Carrying Capacity of Human Resources in Increasing Livestock Productivity in Wagir District, Malang Regency, East Java in the Development of Sheep and Goat Center

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Abstract. Sheep and goat farming is one of the leading livestock products in Malang Regency. This goat and sheep farming business is a livestock business carried out by breeders in 12 villages in Wagir District, Malang Regency as the main supporters of initiating a goat and sheep center. The development of sheep and goat centre is one of the activities in the Program of Development of Regional Competitive Products. Human resources, namely farmers, are one of the determinants of the success of a farm. Therefore, it is necessary to know the carrying capacity of human resources, especially livestock breeders in Wagir District, in order to support the realization of a goat and sheep center. The purposes of this article were to discuss the potencies and constraints of human resources, and to find out a strategy to improving goat and sheep farming human resources in Wagir District, Malang Regency in developing a sheep and goat center. A participatory approach with the concept of learning in the community was applied in exploring potencies, problems and solutions in developing a sheep and goat center by involving key figures from Wagir District. Meanwhile, the method applied in this program is a participatory community empowerment method by adopting Dharmotharan's 7D model. Wagir District is worthy of being developed into a center for goats and sheep in Malang with the potential of its human resources. One of the strategies for developing the Malang goat and sheep center in Wagir District is through optimizing human resources.

Keywords: Livestock, Human resources, Sheep and goat farming, breeders, Carrying capacity of human resources.

1   Introduction

The potencies for sheep and goat farming and the level of animal protein consumption from goats and sheep are very high in Indonesia, and sheep and goat farming can be done by the people because it does not require a large area of farming land, production and harvest are relatively faster than cows/buffalo, and production costs are relatively lower. East Java Province is one of the provinces in Indonesia that is a mainstay supplier of ruminant livestock meat, especially beef cattle, goats and sheep. The development of the ruminant livestock population has increased significantly each year in the 2016-2020 period [1] was presented in Fig. 1.
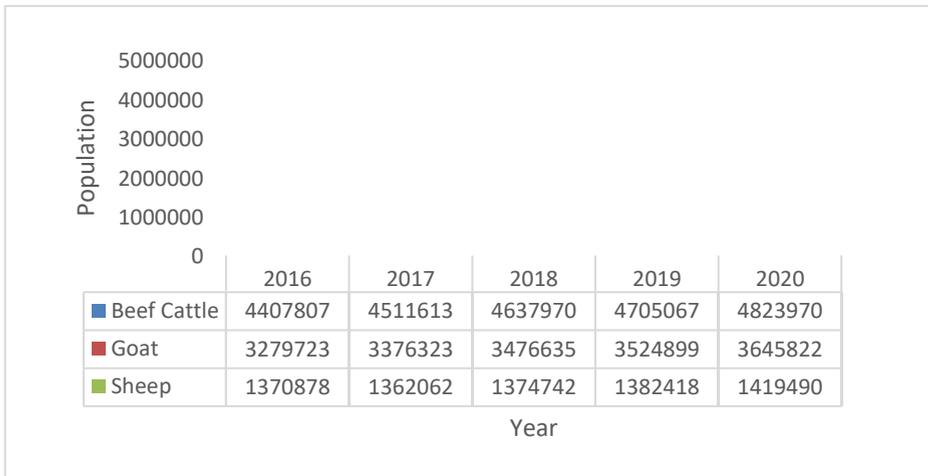
	2016	2017	2018	2019	2020
■ Beef Cattle	4407807	4511613	4637970	4705067	4823970
■ Goat	3279723	3376323	3476635	3524899	3645822
■ Sheep	1370878	1362062	1374742	1382418	1419490

Fig. 1. Development of Livestock Population in East Java 2016-2020 Period.

Meanwhile, based on [2], the development of the beef cattle, goats and sheep population is presented in Fig. 2., which shows a very rapid growth in the goat and sheep population per year. In 2019 the goat and sheep population increased sharply in Malang Regency, and so on is predicted in the following years considering the large potency of livestock resources for these two types of livestock in Malang Regency.

