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Interrelated model of farmer behaviour and agricultural resources in the development of ginger agribusiness at the on-farm level

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Abstract. Ginger agribusiness has business prospects that can increase farmers' income, open employment opportunities and reduce poverty. The problem in the development of ginger agribusiness is the absence of studies on farmer behaviour at the on-farm level and its interaction with agricultural resources. For this reason, it is necessary to map the behaviour of farmers in cultivation, yield processing and marketing of ginger, and interrelate the behaviour of farmers with agricultural resources in ginger agribusiness. Mapping behaviour of farmers includes knowledge, attitudes, and skills in cultivation, processing, and marketing. In the next stage, technology insemination and ginger agribusiness development models are needed. The results showed that the behaviour of ginger farmers at the on-farm level was in the medium and high category in six villages in Moramo Subdistrict. The potential of ginger farmers was the experience of ginger cultivation and interest in business development. Supporting factors of ginger agribusiness include land ownership, land suitability, and availability of ginger seeds. The constraints of ginger agribusiness development were weather changes and price fluctuations. The model of ginger agribusiness development needs to be directed at strengthening the capacity of farmers, partnerships and value-added products to increase the competitiveness of ginger.

1. Background

Ginger cultivation currently has bright business prospects. In addition to the herbal medicine industry, ginger is also much needed for cosmetic ingredients, drinks, food, and others. Historically, ginger has a long tradition of being very effective in alleviating symptoms of gastrointestinal distress. In herbal medicine, ginger is regarded as an excellent *carminative* (a substance which promotes the elimination of intestinal gas) and *intestinal spasmolytic* (a substance which relaxes and soothes the intestinal tract). Modern scientific research has revealed that ginger possesses numerous therapeutic properties including antioxidant effects, an ability to inhibit the formation of inflammatory compounds, and direct anti-inflammatory effects [1].



Ginger prospects are quite bright because of the many benefits of ginger and the high demand, but it cannot be separated from the problems at the on-farm level. Ginger production for 2016 tends to stagnate at 150,000-170,000 tons. Meanwhile, the trend of ginger production actually began to rise since 2013, but it declined again in 2014 and had remained relatively stable [2].

In addition to production problems, there are other faced by ginger farmers, namely that the ginger quality requirements have not been met by the industry. It is also found in Southeast Sulawesi, especially in the ginger centre which is in Moramo Subdistrict, South Konawe District. Thus, optimal income has not been achieved by ginger farmers. Therefore, cultivation technology that can increase productivity, distributors, and the ginger processing industry is needed. Mutual benefit cooperation between farmers and the ginger processing industry is very important so that all the production of ginger farmers can be absorbed. The key to the application of cultivation technology, yield processing, and ginger marketing is the behaviour of farmers as the main actors of agribusiness and agricultural resources at the on-farm level.

Human behaviour is formed from the results of interactions between individual internal situations and the environment. The results of these interactions are supported by goals and confidence (goals to be achieved and self-confidence) that each individual has to produce behaviours that can be observed and shown relating to the object or certain activities. The goals and confidence are supported by environmental factors, the process of adaptation and interaction and social engineering in the form of formal and formal education [3-4].

Thus, understanding of the farmer's behaviour must always be linked to the environmental contexts in which certain behaviours are displayed. Thus, the study of the farmer's behaviour and ginger agribusiness at the on-farm level was very important to be used as a basis for the development of ginger agribusiness, especially in Southeast Sulawesi.

Based on the description above, the purposes of this study were:

1. Mapping farmer's behaviour [level of knowledge, attitude, and skills] in ginger cultivation.
2. Mapping the performance of ginger agribusiness at the on-farm level.
3. Analysing the potential agricultural resource and constraints of ginger agribusiness development at the on-farm level.
4. Arranging interrelated models of farmer behaviour and agricultural resources in ginger agribusiness development.

2. Materials and methods

This research was carried out in Moramo Subdistrict, Konawe Selatan District. Determination of location was done purposively. It was based on the consideration that the location was a centre of ginger which its marketing reaches inter islands but without value-added processing of ginger and productivity fluctuating.

