The role of local knowledge system in enhancing Peranakan Etawa goat farm

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Abstract. The local livestock knowledge system is seen as the contributor to agricultural and rural development but not all local knowledge has the opportunities to be explored, customized, and applied to follow developmental dynamics. This research aimed to analyze the local livestock knowledge system of Peranakan Etawa (PE) goats from its elements, roles, management, and knowledge dissemination. This study was conducted in Kaligesing Sub-district, Purworejo Regency, Central Java using qualitative methods. The data were obtained through interviews, observation, and documentation. Participants were determined purposively which consisted of smallholder farmers. The data validity was checked using triangulation of data sources and methods. Data analysis included data collection, data reduction, data presentation, data interpretation, and data collection. The results indicated that the PE goat farming local knowledge system elements existed by the integration of traditional and scientific knowledge systems that were distributed and applied by the farmers’ community as a source of livestock knowledge. Management and dissemination of local knowledge use the combination of traditional and modern patterns.

1. Introduction
Peranakan Etawa (PE) goat farming contributes as a rural community source of income, food security and local genetic resources. Existence of this farming is inseparable from the variety of knowledge and innovation that were developed by the local community and the government. Many parties acknowledge the role of traditional knowledge both solely or combined with scientific-based knowledge in development of small-farming and the rural community, including livestock small-farming. The recent studies showed that indigenous are still effective for animal disease treatment [1]. The other strong evidence found complementarities between the indigenous technical knowledge and feed chemical composition for better nutritive values in the feeding systems [2]. Study of zoonoses showed that perceived risks of zoonoses were overshadowed by local knowledge in cultural practices and the value of animal source food [3].

Traditional knowledge systems are run through a series of processes that are different from the epistemic value of scientists [4]. Farmers tend to use different procedures than scientists to achieve valid knowledge. The differences include: (1) different approaches in comparing “treatments” because the comparisons made by farmers use various “treatments” over the years, including control treatments; (2) post-harvest reconstruction, where farmers often conduct experiments by comparing field practice with
the result and regard the observed differences as experiments, or even they experiment without realizing it; (3) the improvisation that is done often comes from the result of circumstances such as a lack of input.

There are many definitions of local knowledge systems. A comprehensive concept is needed to help clarify how a right-based approach can support these knowledge systems and their far-reaching implications for agricultural development in general [5]. According to Treakle and Krell [5], it is useful to distinguish between indigenous knowledge systems, traditional knowledge systems, and science-based knowledge systems. Indigenous knowledge systems are those indigenous people and their culture (as cited in United Nations Declaration on the Rights of Indigenous Peoples). Traditional knowledge systems mean those that were transmitted by the preceding generations that are not necessarily indigenous people. Local knowledge systems (LKS) are those that exist in certain geographic or cultural areas that may be a mix of indigenous, traditional, and science-based knowledge systems.

The differences of scientist and farmer methods in achieving knowledge and the knowledge element that forms the local knowledge systems are that the local knowledge systems consist of indigenous knowledge systems, traditional knowledge systems, and science-based knowledge systems [4,5]. Indigenous knowledge or traditional knowledge is the farmer knowledge obtained from procedures in line with farmer epistemology. As for scientific-based knowledge, it is the knowledge that is developed by a procedure commonly conducted by the scientist. Farmer knowledge encompassing indigenous knowledge, traditional knowledge, and science-based knowledge in the form of technology developed by scientists are enriching and complementing each other forming the local knowledge systems.

Based on the recognition of the local knowledge system's role in farming and rural development, exploration on how each element, process, role, management, and dissemination of PE goat farming local knowledge systems is necessary. Local knowledge system in this research is defined as knowledge systems about farming that exist in the Kaligesing area, which can consist of indigenous knowledge systems, traditional and science-based knowledge, built and preserved by the local farmer community as a form of an adaptive strategy to the environment. Subsystems of the local knowledge systems are built and preserved by the local farmer community in this area.