	2017	2018	2019
■ Beef Cattle	234481	234761	238282
■ Goat	33776	34294	261546
■ Sheep	13581	13914	34421

Population / Year — values on vertical axis: 0, 50000, 100000, 150000, 200000, 250000, 300000

Fig. 2. Goat and Sheep Population Growth in Malang Regency.

Goats and sheep are one of the superior products of Malang Regency which are also found in Wagir District. This is stated in the regional medium-term development plan of Malang Regency for 2021-2026 [3]. Wagir District is one of the districts in the Regency with a high goat and sheep population. The goat population in Wagir District is 4,113, while the sheep population is 2,661 across 12 villages [4].

Sheep and goat farming is one of the superior livestock products of Malang Regency. This goat and sheep farming business is a livestock business carried out by farmers in 12 villages in Wagir District, Malang Regency as the main supporter of the initiating of goat and sheep center [5]. The development of sheep and goat center is one of the activities in the Program of Development of Regional Competitive Products. Human resources, namely farmers, are one of the determinants of the success of a farm. Therefore, it is necessary to know how the carrying capacity of human resources, especially livestock breeders in Wagir District, is in order to support the realization of a goat and sheep center. The purpose of this article is to discuss the potential and constraints of human resources (HR) in Wagir District, Malang Regency in developing a goat and sheep center.

2   Materials and Methods

The service activities were carried out in Wagir District, Malang Regency, East Java from June 2023 to 2024. The total numbers of activity participants were 48 people consisting of 36 breeders selected randomly from 319 breeders and 12 village officials from 12 villages in Wagir District. Each village was represented by 3 breeders assigned by each Village Head. The data were processed and combined from samples that represented the population [6–8].

A participatory action and learning system approach [9] was conducted with the concept of learning in society (10) consisting of: (1) devotees and the community (120 livestock breeders from 10 villages in Wagir District, Malang Regency, where each village is represented by 10 livestock breeders) who both play a role as learners, (2) with various levels of learning to know, to do, to be, to live together and to live sustainably, (3) with the principles of lifelong learning, (4) which is community-centered, (5) which creatively develops social cohesion, spiritual, cultural and ecological harmony, (6) which is oriented towards providing added value, (7) which does in continuous and sustainable improvement efforts, and (8) which aims to advance welfare and improve life [9,10]. The stages of activities carried out adopt the 7D community empowerment model according to Dhamotharan (2009) which was also conveyed by Karyasa [9, 10] , namely: (1) developing relations, at this stage the devotee team with the village head and key figures of Wagir District builds reationships for mutual trust, (2) discovering capacities, at this stage the community service team together with the community tries to recognize and to realize the potential of natural resources in Wagir District along with its problems, (3) dreaming of community future, at this stage the community is encouraged to express the ideals of the livestock community, namely a creative picture of a positive future, especially the hope of progress as a result of the solutions implemented, (4) directions of community actions, at this stage the community sets clear goals for community activities, (5) designing community actions, at this stage the community designs actions as a plan with a clear and logical structure, (6) delivering planned activities, the community implements the plan that has been prepared by organizing internal and external inputs so that the activities that have been designed can be implemented successfully, and (7) documenting outputs, outcomes and learning, the community reflects on the process and results that have been achieved.

