

INDONESIAN AGRICULTURAL SECTOR PERFORMANCE 2013-2017

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Abstract. Indonesia is the country with the third largest Gross Domestic Product (GDP) from the agricultural sector in Asia. Agriculture is the backbone of the Indonesian economy, around 32% of the population works in the agricultural sector. These resources make Indonesia the largest producer of several agricultural commodities, some of which are oil palm, rubber, coconut, cacao, tea, tobacco, some spices, and rice. Despite these achievements, Indonesia still faces problems in optimizing agriculture. Both of natural resources and human resources. Climate change has also become an obstacle that has caused flooding and drought in several regions, especially in Java. The impact of these problems that is most felt is food sovereignty still has not been achieved. January to November 2018 period Indonesia has to import 2.2 million tons of rice. Therefore, policies continue to be optimized, including the National Medium Term Development Plan (RPJMN) which is currently underway. Efforts to optimize Indonesian agriculture and other sectors are also supported by a demographic bonus that is predicted to start in 2020. If it is able to deal with it well, this optimization is expected can to achieve food sovereignty and pursue the achievement of being the world's 6th biggest economic power in 2023.

Keywords: production, agricultural performance, Indonesia, food security

INTRODUCTION

Indonesia is regarded as an agricultural country, where agriculture has a very important role in the economy. Based on data from the Statistics Times, in 2018 Indonesia's agricultural sector is ranked fifth in the world as a contributor to GDP, after China, India, the United States, and Brazil. The percentage of GDP from the agricultural sector is 13.9% or around 128 billion US dollars. This contribution places Indonesia as the fifth largest Asian economic power or the 16th in the world for the total GDP of all sectors.

The estimated total agricultural area in Indonesia is 57 million hectares and the forest area is 93.95 million hectares (FAO, 2016; Ministry of Forestry and Environment of the Republic of Indonesia, 2018). The distribution of agricultural sector production achievements from the above data is divided into sectors including food crops, horticulture, plantations, livestock, forestry and fisheries according to data from the Indonesian Central Bureau of Statistics or according to the FAO the distribution includes food, crops, cereals, vegetable oils, root and tubers, fruit and vegetables, sugar, livestock, meal, milk, meat, and fish. But in this review, the discussion of the production sector is based on grouping according to the Indonesian Central Bureau of Statistics.

Some Indonesian agricultural commodities are able to become the leading in the world. Some of them are oil palm, rubber, coconut, coffee, cacao, tea, tobacco, and also rice (Ministry of Agriculture of the Republic of Indonesia, 2018; FAOSTAT, 2018; Sequino and Avenido, 2013; Worldatlas, 2017a; 2018a; 2018b; 2018d; 2018f ; 2019a; 2019b). But in addition to these achievements, the Indonesian agricultural sector still has various obstacles so that it cannot be optimized. The most visible impact of the problem is not yet achieving food sovereignty, especially rice as a staple food. In the period January to November 2018, the Indonesian government still has to import rice of 2.2 million tons for domestic needs

(Katadata, 2019). Therefore, efforts need to be made to optimize the agricultural sector, among others, the National Medium Term Development Plan (RPJMN) and the development of agricultural human resources. In this review will be elaborated on agricultural sector production in 2013-2017, problems and strategies to optimize the Indonesian agricultural sector.

PRODUCTION OF AGRICULTURAL COMMODITIES

Agricultural sector production in this discussion including food crops, horticulture, plantation crops, production forest plants, livestock, and aquaculture according to data from the Ministry of Agriculture, Ministry of Maritime Affairs and Fisheries, Ministry of Forestry and Environment, and the Indonesian Central Bureau of Statistics. The latest publication regarding these commodities that have been collected is production data until 2017.

Rice is the most commodity produced as a food crop because it is a staple food for around 99.39% of Indonesia's population (Indonesian Food Security Agency, 2016). Other important carbohydrate suppliers are maize and cassava. Cabbage, potato, and chili pepper are the three most important vegetables for Indonesia. Banana, mango, and pineapple are the three most produced fruits in Indonesia. (Ministry of Agriculture of the Republic of Indonesia, 2018). Indonesia has around 400 ethnic groups. Each ethnic and sub-ethnic inherit knowledge about traditional medicine. Traditional medicine as a cultural inheritance (SEARO, 2019). Therefore, medicinal plants become important commodities, including ginger, turmeric, and galangal (Ministry of Agriculture of the Republic of Indonesia, 2018). Indonesia has around five thousand species from 25,000 species of orchids in the world (Banks, 2004). Therefore, orchid becomes Indonesia's flagship ornamental plant. Besides orchid, others include *Chrysanthemum* and rose.

