Sustainable Agricultural Development Based on Leading Commodities
(Case Study in Blora Sub-District, Blora District, Central Java, Indonesia)

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ABSTRACT
Sustainable agricultural development emphasises the utilisation of natural resources, especially leading commodities, according to the ability of a region to improve the welfare of its farmers and stimulate economic growth. Agriculture is a sector supporting the economy of the Blora Sub-district. This quantitative descriptive research was designed to analyse the leading food-crop commodities to support sustainable development. Location Quotient (LQ) was employed to determine the basis for said commodities from secondary data on food commodity productivity in 2010–2019 from the BPS-Statistics Indonesia. The data analysis showed that rice, groundnut and mung bean were the chief tradeable food crops in the sub-district indicated by their LQ values higher than or equal to 1. Selecting leading commodities based on the region's potential can help determine which food crops can be developed and take priorities in the development. When focused on them, sustainable agricultural development can create farming practices that are efficient, economically valuable and environmentally friendly so as to improve environmental sustainability.

Keywords: *Agriculture, Productivity, Leading Commodity, Location Quotient, Sustainable Agriculture.*

1. INTRODUCTION

Indonesia is an agricultural country with a comparative advantage in the agricultural sector. According to the Ministry of Agriculture, this sector occupies the largest share of its land area in 2019 is 7,105,145 hectares. It has a relatively strategic position in the structure of the country's economy than other sectors [1]. Apart from creating employment, it also plays a key part in ensuring food security, sustainable economic growth and development [2]. Further, the sector contributes about less than 2% to the average income of developed countries and 2.9% of the country's income worldwide, making it crucial in national development [3,4]. Suppose the leading commodities in the leading sector are developed and managed properly. In that case, the agricultural sector will become the prime mover for regional or national economic growth because of its ability to bring about a multiplier effect on other sectors [5] and reduce poverty and unemployment in the community [6]. Either directly or indirectly, the agricultural sector is strongly related to sectors outside this field, both secondary and tertiary activities [7]. However, if natural resources like leading commodities are not appropriately managed, it will cause a resource curse that will lead to stagnation and negative economic growth, hindering development [8,9].

Natural and environmental resources have limited carrying capacity. According to Running SW (2012), various resources available to humans will reach "ecological limits" in the next few decades which will cause environmental degradation globally [10]. Therefore, natural resource-based development must pay attention to environmental sustainability to encourage sustainable development, i.e., a development paradigm related to the natural balance between economic, social and environmental [11]. An example includes sustainable agriculture, that is, the implementation of this paradigm in the agricultural sector. Sustainable development has a different point of view from economic development which only exploits natural resources for the benefit of humans with less consideration to the environment as a whole, ultimately threatening the community's welfare [12]. Evaluating

the carrying capacity of natural and environmental resources is thereby one of the essential criteria to factor in while implementing sustainable development [13]; this can provide the necessary scientific basis for regional and national planning [14, 15, 16]. In general, the goals of sustainable agricultural development are three-fold. First, agricultural growth must increase farm income, open more employment opportunities and raise demand for goods and services. Second, poverty alleviation can be achieved by improving economic diversification in rural areas, allowing the development pattern to reduce people's dependence on one agricultural product and livelihood, and the third goal is environmental sustainability. The implementation of sustainable agricultural development will support the SDG-oriented programmes carried out by the United Nations since 2016 [17], including economic growth and environmental protection.