3   Results and Discussion

3.1   Factors Motivating Farmers to Raise Goats/Sheep

The driving factors motivating farmers to raise goats/sheep are presented in Fig. 3., where the main motivation for raising goats/sheep is apparently as a side job alongside their main job (52.5%), while the motive for doing it as their main livelihood/entrepreneur is still low, which is only 17.5%, smaller than the hobby motive (30%). Certainly, the sustainability of semi-intensive and intensive production systems poses new challenges for the economy, animal health and welfare, and environmental impacts, which have a dynamic relationship that allows for high-yielding sheep and goat management. Small ruminant production has a significant socio-economic and environmental role worldwide. Therefore, the most relevant aspects of nutrition, reproduction and health management, the three pillars of herd efficiency, production and sustainability related to production intensification in sheep and goats need more attention [11]. Based on the research results of Rasyid [12], it shows that the motivation of farmers to raise goats consists of: (1) economic value; (2) demand; and (3) the role of government. Goats are one of the livestock commodities that make a significant contribution to increasing community income. In addition to the economic benefits obtained, goat farming also

has its own advantages. Raising goats does not require a lot of capital. In fact, it only requires a fairly simple maintenance system and goats are resistant to disease compared to other livestock commodities such as cattle and broiler chickens. This is the reason behind the many people who are motivated to start a goat farming business to increase their family income. Farmer experiences, constraints and preferences can be incorporated into development approaches to ensure management system changes reflect smallholder farmers' expectations [13].

Fig. 3. Factors Motivating Farmers to Raise Goats or Sheep.

3.2   Maximum Number of Livestock that Farmers Are Willing to Raise

Based on the potencies and capabilities of the farmers, the maximum number of goats or sheep that farmers are willing to raise is approximately 24 based on the calculation of the midpoint of the graph shown in Fig. 4. Explanation of the phenomena is that lamb meat consumption ranks fourth after pork, poultry and beef. Moreover, global demand for small ruminant products continues to increase and to meet this demand requires scientific, educational and practitioner infrastructure. This is largely achieved through the organization of producer associations, access to technical services and the establishment of rules and policies to increase profitable small ruminant production and reduce barriers. The results of Mazinani's (2020) [14] research highlight the role of financing and social support for small ruminant farmers, especially goats, to develop appropriate technology, formulate policies through eradicating obstacles to increase productivity and improve livelihoods as a powerful instrument. The total number of sheep per household in India is 25.67 and 27 in small, medium and large flock sizes respectively with an overall average of 71 sheep per farm [15].
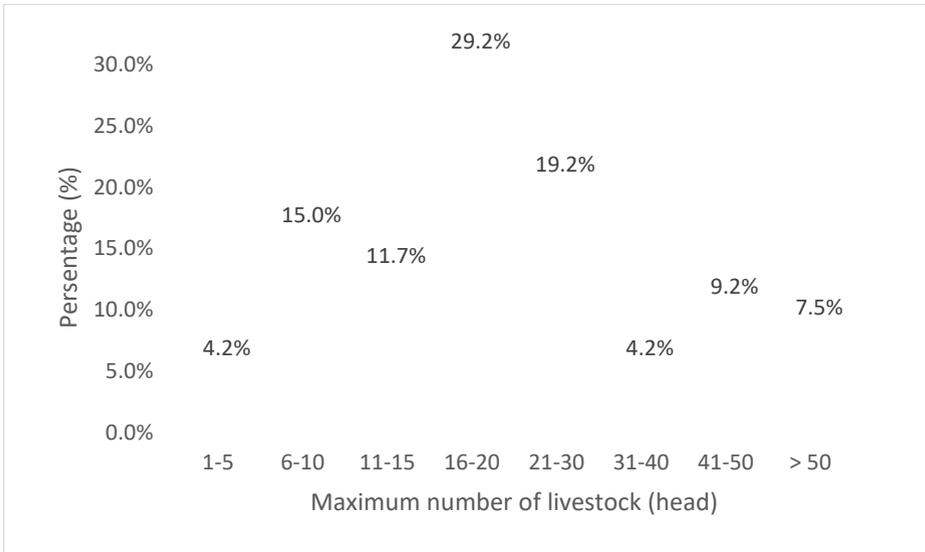
Fig. 4. Maximum Number of Livestock that Farmers Willing to Raise.

