

Assessing Actors Involvement In The Establishing Veterinary and Animal Welfare Using Network Analysis; An Evidence From West Papua, Indonesia

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Abstract. The study used focus group discussion towards fourteen representing individuals, groups, and mass institutions. The queries discussed the background, resource delivery, inter-connectivity among actors, intervention, and innovation. The primary finding is that grouped actors dominated, followed by laws actors, state institutions, stakeholders, and had a positive effect due to importance. However, threats existed indirectly without a turn-back effect. The three top shared resources were 100% on time, access, and satisfaction. Actors can have long-term period programs with sustainability using neutral to substantial power resources. Actors' relationship was found in three groups.

Keywords: Animal Veterinary, Health, Welfare, Stakeholders, West Papua.

INTRODUCTION

One of the leading livestock industries needing significant development and management is animal veterinary and healthcare management (Kijlstra and Eijck 2006; Wabacha et al. 2004; Dione et al. 2014; Felin et al. 2016). Millions have been expended on the loss of livestock production and economic growth due to this sector. According to FAO, losses due to veterinary and health management have been accounted for billions in the world of livestock production. This is attributed to threats of cause and effect, animal rights, health, and economic effects (Dawkins 2017; Oosting et al. 2017; Ventura et al. 2016; Phuong et al. 2014).

For example, the agricultural and livestock sector around the world (Devendra and Thomas 2002) generated, and it was due to the participation and intervention of many stakeholders and shareholders. Each stakeholder cares and strives not to bind themselves to increase their corporation and market-oriented (Nurfadillah et al. 2018). Despite these challenges, it also has the vision to provide food for the world (Bradford 1999). In pursuing community trend on livestock demand and business, particularly veterinary and healthcare products, stakeholders and shareholders have prominent roles. Examples were discussed in detail by Martindah and Ilham (2019) and Mollenhorst and de Boer (2010).

For assuring development of animal production and its welfare promotion, many stakeholders play a role (Prell et al. 2016; Leroy et al. 2017; Sysak et al. 2012; Grimble and Wellard 1997; Nyokabi

et al. 2018), notably the veterinary and health care sectors. Business and value chains officially shaped and formed according to the international and national laws both in central government and regency government (Nurfadillah et al. 2018). We should also consider what, when, and how the stakeholders and/or actors themselves are involved. Definition of a stakeholder is individuals, groups, and organizations with direct and indirect partnerships to modify a particular method (Freeman 2015). However, there are also stakeholders that are not created and shaped by laws in their interaction. They are fundamental in assessing development and play a strategic and prominent role. All parties both individuals and groups mentioned as stakeholders, which are many and vary according to their duties and responsibilities, are the core (Tiwari 2007; Freeman 2015). Many parties are interlinked (Iyai et al. 2021) and shaped the sophisticated systems of this agribusiness chain in the construction of livestock farming systems (Leen et al. 2018a, 2018b), specifically the veterinary and healthcare sectors. The comprehensive veterinary and health care development system, which involves social, economic, and environmental tasks, defines and understands its roles. It is challenging to drive the parties which play critical roles in shaping the looks of the veterinary and health care production without understanding the dynamics of systems. Each process of veterinary and health care growth has its mechanism and has been tied to stakeholders and/or parties involved. The industrial and business divisions of the livestock sector, particularly the veterinary and health care enterprises, are an example.

The engagement of stakeholders in many tropical and emerging countries is undoubtedly real. In controlling the powers, funds, and access, some play a vital role also in controlling the hazard and societal perception. They play critical roles and share significant relationships. In shaping the existence and acceleration rate of veterinary and health care advancement, their relationships are rich and diverse. It seemed to be linearly understandable and mapped inside and outside growth aspects of both the veterinary and health care industry. It is complex and challenging to retain veterinary and health rescue and livestock development, countries such as Indonesia and specifically in West New Guinea without mapping and recognising this veterinary and health care business circle chain. So far, farmers, government, and shareholders are not yet considered by current stakeholders. They have no power to sign and work out a variety of sufficiency from the shortcomings and sources. Therefore, this was the priority of the research to map and provide direct participation of stakeholders on what and how they contribute in developing veterinary and health care industries.

In conjunction with Gephi (Bastian et al. 2009) and Netmap (Schiffer 2007), one robust analysis of social network relationships is Social Network Visualizer which paralleled with SmartPLS (Ringle et al. 2005). Since then, Social Network Analysis (SNA) has been an appropriate and suitable program for measuring networks and relationships (Krupa et al., 2017). Enterprises that have little power and interest would be established by mapping the stakeholders, and, in turn, it would be possible to promote their roles ultimately. Therefore, the involvement and relationships of stakeholders related to the veterinary and animal welfare business sector are specified and respected as the priority of this research objective.

MATERIALS AND METHODS

In Manokwari, West Papua, the study has been undertaken. We selected multiple organisations, groups, and people to assemble all the relevant information and reports. We selected and gathered some relevant information from critical contributors, academic reports, policy papers, journals, daily magazines, and newspapers using field observations and desk qualitative research studies. We

considered doing this because bunches of information and data are spread out and visible even for each and cheapest to get. Under the administration of the West Papuan provinces, we were concerned about the roles of stakeholders and shareholders in shaping and assessing the pattern of veterinary and health care development and interactions on a regional basis, and the study case was notably rolled out in Manokwari. Due to the placement of actors, Manokwari is the primary production of veterinary and healthcare affairs in West Papua. All stakeholders have been organised into local groups, states, banks, markets, private transport, and universities (Table 1).