From the plantation sector, palm oil, rubber and coconut as the three most important commodities for Indonesia. As Indonesia is the largest producer of palm oil and coconut in the world, and the second largest in the world as a rubber producer (Worldatlas, 2017a; 2018a; 2018b). For the production of forest commodities, some of the most important commodities are *Acacia*, *Shorea*, and bamboo (Indonesian Central Bureau of Statistics, 2017). While from livestock, chicken and cattle commodities are commodities with the largest production (Ministry of Agriculture of the Republic of Indonesia, 2018). For aquaculture commodities, seaweed is still the largest production commodity (Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, 2018). A detailed description of each commodity is explained in the discussion of each production sector.

Food crops

Indonesia is the third largest rice producer in the world after China and India with total production in 2017 of more than 81 million tons (Ministry of Agriculture of the Republic of Indonesia, 2018; FAOSTAT, 2019). The average Indonesian rice consumption is 97.6 kg per capita per year (Arifin et al., 2018). In addition to rice, several other important crops for Indonesia including maize, soybean, peanut, mungbean, cassava, and sweet potato (Table 2) (Ministry of Agriculture of the Republic of Indonesia, 2018).

Table 1

Production, harvested area and yield of rice (*Oryza sativa* L.) in Indonesia, 2013-2017

No	Commodities	Year				
		2013	2014	2015	2016	2017
1	Wetland rice					
	Production (000 Ton)	67,392	67,102	71,766	75,483	77,366
	Harvested area (000 Ha)	12,672	12,666	13,029	13,965	14,556
	Yield (Ton per Ha)	5.32	5.3	5.51	5.4	5.32
2	Upland rice					
	Production (000 Ton)	3,888	3,744	3,631	3,872	3,783
	Harvested area (000 Ha)	1,163	1,131	1,087	1,171	1,156
	Yield (Ton per Ha)	3.34	3.3	3.34	3.31	3.27
3	Wetland + upland rice					
	Production (000 Ton)	71,280	70,846	75,398	79,355	81,149
	Harvested area (000 Ha)	13,835	13,797	14,117	15,156	15,712
	Yield (Ton per Ha)	5.15	5.14	5.34	5.24	5.17

Table 2

Production, harvested area, and yield of secondary crops in Indonesia (2014-2017)

No	Commodities	Year			
		2014	2015	2016	2017
1	Maize (<i>Zea mays</i> L.)				
	Production (000 Ton)	19,088	19,612	23,578	28,924
	Harvested area (000 Ha)	3,837	3,787	4,444	5,533
	Yield (Ton per Ha)	4.95	5.18	5.31	5.23
2	Cassava (<i>Manihot esculenta</i> Crantz.)				
	Production (000 Ton)	23,436	21,801	20,261	19,341
	Harvested area (000 Ha)	1,003	950	823	793
	Yield (Ton per Ha)	23.36	22.95	24.62	24.39
3	Sweet potato (<i>Ipomoea batatas</i> (L.) Lam.)				
	Production (000 Ton)	2,383	2,298	2,169	1,914
	Harvested area (000 Ha)	157	143	124	106
	Yield (Ton per Ha)	15.2	16.05	17.6	18.02
4	Soybean (<i>Glycine max</i> L. (Merr.))				
	Production (000 Ton)	955	963	860	539
	Harvested area (000 Ha)	616	614	577	356
	Yield (Ton per Ha)	1.55	1.57	1.49	1.51
5	Peanut (<i>Arachis hypogaea</i> L.)				
	Production (000 Ton)	639	605	570	495
	Harvested area (000 Ha)	499	454	436	374
	Yield (Ton per Ha)	1.28	1.33	1.31	1.32
6	Mungbean (<i>Vigna radiata</i> (L.) Wilczek)				
	Production (000 Ton)				
	Harvested area (000 Ha)	245	271	283	241
	Yield (Ton per Ha)	208	229	224	206
		1.18	1.18	1.13	1.17

In addition to wetland rice, some of Indonesia's rice supply is also supported by upland rice, although the quantity is still quite small, in 2017 it produces 4.6% of total rice production (table 1). In terms of quantity of production, maize is the second staple food in Indonesia, followed by cassava. However, the use of maize is not only a human food ingredient but also as animal feed. In 2016 the average maize consumption per capita per

year is only 0.9 kilograms per capita per year for urban areas, and 2.4 kg per year for rural areas (Arifin et al., 2018).

