Exploration of the potential of upland rice agribusiness development in South Konawe District, Southeast Sulawesi

S A A Taridala¹, W G Abdullah¹*, M A Tuwo¹, A Bafadal¹, I Fausayana¹, I Salam¹, S Wahyuni² and Suaib³

¹Department of Agribusiness, Faculty of Agriculture, Universitas Halu Oleo, Kendari, Sulawesi Tenggara, Indonesia.
²Department of Food Technology, Faculty of Agriculture, Universitas Halu Oleo, Kendari, Sulawesi Tenggara, Indonesia.
³Department of Agrotechnology, Faculty of Agriculture, Universitas Halu Oleo, Kendari, Sulawesi Tenggara, Indonesia.

E-mail: *weka.gusmiarty_faperta@uho.ac.id

Abstract: Upland rice potential needs to be explored from various aspects so that it can really contribute to the increase in national rice production. Potential of upland rice apart from the potential aspects of resources availability also needs to be explored from the social and economic aspects that were studied in the concept of agribusiness. Potential in resource and social were being investigated by the qualitative method, while potential in economics was being investigated by the quantitative method, namely R/C ratio analysis. The results showed: (a) The resources potential in the form of land availability and an increase of upland rice productivity in South Konawe District. Upland rice also has the advantage of adaptation in various agroecology, soil types, and types of plants in intercropping systems; (b) The social potential in the form of farmers' knowledge and skills regarding upland rice cultivation which tends to the concept of organic farming, socio characteristics and social capital; (c) The economic potential in the form of higher prices for rice from upland rice than rice from lowland rice, limited market share, and high financial feasibility.

1. Background
Rice is still the most important food for most Indonesian people among other carbohydrate sources (corn, sago, tubers). It contributes to the high consumption of rice in Indonesia compared to other countries in the world. That is as stated by the Head of the Agency for the Assessment and Application of Technology (BPPT) that Indonesia's per capita rice consumption is among the highest in the world, when compared to China, Japan and Malaysia. In 2016, Indonesian rice consumption is 124 kg per capita per year, China 60 kg, Japan 50 kg, Korea 40 kg, Thailand and Malaysia 80 kg [1]. The amount of rice consumption per capita in the Indonesian population has even reached 150 kg per capita per year in 2017 [2]. It supported by Head of the Food Security Agency (BKP) of Ministry of Agriculture that said that rice still dominates the portion consumption up to 60% [3]. It means that the food security of Indonesian people is still identical with the adequacy of rice stocks as the main carbohydrate source.

So far, the mainstay of national rice production has focused on lowland rice. Dryland has not become the focus of alternative solutions for increasing national rice production. Indonesia has the potential of
dryland large enough to be developed as field rice. The upland rice harvested area in 2017 reached 1,155,729 ha or 7.3% of the total lowland rice harvested area in Indonesia [4].

Similarly, Southeast Sulawesi has the potential for dryland which can be optimized to support efforts to increase national rice production. The area of upland rice in Southeast Sulawesi covers 5,377 ha or 3.9% of the area of paddy fields. South Konawe District as the second largest rice centre area after Konawe District also needs to optimize rice production capability to support national independent food security in order to reduce dependence on imports.

The potential of field rice or known as upland rice needs to be explored from various aspects so that it can really contribute to the increase in national rice production. Potential upland rice aside from the potential aspects of resources availability also needs to be explored from the social aspects where humans and human relations play an important role in the existence and optimization of upland rice production and productivity. Besides the resources and social aspect, this study also analyses the economic aspects. Economic aspects need to be explored so that increased production and productivity, it can also have a positive impact on upland rice farmers, as well as to connect from upstream to downstream subsystems. It is in accordance with [5] that the resource, social, and economic aspects are important to be investigated to optimize the potential of commodities to be developed.

2. Materials and methods
The research was carried out in South Konawe District, Southeast Sulawesi and literature study. Qualitative and quantitative methods were used in this research. Potential in resource and social of upland rice were investigated by qualitative methods. It was described based on real conditions and data at the research location, supported by some literature and similar research results.

