

# Combination of Bonding, Bridging and Linking Social Capital in a Livelihood System: Nomadic Duck Herders Amid the Covid-19 Pandemic in South Sulawesi, Indonesia

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# Combination of Bonding, Bridging and Linking Social Capital in a Livelihood System: Nomadic Duck Herders Amid the Covid-19 Pandemic in South Sulawesi, Indonesia

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**Abstract:** Livelihood systems of nomadic duck herders make a unique study subject due to the livelihood assets, strategies, and outcomes they manage, which involve interactions with various actors that keep moving around. Social capital the duck herders build in their interaction with other actors, namely rice farmers, play an important role to face different vulnerability context, including those brought by the Covid-19 pandemic. This study aims to characterize components of bonding, bridging and linking social capital in the context of relationships between duck herders and other actors, and seeks to find the essential role of the combination of the three types of social capital for livelihood outcomes, particularly in facing vulnerabilities due to the pandemic. The method of grounded theory research was applied for its ability to allow researchers to reveal processual relationships between duck herders and other actors. Data were collected through semi-structured interviews, analyzed by open, axial, and selective coding. The duck herders combine components of bonding, bridging, and linking social capital selectively depending on the interests behind each interaction with different actors. The bridging and linking role that social capital plays in herders' interactions with farmers and irrigation officials is undertaken in order to gain access to natural capital (rice fields and irrigated water), while in their interaction with egg traders, they utilize bridging social capital to gain access to financial capital (in the form of cash and loans). The vulnerability context due to the pandemic has shaken the livelihood system of the duck herders by upsetting the egg supply chain due to social restriction policies. Social capital therefore plays an important role in facing vulnerability, in the context of forming good will among egg traders that continued to buy eggs from the duck herders, which served as a kind of pay back for the loyalty of the duck herders. We find that social capital plays a vital role in a livelihood system, within which the access to livelihood assets depend on social relations. This study also explored the impact of the Covid-19 pandemic as it resonates more on supply chains than production processes.

**Keywords:** social capital; livelihood system; vulnerability context; covid-19 pandemic; nomadic duck herder

## 1. Introduction

A combination of rice farming and duck herding has been practiced for centuries in Asian agrarian societies. The ducks consume the remains of the rice harvest, grasses, insects, and others, while the duck's manure and activities reduce the need for chemical fertilizer, pesticides, as well as manual weeding (Furuno, 2009; Suh, 2014; Jiaen et al., 2017). A type of this rice and duck combination practice is described as a nomadic system of duck herders such as those described in Southern India (Nambi, 2001), whereas others consider the process a part of sedentary nomadism, more appropriately seen as a residual nomadism (Kaufmann, 2009). In the present study, nomadic duck herders are understood as duck herders who constantly move around.

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Nomadic duck herding thrives in the province of South Sulawesi due to the varied planting season among areas within the province. In order to access a plot of wet rice field as their fodder source, the herders transfer their ducks from an area that is about to start their planting season to an area that is recently finished harvesting. In 2019, the harvested rice fields in the province was a little more than 1 million ha, dispersed over 24 districts (*kabupaten*), with a duck population close to 5 million (*Biro Pusat Statistik*, 2020). In a given year, duck herders cover hundreds of kilometers and move around three to four times, staying two to three months in each location (Kasim et al, 2020). This nomadic system involves social relations among herders and between herders and rice fields owners, egg buyers, egg hatching, irrigation operators, village governments, and local inhabitants of the herding areas (Kasim et al, 2019). This means that a social bond is developed between herders and various other actors. This practice has operated in South Sulawesi for decades, involving actors who need each other to sustain their livelihood system, which was disrupted due to the Covid-19 Pandemic, which began to influence public health restrict mobility in early 2020.

Livelihood systems involve interrelations between capabilities, assets, and activities required as a way of living (Chambers and Conway, 1992). Most livelihood systems involve complex, contextual, varied, and dynamic strategies, developed by households in order to fulfil their economic needs (Gaillard, 2010), and respond to new opportunities (Long, 1997) or seek out ways to meet social needs such as food, housing, and health services (Ellis, 1998). A livelihood system is considered sustainable when it can withstand and recover from stresses and shocks, maintain and improve its capabilities and assets, present and future, without degrading natural resources, and yet contributing to other livelihood systems at the local and global level, in short and longer terms (Chambers and Conway, 1992; Carney, 1998). Hence, the sustainability of a livelihood system can be viewed as a working livelihood strategy that can secure adequate livelihood results, through utilization of a combination of human, physical, financial, natural, and social capital, which are influenced by structures (state and private) and processes (policy, institutions, and culture), and have adequate adaptive capacity to respond to various vulnerability contexts (shock, stress, and trends) (Scoones, 2009; Speranza et al., 2014; Thulstrup, 2015).

Social capital is a type of livelihood asset managed to sustain livelihood systems. A number of studies have found that social capital is important to reduce vulnerability of livelihood systems (Malherbe et al., 2020), serve to strengthen livelihood independence (Ayuttacorn, 2019), mediate transitions of livelihood systems (Mallik, 2016), protect livelihood systems from negative shocks (Mbiba et al., 2019), and coalesce as part of a series of adaptation strategies to cope with livelihood risks (Kuang et al., 2020), as well as interacting with other livelihood assets to deal with livelihood sensitivities (Rahman et al., 2018). These studies lead us to conclude that there is a direct relation between social capital and certain aspects of a livelihood system. However, they tend to be less used on specifying the extent to which social capital functions within a livelihood system. In the present study, the importance of social capital is understood as a glue for social relationships, within which power and interest are distributed to ensure access, claim, storage, and distribution of livelihood assets, so much so that livelihood strategies are embedded within social relationships.

Social capital was first defined by Hanifan (1916) as "those tangible substances [that] count for most in the daily lives of people: namely good will, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit." Decades later, several widely influential definitions have emerged. These definitions link aspects to functions of social capital, for instance, aspects of social structure may become resources for actors to reach their objectives (Coleman, 1988); a set of features of social organizations such as networks, norms, social belief can facilitate coordination and cooperation for common purposes (Putnam, 1993); ability of people to work together for shared objectives in groups and organizations (Fukuyama, 1995); norms and networks that enable people to act collectively (Woolcock and Narayan, 2000); or links, shared values, and mutual understanding in a community enable individuals and groups to trust each other

and work collectively (Brian, 2007). The definitions highlight three points: that there are social elements that operate to stimulate collective ways of doing things to reach collective goals.

12 There are three types of social capital that depend on its function among different social units: bonding, bridging, and linking social capital (Klerkx and Proctor, 2013; Szreter and Woolcock, 2004). Bonding social capital refers to a type of social capital that bonds different social units with similar sociodemographic and socioeconomic status. Bridging social capital refers to social capital that ties social units with similar socio demographic backgrounds but differ in socioeconomic status. Finally, linking social capital represents another type of social capital that links social units with different sociodemographic and socioeconomic status.

