

2. Methodology

The study was conducted in Gorontalo Province from January to March 2019. The sampling technique used the snowball sampling technique. The data used were primary data collected through interviews with farmers collectors, wholesalers, retailers using questionnaires. Secondary data were obtained from statistical offices. Data analyses were Descriptive Analysis and Marketing Efficiency Analysis. Analysis of marketing efficiency in the form of Marketing Efficiency and Price Transmission Elasticity.

$$Ep = \frac{TB}{TNP} \times 100 \%$$

Ep = Marketing efficiency (%)

TB = Total Cost (Rp)

TNP = Total Product Value (Rp)

The most efficient supply chain criteria can be seen from the comparison of the marketing efficiency (Ep) value of each channel, namely the smaller the efficiency value (Ep), the more efficient the marketing channel [6]. Price transmission elasticity is measured through simple regression analysis between two prices at two market levels, then the elasticity is calculated. Processing simple regression analysis with the help of software SPSS 16. Mathematically the transmission price elasticity (Et) can be written as follows:

$$Et = \frac{\left(\frac{\delta Pr}{Pr}\right)}{\left(\frac{\delta Pf}{Pf}\right)}$$

$$Et = \left(\frac{1}{b}\right) \times \frac{Pf}{Pr}$$

b = regression coefficient

Pf = prices at farmer level

Pr = prices at retailer level

The criteria for determining efficiency namely if $Et = 1$ means the rate of change in prices at the retailer level is the same as the rate of change in prices at the farmer level. A price change of 1% at the retailer level resulted in a 1% price change at the farmer level. The market runs efficiently. $Et < 1$ means the rate of change in prices at the consumer level is greater than the rate of change in prices at the producer level. A price change of 1% at the retailer level results in a price change of less than 1% at the farmer level. The market runs inefficiently. The market faced is an imperfectly competitive market. $Et > 1$ means the rate of change in prices at the retailer level is smaller than the rate of change in prices at the farmer level. A price change of 1% at the retailer level results in a price change greater than 1% at the farmer level. The market runs inefficiently. The market faced by market participants is that markets are not perfectly competitive.

3. Results and discussion

The supply chain structure of agricultural products does not always follow the chain sequence where farmers can directly sell their agricultural products directly to the market [7]. The supply chain structure of cayenne pepper in Gorontalo Province can be seen in figure 1.