Potency in the economics of upland rice agribusiness was being investigated by the quantitative method, namely R/C ratio analysis. R/C ratio shows feasible or not of the upland rice farming. R/C ratio = \( \frac{R}{C} \); Where \( R \) is revenue ($/month), and \( C \) is total production cost ($/month). Total production cost contains fixed and variable cost. Upland rice farming is feasible if R/C ratio > 1, and it is not feasible if R/C ratio < 1. The result of R/C ratio will be compared with previous studies in order to obtain generalization about the economic feasibility of upland rice farming.

3. Results and discussion
Upland rice is rice that is grown in dryland farming without the presence of dike between rice fields. The source of water comes from the rainfall, also known as huma rice or field rice. Upland rice planting is directly dug, or in a run in the crop without a nursery.

Agribusiness exploration of upland rice is very important to support national food security accompanied by various follow-up benefits that can improve the quality of life of Indonesian people in general and South Konawe District, Southeast Sulawesi in particular. Upland rice agribusiness exploration is assessed from the resource, social and economic aspects.

Exploration of upland rice agribusiness is very important to support national food security accompanied by various follow-up benefits that can improve the quality of life of Indonesian people in general and South Konawe District (Konsel), in particular, Southeast Sulawesi. Exploration of upland rice agribusiness was examined from the aspect of resources, social, and economic.

3.1. Resources potential
The resources potential of upland rice agribusiness was described by the distribution of upland rice farming, the advantage of upland rice adaptation, and the superior nutritional value of upland rice.

3.1.1. The distribution of upland rice farming. One important element in producing food is the availability of land because land is the main production factor for producing food [6]. Land resources for upland rice farming are sufficiently available in Southeast Sulawesi Province. It is indicated by Statistic Bureau data (BPS) of Southeast Sulawesi [7] that upland rice farming is spread in 11 among 17 districts/cities in Southeast Sulawesi, one of the upland rice centres is South Konawe District (upland
rice harvest area 548 ha). Upland rice production in South Konawe District is the fifth largest in Southeast Sulawesi (as many as 1,311 tons per year), but the second lowest productivity among 11 districts/cities upland rice centres, only 23.93 qtl per hectare. It means that upland rice productivity has the potential to be increased in minimum production that equal to the upland rice average productivity of Southeast Sulawesi which is 26.99 qtl per hectare. It is because South Konawe District has sufficient land area (6% compared to wetland rice area). Upland rice in the South Konawe District needs to be explored to support the fulfillment of healthy food needs.

3.1.2. Advantages of upland rice adaptation. The advantages of upland rice adaptation were shown by adaptation to agroecology and soil types, also indicated by the application of intercropping systems on upland rice. Basically, in plant cultivation, plant growth and development are strongly influenced by genetic factors and environmental factors. The most important environmental factors are soil and climate and the interaction of these two factors. An advantage of upland rice plants which was stated by [8] that upland rice plants could grow in various agroecology and soil types. It can grow in areas ranging from low land to high land. In lowland rice requires an altitude of 0-650 m above sea level with temperatures of 22-27°C while in the highlands 650-1,500 m above sea level with temperatures of 19-23°C. The situation is in accordance with the characteristics of South Konawe District where the altitude is below 1,000 m above sea level with minimum temperatures ranging from 21°C – 24°C and maximum temperatures ranging from 28°C – 34°C.

[8] also stated that upland rice could grow on a variety of soil types so that soil types do not significantly affect upland rice growth and yield. Land suitable for upland rice varies from the wet, fine dusty, smooth clay to rough soil and enough water is needed.

Upland rice was very adaptive for an intercropping system. It is consistent with the results of research [9] and [10] that upland rice plants are often intercropped with plantation crops. Apart from being an intercropping plant on plantation land, it can also be planted in industrial plantation forests (HTI) as intercrops [11]. It has an impact on the ease of providing production facilities for upland rice farming. There was often the joint use of production facilities with plantations and/or forestry.

3.1.3. Advantages of nutritional value. Based on the results of the study, red rice has more properties than white rice. Antioxidin content in red rice can be an antioxidants source for health. The nutritional composition of red rice per 100 grams consists of protein 7.5 g, fat 0.9 g, carbohydrate 77.6 g, calcium 16 mg, phosphorus 163 g, iron 0.3 g, and vitamin B1 0.00021 g [12]. Consumption of red rice without waste turns out to contain lots of fiber, natural oils, and essential fats that are useful for our bodies.