2 The focus of this study is the role of a combination between bonding, bridging, and linking social capital in a livelihood system. Unlike previous studies that highlight social capital's roles in livelihood systems with sedentary actors, this study explores a case of a livelihood system with nomadic actors. Being mobile, they interact with different people in different places, creating bridging and linking social capital in the processes. The study seeks to describe how the bonding, bridging, and linking social capital manifested in the relationship between duck herders and other actors, and explains how this combination works within their livelihoods system, including how they deal with vulnerability in the contexts onset by the Covid-19 pandemic. Following this introduction, we present our research methods and findings of bonding, bridging, and linking social capital within relationships between duck herders and diverse actors. The following section identifies the role of social capital in the livelihood system of nomadic duck herders, and provides an analysis of vulnerability shaped by the Covid-19 pandemic, after which we present before our concluding thoughts.

## 2. Materials and Method

This study highlights South Sulawesi's nomadic duck herders and their interactions with other actors along the herding processes. The duck herders studied come from two districts that host the largest duck herder population within the province: Pinrang and Sidenreng Rappang (Sidrap). Duck herders from these districts start to move by going to the closest districts, Soppeng and Wajo, then move further to the south into the district of Barru, Pangkep, Maros, Makassar and even Gowa. They also move further to the northeast, to Luwu, Palopo, Luwu Utara, and Luwu Timur. And they also cross into the neighboring province of West Sulawesi, heading towards the district of Polewali Mandar (Figure 1).

The study applies a qualitative approach using a grounded theory method. We do this for two reasons. First, it emphasizes the importance of close relations between researchers and the social world under study, and second, it seeks to build theoretical concepts from empirical material, not only through synthesizing but also by showing processual relations (Charmaz, 2005). These features are required to explain the processual relations within the social capital networks as they operate within the livelihood systems of the nomadic duck herder.

The main sample of the study are the duck herders, supplemented by other actors that interact with them. The number of actors interviewed are as follows: 14 duck herders, 6 rice field owners, 5 plot distributors, 2 egg traders, a hatcher and a head of hamlet, as well as 2 Irrigation staff. The duck herders were selected through snowball sampling, while other actors were selected purposively based on information from the duck herders about the actors that interact with them. These other actors are selected because the concept of social capital and livelihood system involves varied social relations. As emphasized by Corbin and Strauss (1990), sampling in grounded theory research is framed by a theoretical basis and the size of the sample is determined by data saturation. Data is saturated when the researcher finds no more new information in a set of interviews (Cofre-Brafo, 2019).

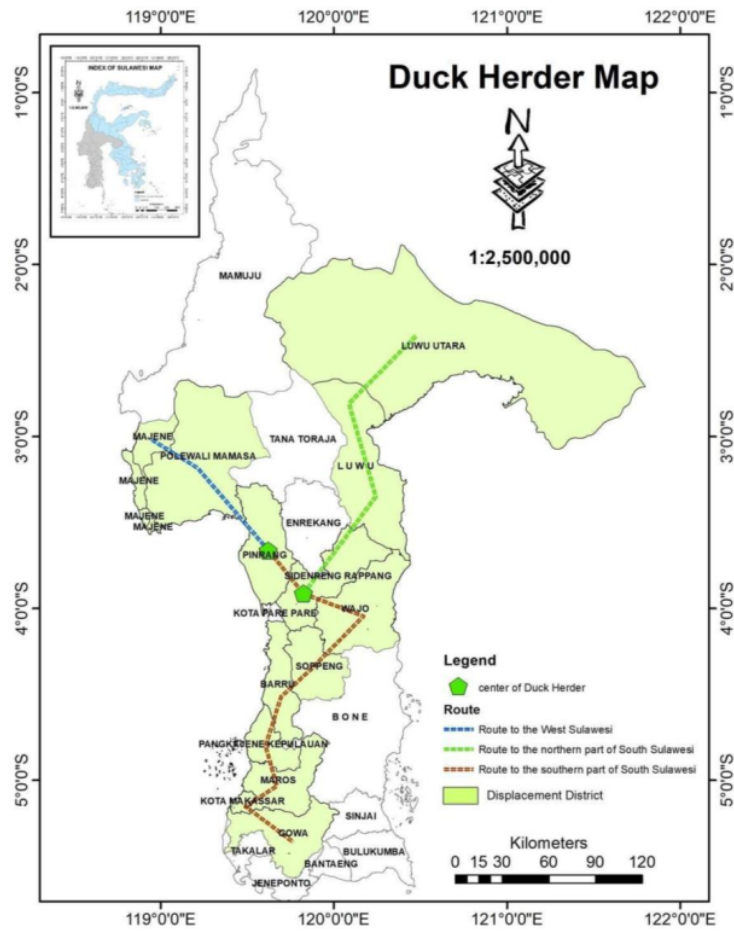


Figure 1. The map of duck herders in South Sulawesi Province

Data collection techniques used were open and structured interviews. In the open interview, the informants answered questions based on their speech flow. However, by the end of the interview, the questions became more structured so that the data would be consistent with the research objectives. Informants with unfinished interviews were interviewed twice to complete the entirety of the questions, which are in line with in-depth interviews (Denzin and Lincoln, 2008). Some of the interviews were face to face, when mimicry and gestures can be seen. But during the Covid-19 pandemic, not all the informants could be directly met, so these interviews done by phone, where expression could be captured through the voice. Before the interviews proceeded to the main topic, we aimed to build rapport in order to create a comfortable situational setting for interviewees. According to Maryudi and Fisher (2020), situational setting is important in an interview. Duration of the interviews was 50 to 90 minutes. Recording and notes from the interviews were written in transcription notes.

Data analysis involved three types of coding, namely, open, axial and selective coding. Corbin and Strauss (1990) write, “open coding is the interpretive process by which data are broken down analytically”. Open coding is done through close reading of the transcripts to identify fragments related to the research questions. The fragments were then labelled with related concepts (code). Axial coding is a stage where output of the open coding is analyzed to produce categories. The axial coding involved deleting, refining, and integrating the open codes into more comprehensive and meaningful codes (Bertolozzi-Caredio et al., 2020). In this process a category was linked to its subcategory and tested with data, then linkages were built among categories (Corbin and Strauss, 1990) (see Table 1). In this study, we tested a subcategory by presenting passages from interviews. Selective coding was conducted in the last part of the coding processes by using the output from the axial coding. In this phase, the results of axial coding were organized under concepts that comprehensively answered the research questions and helped to explain important aspects of the phenomena (Konecki, 2018). In other words, all categories were integrated around the core category and the category that requires explication were filled with descriptive details (Corbin and Strauss, 1998). For instance, the category of “reciprocity” was abstracted as an element of social capital, and “sustained egg production” was abstracted part of “livelihoods outcome”. We also developed abstraction for the vulnerability context of the livelihood system of nomadic duck herders during the Covid-19 pandemic.

Following the three stages of coding, we drew conclusions from the analysis by comparing our findings with findings from other research on social capital and livelihood systems. We recognize that some other researchers have used different approaches and methods to link social capital and livelihood systems. Their findings and conclusions, however, are relevant in clarifying, modifying, explaining and enriching this research. We approached this aspect of our work as a kind of triangulation that was able to enhance our understanding of the processes and results of this research (Cofré-Bravo et al., 2019).