3.3   Level of Knowledge Mastery of Goat and Sheep Farming

According to the farmers' self-assessment, the level of knowledge mastery of livestock farming from upstream to downstream for goats is quite adequate (69.2%), only 21.7% stated that they had adequate to very adequate knowledge of goat and sheep farming, and around 9.2% of farmers had not mastered adequate knowledge of goat farming as shown in Fig. 5. A farmer-oriented training program needs to first assess their needs, interests and convenience. There are various needs of farmers in relation to goat farming such as training needs on feeding, breeding, housing, health care, marketing, product preparation, care and management of newborn calves, etc. Information needs related to health care and animal feeding aspects dominate the other needs. Training programs can be organized according to the convenience of farmers, which will definitely help them in better livestock management. A series of activities from training needs analysis, planning, implementation, follow-up of training activities can bring some desired changes at the target level [16, 17].
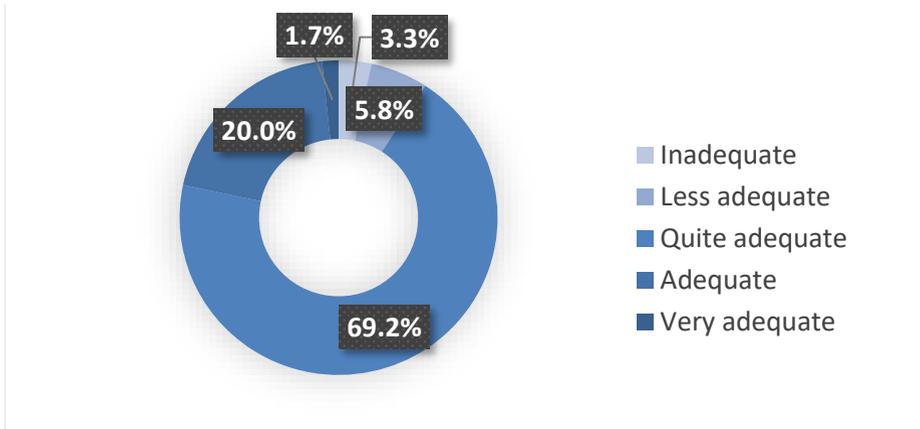
Fig. 5. Level of Knowledge Mastery of Goat Farming.

According to the farmers' self-assessment, the level of knowledge mastery of sheep farming from upstream to downstream is described in Fig. 6., where farmers in general have not mastered the knowledge of sheep farming adequately with a percentage of 66.7%. This means the importance of increasing the knowledge of farmers related to sheep farming. Training programs have an impact in terms of knowledge acquisition and adaptation to scientific practices of sheep and goat husbandry. In the future, the livestock sector must meet the high demand for meat and other products in local, national and international markets. This requires the dissemination of scientific and up-to-date technologies to sheep and goat farmers. In this aspect, training plays an important role and it is recommended to organize more training programs to improve the skills and knowledge of farmers [16, 17]. Training plays a very important role and it is recommended that strengthening of extension workers and training systems should be done to implement more training programs to enrich the knowledge of farmers, which in turn leads to the adoption of scientific maintenance practices [18].
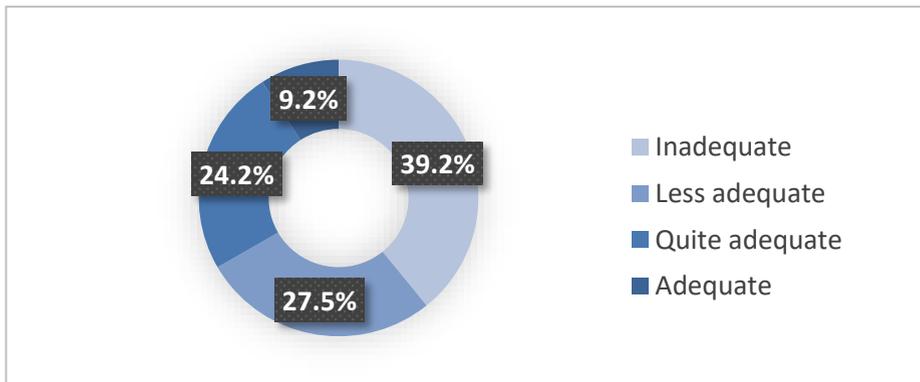

Fig. 6. Level of Mastery of Sheep Farming Knowledge.