The population of this study was all ginger farmers in Moramo Subdistrict, South Konawe District, with a total of 144 people who were divided into 7 groups. Sampling was carried out in a randomized by 40%. The total number of samples was 58 people.

The data analysis used was quantitative descriptive, as follows:

- The behaviour of farmers in ginger agribusiness and its mapping was analysed using the scoring method based on guidelines on cultivation techniques, yield processing, and ginger marketing. Furthermore, the scoring results were mapped based on the level of behaviour of the average values of each selected group of ginger farmers.
- Each component of the behaviour of farmers, potential support and constraints of ginger agribusiness development at the on-farm level, ginger agribusiness performance, as well as the preparation of farmer behaviour models and agricultural resources in ginger agribusiness development at the on-farm level, were also described with tables and pictures.

- Mapping of ginger agribusiness performance at the on-farm level was done by quantitative descriptive analysis based on the average value of each variable. Furthermore, the average value was mapped based on the group of farmers selected at each sample point.

3. Results and discussion

3.1. Mapping behaviour of ginger farmers

The component of the behaviour of ginger farmers includes the level of knowledge, attitudes, and skills in ginger cultivation at the on-farm level. The three components of the ginger farmer's behaviour have varying levels, from moderate to high levels among the six study sites (the Village of Bisikori, Summersari, Ulusena, Pudaria Jaya, and Wonua Jaya) in Moramo Subdistrict, Konawe Selatan District. It could be clearly seen in Table 1.

Table 1. Mapping behaviour of ginger farmers (level of knowledge, attitude, and skills) in cultivation and development of ginger agribusiness in Moramo Subdistrict, South Konawe District

Behavioural Component of Ginger Farmer	Village					
	Bisikori	Sumber Sari	Ulusena	Pudaria Jaya	Pudaria	Wonua Jaya
Farmer's knowledge of ginger cultivation	moderate	high	high	moderate	low	low
Farmer's skills of farmers in ginger cultivation	moderate	high	high	moderate	low	low
Farmers' attitude towards the development of ginger agribusiness	positive	positive	positive	positive	neutral	neutral

Table 1 showed that farmers with high levels of knowledge and skills were found in the Village of Sumber Sari and Ulusena. It was because farmers have a positive attitude towards ginger agribusiness development. A positive attitude was indicated by high motivation in accepting and adopting knowledge, and new skills in the development of ginger agribusiness. Some farmers who also have a positive attitude but were at a moderate level of knowledge and skills, namely in the Village of Bisikori and Pudaria Jaya. It was caused by a weak positive attitude. Meanwhile, farmers with a neutral attitude tend to be at a low level of knowledge and skills in ginger cultivation, namely in the Villages of Pudaria and Wonua Jaya.

Knowledge is a collection of experiences about objects through the selection process, organization, and interpretation of stimuli that come from the environment. The results of research on knowledge by [5-8] concluded that knowledge or observation of an object influences behaviour. In relation to farmer behaviour, knowledge of agricultural objects (including types of crops, growing requirements, and the needs of production factors) and management will shape behaviour in agriculture.

According to [9] that attitude is the tendency to behave or act against objects, ideas, situations or values. In connection with the attitude that is the tendency to behave in the concept of willingness to change (readiness to change) explained that it often happens that some people are very quick to accept innovation or change (change behaviour), but some others are very slow to accept innovation or the change. It is because everyone in a society has the readiness to change that is different despite the same conditions. It is consistent with the results of the study [10-11] so they suggest that strategies for knowledge transfer should then be tailored to the specific technology and audience.

Skill is the ability to do a psychomotor activity that supports the realization of behaviour. Skills are one of the important aspects of behaviour because, without skill, the knowledge and attitude possessed by a person will not be realized with good results. It is consistent with Ahmad's research, [12] that technical skills as the key to success.

Knowledge, attitudes and skills obtained by individuals from the education process (formal and informal) through access to information. Environmental factors have great power in determining behaviour, sometimes even greater strength than individual characteristics.