The agricultural sector in Blora Sub-district has a crucial role in its economy and development, particularly because it is one of the five largest sectors contributing 9.87% of the GRDP in 2019 [18]. Meanwhile, in Blora District it gave the highest percent of the contribution, 24.35%, to the GRDP in 2020. A region's comparative advantage economic potential more or less influences its economic growth. Thus, it is imperative that economically valuable potentials be prioritised while exploring their utilisation and development to achieve sustainability [19] and encourage regional economic growth [20]. For this reason, Yuuhaa and Cahyono (2013) argue that the local government must have extensive knowledge of what constitutes basic and non-basic commodities and which tradeable goods can be developed into basic commodities [21]. Another challenge in agricultural development occurs when farmers do not entirely understand how to develop land potential to multiply production, maintain and conserve resources while increasing income and welfare [22,23]. Therefore, farmers need to acquire detailed knowledge of the basic physical conditions and characteristics of their land before making use of it to accommodate the production of leading commodities [24,25]. This is because land productivity, a factor of agricultural commodities, is dependent upon determinants of the environment and resources [26,27,28].

2. MATERIAL AND METHOD

2.1. Location and Data Acquisition

The research was conducted in Blora Subdistrict, which administratively lies in the Blora District area, Central Java, Indonesia (Figure 1). This research location was purposively selected because the sub-district reportedly relies on agriculture as one of the largest regional and economic development sectors, as evident from its percent contribution to GRDP. Furthermore, this sector has a multiplier effect that drives other sectors. The research is a quantitative descriptive study. In a descriptive method, data are collected following the research design, compiled, processed and then analysed to overview the problems existing in the area [29]. The data used were ten-year secondary data (2010–2019) sourced from the BPS Statistics Indonesia for Blora District.

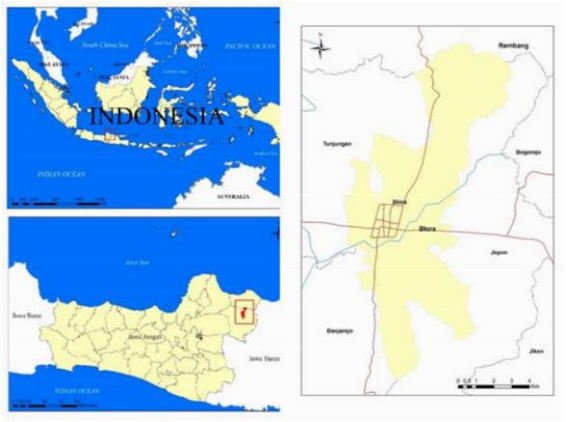


Figure 1 *The Location of Blora Sub-district*

2.2. Data Analysis

The research used Location Quotient (LQ) to determine the basic/potential/leading commodities of a particular area or region. This method compares the ability of commodities in a region relative to the ability of the same commodity in a larger geographic area [30]. Because the variable compared is productivity, the LQ calculation formula is as follows (adjusted) [31,32,33].

$$LQ = \frac{ki/kt}{Ki/Kt} \quad (1)$$

where:

LQ : Location quotient of agricultural commodities

ki : Productivity of agricultural commodity *i* at the sub-district level

kt : Total productivity of agricultural commodity at the sub-district level

Ki : Productivity of agricultural commodity *i* at the district level

Kt : Total productivity of agricultural commodity at the district level

The LQ ratio value differentiates agricultural products into basic and non-basic commodities in the area observed. Based the data analysis, LQ can be categorised into three criteria [34]:

1. LQ > 1 means that the commodity is basic or can serve as a source of growth

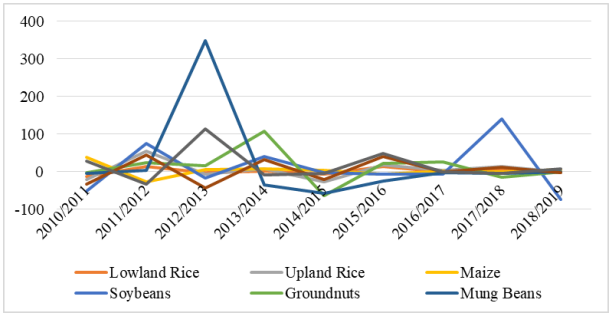
2. LQ = 1 indicates a non-basic (non-leading) commodity that does not have a competitive advantage.
3. LQ < 1 indicates a non-basic (non-leading) commodity

3. RESULTS AND DISCUSSION

3.1 Food-Crop Commodities in Blora District

Rice fields in the Blora District are the second largest land use after the forest, which cover 45,885.16 hectares or 25.20% of the total district area. The agricultural sector is also a driving force for the economy and a source of livelihood for the population. In general, the food-crop commodities in the district showed fluctuating productivities from 2010 to 2019. Several major factors of agricultural productivity include nature/environment, labour, capital and management [35]. Figure 2 provides more details regarding the productivity of eight tradeable food crops in the Blora District.