[13] explained the 6 advantages of red rice which are upland rice varieties, including: (1). More organic. Upland rice is usually planted organically, so it is relatively healthier. It is very dependent on the rain falling, planted in dryland. It can be said that this upland rice is almost left, rarely sprayed (pesticides), fertilization is also rare. (2). More fiber. Upland rice is not hulled; after grinding the husk, the skin is left to stick. The nutrients contained in this epidermis, in white rice are usually removed. In this skin a lot of fiber is useful. No wonder if the fiber content in red rice is twice as high as white rice. (3). More essential fatty acids. The epidermis contains essential fatty acids which are very useful both for growth and development, especially infants and children. The iron content is also higher than white rice. (4). More vitamin B. The content of thiamin or vitamin B1 which is very important for metabolizing carbohydrates and energy. It is also important for neurotransmitters or "anti-stress". Thiamin can also strengthen the immune system and increase the body's ability to withstand stressful conditions. (5). More antioxidants. The red color in red rice is actually antioxidant pigments, such as anthocyanins. An antioxidant can prevent oxidation of fatty acids that can trigger free radicals and cancer. Red rice can also help reduce bad cholesterol in the blood. (6). More resistant to hunger. Red rice is a low glycemic index food that can help prevent a spike in blood sugar in an instant. The effect, consumption of red rice will not cause the stomach to become hungry quickly.
The advantage nutritional value of rice derived from upland rice was also due to the organic nature of upland rice. It was supported by the results of research [9] that most of Tolaki’s upland rice farmers (indigenous tribes of mainland Southeast Sulawesi) have practiced organic farming systems.

3.2. Social potential
The social potential was explored by description analysing about the knowledge and skill about the upland rice cultivation, the characteristics of upland rice farmer (age, gender, education, number of the family member), and social modal of the upland rice farmer.

3.2.1. Knowledge and skill. [14] revealed that the knowledge and skills of upland farmers in South Konawe District regarding upland rice cultivation were obtained from generation to generation. Therefore, a lot of local wisdom leads to organic farming systems that were applied by upland rice farmers. The natural way of upland rice cultivation was also caused by upland rice farmers who have not received an extension and mentoring comprehensively about upland rice cultivation from the government, universities and the private sector. Knowledge and skills in upland rice cultivating based on local wisdom were the potentials of upland rice agribusiness development in accordance with the organic farming concept.

3.2.2. Characteristics of the upland rice farmer. [15] had described the characteristics of upland rice farmers in South Konawe District, among others: almost upland farmers were in productive age, dominated by men, low level of formal education, and moderate family members. The description of upland rice farmers showed the magnitude of the developing potential of upland rice farming sub-systems. Upland rice farmers, most of whom were men in productive age. It was a potential to do development of upland rice agribusiness because of the superior power and enthusiasm of them. A low level of formal education can be transformed into a strength if upland rice observers (government, universities, private) increase the chances of upland rice farmers to be able to participate in various non-formal education to improve the quality and quantity (business scale) of upland rice farmers who did it. It could be explained that people with low education are more receptive to information because of lower selfishness than people who are highly educated. Exploration of the social potential of upland rice agribusiness can also be done through family members of upland rice farmers who are in the medium category. The family member was usually the main labour that can help farmers in each farming activities. Family members could also play a role in processing rice from upland rice to marketing. Even the processing innovation of upland rice to rice flour to various forms of processed food can be adapted to family members. The family member will more effective in giving confidence to the upland rice farming about increasing the value added of upland rice products.

3.2.3. Social capital. Social capital in upland rice cultivation also determines the existence and sustainability of upland rice farming sub-systems. Social capital in the form of trust and mutual cooperation strengthens the existence of upland rice cultivation in increasing condition of labour costs. Based on the results of the study [14] that activities in upland rice farming, carried out independently by farm families (land clearing, seed immersion, weed cleaning, fertilization), and some are carried out in mutual cooperation with other farmers or families (planting, harvesting). Mutual cooperation in planting and harvesting activities is carried out in turn, to anyone who needs it. The existence of mutual cooperation can make production costs more efficient because farmers did not pay labour costs, only paid for consumption costs for farmers who help them, while social capital in the form of trust was realized in terms of land security. Upland rice farmers who have business outside their farming land or even outside the city feel safe leaving their farming land. It could be explained that they believe in entrusting the security of their land to other farmers around it without having to pay wages when they left. The social capital was also realized in the marketing of rice from upland rice. It could be explained that upland rice farmers only rely on marketing by mouth to mouth promotion that was done voluntarily.
by their customers. They also usually have loyal customers who have strongly believed in the quality of the rice they produce.