3.4   How to Acquire Farmers Knowledge of Goat and Sheep Farming

The results of the survey related to how to acquire knowledge of goat and sheep farming from upstream and downstream by farmers who already have an adequate or very adequate level of mastery are described in Fig. 7., where self-study has the largest portion. Based on the results of Sangameswaran's (2022) research, the level of training needs of respondents was calculated based on the training needs index. It was found that the training needs most felt by respondents were goat herding management (84.17), goat purchasing (86.67), the importance of deworming goats (88.33), goat sales and marketing (87.50) and diseases that attack kid goats (90.00). Therefore, periodic needs-based training programs must be offered to update farmers' knowledge about technology to address the knowledge gaps that exist among goat farmers [19].
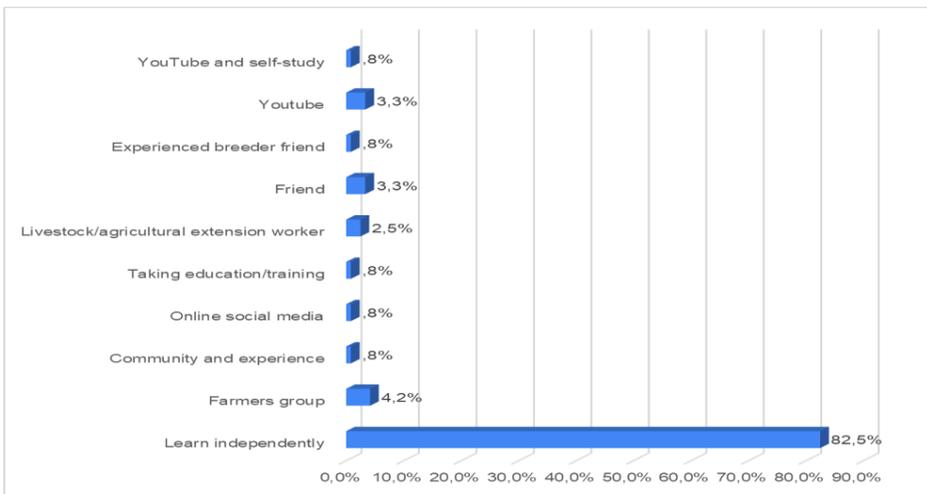

Fig. 7. How to Acquire Knowledge of Goat and Sheep Farming from Upstream to Downstream.

3.5   Level of Mastery of Goat and Sheep Farming Skills

Based on the survey results, goat and sheep farming skills from upstream to downstream mastered by goat/sheep farmers in 12 villages in the Wagir District area are still lacking as shown in Fig. 8. Therefore, training is needed to improve technological knowledge in sheep and goat husbandry [16, 20]. The need to improve the knowledge and skills of livestock farmers in managing goat and sheep farming is very necessary as an effort to increase livestock productivity [19].
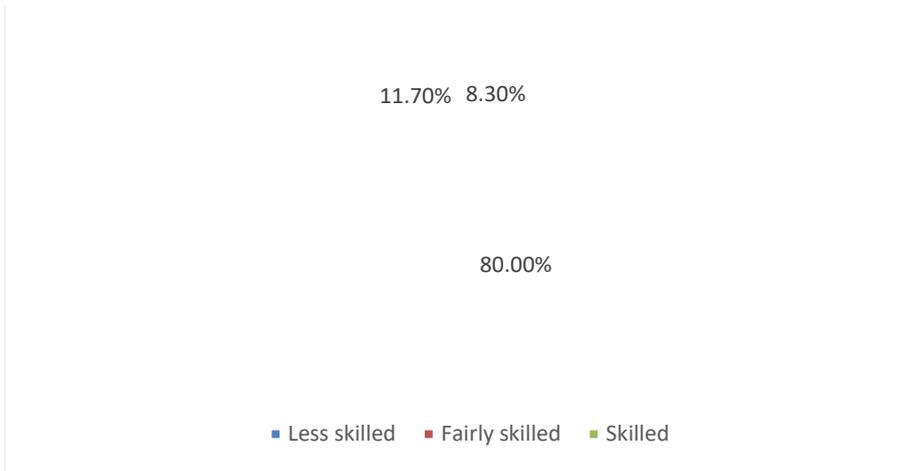
11.70%   8.30%