Horticulture

Production of horticulture crops is divided into four categories including vegetable, fruit, ornament plant, and medicinal plants. Some important vegetable products in Indonesia including shallot, potato, chili, cayenne, garlic, carrot, cabbage, tomato, collards, long beans, and others. Fruit including mango, banana, rambutan, durian, jackfruit, citrus, watermelon, *Salacca edulis*, *Lansium domesticum*, and others. Fruit including mango, banana, rambutan, durian, jackfruit, citrus, watermelon, *Salacca edulis*, *Lansium domesticum*, and others. Ornament plants including *Chrysanthemum*, *Rosa*, *Polianthes tuberosa*, *Orchidaceae*, *Gerbera*, *Anthurium andraeanum*, *Dianthus caryophyllus*, *Gladiolus*, *Heliconia*. Medicinal plants including ginger, turmeric, galangal, *Kaempferia galangal*, *Curcuma zanthorrhiza*, *Zingiber zerumbet*, *Curcuma aeruginosa*, *Boesenbergia rotunda*, and *Acorus calamus*. Data on horticultural crop production in Indonesia is presented in table 3-6 (Ministry of Agriculture of the Republic of Indonesia, 2018).

Cabbage and potato are two of the most important vegetables in Indonesia seen as vegetables with the largest production in Indonesia. However, if it is categorized from the type of plant, eat vegetables from the type of *Capsicum* or chili which are the first most important vegetables in Indonesia, namely *C. annuum* and *C. frutescens* (table 3). *C. annuum* production in Indonesia is the fourth largest in the world, after China, Mexico and Turkey (Worldatlas, 2017b). In 2015, the annual average consumption of chili pepper per capita was 2.97 kilograms, and cayenne consumption per capita per year was also 2.97 kilograms (Arifin et al., 2018).

Fruit production in Indonesia is the second largest contributor to foreign exchange from Indonesia's agriculture sector, after tea coffee and spices. The export value of fruits in 2015 reached 368 million US Dollars (Firmansyah et al., 2017) this achievement puts Indonesia as the fifth largest fruit producer in the world (Narasalagi and Shivashankar, 2017). Banana is the most produced fruit. Indonesian banana consumption is also quite high, which averages more than 5 kilograms per capita per year (Arifin et al., 2018). For world production, Indonesia is the fifth largest mango producer, and the third largest for papaya (Worldatlas, 2017c; 2018c).

There are around 305,000 ha of area under flower production spread throughout the world. In Indonesia there are around 44,000 ha, or the third largest in the world after India and China (Sudhagar, 2013). *Chrysanthemum* is a commodity with the most production, followed by *Rosa*, *Polianthes tuberosa*, *Orchidaceae*, and *Garbera* (table 5). In 2018, the export of ornamental foliage and ornamental flower accounts for foreign exchange of 18.5 million US Dollars. The biggest export destination countries are Japan, the Netherlands, South Korea, China, and Thailand (International Trade Center, 2019). When compared between the area of flower production land in Indonesia with the market value of the ornamental plant, it is still not optimal. Even Indonesia has not entered the top 15 in the world. (World's Top Export, 2018). Therefore there needs to be an effort to optimize the increase of ornamental plant and export production, considering the condition of the resources is very supportive.

Table 3

Vegetables production in Indonesia 2013-2017

No	Commodities	Year				
		2013	2014	2015	2016	2017
1	Cabbage (<i>Brassica oleracea</i>)	1,480,625	1,435,833	1,443,232	1,513,315	1,442,624
2	Potato (<i>Solanum tuberosum</i>)	1,124,282	1,347,815	1,219,270	1,213,038	1,164,738
3	Chili pepper (<i>Capsicum annuum</i>)	1,012,879	1,074,602	1,045,182	1,045,587	1,206,266
4	Onion (<i>Allium cepa</i>)	1,010,773	1,233,984	1,229,184	1,446,860	1,470,155
5	Tomato (<i>Solanum lycopersicum</i>)	992,780	915,987	877,792	883,233	962,845
6	Cayenne (<i>Capsicum frutescens</i>)	713,502	800,473	869,938	915,988	1,153,155
7	Mustard (<i>Brassica rapa</i> subsp. chinensis; subsp. pekinensis)	635,728	602,468	600,188	601,198	627,598
8	Leek (<i>Allium ampeloprasum</i>)	579,973	584,624	512,486	537,921	510,476
9	Eggplant (<i>Solanum melongena</i>)	545,646	557,040	514,320	509,727	535,419
10	Carrot (<i>Daucus carota</i>)	512,112	495,798	522,520	537,521	537,341
11	Cucumber (<i>Cucumis sativus</i>)	491,636	477,976	447,677	430,201	424,917
12	Long beans (<i>Vigna unguiculata</i>)	450,859	450,709	395,514	388,056	381,185
13	Chayote (<i>Sechium edule</i>)	387,617	357,552	431,203	603,314	566,845
14	Bean (<i>Phaseolus vulgaris</i>)	327,378	318,214	291,314	275,509	279,040
15	Kale (<i>Ipomoea aquatica</i> ; <i>Ipomoea reptans</i>)	308,477	319,607	307,071	297,112	276,970
16	<i>Gnetum gnemon</i>	220,837	197,647	213,020	203,620	201,041
17	<i>Parkia speciosa</i>	207,016	230,401	261,055	194,927	213,356
18	Spinach (<i>Amaranthus</i>)	140,980	134,159	150,085	160,247	148,289
19	Broccoli (<i>Brassica oleracea</i> var. italic)	151,288	136,508	118,388	142,844	152,869
20	Kidney bean (<i>Phaseolus vulgaris</i>)	103,376	100,316	42,384	37,165	74,364
21	<i>Archidendron pauciflorum</i>	61,147	53,661	58,684	56,090	66,065
22	Mushrooms (<i>Volvariella volvacea</i> ; <i>Pleurotus ostreatus</i>)	44,565	37,410	33,485	40,914	37,020
23	Radish (<i>Raphanus raphanistrum</i>)	32,372	31,861	21,475	19,478	22,417
24	Garlic (<i>Allium sativum</i>)	15,766	16,893	20,295	21,150	19,510

