SUSTAINABLE LIVESTOCK PRODUCTION IN THE PERSPECTIVE OF NATIONAL FOOD SECURITY POLICY

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ABSTRACT

This paper presents an overview of the role that livestock play in various dimensions of food security. Food security is defined as a state of affairs where all people at all times have access to safe and nutritious food to maintain a healthy and active life. Availability, accessibility, and affordability of individuals to consume food according to their respective socio-economic conditions are important dimensions. It describes the place of livestock products in human nutrition, the contribution of livestock to the national food supply and the way that livestock can affect food access, as a direct source of food and a source of income. Access to food is the most basic human right, especially for Indonesia with more than 240 million people with annual growth of 1.3%. To secure food availability, a sustainable food production growth more than 2% per year, including animal protein sources, is needed. It is necessary to strengthen food supply by maximizing available resources; improve food distribution system to guarantee a stable food supply and public access; encourage diversified food consumption; and prevent as well as resolve food scarcity. Furthermore, within the national objectives for self-sufficiency in rice, corn, soybean, and white sugar, the current annual percapita consumption of livestock products has reached 6.96 kg (meat), 7.3 kg (eggs) and 16.5 kg (milk), which indicates good progress to stimulate sustainable domestic livestock production.

Key words: Food security, sustainability, livestock production

ABSTRAK

PRODUKSI TERNAK BERKELANJUTAN DALAM PERSPEKTIF KEBIJAKAN KEAMANAN PANGAN NASIONAL

Makalah ini menyajikan tinjauan mengenai peran ternak dalam berbagai dimensi keamanan pangan. Keamanan pangan didefinisikan sebagai suatu kondisi dimana seluruh masyarakat setiap saat dapat memiliki akses kepada pangan yang aman dan bergizi untuk menjaga kesehatan dan menjalankan kehidupan secara aktif. Ketersediaan, akses dan keterjangkauan setiap individu untuk mengkonsumsi pangan sejalan dengan kondisi sosial ekonomi merupakan dimensi yang penting. Hal tersebut menunjukkan peran produk hasil ternak dalam gizi masyarakat, kontribusi produk ternak bagi pasokan pangan nasional, serta bagaimana produk ternak dapat mempengaruhi akses kepada pangan, dan sebagai sumber pangan dan pendapatan. Akses kepada pangan merupakan hak setiap manusia yang paling mendasar terutama bagi Indonesia yang memiliki penduduk sebesar 240 juta dengan pertumbuhan 1,3% per tahun. Untuk menjamin ketersediaan pangan, maka diperlukan pertumbuhan produksi pangan, termasuk produk ternak, yang mencapai 2% per tahun. Menjadi sangat penting untuk memperkuat pasokan pangan melalui pemanfaatan sumberdaya yang tersedia secara maksimal, memperbaiki distribusi pangan, menganjurkan konsumsi pangan yang beraneka ragam, yang dapat secara langsung mengatasi kelangkaan pangan. Disamping itu, diantara tujuan nasional untuk Swasembada beras, jagung, kedele, gula konsumsi, dan daging sapi, secara keseluruhan konsumsi daging (6,96 kg), telur (7,3 kg) dan susu (16,5 kg) per kapita per tahun telah menunjukkan kemajuan yang sangat berarti dalam menstimulasi produksi hasil ternak dalam negeri yang berkelanjutan.

Kata kunci: Ketahanan pangan, berkelanjutan, produksi ternak

INTRODUCTION

In general, food security is defined as a state of affairs where all people at all times have access to safe and nutritious food to maintain a healthy and active life. Availability, accessibility, and affordability of individuals to consume food according to their respective socio-economic conditions are important dimensions. In these instances, recent issues on the global food, economic, fuel crisis, and climate change have become a major concern in sustaining the food security. Indonesia as a country gives high priority to the efforts of achieving sustainable food security and has committed to achieve its food security policy and

to put agriculture as one of the important development agenda. This commitment will be implemented through optimal utilization of local resources, application of innovative technologies and taking advantage of market opportunities. Within the national policy on food security, access to food is considered the most important since it serves as the basic human right. This view is very strategic particularly for a country like Indonesia with a population of more than 240 million people and annual growth rate of 1.3% (Suryana 2008).