Table 1. Stakeholders and their responsibility and roles under the Veterinary and Healthcare development sector.

Institution	Roles and responsible
Pet lovers	Individuals and/or groups who have been caring, nursing, and housing the (wild and feral) animals
Clinic	Places to serve and provide the veterinary and animal healthcare works
Veterinarians	Individuals and/or groups who are working by providing services for veterinary and health care works
Paramedic	Individuals and/or groups who are working by providing services for assisting animal doctors in clinic and veterinary health care places
Local livestock officer	Individuals and/or groups who are working in central and local government institutions by providing services for animal production and veterinary and health care works
Quarantine officer	The institution that is working to control the transportation of incoming and out-coming animals
Local community	Individuals and/or groups who are making interaction with veterinary and health cares
Government security offices	Individuals and/or groups who are working in government institutions by providing services for community security works.
Harbor security offices/inspector	The institution is working to control the transportation of incoming and out-coming animals in harbors.
Airport inspectors	The institution is working to control the transportation of incoming and out-coming of animals in airports.
University clinic	Individuals and/or groups who are working by providing services for veterinary and animal health care works.
University veterinary	Individuals and/or groups who are working in universities by providing services for veterinary and health care works
Forest security guard	Individuals and/or groups who are working by providing services for guarding native animals and plants.
Drug food offices	The office has the responsibility to monitor and control the use of drugs and foodstuff distributed in Indonesia, particularly in West Papua.

During the investigation, information and data associated with organizational function and characteristics of veterinary and health care business-related stakeholders were collected, i.e. organizational shape, low status, institutional arrangements, duties, influence, and organizational significance. We also gathered information and data on characteristics and turn-back effects on the growth of veterinary and health care farming. We also reported the organization's sharing of organizational resources, period, reliability of resources, power of resources, and engagement accomplished so far by identifying the stakeholders' roles and involvement. We frequently look at the detail of what intervention is accomplished and modes of innovation by stakeholders to acquire the interference shared by the company. All evidence was collectively entered into the excel database and stored throughout the manuscript. During the analysis, we collected information and data related to veterinary and healthcare-related stakeholders' organisational function and characteristics, i.e. the organisation's shape, low status, organizational styles, functions, effects, and organizational significance. We have also attempted to gather data and knowledge on attributes and turn-back effects on veterinary and health care growth. We also reported the sharing of the organization's resources, length of time, consistency of resources, power of resources, and engagement accomplished so far by the organization in recognizing the roles and involvement of the stakeholders. We used Social Network Visualizer to assess the power and flows of information among stakeholders (SocNetV). SocNetV is a cross-platform, streamlined, and free-of-charge social stakeholder-related software in-network visualization and analysis. We have used the PCC matrix, similarity matrix (SM), power centrality (PC), hierarchical clustering (HCA), clique census (CLQs), and database centrality to visualize those graphs (IC).

The steps for running SocNetV version 2.5 are shown in figure 1. We also look at details of what stakeholders conduct intervention and methods of innovation to catch the intervention communicated by the organization. Collectively, all data were recorded into the Microsoft Excel worksheet and tabled in the manuscript.

RESULTS

Organization profiles

In the veterinary and health care (VHC) sectors, all stakeholders were grouped into national and local governments, business sectors, local communities, national air transport, and private transportation. Government actors comprised government, extension officers, inseminators, quarantine officers, police, retribution officers, harbour inspectors, market officers, and airport investigators. Global shipping, domestic aircraft, and vehicles are private organizations. Organizational forms as participants in leading veterinary and health care farming systems are classified into three parts (Table 2), i.e. individuals (7.14%), community (85.70%), and mass (85.70%). We found that the government regulated the actors of VHC creation (85.70 per cent), and the rest had no law governed by the law (14.30%). Organization categories developed in the veterinary and health care business sectors were clustered into private and state structures, respectively 14.30% and 85.70%. Stakeholders (85.70%) and shareholders portrayed the roles of companies played by actors in veterinary and health care farming systems (7.14%).