Table 4

Fruits Production in Indonesia 2013-2017

No	Commodities	Year				
		2013	2014	2015	2016	2017
1	Banana (<i>Musa</i>)	6,279,279	6,862,558	7,299,266	7,007,117	7,152,678
2	Mango (<i>Mangifera indica</i>)	2,192,928	2,431,330	2,178,826	1,814,540	2,203,789
3	Pineapple (<i>Ananas comosus</i>)	1,882,802	1,835,483	1,729,600	1,396,141	1,795,982
4	Citrus	1,548,394	1,785,256	1,744,330	2,014,206	2,165,184
5	<i>Salacca zalacca</i>	1,034,401	1,118,953	965,198	702,345	953,845
6	Papaya (<i>Carica papaya</i>)	909,818	840,112	851,528	904,282	875,106
7	Durian (<i>Durio zibethinus</i>)	759,055	859,118	995,729	735,419	795,200
8	Jackfruit (<i>Artocarpus heterophyllus</i>)	586,356	644,291	699,487	654,910	656,580
9	Rambutan (<i>Nephelium lappaceum</i>)	582,456	737,239	882,694	572,182	523,699
10	Watermelon (<i>Citrullus lanatus</i>)	460,828	653,974	576,167	480,884	499,467
11	Avocado (<i>Persea americana</i>)	289,893	307,318	382,537	304,932	363,148
12	Apple (<i>Malus domestica</i>)	255,245	242,915	238,433	329,780	319,000
13	<i>Lansium domesticum</i>	233,118	208,424	274,310	206,986	200,488
14	Guava (<i>Psidium guajava</i>)	181,630	187,406	195,743	206,986	200,488
15	Mangosteen (<i>Garcinia mangostana</i>)	139,602	114,755	203,100	162,862	161,751
16	Passion fruit (<i>Passiflora edulis</i>)	141,190	108,145	113,125	101,963	77,190
17	<i>Manilkara zapota</i>	127,686	138,206	134,641	132,279	133,604
18	Honeydew (<i>Cucumis melo</i>)	125,207	150,347	137,879	117,337	92,432

19	Pomelo (<i>Citrus maxima</i>)	106,338	141,288	111,746	124,252	130,226
20	Breadfruit (<i>Artocarpus altilis</i>)	106,934	103,483	125,039	108,370	104,960
21	Water apple (<i>Syzygium aqueum</i>)	91,284	91,975	92,543	88,681	100,918
22	Strawberry (<i>Fragaria x ananassa</i>)	90,352	58,882	31,798	12,091	12,225
23	Starfruit (<i>Averrhoa carambola</i>)	79,634	81,653	98,959	78,761	85,318
24	Soursop (<i>Annona muricata</i>)	52,081	53,059	58,987	55,907	52,272
25	Cantaloupe (<i>Cucumis melo</i> var. cantalupensis)	26,493	38,666	34,306	19,539	18,523
26	Grape (<i>Vitis vinivera</i>)	9,473	11,143	11,406	9,506	11,735