### 3. Result and Discussion

The duck herders begin, develop, and maintain their livelihood system by moving around from one village to another within one district, then move among districts in the same province (South Sulawesi), and they finally venture out to the neighboring province, West Sulawesi. They move from one rice field to another, so that their ducks can feed themselves in the rice fields during the day, can be watched over to protect them from wild animals at night, and their eggs can be collected each morning. The herders’ main income is generated from the sale of the collected eggs. During this nomadic cycle, the herders interacted with their own families and their fellow duck herders, built networks with egg buyers, egg hatchers, rice field owners, (herding) plot distributors, irrigation officials, local government, as well as local people within herding areas. They maintain and use different types of social capital to access, combine, and make use of other livelihood assets such as natural and financial capital. During the Covid-19 pandemic, which started in March 2020, this livelihood system suffered a shock due to different emerging vulnerabilities. We divide our findings into three sections: first, we characterize components operated in bonding, bridging and linking social capital (section 3.1). Second, we describe the essential and supporting role of social capital for the livelihood system of duck herders (section 3.2). Third, we present vulnerability experienced by the nomadic duck herders during the Covid-19 pandemic, and the role of social capital during this period. In identifying components and roles of social capital, we use quotes that represent the larger findings.

#### 3.1. Social capital components in the duck herders’ social relations

This section describes our findings on the components of social capital operating within the three types of social capital—bonding, bridging, linking social capital—relevant to social relations between the duck herders and other actors. (Summary of the description can be found in Table 1).

Table 1. Type of social capital, interacting actors, and operating social capital components

Social capital	Actors	Operating social capital components
Bonding	Family members	Cooperation: provide daily needs during the nomadic herding. Cooperation: rear ducks and collect eggs during the nomadic herding.
	Duck herder in group	Mutual trust: trusting duck watching when leaving a herding location. Mutual trust: entrusted duck to other herder to be herded in new location Cooperation: share information about herding locations.
	Duck herder out-group	Compliance to norms: simultaneously leaving a group of rice fields when the farmers are about to plow them. Compliance to norms: only herd ducks in location determined by the plot distributors. Compliance to norms: bring back other herder's ducks that wander to wrong locations/plots. Compliance to norms: not to disturb local order in herding location.
Bridging	Rice farmers	Reciprocity: rice farmers allow their plots to be duck herding locations, duck herders give eggs to the farmers.
	Plot distributors	Reciprocity: plot distributors allocate rice fields for herding location, duck herders loyal to and obey the terms determined by plot distributors.
	Local villagers	Reciprocity: local people accept the duck herders, and the duck herders give eggs to them.
	Egg traders	Reciprocity: egg buyers help with ducks' transportation and expenses during the nomadic herding period, in return duck herders are loyal and sell their eggs to the egg traders.
	Egg hatchers	Reciprocity: egg hatchers allow delayed payments for hatchlings, in return duck herders are loyal and sell their quality eggs to the hatchers.
Linking	Local village government	Reciprocity: local officials allow duck herders to herd in their villages, in return the duck herders offer some eggs during ceremonies in village offices.
	Irrigation officials	Networking: duck herders use their network with local government officials to get access to water.

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 3.1.1. Bonding social capital: cooperation, mutual trust and norms compliance

The interviews show three sets of actors interacted with duck herders through bonding social capital. First, are the family members, with which a cooperation element of social capital is functioning. Cooperation involves daily needs provision, taking care of ducks, and collecting eggs, as shown in the following quotes from the duck herders:

*During the herding periods, I stay in the rice field hut, and my wife comes along. ... My wife has to come too, because she is the one who goes to the market, cooks, and does laundry. (LD, Sidrap, duck herder)*

*Throughout the herding period in [the district of] Maros last August, I received help from my son. As I had to go back to our home village to attend a family funeral, it was my son that took care of the ducks and collected the eggs." (AB, Pinrang, duck herder)*

Second, are the duck herders in-group relations. Duck herders in-group are duck herders that assemble under the same plot distributors. Social capital components operating here are mutual trust and cooperation. Mutual trust manifests in the form of taking care of each other's ducks, while cooperation is shown in how they access wet rice fields for herding locations. In terms of mutually taking care of others' ducks in a herding area, one duck herder said:

*When a [group] member has some other businesses to take care of outside the [herding] location or has to go home, I work with the other members to look after his ducks. And if I have some obstacle [and have to go out of the herding area], others will take care of my ducks. We trust each other for the security of our ducks when an urgent matter comes up. (LH, duck herder, Sidrap)*

Other forms of mutual trust occur when a herder entrusts his ducks for moving out to a relatively distant location. He does not expect eggs from the entrusted ducks, it is more important that the ducks stay healthy, as expressed by a duck herder:

*When my location is not yet opened [for herding], I entrust my ducks to another member. We have had a deal that the ducks will remain at the same number when they are given back to me. [.....] We don't entrust ducks to a random herder, we have built trust between each other. (SP, duck herder, Pinrang)*

*My ducks are currently in [the district of] Maros, I entrusted them to a friend, 350 of them. [...] he can have their eggs, [...] so long as he can give me back the same number of ducks. (RL, duck herder, Sidrap)*

In terms of helping each other to access herding rice field plots, there are several ways. One is of direct exchange, as mentioned by a duck herder:

*We allow someone to get into our village after harvest, and he will allow us to come to his village [after] they are harvesting. (RL, duck herder, Sidrap)*

*Every harvest season, I certainly come here (Sidrap). My friend invited me. His name is Pak Lahari. We are like brothers. [...] When the harvest comes in my home village [in Pinrang], I also invite him to come there and look for a suitable herding location for his ducks. Pak Lahari is originally from here (Sidrap). (AF, duck herder, Pinrang)*

Another way to access the rice field is to help other duck herders within one's own group with an invitation to join in a rice field plot owned and/or permitted by one's relative. A duck herder reported as follows:

*A week before 'lebaran haji' (a Moslem holiday) I moved to Maros. A relative of my wife let me come to the location. So, I invited my friend Pak Lahari, because the location is large enough. (AB, duck herder, Pinrang)*

*I came to this location because Pak Abu invited me. He has a relative here. [...] He controls around 20 hectares, [enough to] accommodate 800 ducks. (LH, duck herder, Sidrap)*

The third way is when a duck herder group member introduces other members to a plot distributor in an area, and then the new duck herder approaches the plot distributor, so that he can join in the location. A duck herder illustrated this as follows:

*We cannot just take our ducks into a random rice field. We have to approach a plot distributor. Usually, another group member introduces him to us. We call this act as, 'siolli-olliki'—calling each other, so long as we have talk to the plot distributor. (LD, Pinrang, duck herder).*

*Third, are the duck herder out group relations.* Duck herder out group relations are the duck herders that herd in different locations. Although they are not in the same group, they have similar objectives, namely to earn income from duck herding. To achieve this shared goal, there are norms to be complied with. One such norm is when the duck herders leave a location simultaneously although plenty of fodder is still available on the rice field. A duck herder reflected on this as follows:

*Usually, ten days before the planting season begins, the rice field should be left empty. The farmers need to prepare their rice field. They have to empty their field from water and replace it with new water. If they don't do that, there will be a lot of snails, and they are pests for their rice. Besides, the farmers also need to repair dikes and irrigation channels. (LD, duck herder, Sidrap).*

*Sometimes there is still plenty of fodder in the rice field, but if the farmers are about to use it, the location should be abandoned. As duck herders, we have to understand, it's a rule we have to obey. (AF, duck herder, Pinrang)*

Another rule complied with by the duck herders is that they can only herd in a predetermined location allocated by a plot distributor. As one duck herder described: "We, the duck herders, herd in a location predetermined by the plot distributor." (AF, duck herder, Pinrang)

That a duck herder can only use a certain plot determined by a plot distributor is also followed by another rule that a duck herder is not allowed to herd his ducks to a plot allocated for other duck herders, even though he might be a relative to the rice field owner or live near the location. A duck herder explains this as follows:

*A duck herder has to know his location. This is unlike other [relevant] jobs, where people can just come into any location. For example, if an owner of a rice field plot has a cousin who is a duck herder, but another duck herder has been herding there for years, the cousin cannot just take over and occupy that plot. Near my house, there is a rice field, but it is not my location, so I do not herd my ducks there. My location is further out, around two kilometers from here. (LB, duck herder, Pinrang).*

The duck herders also comply with a rule of not taking one another's ducks and instead bringing the wandering ducks back to their rightful owner. A duck herder said:

*Sometimes ducks owned by fellow duck herders, my group or not, wander into my location, so I give the ducks back based on the mark attached to the ducks. If we are not giving them back, the plot distributor will rebuke us. (AF, duck herder, Pinrang).*

Yet, another norm that the duck herders obey is the obligation to keep the peace in the host community, which was expressed by a duck herder who goes far away from her home village:

*When we arrived in Luwu, we went to see and report to the plot distributor. [...] There are rules to be obeyed as long as we stay at his location, among others [...] we cannot create disorder that would irritate the villagers' peace. (HW, wife of duck herder, Pinrang).*

#### 4 3.1.2. Bridging social capital: reciprocity

**Bridging social capital** connects duck herders with actors from other groups with relatively similar status.

First, perhaps the most important actors are the rice field farmers, both owners or cultivators. Without their approval the duck herders will not have a location to herd on. An important component of social capital that bridges the duck herders with the farmers is reciprocity, namely, the duck herders return the favor of the farmers by handing them some eggs. On this matter, duck herders expressed the following:

*Usually, we give eggs to the farmer who is cultivating the rice field." (SA, duck herder, Pinrang).*

*During our time in Palopo, I often invite the farmer to the field hut when we cook and eat eggs. When they go home, I give them eggs, around 10 to 30." (BS, duck herder, Pinrang)*

*We often give the rice field owner some eggs. We give them eggs as often as they come to the field. If they come, they will be handed a rack of eggs. Sometimes, the field owner comes 1 to 3 times during our herding period in a location. We also give the eggs to the field tillers. (RA, duck herder and plot distributor, Pinrang)*

This statement is in accordance with the farmers' who expressed the following:

*Sometimes the duck herder gives eggs to the rice field owner. (SK, rice field owner, Pinrang)*

*When the duck herders come, the farms stop buying eggs. Even if we don't ask [for eggs], the duck herders give them to the farmers. (DE, rice field owner, Gowa)*

Some rice field owners consider that this egg-giving act takes place because the duck herders understand that they have been helped out by the field owner. However, they feel reluctant to receive too many eggs, because they worry that this will also affect the duck herder's livelihoods. A farmer put it as follows:

*Duck herders are sensitive. He gives eggs to the rice field owner during their herding period there. [...] On top of that, when the duck herder is planning to leave the field tomorrow morning, to go to another field, all the eggs produced that morning are not for sale, he will distribute them to the field owner and other villagers. [...] We, plot owners, often feel awkward if the duck herders have been given us eggs three times during their time here, and still offer them once again to us, [we are afraid that] they would serve to lose, because they also work to make a living. (TR, rice farmer, Luwu).*

However, some other farmers/owners feel secretly annoyed by the duck herders, although their sympathy over the herders who are working to make a living and often offer them eggs prevent them from complaining about the duck herders' presence. A rice field owner expressed the following sentiment:

*What can be annoying is when the ducks damage the rice field dike. After they swim in an [inundated] plot, they flock on to the dike, flapping their wings, drying their feathers. If there are thousands of them, the dike will be damaged. Usually the duck herders would patch it back up, but they do so carelessly, just enough to block the outflow of the water from the plot. That is our most common complaint. We can be angry, but not too much, because we have to be careful not to offend them. Besides, we are like brothers, and they always offer us eggs. They usually give us 100 eggs during their time in my plot, and on top of that, they will give us a rack just before they leave. So, we cannot be mad at them, because they always give us eggs or invite us to eat ducks. (PL, rice farmer, Pinrang).*

Second, the plot distributors determine whether a duck herder can herd in a certain location, provide protection for the duck herder along with their ducks, and prevent conflicts. Duck herders said:

*Mr. RA (a plot distributor) has a lot of friends in Palopo. We simply follow him and come to the location he allocates for us. He does not own a rice field. He only depends on his connections with the field owners. (BS, duck herder, Pinrang).*

*The field that we can occupy should be permitted by the plot distributor. Hence, we have to build a good relationship with them through relatives [we have] around the area where they live. (AB, duck herder, Pinrang).*

*Rules that come from the plot distributor should be followed by us, so that we can return to the same location the next rice harvest season. (AF, duck herder, Pinrang).*

These duck herders' descriptions were confirmed by the plot distributors. In the plot distributors' understanding, they are the ones who decide whether or not a duck herder may herd in a certain location, as illustrated by the following quotes:

*The duck herders cannot just herd in some random rice field. If one enters without a permission from a plot distributor, one's duck will not be safe and last long. (LH, plot distributor/duck herder, Sidrap)*

*I give permission for the duck herder to come in here. [...] The rice field is just behind my house. I'm not the owner, but I ask permission from the owner or the farmer who tills the plot. (DW, plot distributor/duck seller/duck herder, Pinrang)*

Each plot distributor applies a number of rules to duck herders that are members of the same herder group as the plot distributor. The rules summarized by a location distributor are as follows:

*The duck herders should obey rules applied by the location distributor, that is, don't take others' ducks, do no damage to the plot's dike, do not make a scene with the local villagers. (SK, plot distributor/duck herder, Sidrap)*

These rules are applied because the plot distributors should be able to protect the duck herders. They will enjoy the same protection should they come to other members' villages, as one location distributor explained in the following statement:

*It's kind of difficult to be a plot distributor, because we have to ensure protection for our herder members and their ducks, as well as keeping the peace of the local villagers here. If we go to*

*their home village, they also have to guarantee protection to us and our ducks. So, we trust each other, understand each other. (SK, plot distributor/duck herder, Sidrap).*

Third, the local villagers and the duck herders interact in the herding locations. The villagers' acceptance determines the protection of the duck herders, for which the duck herders develop good relationships with them by, among others, offering them eggs. Local villagers illustrate this as follows:

*The eggs that lie on a dike or stack of straws, the villagers can take them home. These eggs are considered as a kind of fortune for the locals. The number can reach a rack per day. (DE, villagers/rice field owner, Gowa)*

*When the locals are having a party, they buy eggs directly from the duck herders. On top of the eggs that they pay for, there are also additional free eggs they bring home, which are gifts from the duck herders. The relationship between the duck herders and the locals are good. (TR, rice field owner, Luwu).*

Fourth, duck herders interact with egg traders not only to sell eggs. Egg traders help duck herders when the latter face difficulties, in return a duck herder will be loyal to sell eggs to a certain trader. A duck herder explains:

*When you are in need, because your capital runs out, you can ask for help from egg traders. We've typically gotten their help to transport ducks and to meet the day to day allowance during our stay in a herding location. We would pay them when we move out to another location, and the payment will be deducted from those debts. (SA, duck herder, Sidrap).*

An explanation from an egg trader clarifies this reciprocity:

*I cooperate with duck herders, namely I deliver their ducks to a certain plot using my car, I pick up the eggs wherever they are, I help with fodder if their ducks are not herded in a rice field, and I help them with capital to buy ducklings. The egg price [if I buy from them] is based on current market price. [...] The money will be handed [to me] if they are going to move to another location, we count the number of eggs I'm buying and the expenses I've spent for them. The margin is what the duck herders take home. (HI, egg trader, Pinrang)*

Fifth, are the egg hatchers. Most of the duck that are herded are reared by the duck herders from day old ducks/DOD. Because the duck herders are not always in possession of cash to acquire them, they receive "benevolence" assistance from the DOD sellers, in the form of a loan, and they can pay it back after they have enough cash. As a duck herder says, "[we] lend from the hatchers to acquire the DODs, then pay for the DODs after we sell the drakes. (SI, duck herder, Pinrang)"

This "good will" will be returned by the duck herder by loyally selling their quality eggs to their hatchers, who need quality eggs for hatching. A hatcher explains this relationship as follows:

*The nomadic herders sell quality eggs to be hatched. They have to be rounded, have no dirt, haven't been soaked in rain, and the color should be [light] blue. On the other hand, when they have become DODs, [...] the herders will be back to buy them from us. (AS, hatcher, Sidrap).*

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### 3.1.3. Linking social capital: networking

Through linking social capital, the duck herders connect to actors with higher social status. First, are the local governments, in this case the head of hamlets and villages in herding locations. The duck herders need to be formally accepted by local governments of the herding locations. To this end, the duck herders utilize their networks with plot distributors, as several actors explained as follows:

*The first time Pak Lade came to Sidrap, I took him to formally report to the head of the hamlet. The head of the hamlet then reported to the head of the village. (SF, plot distributor, Gowa)*

*When we come into a village, we try to report to any authority of the village, namely, head of the neighborhood association (RT), head of hamlet, and they will then extend the report to the head of the village. (RA, plot distributor/duck herder, Pinrang)*

*Before a duck herder enters a village, the plot distributor would make a report about their coming to the head of the village. His identity will be recorded in the Village Office, and therefore, the village government can help should any trouble arise." (TR, rice field owner, Luwu).*

Second, are the irrigation officials. Duck herders need water for their ducks, and the irrigation officials are important for the distribution of water to rice fields. The connection built among duck herders and head of hamlets is important to interact with the irrigation officials. A head of hamlet clarifies this interaction as follows:

*I'm the head of this hamlet. I have just paid visit to the irrigation official to ask for water distribution for Mr. Hari (a duck herder) .... I hope soon the water will reach [his plot] here. (JI, head of hamlet, Maros)*

The local irrigation officials indeed pay special attention to water access of the duck herders. They closely monitor the activity so that the duck herders would not open the irrigation slide gate by themselves, in which case the water volume releases would be incalculable, and the excess water will disturb the other rice field plots. Two irrigation officials in the District of Pinrang put this as follows:

*So long as a duck herder asks for permission, as irrigation officials, we will provide them water. If we are the one who provides the water, we can allocate the volume. When they open the slide gate without our permission it can upset the irrigation system, because they usually open it all the way, and pay no attention to the volume.... Sometimes the rice farmers are harvesting at different times, so when the slide gate is opened all the way, it can damage unharvested plots... [while] we, as irrigation officials, act in discretion to distribute the water to for their livelihoods (MM, operational manager of the district water resource management office, Pinrang).*

*There are three slide gates under my watch. There is a certain schedule when to open and close them. The schedule was made by deliberation. We can help the duck herders so long as all the farmers within their location have finished their harvest, [after that] we will open the gate when the duck herders ask for it. Often, the head of the hamlet comes to ask for it. We help them because they also work to make a living. (MN, irrigation official, Kecamatan Tiroang, Pinrang).*

This section answers the question of which social capital component manifested in the interaction between duck herders and other actors. We found that there are variations of social capital components applied by duck herders. This variation is related to the types of social capital utilized; they are, cooperation and mutual trust components within bonding social capital; reciprocity of bridging social capital, and networking in linking social capital. The dominance of cooperation and mutual trust of the bonding social capital, correlated with the closeness of social location and demographic proximity (of the family member and among duck herders). Meanwhile, the dominance of reciprocity within bridging social capital and networking within linking social capital correlated with farther social distance and therefore the duck herders require a practice of reciprocity (for instance, with plot owners), even utilizing their networks (such as, gain access to water). This is in line with Woolcock and Narayan (2000) findings that highlighted a combination of components within bonding, bridging and linking social capitals is dynamic in order to achieve its optimal effect over time. Similarly, Cofré-Bravo et al. (2019) also showed how a combination of bonding, bridging, and linking social capital allows configurations of farmer networks to develop innovations.

3.2. The role of social capital in a livelihood system

In the previous section we identified and described the main factors interacting with duck herders and the components of social capital in their interactions using the concept of bonding, bridging, and linking social capitals. In this section, we focus on the role of social capital in the duck herders' livelihood system. We will also describe their livelihood outcome. We found that access to natural capital is an essential role contributed by social capital, while access to financial capital functions as a supporting role. The overall description is summarized in Table 2.