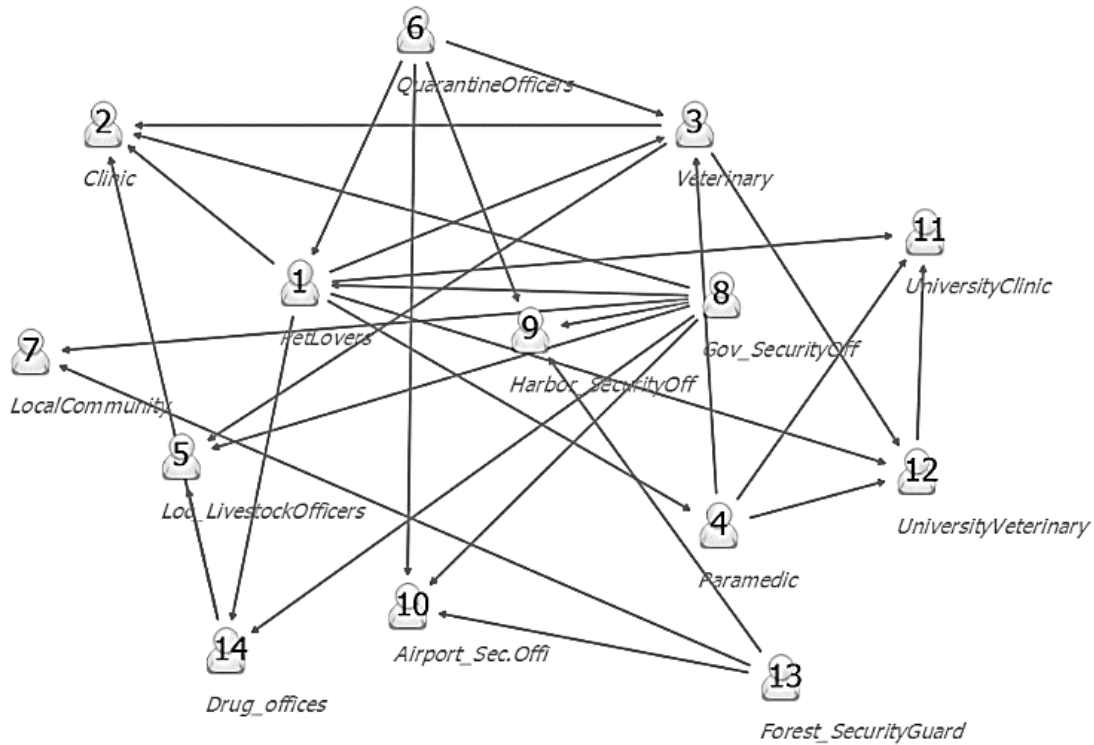


Figure 1. Design of actors on map relationships using SNA under Veterinary and animal welfare (VAW) sector.

Effects of the VAW market cycles on participating stakeholders suggested that 13 actors had a positive impact (92.90%) and that only one actor had a negative effect in between (7.14%). We were interested in documenting the importance of the actors regulating the recipient of the VAW company. A total of 92.90% of stakeholders (13 organizations) reported significant, and the remainder reported less significant (7.14%). We assessed the hazard hidden in the veterinary and health care sector to ensure the continuity of this business. We found that four organizations had a direct threat to the growth of veterinary and health care production (28.60%) and that the remaining 11 actors (71.40%) had indirect effects.

Table 2. A descriptive pattern of organization of VAW development sector in West New Guinea.

No.	Characteristic	Sum	Proportion (%)
a	Shape of Organization		7.14285714
	Individual	1	3
	Group	2	1
	Mass	1	3
b	Law	1	85.7142857
	Law	2	1
	Unlaw	2	9
c	Types		14.2857142
	Private	2	9
	States	2	1
d	Roles	1	85.7142857
	Staholder	2	1
	Shareholder	1	3
e	Effect		0
	Positive	3	6
	Negative	1	3
f	Importance		0
	Important	3	6
	Unimportant	1	3
g	Threats		0
	Direct	4	7
	Indirect	0	3
h	Turnback Effect		0

		57.1428571
Feedback	8	4
		42.8571428
Unfeedback	6	6

Finally, we were eager to see if the VAW within actors has a turn-back impact. There was also no turn-back effect observed within six institutions (42.90 %) in the findings of this study, and only 57.10% had turn-back effects. We concluded that veterinary and health care business benefits would maintain and have future growth in West New Guinea by knowing this characteristic evidence of actors in practice.

Shared resources

Time, access, and satisfaction were the findings and phenomena faced by the VAW growth (100%). Policy, space, information, skills (Table 3) were the other shared resources offered (71.42%). However, 50 per cent is power and feed materials. In this sector, support from funds was tiny, i.e. 35.71 per cent shared by five actors. A low hazard, i.e. 28.57%, has been identified in this VAW market.

Table 3. Identified shared resources of actors of Veterinary and Animal Welfare development sector in West New Guinea

Actor	Sum	Proportion (%)
Sharing resources		
Policy	10	71.42
Funds	5	35.71
Space	10	71.42
Time	14	100
Access	14	100
Satisfaction	14	100
Knowledge	10	71.42
Skills	10	71.42
Threat	4	28.57
Power	7	50
Feed materials	7	50
Duration period		
Short-term	1	7.14
Long term	13	92.85
Continuity of Resource		
Sustain	13	92.85
Unsustain	1	7.14
Power of resources		
Strong	13	92.85
Neutral	0	0
Weak	0	0

Intervention			
Need		12	85.71
Unneeded		2	14.28

The stakeholder-organized resource sharing cycle length consisted of a short-term (7.14%) and a long-term period (92.85%). Of the actor profile, we found that actors could share resource continuity, i.e. maintain (92.85 per cent) and only 7.14 per cent in sustain. Strong power players dominated the power of resources discovered (92.85%). 12 actors (85.71%) found the need for action, and the remainder did not need to intervene (14.28%). Policy, finance, expertise, skills, and specific needs may be linked to delivery intervention.

The performance of SNA (Figure 2.) displayed the image of power centrality. Oh, from figure 2. We have successfully mapped the interlinked relationship network between VAW players in business systems and table 4. Multiple actors 1-14 have strongly associated with PCC=1, down to table 4. Actors with PCC=0 had no interaction at all. The rest, however, had a negative (PCC<0) correlation. Pet lovers 1 with veterinarian 3, paramedic 4, university veterinarian 12, and drug and food office 14 had positive correlations among actors. The results satisfied the findings of (Leroy et al. 2017).