In ginger agribusiness, farmer behaviour was reflected in varieties and ginger cultivation techniques, management of production facilities, yield processing, and marketing that were influenced by the environment. Therefore, the behaviour of farmers in ginger agribusiness was influenced by physical environmental factors and reinforced by individual decisions of farmers. Physical environmental factors were conditions outside that influenced the behaviour and decision-making of ginger farmers in the development of ginger agribusiness. It could be in the form of support and intervention from local governments, universities, and the private sector. It was in accordance with the research results [13] that possible interventions that supply authorities and supply chain leaders might implement to stimulate farmers' sustainable behaviours. The importance of environmental factors for agricultural human resources was also stated by [14] that it was very important that environmental factors be considered in empowering farmers where empowerment models were based on interaction with the environment could increase the farmer's income, ensuring the social value and sustainability of the area function

3.2. Ginger agribusiness performance

The average area of ginger plantations in Moramo Subdistrict ranges from 0.5 ha to 3 ha for each farmer. The cropping pattern used was monoculture and polyculture. Ginger productivity was an average of 10 times the number of seeds, namely ginger seeds as much as 1 ton per hectare with yields of 10 tons per ha. Ginger agribusiness performance in Moramo Subdistrict could be seen in Table 2.

Table 2. Ginger agribusiness performance in Moramo Subdistrict, South Konawe District

Ginger Agribusiness Performance	Village					
	Bisikori	Sumber Sari	Ulusena	Pudaria Jaya	Pudaria	Wonua Jaya
Number of Ginger Farmers	80	150	127	230	150	150
Number of Ginger Farmers Group	4	12	5	5	5	5
Ginger Farm Area (Ha)	70	50	75	60	30	100
Ginger Varieties	Ganyong+	Ganyong = Gajah	Gajah+	Ganyong = Gajah	Ganyong+	Gajah+
Cropping Pattern	Mono = Poly	Mono = Poly	Mono = Poly	Mono-culture	Poly-culture	Poly-culture+
Ginger Productivity (Ton/Ha)	2	2	6	6	3	1
Production Trend	increased	increased	decreased	constant	constant	decreased

From the results of the study, it was found that the production facilities is a very important factor in helping smooth ginger farming. Production facilities (especially seeds) could be obtained by farmers from their respective fields or obtained from farmers in neighboring villages. The amount of production costs for ginger farming was \$ 2,086.06, profit of \$ 2,248.97 and the feasibility value was 1.078 which indicated that ginger farming was profitable. Some research results also showed that ginger farming always shows favorable conditions, including [15] that the R/C ratio of ginger farming in Ampel Subdistrict, Boyolali District is 1.82 [16] that the B/C ratio of white ginger farming in Sumedang District amounted to 1.70 [17] that the R/C ratio of white ginger farming in Sempaja Village, North Samarinda Subdistrict, Samarinda City was 1.57.

However, from a period of six years (2011-2017), there were quite sharp price fluctuations, ranging from \$ 0.20 - \$ 1.36. At the time of data collection in August 2017 (before Eid Al-Fitr) the price of

ginger was between \$ 1.02 - \$ 2.38, but two months later when the Focus Group Discussion (FGD) was conducted, the price of ginger ranged from \$ 4.08 - \$ 4.42. Price of \$ 4.42 was reached in 2016.

3.3. *Agricultural resource potential at the on-farm level*

The potential of agricultural resources at the on-farm level could be seen in terms of capital availability, cultivation technology, and availability of quality seeds. Capital availability in ginger agribusiness development was quite good. It was because the dominant capital used in ginger agribusiness at the on-farm level was capital intensive (not money), both in terms of supply, plant maintenance, and labour. It was a very good potential because the maintenance of mutual cooperation among ginger farmers can make farming costs more efficient. Meanwhile, capital in the form of money used by ginger farmers, most of which come from their own capital. Nevertheless, the availability of money capital needs to be increased through the help of government and non-government financial institutions for the purpose of ginger agribusiness development. As many as 86% of respondents stated that their capital was insufficient for the needs of farming costs, especially for the provision of production facilities and labour costs ranging from labour wages to land processing, maintenance to post-harvest.