Table 5

Ornament Plants Production in Indonesia 2013-2017

No	Commodities	Number of stalks per year				
		2013	2014	2015	2016	2017
1	<i>Chrysanthemum</i>	387,208,754	427,248,059	442,698,194	433,100,145	480,685,420
2	<i>Rosa</i>	152,066,469	173,077,811	188,302,152	181,884,630	184,455,598
3	<i>Polianthes tuberosa</i>	104,975,942	104,625,690	116,687,423	117,094,086	112,289,567
4	<i>Orchidaceae</i>	20,277,672	19,739,627	21,513,280	19,978,078	20,045,577
5	<i>Gerbera</i>	7,735,806	7,454,459	7,118,774	5,412,790	14,751,610
6	<i>Anthurium andraeanum</i>	4,044,012	2,805,548	2,837,074	1,760,610	2,625,565
7	<i>Dianthus caryophyllus</i>	3,164,326	2,934,039	2,185,392	1,814,485	1,672,956
8	<i>Gladiolus</i>	2,581,063	1,884,719	2,552,060	1,008,191	1,385,870
9	<i>Heliconia</i>	2,043,579	1,122,419	1,272,012	1,088,191	1,385,670

Tabel 6

Medicinal Plants Production in Indonesia 2013-2017

No	Commodities	Ton per year				
		2013	2014	2015	2016	2017
1	Ginger (<i>Zingiber officinale</i>)	156,256	226,115	313,064	340,341	216,586
2	Turmeric (<i>Curcuma longa</i>)	120,726	112,088	113,101	107,809	128,338
3	Galangal (<i>Aplinia galangal</i>)	69,730	62,520	56,149	59,456	63,536
4	<i>Kaempferia galangal</i>	41,343	37,715	36,971	36,540	36,655
5	<i>Curcuma zanthorrhiza</i>	35,664	25,128	27,840	22,127	24,561
6	<i>Zingiber zerumbet</i>	11,407	7,369	10,123	8,467	7,728
7	<i>Curcuma aeruginosa</i>	9,583	6,487	8,451	6,069	6,407
8	<i>Boesenbergia rotunda</i>	8,829	5,999	5,019	3,991	4,291
9	<i>Acorus calamus</i>	634.33	601.31	778.13	469.87	433.38

Natural resources are very supportive of the cultivation of medicinal plants in Indonesia. No wonder Indonesia is the biggest producer of several medicinal plants. For example, such as ginger and galangal as the fourth largest producer in the world, and the third largest exporter of turmeric (Worldatlas, 2017d; Statista, 2018). The nine commodities mentioned in table 6 are only part of the main medicinal plants. Complete data on all medicinal plant commodities can be accessed on the statistics page of the Ministry of Agriculture of the Republic of Indonesia and the Indonesian Central Bureau of Statistics, as well as other reputable references. These medicinal plants are used as a source of secondary metabolites for pharmaceutical industries (Sholikhah, 2016), traditional medicines such as *jamu* (health herbal drinks), or often used as kitchen spices.

Plantation

Oil palm has truly become an excellent state crop for Indonesia in the last few decades. So many call it green gold. Oil palm is a versatile plant as the basic material and support for several types of products as well as those needed by humans today for daily

needs, such as cooking oil, margarine, vegetable fat, soap, shampoo, detergent, cosmetics, to bio-diesel. Regarding the implementation of bio-diesel, since September 2018 the Indonesian government has reached B20 (mixing bio-diesel 20% and 80% petroleum). Consumption of biodiesel in 2017 has reached 6.44% of total national energy consumption (Katadata, 2018). Since 2006, Indonesia has been the largest producer of palm oil in the world (Sequino and Avenido, 2013). From year to year, the production has increased, which is also supported by the extensification. In 2017, oil palm fruit production is more than 37 million tons with a land area of 14 million ha (Table 7) (Ministry of Agriculture of the Republic of Indonesia).

Other leading crop estate commodities include coconut as the first largest producer, rubber as the second largest producer, sugarcane as the eighth largest producer, cacao as the third largest producer, coffee as the fourth largest producer, tea and tobacco as the seventh largest producer in the world (Worldatlas, 2017a; 2017e; 2018b; 2018d; 2019a; 2019b; Statista, 2018b).