In terms of food availability, a sustainable growth in food production of more than 2% per year is importantly needed. It seems that a reformative action is needed to prevent Indonesia from food scarcity, hunger, and starvation. Therefore, a solid national policy on food security is required. The government uses the approaches to this policy through strengthening food supply by maximizing available resources in a sustainable manner, improving food distribution system to guarantee a stable food supply and public access to food, encouraging diversified food consumption, as well as preventing from and resolving for food scarcity. Furthermore, livestock play a role in food security which covers food production, stability of supply and access to food. Livestock also makes a significant contribution to food production through the provision of high value protein-rich non-replaceable animal products. Indirectly, livestock support crop production through draught power and manure for fertilizer, and significant source of income and store of wealth for smallholders. Moreover, livestock make necessary and important contribution to global calorie and protein supplies.

While livestock products are not absolutely essential to human diets, they are still desirable, since meat, milk and eggs in appropriate amounts, are valuable sources of complete and easily digestible protein and essential micronutrients. Therefore, livestock can increase the world's edible protein balance by converting protein found in forage, that is inedible to humans into forms digestible by humans. They can also reduce the edible protein balance by consuming protein that is edible by humans, from cereal grains and soya and converting it into small amounts of animal protein. Choice of production systems and good management are also important factors in optimizing protein output from livestock (FAO 2011).

Animals provide food, income, traction, manure for fertilizer, social capital, financial assets and a means of recycling crop wastes. They bring value, versatility and resilience to mixed farming households, which are more robust and food secure with animals than they would be without them in rural livelihoods. Small-scale mixed farms remain enormously important because of the large number of rural households they feed and provide with livelihoods. They also contribute to the food supply of developing countries and use and recycle resources effectively. This paper describes the place of livestock products in human nutrition, the contribution of livestock to the national food supply and it discusses the way that livestock can affect food access, as a direct source of food and a source of income, as elements of sustainability for the production itself.

NATIONAL POLICY ON FOOD SELF SUFFICIENCY

The government of Indonesia's Development Priority Program on Agriculture, has targeted 2014 to achieve sustainable food security by producing 75.70 million tons of rice, 29 million tons of corn, 2.7 million tons of soybeans, 4.81 million tons of white sugar, and 0.55 million tons of beef. This target is considered not too excessive from the viewpoint of the fact that each region in Indonesia has its potential and capability for developing a strategic food commodities. The role of local government, of course, is very vital to the success of the self-sufficiency program for commodities which are presently not able to achieve the index, or the sustainable self-sufficiency program for the commodities which are already experience surplus in production. Additional land availability, which represents at least 40 percent of the critical success factors of production, must be realized. Therefore, the government has to clearly define and expand the production areas with the necessary support of infrastructure and other measures to support the program.

Five important commodities such as rice, corn, soybean, beef, and white sugar which should be prioritized for to achieve its self-sufficiency index by 2014 is presented in (Table 1).

It is interesting to know that the index for rice and corn for both 2011 and 2012 are satisfied where the production levels are achieved beyond the requirement, while white sugar is the next commodity where its production level is very close to the requirement. It seemed that soybean production will be the most challenging commodity in closing the gap by 2014 with the lowest index (34.71 percent) in 2012 compare to its level in 2011. It is good that beef production has progressed toward a 100% self-suficiency index by 2014, as it is forecasted to achieve its index of 82.49 percent for 2012.

In the interest of national milk production, the most recent livestock statistics and livestock census (MOA 2011) indicates that by 2010 dairy cattle population reached 597,213 heads. Most of the dairy stock (99.2%) are found on the island of Java among 192,160 farm households, with average farm size of 3-

4 heads per household. Of these households, 183,189 were involved in dairy husbandry, 7,986 households dealt with breeding while 985 households were dairy cattle traders. With the average daily milk production of 11.5 L/head and an average lactation length of 271 days, average production is 3,139 L per lactation, current annual national per capita milk consumption is 11.1 kg fresh milk equivalent. In addition, Achjadi (2012) found that reproduction diseases such as brucellosis, IBR and BVD lead to low calf crops, while mastitis reduces milk quality. Farm record keeping is negligible which caused slow pogress in quality improvement and it leads to inefficient production practices and low farm income.