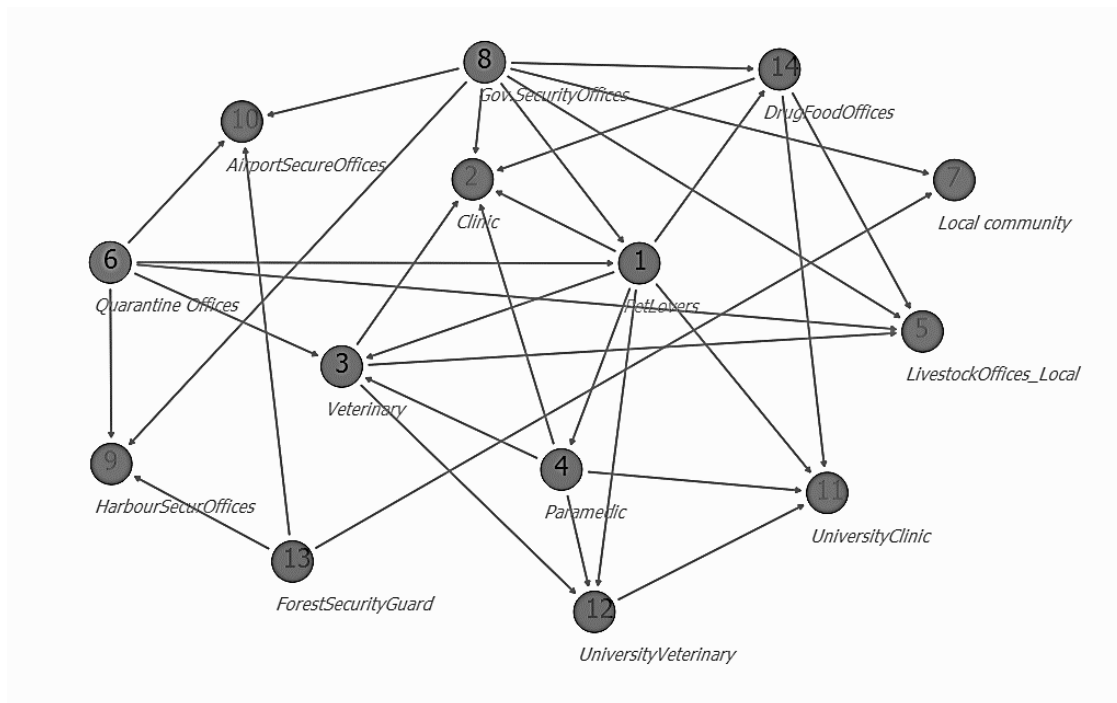


Figure 2. Stakeholder Network Analyses (SNA) of Veterinary and Animal Welfare development actors’ relationship based on Power centrality index and Kamada-Kawai (Force-directed model). Small and big size cubes indicated power. Changed red to greed and blue colors indicating the importance and strategic actors’ involvement from lower to high power.

Table 4. Matrix of Pearson Correlation Coefficient (PCC) of Veterinary and Healthcare development actors

Actor _i /Actor _j	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.000	0.000	0.251	0.603	0.000	-0.228	0.000	-0.289	0.000	0.000	0.000	0.320	-0.452	0.059
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.251	0.000	1.000	0.152	0.000	-0.330	0.000	0.174	0.000	0.000	0.000	-0.145	-0.273	0.782
4	0.603	0.000	0.152	1.000	0.000	0.055	0.000	-0.522	0.000	0.000	0.000	0.531	-0.273	-0.213
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	-0.228	0.000	-0.330	0.055	0.000	1.000	0.000	0.316	0.000	0.000	0.000	-0.175	0.440	-0.258
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	-0.289	0.000	0.174	-0.522	0.000	0.316	0.000	1.000	0.000	0.000	0.000	-0.277	0.522	0.408
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.320	0.000	-0.145	0.531	0.000	-0.175	0.000	-0.277	0.000	0.000	0.000	1.000	-0.145	-0.113
13	-0.452	0.000	-0.273	-0.273	0.000	0.440	0.000	0.522	0.000	0.000	0.000	-0.145	1.000	-0.213
14	0.059	0.000	0.782	-0.213	0.000	-0.258	0.000	0.408	0.000	0.000	0.000	-0.113	-0.213	1.000

Actors that had a negative correlation were pet lovers 1 with quarantine officers 6 (PCC=-0.228), government security office 8 (PCC=-0.289), and forces security guard 13 (PCC=-0.452). Actors with no correlation (PCC=0.000) were pet lovers 1 with clinic 2, local livestock officers 5, airport inspectors, and a university clinic.

Relationships of actors

Down to figure 3., it was interested in mapping actors into other indicators, i.e. powers and interest (Bryson 2007). We considered this as necessary due to organizational theoretical background (Grimble and Wellard 1997). We grouped these two indicators into four quadrants (Qw1-Qw4). In the first quadrant (Qw1), we had three actors involved with low power and high interest, i.e. university clinic, forest security guard, and university veterinary workers. However, in the second quadrant (Qw2), we identified six actors of VHC consisted of pet lovers, clinic, veterinary, paramedic, local livestock officers, and quarantine officers. In this quadrant, actors were grouped with high power and high interest.

Contrary to the third quadrant (Qw3), one actor was found, i.e. local community. The last segment is a fourth quadrant (Qw4) that was dominantly filled by several actors, i.e. government security officers, harbour security officers, and drug-food officers. Analyzing the places on the quadrant by some actors, we suggest promoting several actors' capacity building, roles, and power. We aim to revitalize these organizations to have better roles and responsibilities. Actors in the Qw1 (Forest security guard) should move to the Qw2. Actors in Qw4 (airport-, and harbour security officers) shall move to Qw2.

This is done by considering that actors will have better high interest and power to protect animal trafficking. Animal transportation using aeroplanes and ships shall obey the rules and laws.