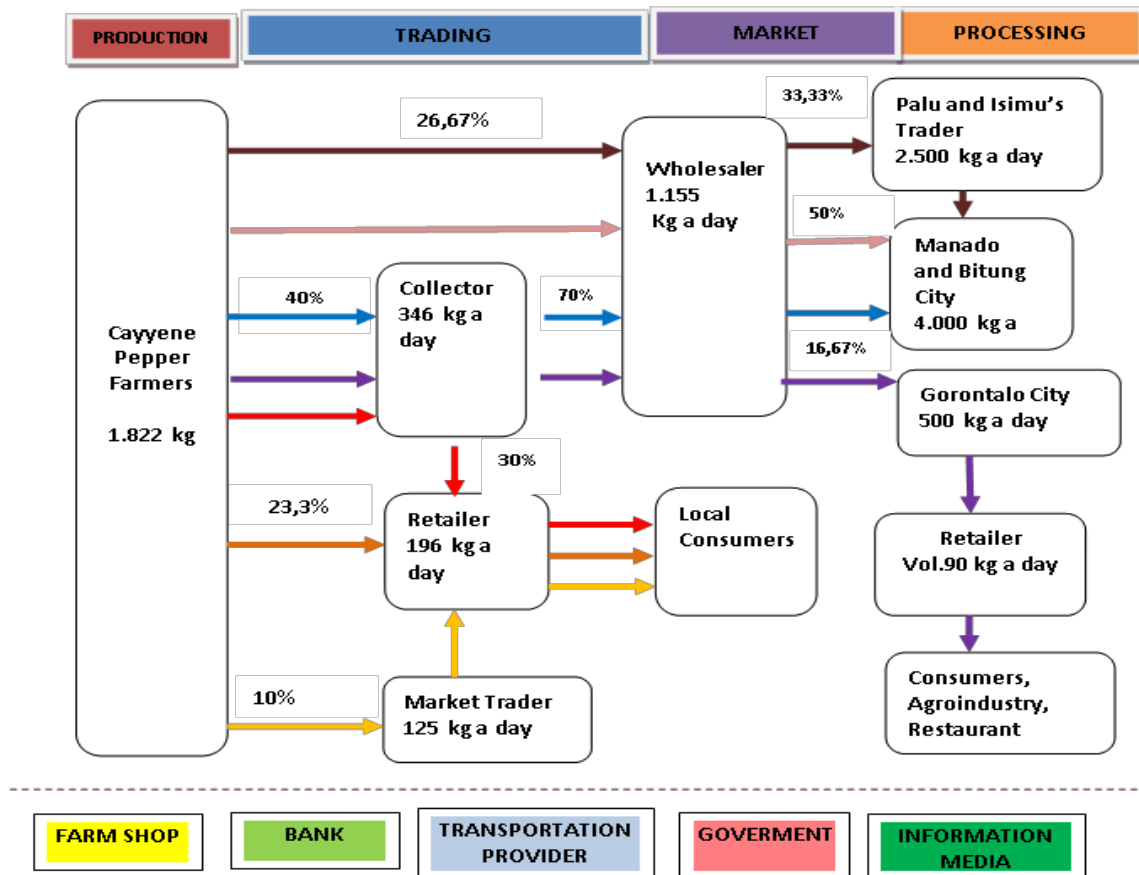


Figure 1. Structure of Cayenne Pepper Supply Chain Gorontalo Province, 2019.

Figure 1 shows the flow pattern of cayenne pepper supply chain from farmers is divided into 4 chains, namely 1) farmers sell through collectors by 40 percent (346 kg) (2) farmers sell through wholesalers by 26.67 percent (1.155 kg), 3) farmers sell-through market traders by 10 percent (125 kg), and 4) farmers sell directly to retailers by 23.33 percent (196 kg). It shows that most farmers are still dependent on collectors even though they have been supported by road and transportation infrastructure and wholesalers are already in the sub-district capital. It causes the proximity of the location to a collector, little harvest volume, and collectors pick up cayenne pepper to farmers directly so that farmers do not pay for transportation costs. In addition, farmers are bound by agreements with collectors, because some farmers often borrow money from collectors. It shows that most farmers choose to sell to village collectors because of the bond loans that farmers have received before harvest, a small volume of harvest, a closer distance to farmers and family relations [8] including marketing institutions [9].

The most dominant distribution channel is channel three, where 16.67 percent of farmers choose to sell cayenne pepper to 70 percent of the traders and then to 50 percent of wholesalers who send it to Manado and Bitung City. In addition, the flow pattern of the cayenne pepper supply chain from wholesalers is divided into three chains, namely 1) delivery to Palu and Isimu trader is 33.33 percent (2,500 kg a day), 2) delivery to Manado and Bitung by 50 percent (4,000 kg a day), and 3) delivery to Gorontalo City at 16.67 percent (500 kg a day). While the flow pattern of the cayenne pepper supply

chain from the collector is divided into two chains, namely 1) sales to wholesalers by 70 percent (2.293 kg a day) and 2) sales to retailers by 30 percent (350 kg/day).

At the farm level, there is a production stage where the supply of inputs, especially seedlings, comes from collecting traders (10 percent), other farmers (26.67 percent), farm shops (6.67 percent)) and from the previous harvest seeds (56.67 percent). Fertilizers and pesticides were mostly bought by farmers at farm shops, while others were obtained from collectors. There were also farmers who received assistance from the Agriculture Service in the form of seeds and liquid fertilizer. At the production stage, it starts from land preparation, planting, maintenance, and harvesting. Then after harvest, farmers sell to cayenne traders. In the trading phase is processing and delivery of cayenne pepper to out of town's market by using transportation services in the form of pick-up cars, buses, and airplanes. Payment system from out-of-town merchants through transfers in bank accounts (Banking). The price information is available through information media such as radio and television. Processing of fresh cayenne pepper into sagela sauce is done at the agro-industry level.

Marketing efficiency is often used in assessing work performance marketing processes. Farmer's Share and Marketing Efficiency often used to determinant marketing efficiency [10]. Based on the value of marketing efficiency, channel 6 and channel 7 are efficient marketing channels because the smaller the value of marketing efficiency, the more efficient the marketing channel. This can be seen in table 1.

Table 1. Marketing Efficiency Value of Cayenne Peper Supply Chain in Gorontalo, 2019.

Marketing Channel	Prices at Farmer Level (IDR a Kg)	Prices at End Level (IDR a Kg)	Marketing Margin (IDR a Kg)	Marketing Cost (IDR a Kg)	Marketing Efficiency (%)
1	25.000	40.000	15.000	6.130	15,33
2	25.000	30.000	5.000	2.480	8,27
3	20.000	30.000	10.000	2.790	9,30
4	20.000	40.000	20.000	3.440	8,60
5	20.000	30.000	10.000	1.560	5,20
6	25.000	30.000	5.000	950	3,16
7	30.000	40.000	10.000	1.110	2,78

Table 1 shows the most efficient channels are channels six and seven because they have the lowest marketing efficiency value, namely 3.16 percent and 2,78 percent. 23.3 percent of farmers who chose channel six and 10 percent of farmers chose channel seven. This is because channels six and channel seven have small marketing margins and low marketing costs. Besides their marketing channels are quite short which involves only a few marketing institutions, namely channel 7 (farmers □ market trader □ retailers), and channel 6 (farmer □ retailers). The low marketing costs are caused by the close distribution distance between farmers and involving only one or two marketing institutions. Marketing efficiency is influenced by the length of the marketing chain and the size of marketing margins. The shorter the marketing chain and the smaller the marketing margin, the more efficient marketing activities [11].