Furthermore, (Table 2) indicated that during the period of 2005-2011, paddy production grew by 3.33 percent, which is less than its production growth during 2005-2010 period which was increased annually by an average growth of 4.21 percent. Similarly the growth of some commodities in 2011, which were lower than their growth rates in 2010, were maize production (3.73 percent), soybeans (6.15 percent), and

Table 1. Production and Requirement for Self-sufficiency achievement of important food commodities in Indonesia, 2011-2012 (000 ton)

Commodities	Items	2011	2012*
Rice	Production	36,969.00	38,564.00
	Requirement	33,045.00	33,035.00
	Self Sufficiency Index** (%)	111.87	116.74
Corn	Production	17,643.00	18,945.00
	Requirement	15,272.00	16,097.00
	Self Sufficiency Index** (%)	115.52	117.69
Soybean	Production	851.00	780.00
	Requirement	2,122.00	2,246.00
	Self Sufficiency Index** (%)	40.10	34.71
Beef	Production (domestic)	292.45	399.32
	Requirement	449.31	484.07
	Self Sufficiency Index** (%)	65.09	82.49
White sugar	Production (domestic)	2,230.00	2,660.00
	Requirement	2,790.00	2,850.00
	Self Sufficiency Index** (%)	79.93	93.33

*1st forecast, CBS (2011); **Self-sufficiency index=(domestic production/requirement)x100%

Source: MOA (2012)

Table 2. Production of important food commodities in Indonesia, 2005-2011

Commodity	Production (000 ton)							Growth (%)
	2005	2006	2007	2008	2009	2010	2011	
Paddy	54,141	54,455	57,157	60,326	64,399	66,469	65,757	3.33
Maize	12,524	11,609	13,288	16,317	17,630	18,328	17,643	6.37
Soybean	808,000	748,000	593,000	776,000	975,000	907,000	851,000	2.54
White sugar	2,243	2,306	2,448	2,703	2,851	2,364	2,353	0.04
Beef	359,000	396,000	339,000	393,000	405,000	436,000	466,000	4.90
Broiler	1,126	1,260	1,296	1,350	1,359	1,540	1,614	6.24
Eggs	1,052	1,204	1,382	1,324	1,405	1,366	1,432	5.53
Milk	536,000	617,000	568,000	647,000	827,000	910,000	926,000	10.11

Source: CBS (2011)

white sugar (0.49 percent). However, the production of food commodities of animal origin, such as the beef, broiler, eggs and milk in 2011 were having positive growth compared to their figures in 2010.

Availability of important food commodities, both from food crops and animal products during the period of 2005-2011 have positive growth (Table 3). When compared to 2010, the availability of some food commodities in 2011 has decreased, namely rice (1.07 percent), maize (3.84 percent), soybeans (6.06 percent), and white sugar (0.49 percent). But the figures were different for animal products, where the growth of these commodities have increased compared to their performance in 2010.

Furthermore, Food Balance Sheets analysis for the last six years during the period of 2005-2010 showed that the average quantity of food available per capita per day reached 3300 kilocalories of energy and 82.49 grams of protein. These figures are already surpassing the results stated by the *Widyakarya Pangan dan Gizi IX* or 9th National Workshop on Food and Nutrition in 2008. which recommended the per capita daily availability food were targetted for 2200 kilocalories of energy and 57 grams of protein.

In the period of 2005-2010, the availability of energy rose at an average of 4.50 percent and protein rose 4.09 percent per year. These figures were affected by relatively high production growth and decline in import volumes. Furthermore, within this period of 2005-2010 the availability of protein sources from plant materials (67.76 gram) still dominant compared to animal sources (14.74 gram). Similarly for energy availability that is 3,129 calories from plant materials while only 137 calories from animal sources (Table 4).