Local knowledge, including indigenous knowledge, is the product of farmers' interaction and adaptation with local nature and environment conditions to maintain the existence of PE goat farming. Because it is based on the context and nature of the environment which the farmers are familiar with, then local knowledge can be accepted socially and economically so its stay existed. This knowledge is self-tested by the farmer's experience and observation. Therefore, this research aimed to explore local farming knowledge systems in the Kaligesing region based on elements and sources of knowledge management, usage, and dissemination of existing local knowledge. Identification and understanding of local knowledge systems owned by the farmers community will be beneficial in supporting this knowledge system and its wider implications can support the farming activity.

2. Methodology
This study was conducted in January until August of 2016 in Kaligesing, Purworejo, Central Java which is the center of PE goat farming and the origin of Kaligesing breed as the superior breed which is necessary to be preserved. This research used a qualitative approach by intrinsic case study and instrumental case study [6]. Regional characteristics as the PE goat center was used as an intrinsic case. For the instrument case, researchers used the concept of local knowledge systems from Treakle and Krell [5], namely local knowledge systems that exist in an area or culture, which can be a mixture of indigenous knowledge systems, traditional and science-based knowledge systems. Data was collected by applying the tools developed by van Vlinderen [7] (table 1) to access and explore local knowledge in tropical livestock production systems in the form of unstructured interview, structured interview, and observation.

The sampling technique was used to select informants with rich information that consisted of smallholder farmers and extension workers [8]. The data validity was checked using triangulation of data source and methods [6,9]. Data analysis included data collection, data reduction, data presentation and data interpretation [9].
Table 1. Activities and tools to access local knowledge in a tropical livestock production system

| Activity                      | Tools                                      |
|-------------------------------|--------------------------------------------|
| Record what people say        | Unstructured and semistructured interviews |
|                               | Structured interviews                      |
|                               | Audio taping                               |
|                               | Analysis of local songs, riddles, proverbs and stories |
| Record what people show and do| Diagrams: calendars, matrices, maps, video, etc |
| Record what people do and say | Observation, popular theatre or role plays |

Source: van Vlaenderen [7]

3. Result and discussion

The concept from Treakle and Krell [5] in interpreting the phenomenon of the existence of a local knowledge system is used to define the findings of a local knowledge system that develops along with the dynamics of the Kaligesing goat farm. The findings on the field show that while the agricultural knowledge and information systems (AKIS) driven by the government have not worked well enough in facilitating the knowledge and information needs of farmers, the progress of Kaligesing goat farming shows the existence and contribution of local knowledge systems in it.

In that knowledge system, various knowledge is created, integrated, disseminated and applied by the community of farmers as a source of knowledge on Kaligesing goat farm. Various types and knowledge enrich the local livestock knowledge subsystem in supplying the needs of farmers to develop Kaligesing goat farm as a local commodity that has high economic and social value.

3.1. Element and roles of local knowledge systems

Traditional knowledge exists in livestock farming, with some aspects that includes: breed selection, feed, housing, reproduction and animal health. Some of them show traditional knowledge about the physical characteristics of a livestock that needs to be avoided in selecting breeds. This long-rooted traditional knowledge appears in local terms regarding unfavorable livestock characteristics, such as ‘kadang karing’ and ‘buntel mayit’. Goats have the characteristics of ‘kadang karing’ if they have a physical characteristic in the form of a tail on the back that has a speck or pointed (‘uyeng-uyeng’ according to local terms). ‘Buntel mayit’ is characterized by a goat with a tail whose fur’s color is dominantly black but has some white colorings on its head and also has some white colored fur.

‘Kadang karing’, and ‘buntel mayit’ that’s some of the bad ones.’ (interview with farmer; 16/6/2016)

Based on the knowledge of farmers that was gained from experience, goats with these characteristics tend to be violent and cannot get along with other livestock. This is harmful for the safety of other livestock. According to the farmers, this is not a good character to be selected as a prospective buck. Apart from the characteristics of a goat that must be avoided, the characteristics of good Kaligesing goats are also classified by farmers based on their experience. The characteristics of the farmers’ version are then known as characteristics A, B, C, D along with their inherent qualitative characteristics. One of the characteristics of a good Kaligesing goat is seen from the color of its fur, which is a white body with a black head. In the market, the selling value of the goat is also higher than the goat with brown fur.

‘The ones with the black fur are more likely to be sold’ (interview with farmer; 17/1/2016).