80.00%

■ Less skilled   ■ Fairly skilled   ■ Skilled

Fig. 8. Level of Mastery of Goat and Sheep Farming Skills.

3.6   Farmers' Participation in Extension, Education and Training

The participation of farmers so far in participating in extension, education, training, mentoring and similar activities to improve livestock knowledge is still low. This is reflected in the survey results where 47.5% of farmer respondents stated that they had never attended extension, education and livestock training events as shown in Fig. 9. The results of the Suvedi's study [21] showed that training participation was influenced by socio-economic variables – age, education, number of household members, and distance to the extension office. Distance to training limited participation in extension and adoption activities, respectively, and education, number of household members, and group membership stimulated their participation in training program.
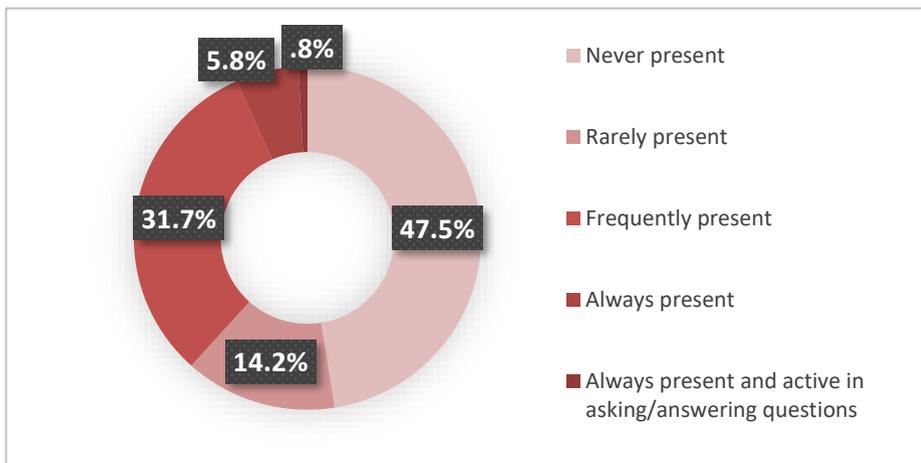

5.8%   .8%

31.7%

47.5%

14.2%

■ Never present

■ Rarely present

■ Frequently present

■ Always present

■ Always present and active in asking/answering questions

Fig. 9. Farmers' Participation in Extension, Education and Training.