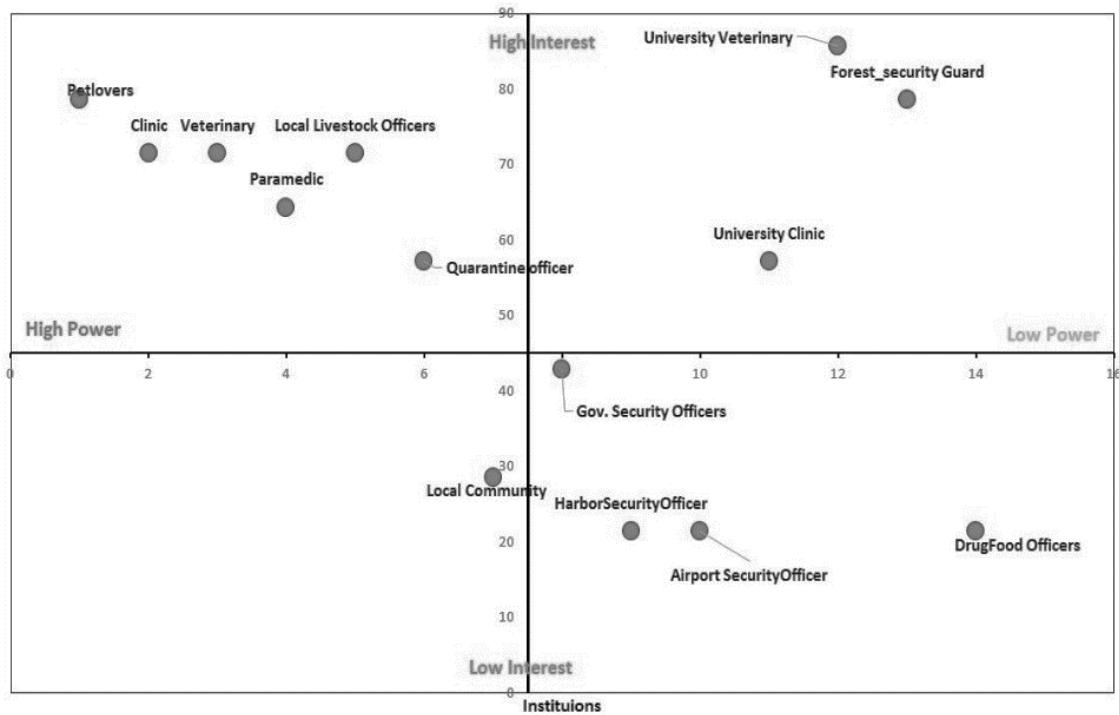


Figure 3. Stakeholder mapping on power and interest relationships under veterinary and animal welfare.

Intervention and innovation

It was interested in measuring the intervention needs of the veterinary and health care sector. As much as 50% of actors need intervention in skills (Table 5). A similar number of findings was on policy, funds, and power, i.e. 42.85%. Interventions such as access and knowledge were confronted by four actors. An almost similar number were time (21.42%). The threat was found by three actors.

Table 5. Intervention and innovation provided by veterinary and animal welfare actors.

Resource component	Sum	Proportion (%)
Intervention		
Policy	6	42.85
Fund	6	42.85
Space	2	14.28
Time	3	21.42
Access	4	28.57
Satisfaction	1	7.14

Knowledge	4	28.57
Skills	7	50
Threat	3	21.42
Power	6	42.85
Feed materials	1	7.14
Innovation		
Policy	6	42.85
Fund	6	42.85
Space	2	14.28
Time	3	21.42
Access	4	28.57
Satisfaction	1	7.14
Knowledge	4	28.57
Skills	7	50
Threat	3	21.42
Power	4	28.57
Feed materials	1	7.14

Intervention needs to assure the sustainability of veterinary and health care. Not many actors needed feed materials (7.14%). Differs from intervention, what innovations are needed are questionable and shall be addressed to obtain clear concepts and programs for improving veterinary and health care business in West Papua. Intervention needs in some ranges of efficient veterinary and health care and animal welfare (Dawkins 2017), as the business of veterinary and health care has been recorded facing these two issues.

Innovation needed by stakeholders consisted of skills, policy, and funds (42.85%). Example in pig production explained by Iyai et al. (2013) and Iyai et al. (2021). To some extend, stakeholders needed access, knowledge, and time (21.42%). However, innovation shall be needed to avoid the threat during animal movement (Muhanguzi et al. 2012), misbehaving practices in animal care (Dione et al. 2016; Correia-Gomes et al. 2017), and animal handling by using vehicles, drugs, and medical tools. Last was the satisfaction and feed materials (7.14%).

DISCUSSIONS

We also faced limitations that not all stakeholders have made possible so far. Lack of services (Ullah and Kim 2020), initiatives (Baltenweck et al. 2019), budgets (Mayulu and Sutrisno 2014), and human capital, i.e. community services, facilities (clinics, shipping, and slaughterhouses), laws and regulations, veterinary and health care technologies, policy (importation, taxes, and retribution) mentioned and became the factor constrained the development of veterinary and animal welfare. Public programs have made pet lovers more relaxed with their company. On the one hand, the skills and innovation offered would enable pet lovers to retain their production and business sizes and veterinary and animal health care. Programs provided by other stakeholders in the fields should be relevant and easy to practice. The budget for supporting pet lovers must allow farmers to insure and drive the business scale. Human resources can function efficiently, such as extension programs and field managers. Pet lovers will have partners to consult and advise on the technological challenges and constraints

encountered. Facilities such as lodging and shipping would require pet lovers to accomplish those working hours and willingness to live up to the veterinary and healthcare business process. Rules and regulations should enable this sector to develop their working tract to promote good animal health and welfares (Devitt et al. 2016; Kling-Eveillard et al. 2007; Bracke and Spoolder 2011; Dawkins 2017; Ventura et al. 2016; Kijlstra and Eijck 2006).