Traditional knowledge is also included in some of the practices in making housing. Farmers have this belief that certain days are considered good in making housing according to the Javanese rural community calendar system, such as Kliwon Wednesday or Pon Friday. Other traditional knowledge that has developed is the knowledge in determining auspicious days to bring goats home, namely Kamis Pahing, Rabu Kliwon, Setu Wage, Jum‘at Pon atau Minggu Kliwon which are considered to bring good fortune and good influence for goat livestock.

Although it doesn’t undergo scientific procedures like the procedures carried out by scientists, continuous direct observation and experience eventually results in consistent information and can be
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held by the public as a guide. This shows what is called valid knowledge based on farmers’ ‘experiments’ through repeated experience over a long period of time [4]. The strong knowledge that exists in the local knowledge system regarding the characteristics of the Kaligesing goat in terms of fur color also has the potential to create an impact in the form of a behavior that is less than commendable from farmers. As found in the field, unscrupulous traders manipulate the color of goat fur sold in the market with an artificial coloring process, as shown in the following picture:

![Figure 1. A qualitative manipulation of the Kaligesing goat to obtain a high selling price](image)

The majority of traditional knowledge regarding feeding is related to the use and treatment of forage feed, which is widely available on their land. Local plants known to breeders as forage feed are elephant grass leaves, *odot, dadap, klereside*, cassava, *kaliandra* and jackfruit leaves. Especially for this type of forage feed, there is a combination of knowledge between farmers with knowledge introduced from outside the farmer community. *Kaliandra* and *sataria* are plants introduced by the local government in the context of the reforestation movement, which eventually became a source of forage for livestock. Farmers apply traditional knowledge in the form of using plants and local resources for the treatment and maintenance of livestock health. Among those are used for the treatment of diarrhea, scabies and infections. Farmers use ‘babal kucing’ for the treatment of scabies, use ‘jambe’ leaves for ‘korang’ treatment and give turmeric for antibiotics (prevents infection). In the maintenance of ‘tempe bosok’ livestock, grated turmeric or papaya leaves are used to increase stamina and maintain livestock health. In its development, science-based knowledge regarding the treatment and rearing of livestock is also included in the local knowledge system. Among those are the knowledge about the importance of feed composition, which consists of forage feed and supplementary feed, vitamins and modern medicines. This knowledge comes from outside the community, such as local government and the private sector.

‘Actually, technologies are already known inside the farmers’ community, but sometimes if there is raw materials, they process it, but not all of them can apply it. Due to the availability of raw materials, as well as the availability of fresh feed, processing feed (fermented feed) is still doable. For example, if the availability of forage feed is sufficient for the year, he will not process the feed. But he knows how to process, for example make silase, preserve feed, then make burgers, he can do it, you know. Sometimes, for example, silase is not very suitable for goats because goats are small ruminants that usually eat fresh grass.’ (interview with farmer; 19/4/2016).

Forage feed innovation as a new knowledge includes the manufacture of fermented feed and silase introduced by the extension subsystem. Fermented feed and silase technology is one form of science-based knowledge, which is generated from the research process by scientists. Feed technology was introduced to the farming community as a solution to overcome the scarcity of forage feed in the dry season. However, there are many factors that prevent this innovation from being applied by farmers, including the constraints on the availability of chopping machines, raw materials and livestock factors. According to farmers, fermented feed is relatively disliked by livestock, so they are reluctant to apply the fermented feed.
3.2. Management and dissemination of local knowledge

Various functions such as creation, transfer, access, exchange and application of various elements of knowledge occur in the local knowledge system, and ultimately contribute to the knowledge and information of the Kaligesing goat farm. The knowledge and information inside the local knowledge system are in the form of traditional knowledge, indigenous knowledge and science-based knowledge. When viewed from the function of knowledge creation, the process is relatively difficult to trace. This is due to the various types of knowledge and information and the sources from which the knowledge and information comes. The knowledge and information inside the local knowledge system of farmers includes the aspects of the Kaligesing goats’ farming such as reproduction and feed management, housing, livestock health and marketing. These various types of knowledge and information exist inside the indigenous and traditional knowledge that have been held for a long time by the local communities as well as modern knowledge that contributes to enriching this knowledge. Modern knowledge is mainly obtained from outside the community and from within the community itself.