Cultivation Technology. Generally, the ginger farmers still use simple cultivation technology. It caused low productivity of ginger. Soil processing carried out by farmers is still simple and has not been carried out in accordance with the principles of good and right soil treatment. Besides that, the use of seeds, fertilization, control of disturbing organisms, maintenance of plants was not in accordance with the timeliness, dosage, or type. The productivity gap between field conditions among the farmer and the potential productivity was an indication that the use of cultivation technology was still weak. This condition is a potential for socialization and assistance in the implementation of optimal production technology because of the simplicity of production technology currently applied by ginger farmers. Through the application of technology and intensive handling efforts supported by the adequacy of optimal production facilities, the quality and quantity of product output are expected to be able to be increased to near optimal product capacity.

In the development of ginger agribusiness, one of the limiting factors in efforts to increase production was the availability of quality seeds from superior varieties. The unavailability of seeds with varieties that the market wants in an adequate amount, time and price was very influential in its development. Until now there has been no superior variety of medicinal plants released by the Minister of Agriculture so that the reference for determining quality seeds cannot be determined [18].

Some of the problems faced in the supply of quality seeds of ginger include:

- a. Supply of seed sources of medicinal plants produced by the Research Institute has not met the needs, both in quantity, type and time and continuity of supply.
- b. The low level of productivity, it was because farmers only cultivated ginger as a side business so that the handling was less intensive and the seeds used to come from careless seeds.
- c. There was no market guarantee.
- d. Flow distribution of ginger seed has not gone well. Farmers still buy consumption products to be used as seeds.
- e. There was no ginger seed management unit that processes and distributes quality seeds to the farmers.
- f. Horticulture Seed Centre has not been able to produce and market quality seeds, due to limited funds, skilled workers and facilities needed in the process of producing quality seeds.
- g. Most of the farmers were not used quality seeds because the selling place was unknown.
- h. The number of quality seed traders was very limited. Therefore, the supply of quality seeds of ginger plants was a challenge.
- i. The behaviour and habits of farmers in ginger cultivation and product processing were in a low category. It was suitable with the research by [19] that farmer's motivation in processing business were in low category, with the indicator is the motive of imitation, economic, security, affiliations, awards, and self-actualization.

- j. It was because agribusiness coverage is broad and complex, starting with the production process, processing to marketing agricultural products including supporting production processes, then agribusiness plays an important role. The decline in prices and the high production costs (high-cost economy) were due to several factors, including a pattern of production was non-group, inadequate economic facilities and infrastructure, patterns of agro-industry tend to be centralized in urban areas.

3.4. *Interrelation model of the behaviour of ginger farmers and agricultural resources in the development of ginger agribusiness*

Interrelation model of the behaviour of ginger farmers and agricultural resources in the development of ginger agribusiness was visualized as in Figure 1.