Table 7

		Production and area of estate crop in Indonesia 2014-2017			
		Year			
No	Commodities	2014	2015	2016	2017
1	Oil Palm (<i>Elaeis guineensis</i>)				
	Production (Ton)	29,278,189	31,070,015	31,730,961	37,812,628
	Area (Ha)	10,754,801	11,260,277	11,201,465	14,030,573
2	Rubber (<i>Hevea brasiliensis</i>)				
	Production (Ton)	3,153,186	3,145,398	3,357,951	3,629,544
	Harvested area (000 Ha)	3,606,245	3,621,102	3,639,048	3,659,129
3	Coconut (<i>Cocos nucifera</i>)				
	Production (000 Ton)	3,005,916	2,920,665	2,904,170	2,870,739
	Harvested area (000 Ha)	3,609,812	3,585,599	3,653,745	3,653,167
4	Sugar cane (<i>Sacharum</i>)				
	Production (000 Ton)	2,579,173	2,497,997	2,204,619	2,121,295
	Harvested area (000 Ha)	478,108	454,171	445,075	430,112
5	Cacao (<i>Theobroma cacao</i>)				
	Production (000 Ton)	728,414	593,331	658,399	659,776
	Harvested area (000 Ha)	1,727,437	1,709,284	1,720,773	1,730,002
6	Coffee (<i>Coffea</i>)				
	Production (000 Ton)	643,857	639,412	663,871	668,677
	Harvested area (000 Ha)	1,230,495	1,230,001	1,246,657	1,253,796
7	Sago (<i>Metroxylon sagu</i>)				
	Production (000 Ton)	310,656	423,946	383,613	385,761
	Harvested area (000 Ha)	135,484	196,415	185,494	190,454
8	Tobacco (<i>Nicotiana tabacum</i>)				
	Production (000 Ton)	198,301	193,790	126,728	152,319
	Harvested area (000 Ha)	215,865	209,095	155,950	185,708
9	Tea (<i>Camellia sinensis</i>)				
	Production (000 Ton)	154,369	132,615	138,935	139,362
	Harvested area (000 Ha)	118,899	114,891	113,617	113,692
10	Cashewnut (<i>Anacardium occidentale</i>)				
	Production (000 Ton)	131,302	137,580	137,094	131,685
	Harvested area (000 Ha)	531,153	522,863	514,491	511,268
11	Clove (<i>Syzygium aromaticum</i>)				
Production (000 Ton)	122,134	139,641	139,611	123,773	

	Harvested area (000 Ha)	510,174	535,694	545,027	548,091
12	Pepper (<i>Piper nigrum</i>)				
	Production (000 Ton)	87,447	81,501	86,334	87,029
	Harvested area (000 Ha)	162,751	167,590	181,390	181,978
13	Nutmeg (<i>Myristica fragrans</i>)				
	Production (000 Ton)	32,729	33,711	33,305	34,385
	Harvested area (000 Ha)	158,326	168,904	178,333	180,205
14	Patchouli (<i>Pogostemon cablin</i>)				
	Production (000 Ton)	2,103	1,986	2,192	2,115
	Harvested area (000 Ha)	20,714	18,626	19,612	18,841
15	Cotton (<i>Gossypium</i>)				
	Production (000 Ton)	761	759	932	519
	Harvested area (000 Ha)	3,670	6,118	4,600	5,833

Production forest plants

Indonesia has 93.95 million ha of forested land consisting of protected forests, conservation forests, production forests, and other use areas (Ministry of Environment and Forestry of the Republic of Indonesia, 2018). Of the forest area, some are production forests that produce timber plants. Total roundwood production in 2017 reaches 49 million m³. The ten most important round wood producing plants including *Acacia*, *Shorea spp.*, *Albizia falcataria*, *Tectona grandis*, *Eucalyptus*, *Intsia bijuga*, *Pinus*, *Swietenia mahagoni*, dan *Hevea brasiliensis* (Figure 1) (Indonesian Central Bureau of Statistics, 2017). While leading non-wood products include: bamboo (14.8 million stems), rattan (560,786 stems), roomie (326,769 liters), shingle roof (296,000 pieces), Cajuput oil (228,099 liters), pine sap (108,171 liters), honey (54,293 liters), and gum rosin (19,050 tons) (Indonesian Central Bureau of Statistics, 2017).

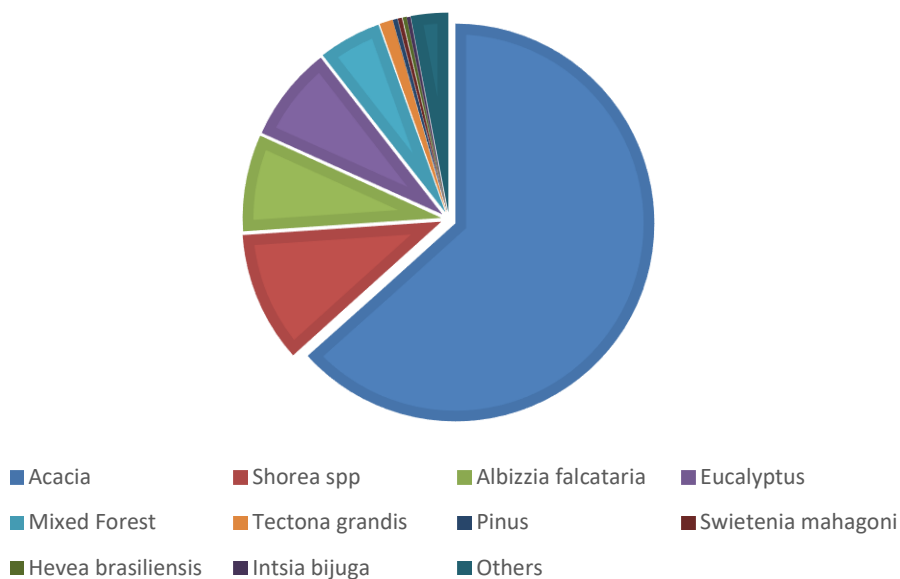


Fig. 1. Production of timber-producing commodities in 2017 (m³)