Information- and experience-related professional veterinary and health care (Martindah and Ilham 2019) will enhance and allow pet lovers to sustain veterinary and health care production with optimal health and animal welfare. Therefore, up-to-date information and skills in how to supply quality feeds (Peiretti 2018), management of reproduction, the option of breeding (Kijlstra and Eijck 2006). The priority recognized by farmers must be artificial insemination (Leroy et al., 2017). To date, policies to encourage the veterinary and health care industry are far from small-scale veterinary and health care policies (Devendra 2007). Pet lovers do not have adequate policies and regulations that will allow their animal husbandry to obtain optimum opportunities for business beneficiaries.

Therefore, the actors responsible for ensuring safety and security (Murray et al. 2016; Rayfuse and Weisfelt 2012; Truebswasser et al. 2018; FAO 2013) should be involved in this veterinary and health care farming business. Lack of actor's involvement will induce failure. Several constraints were shared by Uganda's veterinary and health care farmers.

CONCLUSIONS

We highlight that the number of corporations in this sector was controlled by stakeholders, collective actors from states, and were officially under the legislation. Such actors are typically reasonably necessary and have ownership of the firm. Access, time, and satisfaction are the top five mutual resources. The services will remain longer To retain vital needs in the veterinary and health care field, and these services will remain longer. The interaction of actors is governed by the association ranges that differ between negative, neutral, and positive. Low-interest and low-power actors can then be elevated to high-interest and high-power by using each actor's supports, advice, and resources from its value chain and shared cooperation and power.

Declaration Statement

Funding statement

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Conflict of interest/competing interests

We stated and clarified that there is no conflict of interest with any financial, personal, or other relationships with other people or organizations related to this research and manuscript.t

Code or data availability

Software application to compute relationship of stakeholder was Social Network Visualizer 2.5.

Ethical Approval

No approval of research ethics committees was required to accomplish the goals of this study because no experimental work was conducted with animal species.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Consent for publication

The authors affirm that human research participants provided informed consent to publish the images in the Figures.

Declaration for competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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REFERENCES

- [1] Asminaya, N S, B P Purwanto, N Nahrowi, W A Ridwan, and A Atabany. 2018. "Ecological Sustainability of Smallholder Dairy Farm with Leisa Pattern." *Journal of the Indonesian Tropical Animal Agriculture* 43 (60): 412–20. <https://doi.org/10.14710/jitaa.43.4.412-420>.
- [2] Baltenweck, I, R Banerjee, and I Omondi. 2019. "Leveraging Development Programs – Livestock Research." *Encyclopedia of Food Security and Sustainability* 3: 401–10. <https://doi.org/10.1016/B978-0-08-100596-5.21564-3>.
- [3] Bastian, M, S Heymann, and M Jacomy. 2009. "Gephi : An Open Source Software for Exploring and Manipulating Networks Visualization and Exploration of Large Graphs." *International AAAI Conference on Weblogs and Social Media*, 361–62. <https://doi.org/10.13140/2.1.1341.1520>.
- [4] Bracke, M B M, and H A M Spoolder. 2011. "Review of Wallowing in Pigs : Implications for Animal Welfare," 347–63.
- [5] Bradford, G E. 1999. "Contributions of Animal Agriculture to Meeting Global Human Food Demand." *Livestock Production Science* 59: 95–112.
- [6] Bryson, J M. 2007. "What to Do When Stakeholders Matter Analysis Techniques." *Public Management Review* 9037 (2004): 20–53. <https://doi.org/10.1080/14719030410001675722>.
- [7] Correia-Gomes, Carla, Madeleine K. Henry, Harriet K. Auty, and George J. Gunn. 2017. "Exploring the Role of Small-Scale Livestock Keepers for National Biosecurity—The Pig Case." *Preventive Veterinary Medicine* 145: 7–15. <https://doi.org/10.1016/j.prevetmed.2017.06.005>.