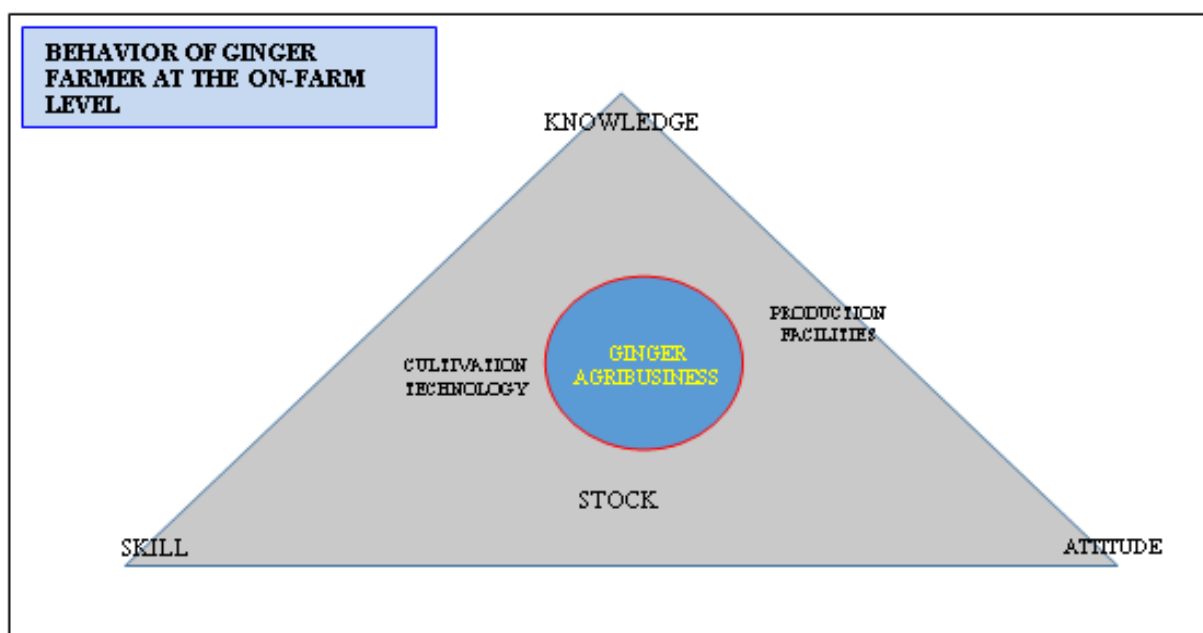


Figure 1. Interrelation model of the behaviour of ginger farmers and agricultural resources at the on-farm level

It could be seen in Figure 1 that ginger agribusiness development at the on-farm level was determined by the knowledge, attitudes, and skills of farmers in cultivation technology to the marketing with integration and dependence on the availability of agricultural production facilities, cultivation technology, and ownership and suitability of land, weather changes and market price fluctuations. Thus, to develop ginger agribusiness, it was necessary to optimize agricultural resources according to natural conditions and improve farmer behaviour.

Furthermore, it took the role of agribusiness development support institutions such as the government of South Konawe District, university, and cooperatives to develop ginger agribusiness in Moramo Subdistrict, South Konawe District. It could be explained that only a part of farmers feels the role of related institutions, especially in giving the opportunity to attend the ginger processed production exhibition. The role of the cooperative in the development of ginger agribusiness in Moramo Subdistrict cannot be felt by all sample farmers. The role of the University was felt for the first time as a form of reciprocal information channel for ginger farmers from the aspect of cultivation, marketing to the added value of ginger products. The role of the banking sector was also not yet felt by ginger farmers. Many farmers have not made capital loans because of their lack of understanding of credit schemes and procedures.

In agribusiness development efforts, a strategy that could be developed against ginger farming in Moramo Subdistrict, South Konawe District was to exploit potential land to take advantage of existing market opportunities, utilize farmer groups by utilizing collaboration and learning platforms to improve farmers' mastery of cultivation technology, utilizing manual transport means to transport ginger production from farming land until it reached the main road. In addition, ginger farmers also need assistance to overcome the low carrying capacity of the local market, improve ginger cultivation technology in order to overcome the changing and unpredictable weather changes.

4. Conclusions

Based on the results of the research and discussion, it could be concluded that the behaviour of ginger farmers at the on-farm level was in the moderate and high category in six villages in Moramo Subdistrict Konawe Selatan District. The performance of ginger agribusiness in Moramo Subdistrict, South Konawe District was shown by the average productivity of 5 tons per hectare, the price fluctuates between \$ 0.20 - \$ 1.36 and the yield processing activity (ginger juice, instant ginger, and ginger dodol) were in two villages. Moreover, the potential possessed by ginger farmers in Moramo Subdistrict was the experience of ginger farming which was sufficient and an interest in the development of ginger agribusiness. Supporting factors of ginger agribusiness development include land ownership, land suitability, and availability of ginger seeds. The problems of ginger agribusiness development were the program and government policies have not been focused on ginger agribusiness because it did not become superior commodities, as well as weather changes and price fluctuations. In addition, interrelation of the behaviour of ginger farmers and agricultural resources in ginger agribusiness at the on-farm level focused on the implementation of knowledge, attitudes, and skills in optimizing agricultural resources by optimizing the utilization of internal opportunities and anticipating weather fluctuations and the price of ginger products.

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