Livestock and Aquaculture

The supply of animal protein in Indonesia is still dominated by chicken poultry, broiler and chicken eggs with production in 2017 of 2 million tons and 1.5 million tons respectively. Cows become the largest production livestock commodity after chickens with beef production in 2017 reached 486.32 thousand tons (table 8) (Indonesian Central Bureau of Statistics). Followed by several types of fish, the largest production consisting of *Clarias*, *Oreochromis niloticus*, *Chanos chanos*, and shrimp with production in 2017 1.12 million tons, 1.28 million tons, 701,319 tons, and 919,959 tons respectively (figure 2) (Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia). Fish consumption in Indonesia as a source of protein is quite high, given the natural resources that support it. Average per capita consumption is around 18 kilograms per year (Arifin et al., 2018), or Indonesia's total fish consumption as a whole is ranked ninth in the world (Worldatlas, 2018). Aquaculture commodities that have the highest yield and in contrast to other commodities, namely seaweed reaching 10.5 million tons (figure 2). There are more than 500 types of seaweed derivative products, ranging from food products, pharmaceuticals, cosmetics, and tissues (Detik Finance, 2016).

Table 8

Population and Production of Livestock in Indonesia 2013-2017

No	Commodities	Production per year			
		2014	2015	2016	2017
Meat (000 ton)					
1	Broiler	1,544.38	1,628.31	1,905.50	2,046.79
2	Beef cattle	497.67	506.66	518.48	486.32
3	Pork	302.29	330.21	339.61	317.40
4	Domestic chicken	297.65	299.77	284.99	300.13
5	Laying hens	97.20	102.80	110.28	114.90
6	Goat	65.14	64.95	67.84	70.35
7	Sheep	43.61	44.52	45.91	55.11
8	Buffalo	35.24	35.41	31.90	29.38
9	Duck	33.18	34.85	41.87	36.39
10	<i>Cairina moschata</i>	4.81	5.30	5.61	5.93
11	Horse	2.31	2.24	2.56	2.74
12	Quail	0.97	0.95	0.96	1.14
13	Rabbit	0.48	0.55	0.46	0.48
14	Pigeon	0.29	0.32	0.36	0.53
Egg (000 ton)					
1	Laying hens	1,244.31	1,372.83	1,485.69	1,506.19
2	Duck	273.00	278.54	292.04	302.70
3	Domestic chicken	184.64	190.74	196.70	221.00
4	<i>Cairina moschata</i>	30.00	31.38	33.22	35.09
5	Quail	20.71	22.13	23.57	25.02
Milk (000 ton)		800.75	835.12	912.74	928.11