3.3. Economic potential
The economic potential of upland rice farming was explored by analysing price condition, market share, and the financial feasibility of upland rice farming.

3.3.1. Price condition. Based on the results of the study [14] showed that the upland rice price in South Konawe District was in the range between $0.81 to $0.88 per kg, with an average price of $0.84 per kg. The Head of Food Crops Research Institute (BPTP) of Research and Development Agency (Balitbang) of Bangka Belitung revealed that the farmer level red rice selling price reached $0.88 - $1.01 per kg [4]. It shows that upland rice prices are higher than the price of rice from lowland rice which is wasteful of chemical inputs. The higher price was caused by the higher demand than supply for rice from upland rice [14]. The high demand was due to consumer awareness of the health benefits of rice from upland rice. The limited supply was due to upland rice was planted once a year with low productivity from lowland rice. The average upland rice productivity in South Konawe District was 476 kg per ha. Thus, it was very potential for farmers to more increase the price of upland rice by carrying the health issue of upland rice as rice healthy and gluten-free. The possibility of a decrease in the price of brown rice due to increased supply in the future can be anticipated by maintaining the exclusivity of brown rice as a functional food with high health benefits. It can be done through further studies on functional food marketing strategies.

3.3.2. Market share. Currently, the market share of rice from upland rice was still limited to people who have consumed it for generations and to people who have realized the health benefits of rice from upland rice [14]. It was also a limitation of market share was the phenomenon that rice from upland rice from Southeast Sulawesi including brown rice from South Konawe District has not been sold freely ‘still rare’ in traditional markets or modern markets. Most consumers of brown rice in Southeast Sulawesi obtain it directly from farmers. The potential for upland rice market share needs to be explored through the provision of rice products from upland rice in modern markets. Consumers who are beginning to realize ‘organic’ healthy food usually shop in the modern market. They were willing to pay higher for organic food. It was suitable with the results of the study [16] that the factors that significantly influence the willingness to pay consumers for organic food are the level of education, the amount of income per month and the quality of products. The price of organic food tends to be higher than non-organic food, and it seems exclusive so that it is more common in modern markets with market share is middle to upper class consumers who are willing to pay higher for organic food products.

3.3.3. Financial feasibility. The upland rice farming subsystem has the potential to be developed and even explored to support national food security, also to improve the welfare of upland rice farmers. The results of the study [15] showed that upland rice farming in South Konawe District which was cultivated in the small area has a cost structure where fixed cost was higher than the variable cost. However, it had experienced an increase in productivity but still lower than lowland rice. [15] also said that the price of rice from upland rice was relatively higher than the price of rice from lowland rice. This condition was the reason for the feasibility of upland rice sub-systems with high values, namely the R/C ratio of 27.3. This condition was also supported by the use of more efficient production facilities. It was as stated by [8] that upland rice plants have excellent adaptability for various types of agroecology and soil types. Upland rice farmers in South Konawe District planted upland rice with intercropping systems with various horticultural and forestry crops. The structure of upland rice farming costs that is more efficient than lowland rice farming is also consistent with the results of the BPS survey that the total production costs for lowland rice reached $916.22 per ha per year, while the cost of field rice production was $571.62 million per ha per year [17]. Several studies also show that the upland rice farming sub-system
is financially feasible [10, 18-20]. Feasibility in upland rice farming sub-system will strengthen efforts to increase the added value of rice from upland rice through processing and marketing sub-systems.