- [8] Dawkins, M S. 2017. "Animal Welfare and Efficient Farming: Is Conflict Inevitable?" *Animal Production Science* 57 (2): 201–8. <https://doi.org/10.1071/AN15383>.
- [9] Devendra, C. 2007. "Perspectives on Animal Production Systems in Asia." *Livestock Science* 106 (2007): 1–18. <https://doi.org/10.1016/j.livsci.2006.05.005>.
- [10] Devendra, C, and D Thomas. 2002. "Smallholder Farming Systems in Asia." *Agricultural Systems* 71 (2002): 17–25.
- [11] Devitt, C., L. Boyle, D. L. Teixeira, N. E. O'Connell, M. Hawe, and A. Hanlon. 2016. "Stakeholder Perspectives on the Use of Pig Meat Inspection as a Health and Welfare Diagnostic Tool in the Republic of Ireland and Northern Ireland; a SWOT Analysis." *Irish Veterinary Journal* 69 (1): 1–4. <https://doi.org/10.1186/s13620-016-0076-3>.
- [12] Dione, M M, E A Ouma, K Roesel, J Kungu, P Lule, and D Pezo. 2014. "Participatory Assessment of Animal Health and Husbandry Practices in Smallholder Pig Production Systems in Three High Poverty Districts in Uganda." *Preventive Veterinary Medicine* 117 (3–4): 565–76. <https://doi.org/10.1016/j.prevetmed.2014.10.012>.
- [13] Dione, M, E Ouma, F Opio, B Kawuma, and D Pezo. 2016. "Qualitative Analysis of the Risks and Practices Associated with the Spread of African Swine Fever within the Smallholder Pig Value Chains in Uganda." *Preventive Veterinary Medicine* 135: 102–12. <https://doi.org/10.1016/j.prevetmed.2016.11.001>.
- [14] FAO. 2013. *Biotechnologies at Work for Smallholders: Case Studies from Developing Countries in Crops, Livestock and Fish Innovation in Family Farming Biotechnologies at Work for Smallholders: Case Studies from Developing Countries in Crops, Livestock and Fish*. Edited by J Ruane, J D Dargie, C Mba, P Boettcher, H P S Makkar, D M Bartley, and A Sonnino. Food and Agriculture Organization of United Nations. <http://www.fao.org/3/a-i3403e.pdf>.
- [15] Felin, Elina, Elias Jukola, Saara Raulo, Jaakko Heinonen, and Maria Fredriksson-Ahomaa. 2016. "Current Food Chain Information Provides Insufficient Information for Modern Meat Inspection of Pigs." *Preventive Veterinary Medicine* 127: 113–20. <https://doi.org/10.1016/j.prevetmed.2016.03.007>.
- [16] Freeman, R E. 2015. "The Stakeholder Approach." *Strategic Management* 5 (3): 1–2. <https://doi.org/10.1017/cbo9781139192675.003>.
- [17] Grimble, Robin, and Kate Wellard. 1997. "Stakeholder Methodologies in Natural Resource Management: A Review of Principles, Contexts, Experiences and Opportunities" 55 (2).
- [18] Hou, Y., G. L. Velthof, S. D.C. Case, M. Oelofse, C. Grignani, P. Balsari, L. Zavattaro, et al. 2018. "Stakeholder Perceptions of Manure Treatment Technologies in Denmark, Italy, the Netherlands and Spain." *Journal of Cleaner Production* 172: 1620–30. <https://doi.org/10.1016/j.jclepro.2016.10.162>.
- [19] Iyai, D A, D Nurhayati, M Arim, D Saragih, M Orisu, M Djunaedi, S Yohanes, et al. 2021. "Analyses of Interlinked Actors in Determining the Potential Business Bene Fi Ciaries of Small-Scale Pig Farming Systems in West Papua, Indonesia." *Heliyon* 7 (January): 1–14. <https://doi.org/10.1016/j.heliyon.2021.e05911>.
- [20] Iyai, D A, D Saragih, and M Kayadoe. 2013. "Quantifying Feeding Regimes on Weaned Sows under Tropical Papua Pig Keeping Systems." *Animal Production* 15 (2): 106–18.
- [21] Iyai, Deny A, Desni T R Saragih, and Frandz P Rumbiak. 2016. "Effect of Traditional Cattle Farming Systems on Farmer Knowledge, Cattle Performances and Agribusiness Potential in West New Guinea-Papua Barat Province, Indonesia" 4 (1): 5–10.

- <https://doi.org/10.11648/j.av.s.20160401.12>.
- [22] Kijlstra, A, and I A J M Eijck. 2006. "Animal Health in Organic Livestock Production Systems : A Review." *NJAS - Wageningen Journal of Life Sciences* 54 (1): 77–94. [https://doi.org/10.1016/S1573-5214\(06\)80005-9](https://doi.org/10.1016/S1573-5214(06)80005-9).
- [23] Kling-Eveillard, Florence, Anne Charlotte Dock??s, and Catherine Souquet. 2007. "Attitudes of French Pig Farmers towards Animal Welfare." *British Food Journal* 109 (11): 859–69. <https://doi.org/10.1108/00070700710835679>.
- [24] Kodoati, G, P O V Waleleng, J Lainawa, and D R Mokoagouw. 2014. "Analisis Potensi Sumbderlandaya Alam, Tenaga Kerja, Pertanian Dan Perkebunan Terhadap Pengembangan Peternakan Sapi Potong Di Kecamatan Eris Kabupaten Minahasa." *Jurnal Zootek* 34 (Mei): 15–26.
- [25] Krupa, M, M Cenek, J Powell, and E J Trammell. 2017. "Mapping the Stakeholders : Using Social Network Analysis to Increase the Legitimacy and Transparency of Participatory Scenario Planning." *Society & Natural Resources* 0 (0): 1–6. <https://doi.org/10.1080/08941920.2017.1376140>.
- [26] Leen, Frederik, Alice Van den Broeke, Marijke Aluwé, Ludwig Lauwers, Sam Millet, and Jef Van Meensel. 2018a. "Stakeholder-Driven Modelling the Impact of Animal Profile and Market Conditions on Optimal Delivery Weight in Growing-Finishing Pig Production." *Agricultural Systems* 162 (July 2017): 34–45. <https://doi.org/10.1016/j.agsy.2018.01.013>.
- [27] ———. 2018b. "Stakeholder-Driven Modelling the Impact of Animal Profile and Market Conditions on Optimal Delivery Weight in Growing-Finishing Pig Production." *Agricultural Systems* 162 (February): 34–45. <https://doi.org/10.1016/j.agsy.2018.01.013>.
- [28] Leroy, G., R. Baumung, D. Notter, E. Verrier, M. Wurzinger, and B. Scherf. 2017. "Stakeholder Involvement and the Management of Animal Genetic Resources across the World." *Livestock Science* 198 (June 2016): 120–28. <https://doi.org/10.1016/j.livsci.2017.02.018>.
- [29] Martindah, E, and N Ilham. 2019. "J i t a A." *Journal of the Indonesian Tropical Animal Agriculture* 44 (60): 56–64. <https://doi.org/10.14710/jitaa.44.1.56-64>.
- [30] Mayulu, Hamdi, and C Imam Sutrisno. 2014. "Kebijakan Pengembangan Peternakan Sapi Potong Di Indonesia." *Jurnal Litbang Pertanian* 29 (1): 34–41.
- [31] Mollenhorst, H., and I. J. M. de Boer. 2010. "Identifying Sustainability Issues Using Participatory SWOT Analysis." *Outlook on Agriculture* 33 (4): 267–76. <https://doi.org/10.5367/0000000042664747>.
- [32] Muhanguzi, D, V Lutwama, and F N Mwiine. 2012. "Factors That Influence Pig Production in Central Uganda - Case Study of Nangabo Sub-County, Wakiso District." *Veterinary World* 5 (6): 346–51. <https://doi.org/10.5455/vetworld.2012.346-351>.
- [33] Murray, Kris A, Toph Allen, Elizabeth Loh, Catherine Machalaba, and Peter Daszak. 2016. "Emerging Viral Zoonoses from Wildlife Associated with Animal-Based Food Systems: Risks and Opportunities." In *Food Safety Risks from Wildlife: Challenges in Agriculture, Conservation, and Public Health*, edited by Michele Jay-Russell and Michael P Doyle, 31–57. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-24442-6_2.
- [34] Nurfadillah, S, D Rachmina, and N Kusnadi. 2018. "Impact of Trade Liberalization on Indonesian Broiler Competitiveness." *Journal of the Indonesian Tropical Animal Agriculture* 43 (4): 429–37. <https://doi.org/10.14710/jitaa.43.4.429-437>.
- [35] Nyokabi, Simon, Simon Oosting, Bockline Bebe, Lisette Phelan, and Bernard Bett. 2018. "The