**Table 2.** Summary of social capital role in livelihood system

Type of roles	Form of roles	Social capital utilized
Essential roles	Access to natural capital	Bridging and Linking
Supporting roles	Access to financial capital	Bridging
	Effective utilization of natural capital	Bonding

3.2.1. Essential role: access to natural capital

Social capital has an important role in gaining access to the most essential livelihood capital for duck herders, that is harvested plots of rice fields. They contain numerous kinds of fodder for the ducks. The bridging social capital is evident in the relationship between duck herders and farmers, within which reciprocity is a vital factor. The rich nutrients of a rice field for the ducks are explained by one herder as follows:

*The ducks are looking for fodder in their fields comprised of leftover rice, small earthworms and snails. Beside leaves and grains from grasses the ducks normally eat. (SD, duck herder, Pinrang)*

One duck herder explained that the rich content of a rice field is not consumed at once as the ducks arrive at the plot. He described the sequence as follows:

*Usually, when we arrive at a newly harvested plot, the ducks first eat the leftover unhusked rice scattered around the plot, and also eat the small snails. When the plot has been filled*

*with water, a week later the soil will be moist and small worms and grass grains start to appear, which are then consumed by the ducks. A month later, new rice shoots will grow out of the rice remains about one or two centimeters (above the ground), also becoming fodder for the duck, and the ducks love it. (LD, duck herder, Sidrap).*

Besides fodder, the other essential need for the ducks is water. Although different types of fodder are available in a newly harvested rice field, the ducks would not produce eggs optimally without enough water, as one duck herder explained:

*When we arrive at a location, the water is not yet available, [so the duck] only eats unhusked rice grains, and as a result, the egg production will definitely fall .... Around 10 days later, when the water is there, the production will go back to normal. (LD, duck herder, Sidrap)*

Fodder and water are vital for egg production. All duck herders confirmed this. They see it as similar to a human that also needs some sauce while eating; for ducks, water is the sauce. In addition, water is also used by the ducks for playing and swimming. One duck herder explained:

*When we move to a new plot and it has fodder but no water, the duck won't produce eggs. [...] As the Bugis put it, a meal has to have sauce. [...] The water, besides for drinking purposes,, is also good for the ducks to play or swim. (SK, duck herder, Pinrang).*

The nomadic method of the duck herders is done to provide fodder and water for the ducks, which pushes the herders to **build and maintain social capital in** their relationships with **the** rice farmers. Likewise, our interviews with farmers found that they too yield benefits from the herders coming into their plots. The passages below show how this normally takes place for the rice field owners.

*With the ducks coming to eat in the rice fields, they can cut clean the remains from the last harvest. Next season, when the farmers plant another cultigen it won't blend together with the previous one. And if this mix takes place it will upset the rice field productivity. Different rice grows and are harvested at different times, as well as the treatment for pruning, fertilizer application, watering, and harvesting, which also varies. [...] From my experience, if a rice field is not occupied by a flock of ducks, although the farmer tries to clean the remains from last season, it cannot be as clean. So, the ducks help the farmers to clean the rice field leftovers from the last season. (TR, rice field owner, Luwu)*

*With the ducks coming, the rice field becomes fertile. The duck wastes make the plot fertile, so that the fertilizer application can be reduced and lessens the cost. Around five years ago, the first time the ducks occupied my (dry) field it was covered by corn, vegetables, and legumes. The plot that the ducks occupied turned out to be so fertile. After that, I let the duck herders come into my (wet) rice field. Other than that, the ducks eat the golden snails so that their populations decrease in the fields. That way, the amount of chemical pesticides used to eradicate the snails becomes much less. (DE, rice farmer, Gowa)*

Social capital also affects the duck herders' livelihood system through access to other natural resources namely DODs, which they buy from the hatchers. Access to the ducklings is not only gained through financial transactions but also through reciprocities among duck herders and hatchers. This can be seen in the statements of SI (duck herder, Pinrang) and AS (hatcher, Sidrap) in section 3.1.2 above.

### 3.2.2. Supporting roles: access to financial capital

We also found that through social capital the duck herders can gain access to financial capital. Financial capital can be accessed through interactions with egg traders and hatchers. With the egg traders, the duck herders can lend some money for daily expenses throughout their nomadic herding period, the money is also used to buy fodder when the ducks cannot be herded in a rice field, and helps with the transportation costs when the ducks are transported to a new location. The money will be paid back when the herders complete a cycle of nomadic herding, and are about to move out to a new location. A duck herder describes this as follows:

*When we are in need and don't have the money, we would ask it from the egg traders. This help [comprises of] duck transportation and daily expenses in herding location. [...] Just recently I asked for help to buy ground rice husk (for fodder) when I kept my ducks at home in the village because there were no rice fields yet open for herding. When we're about to move out to another location, the trader will deduct the buying price of the eggs [from the money I borrowed]. (SA, duck herder, Sidrap)*

Although most of the duck herders are supported by the egg traders when they are short in money, some duck herders avoid asking for such support because they are able to meet their needs without a loan. As one duck herder says:

*A boss [trader] can lend you some money if you [potentially] have eggs. When there are eggs, there is money. During my entire duck herding period I never borrowed any money. I tried to meet my own needs, so that after a round of herding period in a location, I will earn all my money from selling the eggs. (SK, duck herder, Pinrang)*

However, social capital affects access to financial capital not only in terms of loans from egg traders. Sold eggs also can be seen as a result of social interactions involving loyalty, mutual trust and reciprocity. This can be seen in the statements of SI (duck herder, Sidrap) and HI (egg trader, Pinrang) in section 3.1.2 above.

Another supporting role of social capital is to effectively utilize the rice field to optimize egg production. Bonding social capital among the family/kin members and among members of the duck herder groups or cooperatives specifically involve their mutual trust, compliance to norms, and all have some role to effectively use the rice field, which are accessed through bridging social capital with the rice farmers.

### 3.2.3. Livelihood outcome

Our interviews show that there are three levels of livelihood outcomes achieved by the duck herders. First, the outcome allows the duck herders to satisfy basic needs, though not enough to live a wealthy life. This livelihood outcome can afford daily needs, and save some surplus, but when they face deficiencies in duck herd related expenses, this surplus will quickly run out. This condition is experienced all through the career of some duck herders. This is illustrated by one duck herder as follows:

*It is pleasing for a duck herder when the ducks are producing eggs. But when we face hardships, for example, when we have to buy fodder because the rice fields are yet to open for herding, all gold would be sold, motorcycles may also have to go. It is done to sustain the ducks, they have to eat, or else they will die. These things came from ducks, so it is alright that we sell them for the duck's sake. [...] Duck herding does not lead us to a wealthy life, but in hard times the ducks help us, or we can say they become our lifeline. We bought our*

*homes from duck herding, we bought rice fields thanks to them [...] The ducks too allow us to send our children to school, to middle and high schools. (SK, duck herder, Pinrang)*

Second, the livelihood outcomes enable duck herders to consolidate livelihood assets so that the surplus can be used for investments on top of satisfying basic needs. Most duck herders reached this level of outcome. From this outcome they can build a home, buy rice fields, a motorcycle, and some even a car. In rural South Sulawesi communities, having a car is a symbol of wealth. This level of achievement is illustrated below by one duck herder:

*I started duck herding right after I married. I joined my (father) in law who was a duck herder. I initially had a small house I inherited from my parents. After a few years of duck herding, I made my house larger. It's much better. The costs come from duck herding [...] I sent my children to school, thanks to duck herding. One [of my children] has graduated from university, one did not. Another one is now in his fifth semester [...] On top of that, the duck herding allows me to buy motorcycles. There are three of them now at home. [...] I also own a plot of rice field, about a third of a hectare. The harvest is modest but enough for the whole family. In 2018, I dared myself to buy a car by credit. It's almost completed. I can afford these things because of the duck herding. [...] And this car, my son sometimes uses it to transport his friends' ducks, or transport things. (DL, duck herder, Pinrang).*