The primary food-crop commodities in Blora District are rice and corn. Table 1 shows that the agricultural fields produced 53.12 quintals per hectare of lowland rice in 2010, which later decreased by -13.31% to 46.05 in 2011 then continuously fluctuated until 2019 where the productivity was 60.60 quintals per hectare or increased by 0.49% from the previous year.



Source: Secondary data analysis, 2021

Figure 2 *Productivity Rates of Food Crops in ct in 2010–2019 (in quintals per hectare)*

Meanwhile, the productivity of upland rice increased by 39.31% in the second half of the observation years (2015–2019). On the contrary, some secondary crops such as soybeans, groundnuts, mung beans and sweet potatoes experienced a significant decline in 2019.

Table 1 *Productivities of Food-Crop Commodities in Blora District in 2010–2019*

No	Commodities	Productivities (quintals per hectare)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Lowland rice	53.12	46.05	52.80	51.66	51.99	48.70	55.86	56.05	60.31	60.60
2	Upland rice	38.67	30.21	46.98	43.77	46.83	33.78	39.95	41.44	47.04	47.07
3	Maize	45.94	63.73	46.85	49.74	53.08	54.62	51.45	51.89	51.43	53.90
4	Soybeans	23.33	11.08	19.47	16.31	22.81	22.03	20.37	19.05	45.93	12.12
5	Groundnuts	9.40	9.10	11.29	13.03	26.95	9.63	11.83	14.86	12.51	12.40
6	Mung beans	9.74	9.29	9.70	43.64	28.55	12.00	8.94	8.77	8.40	8.30
7	Sweet potatoes	193.75	128.58	186.16	106.02	141.19	111.42	155.68	155.07	173.39	169.31
8	Cassava	139.10	177.26	118.49	253.73	229.77	216.88	321.18	322.17	305.24	331.23

Source: Secondary Data Analysis, 2021

Maize was produced at fluctuating rates, which showed a 4.81% increase from 51.43 quintals per hectare in 2018 to 53.90 quintals per hectare in 2019. However, its productivity was stable near the end of the observation period, so was cassava. In the national economy, maize, a traditional secondary crop, has changed from a side crop to a strategic one [36].

3.2 Food-Crop Commodities in Blora Sub-District

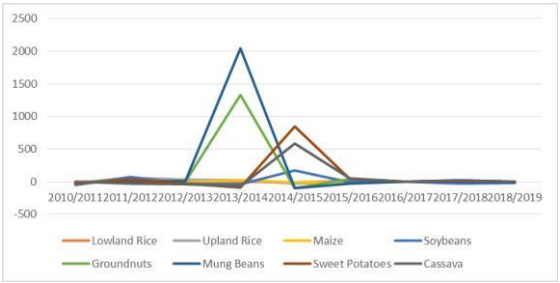
In Blora Sub-District, agriculture is a sector with great potential for development. This is evident from its contribution to the sub-district's GRDP that reached 9.87% in 2019. Also, considering that the rice fields covered up to 78.25% of the total subdistrict area, the sector is one of the drivers of regional economic development. Rice is one of the most extensively cultivated food crops because it is the staple food of most population in Indonesia, especially on the island of Java.