4. Conclusions
Based on the results of the research and discussion could be concluded that the potential of upland rice agribusiness was explored based on the potential of resources, social, and economic, as follows:
1. Resources potential; land availability, an increase of upland rice productivity in South Konawe District, and the advantage of upland rice in various agroecology, soil types, and types of plants in intercropping systems.
2. Social potential; farmers’ knowledge and skills regarding upland rice cultivation which tends to the concept of organic farming, also the advantages in socio characteristics and social capital.
3. Economic potential; the price of upland rice was higher than lowland rice, limited market share, and high financial feasibility.

References
[1] Suranto 2016 Kepala BPPT: Konsumsi Beras Per Kapita Indonesia Tertinggi di Dunia [Head of BPPT: Indonesian Rice Consumption Per Capita is the Highest in the World] http://infopublik.id/read/164632/kepala-bppt--konsumsi-beras-per-kapita-indonesia-tertinggi-di-dunia.html Accessed August 2018
[2] Indonesia Investments 2017 Beras [Rice] https://www.indonesia-investments.com/id/bisnis/komoditas/beras/item183 Accessed August 2018
[3] Anindita A 2017 Kementan: 60% Masyarakat Masih Konsumsi Beras, Idealnya Maksimal 50% [Ministry of Agriculture: 60% of the Society Still Consume Rice, Ideally Maximum 50%] https://economy.okezone.com/read/2017/12/04/320/1824667/kementan-60-masyarakat-masih-konsumsi-beras-idealnya-maksimal-50 Accessed August 2018
[4] Idris M 2017 Bisa Panen Banyak, Jangan Lagi Remehkan Padi Ladang [Can Harvest a Lot, Don’t Underestimate The Upland Rice Fields Anymore] https://finance.detik.com/berita-ekonomi-bisnis/d-3785869/bisa-panen-banyak-jangan-lagi-remehkan-padi-ladang Accessed August 2018
[5] Abdullah W G, Rianse U, Iswandi R M, Taridala S A A, Rianse I S, Zulfikar Z L, Baka L R, Abdi A L, Cahyono E, Widayati W, and Baka W K 2015 Potency of Natural Sweetener: Brown Sugar WSEAS Transactions on Business and Economics 12 pp 99-110
[6] Irawan B 2015 Dinamika produksi padi sawah dan padi gogo: Implikasinya terhadap kebijakan peningkatan produksi padi [Dynamics of rice and upland rice production: Implications for the policy to increase rice production] Memperkuat Kemampuan Swasembada Pangan [Strengthening Food Self-Sufficiency Capabilities] (Jakarta: IAARD Press, Badan Penelitian dan Pengembangan Pertanian Indonesia [Agency for Agricultural Research and Development Indonesia]) p 68-88
[7] Badan Pusat Statistik Provinsi Sulawesi Tenggara [BPS-Statistics of Southeast Sulawesi Province] 2017 Provisi Sulawesi Tenggara dalam Angka Tahun 2017 [Southeast Sulawesi Province in Figures 2017] (Kendari: Badan Pusat Statistik Provinsi Sulawesi Tenggara [BPS-Statistics of Southeast Sulawesi Province])
[8] Norsalis E 2011 Padi Gogo dan Padi Sawah. Tinjauan secara Morfologi, Budidaya, dan Fisiologi [Lowland and Upland Rice. Overview in Morphology, Cultivation, and Physiology] http://skp.unair.ac.id/repository/Guru-Indonesia/Padigogodansawah_ekonorsalis_17170.pdf Accessed August 2018 pp 1-14
[9] Taridala S A A, Meisanti, Suaib, Wahyuni S, Wianti N I, Zani M, Abdullah W G, Rosmawaty, and Batao H 2018 Respect to Nature: Lessons Learned from Dryland Rice Farming Practices by Tolaki International Conference on Green Agro-industry and Bioeconomy (ICGAB) (Malang: Universitas Brawijaya)
[10] Purwantini T B 2014 Kendala dan Prospek Pengembangan Padi Gogo di Kabupaten Aceh Timur [Obstacles and Prospects for Upland Rice Development in East Aceh District] Seminar Nasional
Acknowledgments

We extend our gratitude to the Ministry of Research, Technology and Higher Education for funding support in the Postgraduate Research Grant scheme with contract number: 471/UN29.20/PPM/2017. We are also thankful to the reviewers for their insightful comments on the paper. The suggestions given have helped us to improve the paper making it more enhanced and worthwhile for the readers.