Third, the livelihoods outcomes allows duck herders to invest *and* raise their social status within the community. Among them, some are able to increase their livelihoods outcome, and therefore are able to expand their businesses to duck trading, hatching, and even becoming legislative members of their districts, hence raising their social status. The case below illustrates this outcome:

*First, I bought a plot of rice field, fairly large, in 1994, which was possible due to duck herding. I didn't have a house at that time, but I lived in a small house owned by my relatives, with my wife and children. [...] So, after that our income started to increase, from ducks and rice. All these investments took place before I became a legislative member, most from duck herding. I went to Mecca for Hajj in 2000 with my mother, also possible because of duck herding. When I earned income from duck herding, I invested them back to buy cows, dry fields, and sent my children to school. My married child, I gave him capital so that he can also stand on his own. All of these came from duck herding, rice fields, cows, and the dry fields. But they all originated from duck herding. Including to run for a legislative election, the costs came from duck herding. The new car I drive nowadays, some of the money I used to buy it also originated from duck herding income. So, within all the things that I can buy, there is income from duck herding. [...] I do not want to leave this duck herding, it's part of my life. During my tenure as a legislative member, my partner took over my duck herding responsibilities, but when I'm done, I will be back to take care of my ducks (BR, duck herder/legislative member, Pinrang).*

This section has dealt with the question of how <sup>2</sup> social capital operated in a livelihood system of duck herders. First, the <sup>37</sup> social capital shows some roles in gaining access and usage of other livelihood capital, namely natural capital (land and water) and financial capital (cash and loans). Second, the social capital has two types of roles, essential and complementary roles. Essential role means that without livelihood asset/capital, which can be accessed using the social capital, the livelihood outcomes will not be achieved. Complementary role is when livelihood capital, whose access can be gained by social capital facilitation, stands as supplementary to achieving a livelihood outcome. These roles are shown by the claim toward land and water, prerequisite for egg production, and financial claim that supports the cost of duck herding. This finding confirms the

conclusion made by Vervisch et al (2013) that social relationships based on social capital are social wires through which resources are claimed and distributed. On the other hand, the findings also suggest different emphasis from the conclusion made by Mbiba et al (2019) on relationships between natural capital and social capital in rural livelihoods. They suggest that the safety net role of social capital is not sufficient to offset the demand for natural resources. In the case of the duck herders' livelihood systems that depend on newly harvested rice fields (natural resources), there is no rent system applied to access rice fields, but instead requires interaction with actors at various locations, which makes the safety net role of social capital vital.

### 3.3. Covid-19 Pandemic as a Vulnerability Context

Covid-19 pandemic creates shocks in the duck herders' livelihood system at least since March 2020, when district governments started to introduce measures of social restriction that require people to work, study, and pray from home. From April through June the governments applied a 'large scale social restriction' (PSBB) for several regions, including Makassar (capital city of South Sulawesi province) and the District of Gowa (a district bordering Makassar). Following this rule, the government introduced the term 'new-normal', where people are allowed to go to work outside but should comply to health procedures, namely wearing a mask, keeping their distance, and washing hands frequently. In addition, several districts applied a requirement for a letter of Covid-free and rapid test result to be presented in order to enter the districts, though this rule was rather loosely enforced.

Our interviews identified two vulnerability contexts in the livelihood system of the duck herders during the pandemic. First, eggs could not be sold because traders failed to enter a district where duck herders are located. This situation resulted in the decreased income for the herders. This vulnerability was experienced during April through June 2020. The duck herders reported diverse reactions to this, as follows:

*We can feel the impact of Covid-19. At that period, the traders decreased their buying, therefore the eggs stored much longer in the hut where the herders brought their ducks. The price dropped to Rp. 35.000/rack, while before it was Rp. 60.000/rack. It happened because the eggs also amassed at the trader houses, because they failed to enter Makassar to sell the eggs. The PSBB was enforced in Makassar, which took place in April to mid-July. At that time, my eggs stacked in a rice field hut, about 50 racks, no trader came to pick them up (RA, duck herder/plot distributor, Pinrang)*

*At that time, I was with my ducks in [the district of] Polewali Mandar. My eggs were not picked up by the boss (trader). He said, 'just sell them there, because I have mine [here also] piled up'. So, when the boss didn't come, I sold the eggs to local traders and villagers in Polewali Mandar. The price was so low, Rp. 35.000/rack. [...] My income fell significantly, but it's ok, so long as the ducks are alive. (SK, duck herder, Pinrang)*

*I got hit hard by this Corona. In January I sold my old ducks, 500 of them to a duck trader in Pare-pare named Unding. [...] At that time, I'd already heard about Corona, but it was happening abroad, not in Indonesia. [...] When you sell ducks to the trader, they don't directly pay you. Only when he gets money from Kalimantan (where the ducks are sold), will they pay. So, before he can pay me, the Corona came. I actually felt bad for the trader. Many of the slaughtered ducks were rotten because the shipping to other islands were suspended, no ship was operating. If he decided to sell them [locally], nobody would buy, because most of the restaurants were closed. The people were also afraid to go out of their homes. I have Rp. 20 million in loans at the trader, because at the time of the transaction, the price was*

*Rp 40,000/duck. My plan was to buy ducklings with the money, but this plan is gone. (RL, duck herder, Sidrap).*

Several duck herders are able to sell their eggs to their respective traders, with slightly reduced prices, as one duck herder reported:

*At the peak of the Corona [pandemic], April to May, I herded my ducks in Sidrap, and the egg price was so low, around 35.000/rack. The egg stacks were piling up, the selling dropped. But my trader kept coming to pick up my eggs because we are loyal to each other. I only sell my eggs to him. His name is La Capi. That's why he helped me. During hard times he helped to trade my eggs. But it comes with a consequence also, as the trader that buys my eggs at a lower price. But it's alright, it's better than failing to sell them at all. So, at that time, my income fell, but I was not losing because I didn't have to buy fodder, they can eat in the harvested rice fields. (AB, Pinrang, duck herder).*

This situation created a dilemma for the egg traders. If they did not buy eggs, it would mean that they ignored their sinking partners. However, if they insisted on buying the eggs, they will lose. Hence, the traders only bought eggs from duck herders who are loyal, those who never sell to other traders. Traders with rather large-scale business explain this situation as follows:

*As a trader, I should buy their eggs because they have been loyal to me. I cannot fail to buy from them, because I feel bad for them. That's the risk I had to take as a trader, it's a dilemma, but I had to buy their eggs. So, at the time, as a trader I was overwhelmed. (LC, egg trader, Pinrang).*

*During the Covid [pandemic], I kept buying the eggs from the herders who are my loyal partners and never sell their eggs to any other trader. This is what we can do to help the duck herders. But the herders like to move around to sell their eggs and not to their loyal buyer, in other words, there are other bosses, we didn't buy from them at the time. This is because only when they face hard times do they sell to me. This adversity lasted around two months. (HI, egg trader, Pinrang)*

Second, there were also obstacles in transporting ducks. The Covid-19 task force in each district introduced checking points at district borders for all passengers on every vehicle during the peak of the pandemic, from March to July 2020. For duck herders this mechanism is an obstacle to their inter-district movement to find herding spots. Duck herders developed several strategies to overcome this issue:

*In March I tried to move my ducks to Polewali Mandar right at the time when the Corona virus came. Cars were checked at borders. The driver said he's only tasked to transport the ducks to Polewali Mandar and would be back again to Pinrang. Finally, he was permitted to pass. I was on another car behind him to supervise the moving. [...] The problem was that the check took a long time, the ducks suffered from heat and in some conditions they might die. (SK, duck herder, Pinrang)*

*On the way to Gowa, from Pinrang, there was no problem, because we moved during night time, and we could pass by the checkpoints. My son drove the car to transport the ducks. When we entered Makassar, we avoided the main roads, made a detour through Batangase and Moncongloe, to reach this place. (DL, duck herder, Pinrang)*

The duck traders, who buy older ducks from the duck herders, also complained about obstacles on the road during the Covid-19 pandemic.