3.7   Participation in Farmers' Groups

So far, the participation of farmers in participating in farmer group activities is still relatively low. This is reflected in the survey results where 86.7% of livestock respondents stated that they had never joined a group as shown in Fig. 10. The results of the Saini study [22] indicate that the Participatory Extension Approach (PEA) has emerged as a promising approach to agricultural extension that prioritizes the active participation and empowerment of farmers in the development process. Challenges, including resistance to change, limited resources, power dynamics, lack of institutional support, and inadequate monitoring and evaluation hamper the implementation of PEA. However, with effective communication, capacity building, and an enabling policy environment, PEA has the potential to promote sustainable agriculture and rural development.
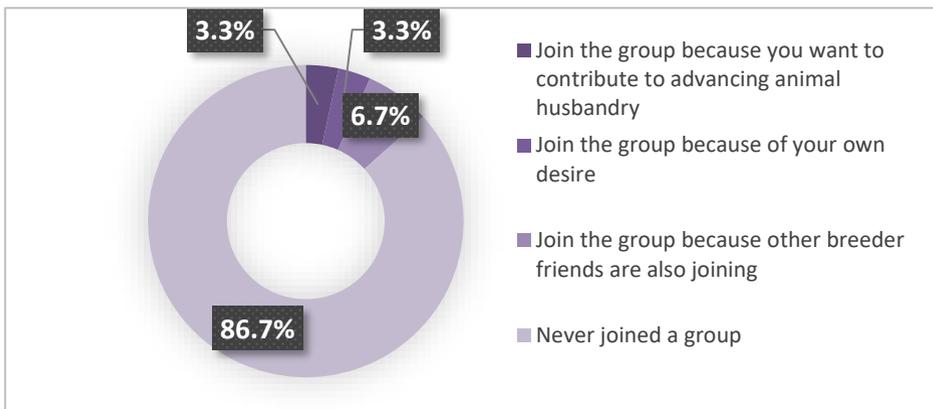

Fig. 10. Participation of Livestock Farmers in Livestock Groups.

3.8   Farmers' Responses to The Development of Livestock Science and Technology

Farmers' response to the development of livestock science and technology is quite good. This is supported by the survey results where 57.5% of farmers stated that the development of livestock science and technology is quite important to follow and requires various information or knowledge, while only 6.6% of farmers stated that it was less or even unimportant, conversely 18.3% stated that it was important and 17.5% stated that it was very important (Fig. 11.). The development of livestock production technologies has made a significant contribution to the economies of developing countries, especially in providing important commodities, such as milk and meat with high production value. In developing countries, rural households raise livestock as a liquid asset and source of income, ensuring nutrition and access to credit, with cascading implications for their social status through education and health care. Developing systems at a good pace requires sophisticated analytical frameworks that allow for integrated assessment of social, economic, environmental and climate interactions within and across regions [23]. Stakeholders, including researchers, policy makers, and funders, need to prioritize

ethical considerations associated with the implementation of livestock technology developments [24].
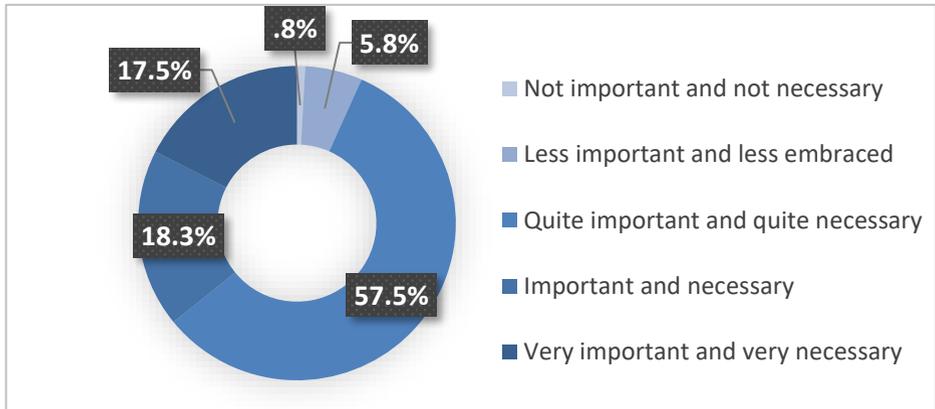

Fig. 11. Farmers' Response to the Development of Livestock Science and Technology.