Table 2 *Productivities of Food Crops in Blora Sub-District in 2010–2019*

No	Commodities	Productivities (quintals per hectare)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Lowland rice	25.07	47.74	54.63	53.05	53.99	51.14	58.34	58.34	63.13	63.12
2	Upland rice	24.71	19.64	31.25	40.45	47.60	35.50	41.30	41.30	48.45	48.44
3	Maize	46.45	42.88	47.37	45.08	53.99	51.85	49.08	49.08	48.72	51.12
4	Soybeans	23.35	11.03	19.40	14.16	9.19	24.81	22.19	22.19	16.70	13.33
5	Groundnuts	9.99	9.52	11.96	11.69	167.28	7.37	10.73	10.73	12.53	12.54
6	Mung beans	9.92	9.49	9.79	11.11	237.90	11.43	8.16	8.16	8.46	7.50
7	Sweet potatoes	194.30	130.67	174.29	122.22	11.71	110.43	153.64	153.64	169.46	168.18
8	Cassava	168.26	168.26	121.00	73.40	25.79	178.13	263.08	263.08	308.02	308.09

Source: Secondary Data Analysis, 2021

In 2010 the productivity of lowland rice in the sub-district was 55.07 quintals per hectare, which increased to 63.12 quintals per hectare in 2019. The same case applies to maize, whose productivity increased from 46.45 quintals per hectare in 2010 to 51.12 quintals per hectare in 2019. Table 2 and Figure 3 present more details regarding the productivity of eight tradeable food crops in the Blora Sub-District.



Source: Secondary Data Analysis, 2021

Figure 3 *Productivity Rates of Food Crops in Blora Sub-District in 2010–2019 (in quintals per hectare)*

3.3 Leading Food-Crop Commodities in Blora District

Regional economic development has the main policy of scrutinising different commodities to determine development priorities that meet the potential of a region. Because said potentials can widely vary by region, it is imperative that the dominant leading tradeable products be analysed [37]. A basic or leading commodity is defined as a commodity that has added value and large production to a point where it can stimulate economic growth, has a multiplier effect on other economic activities and regional development and has high market demand [38]. Basic commodities in Blora Sub-District were identified using LQ analysis. Based on the average LQ value, there are three leading commodities: lowland rice, groundnuts and mung beans. Table 3 provides more details regarding the LQ values of eight tradeable food crops in the sub-district.

The analysis of the data presented in Table 3 revealed that lowland rice consistently had LQ > 1 from 2010 to 2019, except in 2013 where the LQ was 0.99 (< 1). This shows that statistically, Blora SubDistrict is specialised in lowland rice production more significantly than Blora District. Therefore, with lowland rice considered the sub-district's leading commodity, the government's programme should prioritise it as a strategic commodity to achieve food self-sufficiency by increasing its production and productivity in a sustainable manner [39].

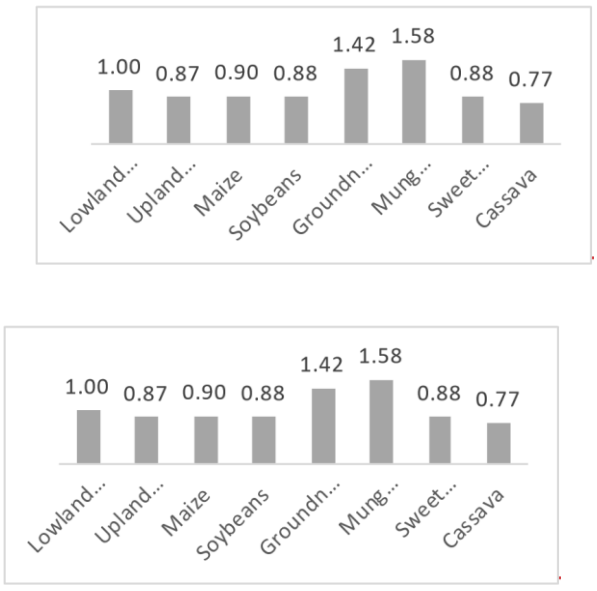
Table 3 *Location Quotient (LQ) Values of Food-Crop Commodities in Blora Sub-District*