*There were a lot of checkpoints on the way when we transported the ducks. Two days ago (interview was July, 17<sup>th</sup>) when we were moving the ducks to our loyal buyer in Gowa and Takalar, we were stopped many times. At the toll road gate, only those who can present rapid test letters were able to pass. We, the duck traders, didn't know that there is this kind of license required to enter Makassar. Finally, my driver took another road to be able to reach Gowa and Takalar. The problem is that when the ducks have to endure a long drive, they can get sick and die out of the heat. (DW, duck herder/trader, Pinrang)*

All through June and July 2020, some duck herders stopped herding due to fear that the people in their destinations see them as virus carriers, and they were also worried about being infected by the virus from the people in their destinations.

*Duck herders who planned to go out of the district were afraid to do so. They feared that people in other regions would not accept them, and thought these people considered them as Covid carriers. They also worried that their destination areas have been infected by Covid. [...] Also, the free-Covid check points at district borders, presented another obstacle. Most of the drivers didn't know how to get the free-Covid letter or obtain a rapid test. (DW, duck herder/trader, Pinrang)*

In August, we found that duck herders' fear about Covid-19 infection was starting to fade and the local villagers at the herding destination no longer rejected them due to fears of the virus. Duck herders explained:

*In terms of Corona, I think it doesn't have direct effects on the ducks and me. We live in rice fields, and rarely see many people. And the sun is shining bright. So, the Corona wouldn't likely affect me because of the heat. And the same goes for the ducks. (AB, duck herder, Pinrang).*

*People in Gowa are not complaining with our coming, they don't bother us. Probably because I stay in the rice field all the time with my ducks, so they are not worried if we carry the virus. (DL, duck herder, Pinrang)*

These descriptions show that the vulnerability experienced by the duck herders during the pandemic were more related to distribution than production processes. Among the relationships between supply chain and Covid-19 pandemic, Morton's (2020) hypothesis may be relevant to be analyzed here, which is the aspect of susceptibility, that is "the chance of an individual becoming infected" and vulnerability, namely, "the likelihood of significant impacts occurring at individual, household or community level". In the case of duck herders, in terms of susceptibility, the duck herders were relatively unaffected because they worked in the rice fields and rarely interacted with crowds, thus were assumed to have little chance of being infected (as seen in quotes from duck herders and local villagers in this section). Meanwhile, in terms of vulnerability, they experienced obstacles during eggs and ducks' transportation to customers, during which social restrictions effectively cut demands. They were also hampered by the requirement to provide a letter showing they were Covid free at district borders, while their livelihood depended on their mobilization between districts. This confirms Morton's (2020) emphasis that one aspect of the Covid-19 pandemic can cause vulnerability on the supply chain is the government response in the form of

lock down and travel bans that affected the product selling, input providing, and workers migration. In the case of duck herders, however, the concept of worker migration, as worker movements toward a stationary workplace, may not be suitably applied. The duck herders practice mobile type of work. In relation to selling obstacles, the vulnerability framework developed by Ribot (2014), whereby a shock is sustained over a long period creates an effect that may create both vulnerability through the loss of livelihood.

Finally, how does social capital roles relate to vulnerability of the egg supply chain? Both duck herders and egg traders mentioned that loyalty is an important consideration for the traders to keep buying from their loyal duck herders. In the eyes of the egg traders, duck herders who frequently sold eggs to other traders would least likely get their eggs bought by the traders. This consideration means that the loyal duck herder would experience less vulnerability, relative to those that are not. However, a question remains: if the government continues to enforce social distancing and the travel ban continues to reduce demand, and the traders' storage are full with rotten eggs, will they keep buying eggs even from the most loyal duck herders? In this kind of situation, we can argue that there is a limit to social capital.

#### 4. Conclusion

The main finding of this study is that the roles of bonding, bridging, and linking social capital in the duck herders' livelihood system appear at two levels, namely, essential and complementary roles. These levels are defined by the type of livelihood assets accessed through certain types of social capital. In this case, the role of bridging and linking social capital for the duck herders to gain access to natural capital (land and water) for duck productivity is essential for livelihood outcome. Meanwhile, their role in accessing financial capital is supplementary. In addition, this study found that vulnerability due to the Covid-19 pandemic is more related to distribution than production processes. Vulnerability within distribution was caused by policy responses by the government that introduced social restrictions and a travel ban, through which most of the duck herders failed to sell eggs. Only the loyal, and therefore trusted duck herders succeeded to sell their eggs to the trader at the peak of social distancing enforcement. Loyalty, or trustworthiness, is a social capital component that allows part of duck herders to receive "help" from traders when demand fell due to pandemic.

Literature on the role of social capital in a livelihood system has explored how the combinations of bonding, bridging and linking social capital work. Nevertheless, the way this nomadic livelihood system works involves interactions between different actors and space, and shows that these dynamics have not been adequately explored in the wider literature. In the middle of the Covid-19 pandemic that demands social distancing, a livelihood system that depends on mobility across administrative boundaries requires exploration of how social capital is utilized to overcome vulnerability. This study elaborated these aspects. However, in relation to social capital roles during the Covid-19 pandemic, further studies are needed. For example, if the government keeps enforcing social distancing policies so that the egg demands continue to fall, so much so that the egg traders experience pressure toward their businesses, can the duck herders' loyalty (as social capital) help them to sustain the demand from the egg traders?

Meanwhile, from the agrarian policy perspective, especially those that promote integrated farming systems, a combination of duck and rice, supported by reciprocity between rice farmers and duck herders, is a good practice that needs to be facilitated. Road access to farms and irrigation networks are part of government responsibilities to provide them as public goods, and they are highly beneficial for both duck herders and rice farmers to continue practicing integrated farming systems. This will strengthen the roles of the various elements of social capital. By linking it with policies to overcome the pandemic impacts, this case shows that the pandemic is not only related to shocks in the production process of a livelihood system, but also to the supply chain of a

commodity. Therefore, the lift of social restriction measures when the infection rate is diminishing is as important as enforcing the same restriction rules when the infection is rising. In relation to the sustainability of a livelihood system, both are policy instruments that need to be applied in balance to one another.

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