Channels one, three, four and five are inefficient because they have a large marketing efficiency value and marketing margins, high marketing costs, and involving several marketing institutions such as wholesalers and out-of-town traders in the process of distributing cayenne pepper. Large marketing costs are due to high transportation costs for delivering cayenne pepper out of town. The handling of marketing functions that are less efficient can cause marketing costs to be higher because the purpose of marketing institutions is to seek profits, then the marketing costs are delegated to producers or consumers by reducing prices at the producer level and increasing prices at consumer level [11].

Price transmission elasticity is a comparison of relative changes in prices at the retail level with price changes at the farm level [12]. Price transmission elasticity is used to determine the response of agricultural commodity prices at the farm level because of changes in price changes at the consumer

level through price information [13]. By knowing the relationship, it is expected that the benefits of market information about the balance of supply and demand between farmers and traders can prevent excessive price fluctuations and the possibility of reducing production and marketing risks so as to reduce losses [12].

For analysis of price transmission elasticity, the price of cayenne pepper every month for three years (2016-2018) at the farm level and the retail level are processed using a simple regression approach. The result is value of b = regression coefficient = 0.536. P_f = average price of cayenne at farm level = 27,944.44 IDR a kg and P_r = average price at retail level = 47,138.89 IDR a kg. The price transmission elasticity (E_t) is: $E_t = 1/b \times P_f/P_r$

$$= 1/0.536 \times 27.944,44/47.138,89 \\ = 1,11$$

The value of price transmission elasticity is 1.11, which means the market runs inefficiently because of $E_t > 1$. It means the rate of change in prices at the level of cayenne pepper retailers is smaller than farmers. The price change is 1% of cayenne pepper at the retailer level resulted in a change in the price by 1.11% at the farmer level. It shows the market is not perfectly competitive. Efficient marketing is a perfectly competitive market structure. But this rarely happens in the community. Marketing that often happens is the oligopoly competition market structure [14].

The results of simple regression analysis also illustrate the relationship of prices at the level of cayenne farmers with prices at the level of retailers. The value of the correlation coefficient (r) of 0.865 which means the relationship between the price of cayenne pepper at the farm level and retailers is quite strong because the value is close to 1. In addition, the determinant coefficient (r^2) is 0.748, which means the price variation at farm level 74.8% can be explained by price variations at the retailers level, and the remaining about 25.2% is caused by other factors. The regression coefficient value (b) is 0.536, which means that each price of cayenne pepper at the retailer level of 1,000 IDR a kg will cause the price of cayenne pepper at the farm level to increase by 536 IDR a kg.

The level of marketing efficiency can be seen from the margin distribution of the marketing chain. Marketing efficiency is relative depending on which aspects of the actor see it. For farmers, marketing is said to be efficient if the price level received (farmer's share) is high and getting better. However, marketing efficiency occurs when margins are evenly distributed, meaning the transmission of prices from consumers to producers and producers to consumers can run well. Applicable otherwise if there is a build-up of margins there are market players who control the market and inhibit the transmission of prices [14]. Agricultural products usually have a price transmission elasticity value smaller than one. It means the volume and price of inputs are constant so the relative changes in prices at the retail level will not exceed the relative price changes at the farm level [16].

4. Conclusion

The supply chain structure of cayenne pepper consists of primary and secondary members. Primary members consist of farmers as cayenne suppliers, collectors, wholesalers, retailers as customers. and agro-industry as a processor. Secondary members consist of farm shops, banks, transportation service providers, government, and information media. The flow pattern of cayenne pepper supply chain from farmers is divided into 4 chains, namely 1) farmers sell through traders (2) wholesalers, 3) market traders, and 4) farmers sell directly to a retailer. Besides, the supply chain consists of seven distribution channels. The most dominant distribution channel is channel three, where 16.67 percent of farmers choose to sell cayenne pepper to 70 percent collectors and 50 percent wholesalers who send it to Manado and Bitung City. Channels six and seven are the most efficient channel because it has a small marketing efficiency value of 3.16 percent and 2.78 percent, respectively. The value of the price transmission elasticity of cayenne pepper is 1.11, which means the market is running inefficiently. It shows the rate of change in prices at the cayenne retailer level is smaller than farmers. The market is not a perfectly competitive market.

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