The existence of various traditional, indigenous and modern knowledge that is still held and applied by the community shows the existence of a knowledge storage function and knowledge application in the local livestock knowledge system. The storage of knowledge is carried out in the minds of each actor, which will be actualized in the form of the use of knowledge in daily animal husbandry practices. In relation to the function of disseminating and sharing knowledge, the role of interpersonal communication has an important position in the local knowledge system of farmers. Traditional knowledge is mainly obtained from stories, observations and direct experience by the farmers. The pattern of transfer and dissemination of knowledge in the knowledge system consists of direct face-to-face interactions and indirect interactions.

The way knowledge is spread and exchanged in local knowledge systems seems to start to shift. In the beginning, the majority was in the form of reproduction and transfer of family-based knowledge and other social interactions among local communities, and now there has been a shift towards a wider network of interactions with farmers and other parties outside the local community. Although parents and families are the main sources of knowledge, there are internal and external environments of the farmer community that became a reference in raising livestock. However, the encouragement of local knowledge development is mostly introduced by local communities. The pattern of knowledge dissemination and diffusion is horizontal, that is, from the farmer to the farmer themselves. Conversational media through personal and group contacts become an effective platform for sharing knowledge.

In relation to the supply of knowledge and information that characterizes the local livestock knowledge system, the role of the previous generation as a source of knowledge occupies an important position. In this case there are cultural factors that enrich the existing local knowledge system. The method of creating and applying local knowledge is participatory, communal, based on experience and reflects the local area [10]. This local innovation system refers to new initiatives and innovation processes of local communities (groups or individuals), which seeks to overcome poverty and environmental problems including establishing technical, institutional, marketing or innovation management interactions with local communities [11]. The premise of globalization brings many subsistence societies that combine modern technology with their traditional practices [12]. In Kaligesing, contribution of exogenous knowledge factors from outside the farmers’ community and supported by advances in information and communication technology so as to enrich the dynamics of the local knowledge system from the aspect of knowledge content, exchange and dissemination as well as its application, the local livestock knowledge system can be described as follows:
Table 2. The system elements of the PE goat local knowledge

| Elements                      | Aspects                                                                 |
|-------------------------------|-------------------------------------------------------------------------|
| Forms of knowledge            | Livestock production (reproductive management, feed management,         |
| Indigenous                    | livestock raising)                                                      |
| Traditional                   | Tradition and local beliefs                                            |
| Scientific                    | Marketing                                                               |
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| Indigenous                    | livestock raising)                                                      |
| Traditional                   | Tradition and local beliefs                                            |
| Scientific                    | Marketing                                                               |
| The process of creating       | Unknown                                                                 |
| knowledge                     | Observation and experience                                             |
|                               | Farmers’ experiment                                                    |
|                               | Modification and integration of existing knowledge                     |
| Source of knowledge           | Parents                                                                 |
|                               | Farmers                                                                 |
|                               | Government                                                              |
|                               | Social media and mass media                                            |
|                               | The other sources                                                       |
| The process of sharing and    | Interpersonal channels (individual or communal)                         |
| dissemination of knowledge    | Modern communication media                                             |
|                               | Combination of interpersonal channels and modern media                  |

Source: interview analysis

4. Conclusion and suggestion
The local knowledge system of PE goat farming consists of elements of indigenous, traditional and scientific knowledge which are jointly accessed, managed and utilized by farmers in the form of technical knowledge and trust. Local knowledge plays a role and is applied by farmers in livestock management (aspects of breed selection, housing, livestock raising) and marketing. Sources of knowledge came from farmers, the government, and other sources of knowledge such as internet-based media which are determined through traditional and modern media. Efforts to develop the potential for innovation by local farmers can be increased through the support of various farmers’ experiments to build on existing practices. Support can be done through: (1) knowledge documentation as information that can be stored and reused more widely by farmers; (2) identifying and discussing relevant topics on livestock and adding them as a variety of experimental options that can be carried out by farmers; (3) social organizing considering that innovation is not only technical in nature but often also requires organizing arrangements; (4) reducing risk and providing resource support for farmers to conduct experiments; (5) developing coordination and interaction with formal research institutions so that they can enrich and complement each other between the results of experiments in livestock business areas and experiments in formal research facilities, the results of which can often be different.

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