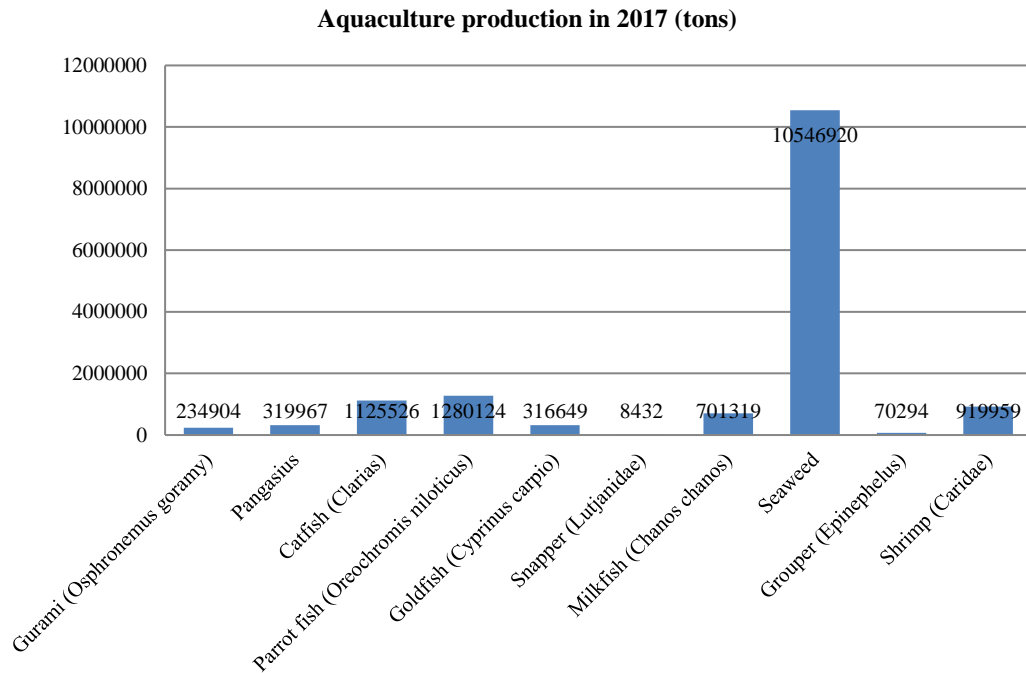


Fig. 2. Aquaculture Production in 2017

PROBLEMS IN INDONESIAN AGRICULTURE

Food security

Although Indonesia is the third largest rice producer in the world, and some commodities are able to become the leading in the world, but until now Indonesia is still the net importer of grain, horticulture and livestock products. Indonesia still has to do food imports in very high quotas. In 2018 from January to November, Indonesia imported 2.2 million tons of rice, while the export value was only 3,196 tons (Katadata 2019).

Climate change

Climate change can have an impact on food security that has a positive trend in production and productivity due to rising temperatures and sea levels, changes in rainfall patterns that lead to a reduction in the area of arable land, increased forest fires that cause forest loss, and increased sea temperatures and acidification causing loss of fisheries. Climate change can result in a decrease of 9% -25% of the net income at the farm level in the future. Opportunities for dangerous delays in monsoon rains can more than double in some of the most important rice growing areas in Indonesia. (Naylor et al., 2007).

Water security

The developing population needs more water for drinking, cleaning and food production. A developing economy requires increased energy supply, which in turn depends on access to more water, and most industries need reliable freshwater supplies in some parts of their processes (Quincieu, 2015). It is estimated that dam storage capacity is only 54 m³ per capita, far below 1,975 m³ per capita as targeted in the National Long Term Development Plan (RPJPN) 2005-2025. Broader deficiencies are expected due to rising temperatures and changes in rainfall patterns, as a result of climate change. Flooding is an annual event that continues to increase in most regions. Average annual flood damage

including in the agricultural sector 168,000 hectares of crops are flooded (National Disaster Management Agency of Republic of Indonesia, 2014).

Drought

Entering the dry season, agricultural areas in several regions in Indonesia are prone to drought. In the dry season of 2018, the provinces of West Java, Central Java, and East Java were the most severely affected by the drought. Based on data from the Directorate General of Food Crops, rice fields affected by drought until mid-August 2018 cover 127,101 ha, and puso (crop failure) 25,405 ha. The biggest drought occurred in May to July 2018, which affected an area of 87,827 ha and until harvest failure occurred covering an area of 22,153 ha. (Ministry of Agriculture of the Republic of Indonesia, 2019).

National Medium Term Development Plan

The Indonesian Government's 2015-2020 National Medium-Term Development Plan (RPJMN) highlights two different roles of the agricultural sector, namely (i) increasing rice production for food security, and (ii) developing higher-value planting to improve rural livelihoods. The 2015-2019 RPJMN promotes: (i) rehabilitation of 3.2 million ha of irrigated land; (ii) development of 1.0 million ha of new irrigation systems; (iii) adoption of sustainable approaches to agriculture in rehabilitated highlands; (iv) development of agricultural roads; and (v) increasing adoption of environmentally friendly technologies for food crops. Water security is the main pillar of the 2015-2019 plan, which also recommends continuing to implement Integrated Water Resources Management (IWRM) through: (i) improving land use planning and management; (ii) rehabilitation of critical land; (iii) increasing water storage, including the construction of 49 new dams; (iv) reducing the flood area by 200,000 hectares; and (v) improving water quality.

CONCLUSION

Agriculture is the backbone of the Indonesian economy, with about 32% of the population working in the agricultural sector. These sources make Indonesia be an important producer of various agricultural commodities, including palm oil, rubber, coconut, cocoa, tea, tobacco, some spices, and rice. Despite these achievements, Indonesia still faces problems in optimizing agriculture. Both natural and human resources. The most felt effect of these problems is that food sovereignty still cannot be achieved. Indonesia needs to import 2.2 million tons of rice during the January-November 2018 period. Therefore, policies, including the ongoing National Medium Term Development Plan (RPJMN), are being optimized. Efforts to optimize Indonesian agriculture and other sectors are supported by a demographic bonus expected to begin in 2020. If it can be optimized well, it can be expected that this optimization will reach food sovereignty. According to an estimate made by the International Monetary Fund in 2023, Indonesia will be the world's 6th largest economic power.

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