- Kenyan Dairy Sector : Stakeholder Roles and Relationships , and Their Impact on Milk Quality
The Kenyan Dairy Sector : Stakeholder Roles and Relationships , and Their,” no. August: 0–12.
- [36] Oosting, S J, H M J Udo, and T C Viets. 2017. “Development of Livestock Production in the Tropics: Farm and Farmers ’ Perspectives.” *Animal* 8 (2014): 1238–48. <https://doi.org/10.1017/S1751731114000548>.
- [37] Peiretti, P G. 2018. “Amaranth in Animal Nutrition : A Review” 30 (February): 9808.
- [38] Phuong, N V, D T M Hanh, T H Cuong, A Markemann, A Valle Zárate, and M Mergenthaler. 2014. “Impact of Quality Attributes and Marketing Factors on Prices for Indigenous Pork in Vietnam to Promote Sustainable Utilization of Local Genetic Resources” 26 (5): 2014.
- [39] Prell, Christina, Klaus Hubacek, and Mark Reed. 2016. “Stakeholder Analysis and Social Network Analysis in Natural Resource Management.” *Society and Natural Resources*, no. January: 367–83. <https://doi.org/10.4324/9781315748771>.
- [40] Rayfuse, Rosemary, and Nicole Weisfelt. 2012. “The Challenge of Food Security” 327 (February): 812–19. <https://doi.org/10.4337/9780857939388>.
- [41] Ringle, C M, S Wende, and J M Becker. 2005. “SmartPLS.” Germany: SmartPLS GmbH. www.smartpls.com/smartpls2.
- [42] Schiffer, E. 2007. “Net-Map.” <http://www.visualcomplexity.com/vc/project.cfm?id=644>.
- [43] Staaveren, Nienke Van, Bernadette Doyle, and Alison Hanlon. n.d. “Multi-Stakeholder Focus Groups on Potential for Meat Inspection Data to Inform Management of Pig Health and Welfare on Farm.” <https://doi.org/10.3390/agriculture9020040>.
- [44] Sysak, T., P.K. Holyoake, R. Beilin, J. Gilmour, M. Hernández-Jover, J.-A.L.M.L. Toribio, and N. Schembri. 2012. “Use of Stakeholder Analysis to Inform Risk Communication and Extension Strategies for Improved Biosecurity amongst Small-Scale Pig Producers.” *Preventive Veterinary Medicine* 104 (3–4): 258–70. <https://doi.org/10.1016/j.prevetmed.2011.12.006>.
- [45] Tiwari, Narayani. 2007. “Women ’ s Agency in Relation to Population and Environment in Rural Nepal Narayani Tiwari.” Wageningen University.
- [46] Truebswasser, Ursula, Fiona Flintan, and Senior Scientist. 2018. *Extensive (Pastoralist) Cattle Contributions to Food and Nutrition Security. Encyclopedia of Food Security and Sustainability*. Elsevier. <https://doi.org/10.1016/B978-0-12-812687-5.21529-3>.
- [47] Ullah, I, and Dong-young Kim. 2020. “A Model of Collaborative Governance for Community-Based Trophy-Hunting Programs in Developing Countries.” *Perspective in Ecology and Conservation* 18: 145–60.
- [48] Ventura, B A, D M Weary, A S Giovanetti, and M A G Von Keyserlingk. 2016. “Veterinary Perspectives on Cattle Welfare Challenges.” *Livestock Science*. <https://doi.org/10.1016/j.livsci.2016.10.004>.
- [49] Wabacha, J K, J M Maribei, C M Mulei, M N Kyule, K H Zessin, and W Oluoch-Kosura. 2004. “Health and Production Measures for Smallholder Pig Production in Kikuyu Division, Central Kenya.” *Preventive Veterinary Medicine* 63 (3–4): 197–210. <https://doi.org/10.1016/j.prevetmed.2004.02.006>.