No	Commodities	Productivities (quintals per hectare)									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Lowland rice	1	1	1	0.99	1	1.01	1.01	1	1.01	1
2	Upland rice	0.62	0.63	0.64	0.89	0.98	1.01	1	0.96	0.99	0.99
3	Maize	0.97	0.65	0.97	0.87	0.98	0.92	0.92	0.91	0.91	0.91
4	Soybeans	0.97	0.96	0.96	0.84	0.39	1.09	1.05	1.12	0.35	1.06
5	Groundnuts	1.02	1.01	1.02	0.87	5.98	0.74	0.87	0.7	0.97	0.98
6	Mung beans	0.98	0.99	0.97	0.25	8.03	0.92	0.88	0.9	0.97	0.87

7	Sweet potatoes	0.97	0.98	0.9	1.11	0.08	0.96	0.95	0.96	0.94	0.96
8	Cassava	1.17	0.92	0.98	0.28	0.11	0.79	0.79	0.79	0.97	0.9

Source: Secondary Data Analysis, 2021

Figure 4 shows the average LQ values of eight food-crop commodities in Blora Sub-District from 2010 to 2019. Although upland rice had LQ ≥ 1 for only two consecutive years (1.01 in 2015 and 1 in 2016), the average LQ was 0.87 (< 1), meaning that the sub-district has a lower concentration in upland rice production than the district. This also implies that upland rice is not a leading commodity in the sub-district. The LQ analysis also revealed that maize consistently had LQ < 1 in the entire years of observation, meaning that it is not a leading commodity in Blora Sub-District because it is less concentrated when compared to maize production in Blora District. Soybeans also had an average LQ of 0.88 (< 1), which classifies this tradeable agricultural product as non-basic in the sub-district even though its LQ values in 2015, 2016, 2017 and 2019 were < 1. Similarly, sweet potatoes and cassava are not the leading commodities, as indicated by their LQ values that were smaller than 1. On the contrary, the average LQ values of upland rice, groundnuts and mung beans were higher than or equal to 1, thus supporting the conclusion that these three food crops are the leading commodities of the sub-district.



Source: Secondary Data Analysis, 2021

Figure 4 *Average Location Quotient (LQ) Values of Food-Crop Commodities in Blora Sub-District in 2010 –2019*

Identifying basic or leading commodities in Blora District can facilitate the implementation of strategies to increase productivity through various targeted programmes, including providing affordable production facilities, improving cultivation and post-harvest technology, and conducting various trainings for farmers and agricultural extension workers so as to achieve sustainable agricultural development. Agricultural development with leading commodity management that incorporates efficient production improvement can reduce environmental degradation and realise the wide practice of environmentally sound development. Successful regional development will also be able to encourage successful national development directly [40]. In addition, the development of leading commodities also conforms to what the Act of the Republic of Indonesia Number 18 of 2022 on Food mandates, i.e., the government and local governments are responsible for the availability of food in the region and the development of local food production to meet the needs and consumption of the communities, households and individuals sustainably. This perspective can be used to direct the taking of initiatives that are oriented to regional potential in the development process to create employment opportunities and increase economic activities [41].

4. CONCLUSIONS

The leading commodities in Blora Sub-District are lowland rice, groundnuts and mung beans. Agricultural development that focuses on these commodities is believed to create more environmentally friendly farming practices that can increase economic growth and regional development and control environmental degradation. To realise this practice, cooperation between local governments and farmers is necessary so as to increase the productivity of basic or leading tradable food crops by encouraging environmentally-friendly agriculture, improving farming practices and post-harvest technology, developing the infrastructure and providing necessary production facilities. In addition, it is imperative that both agricultural extension workers and farmers receive relevant training and that the agricultural sector studies factor in the region's agroecological and ecogeographic potential to achieve sustainable agricultural development.

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