3.9   Contribution of Livestock Results to Family Income

Raising goats or sheep contributes significantly to family income. The survey results show that the contribution of livestock farming activities is quite significant (31-50% of family income) as stated 71.7% of livestock farmers who were respondents to this survey as shown in Fig. 12. Meanwhile, 18.3% stated that it contributed 51-80% of family income and 4.2% stated that it contributed 81-100% of family income. Livestock plays a vital role in rural livelihoods and the economies of developing countries. Livestock provides income and employment for producers and others working in sometimes complex value chains [25]. The results of a review presented by Banda [26] show that 68% of households throughout the developing world earn income from livestock.
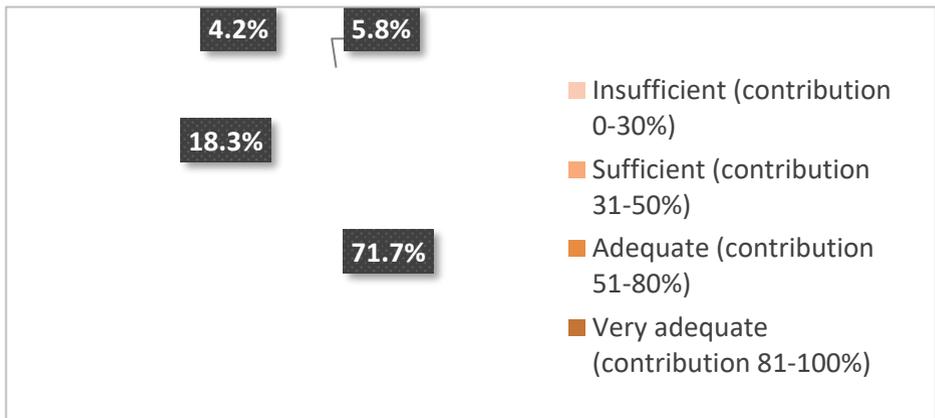

Fig. 12. Contribution of Livestock Results to Family Income.

3.10   Results of SWOT Analysis of Livestock Human Resources

Results of SWOT analysis of livestock human resources include:
1) Strengths
   a. The population of goat and sheep farmers in Wagir District is 419 people, currently on average raising 11-12 goats/person with interest, willingness and facilities for cages have the prospect of raising 24 goats per person.
   b. Their potency as learning farmers dues to their habits of learning on their own, assisted by YouTube, and farmer friends and farmer groups.
2) Weaknesses
   a. Participation in education and training and group activities is still low
   b. Knowledge and skills in livestock farming from upstream to downstream still need to be improved.
   c. Motivation for livestock farming as a source of life or a way of life still needs to be improved.
3) Opportunities
   a. Various useful information and knowledge and technology related to livestock competency are available on YouTube and social media.
   b. Training assistance, livestock certification by the government and the business world of the related industry.
   c. Livestock community to increase motivation and competence.
4) Threats
   a. Increasingly tempting job offers for changing professions,
   b. Competition between large livestock companies and free markets that can threaten the lives of local livestock farmers and community-based livestock center.

According to SWOT analysis results, it can be purposed a strategy in improving the livestock human resources consisting a plan to empower the learning habits of farmers in increasing their goats and sheep farming knowledge and skills by facilitating them with online and self-regulated learning infrastructures, and increasing their participation in goats and sheep farming knowledge and skills learning and training programs in their farmer groups. Furthermore, the plan should be executed, evaluated and reflected together among farmers, academicians, NGO's parties and related officials in terms of four-helix partnership. Thus, because of goats and sheep farming human resources are one of the key success in developing Wagir District of Malang Regency as a goat and sheep center, the strategy should be socialized though out all stakeholders getting involved in.

4   Conclusion

Based on the results of this study, it can be concluded that Wagir District is worthy of being developed into a goat and sheep center in Malang with the potential of human resources, and livestock traditions with the ability of independent learning of farmers. Consequently, a strategy for developing a goat and sheep center in Malang in Wagir District through optimizing local human resources should be supported by a strategy

for increasing the capacity of knowledge and skills in raising goats and sheep from upstream to downstream. The work program that can be proposed in the strategic plan for developing Wagir, a goat and sheep center in Malang, is the program (a) of highly literate and skilled livestock human resources; (b) modernizing goat and sheep farming by optimizing livestock resources based on local wisdom; and (c) entrepreneurship for independent and community-based farmers.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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