Table 3. Availability of important food commodities in Indonesia, 2005-2011

Commodity	Availability							Growth (%)
	2005	2006	2007	2008	2009	2010	2011	
Rice	30,663	30,841	32,371	34,166	36,207	37,371	36,969	3.20
Maize	11,039	10,234	11,709	14,379	15,536	16,222	15,599	6.41
Soybean	731	677	538	704	884	820	770	2.42
White Sugar	2,221	2,284	2,424	2,677	2,823	2,341	2,330	0.04
Beef	255	n.a.	242	279	288	311	332	4.90
Broiler	620	694	714	744	749	848	885	6.15
Eggs	953	1,098	1,260	1,221	1,296	1,253	1,299	5.54
Milk	452	520	479	545	697	767	780	10.11

Source: CBS (2011); Agency for Food Security (2010); MOA (2012)

Table 4. Progress of average daily per capita available energy and protein, 2005-2010

Tahun	Energy (cal)			Protein (g)		
	Crop	Animal	Total	Crop	Animal	Total
2005	2,796	116	2,912	64.53	12.26	76.79
2006	2,863	126	2,989	59.86	13.13	72.99
2007	3,220	138	3,358	65.60	14.48	80.08
2008	3,309	139	3,448	69.05	15.01	84.06
2009	3,176	144	3,320	71.96	15.78	87.75
2010	3,414	161	3,574	75.56	17.76	93.32
Average	3,129	137	3,300	67.76	14.74	82.50
Growth (%)	4.25	6.85	4.50	3.37	7.74	4.09

Source: CBS (2011)

Desirable dietary pattern or *Pola Pangan Harapan* (PPH) is defined as a balanced composition of food to be consumed in order to meet the nutritional needs. The PPH can be expressed in the form of (1) composition of the energy (calorie) from variety of food, and (2) composition by weight (grams or kilograms) of food variety. Therefore, PPH reflects the composition of food consumption which are recommended for the people in order to live healthy, active and productive. PPH was introduced for the first time in 1989 by the FAO-RAPA in Bangkok. The objective of the PPH is to produce a standard food composition for nutritional needs of the people, while also considering the nutritional balance, taste, digestibility, acceptability by the society, quality and affordability. Therefore, the PPH is useful for (a) planning for food production and availability, (b) used as an evaluation point for the planning, (c) measuring diversification and food security, and (d) guidelines in formulating nutrition.

The daily per capita energy and protein consumption increased from 2006 to 2008, but they decreased after then to 2011 as they were shown by Table 5, which indicated that the PPH score of the progress of daily per capita energy and protein consumption in Indonesia declined since 2008 (81.9) to only 77.3 in 2011. The current annual per capita consumption of livestock products has reached 6.96 kg (meat), 7.3 kg (eggs) and 16.5 kg (milk), which indicates good progress to stimulate sustainable domestic livestock production and their important contribution to total food availability along with other important food commodities in the country (DGLAHS 2011).

LIVESTOCK AND THE FOOD SUPPLY

Livestock make their most important contribution to total food availability when they are produced in places where crops cannot be grown easily, such as marginal areas, or when they scavenge on public land, use feed sources that cannot directly be eaten by humans, or supply manure for fertilizer and traction for crop production. In these situations, they add to the balance of energy and protein available for human consumption. When livestock are raised in intensive systems, they convert carbohydrates and protein that might otherwise be eaten directly by humans and use them to produce a smaller quantity of energy and protein. In these situations, livestock can be said to reduce the food balance. In a world that is increasingly concerned with sustainable food production, ideally the contribution of livestock to the food balance should be at least neutral, making the conversion of natural resources to human food as efficient as possible while also ensuring that people still have the possibility of eating a diverse diet that includes livestock products. However, on a global scale, this is not the case and may not even be possible (Steinfeld et al. 2006).

The production system and the species of livestock, such as monogastric and ruminants, both affect the food balance. Extensive systems require animals to find a large proportion of their feed from sources not edible to humans, such as grasses, grains left over from harvests and kitchen waste, while animals in intensive systems are fed concentrate feed that includes cereals, soybean and fishmeal as well as roughage. Intensive poultry and pigs are the biggest consumers of grain and protein edible by humans, although both have been bred to be efficient feed converters. Intensive beef systems in feed lots convert concentrates less efficiently but can be fed partly on brewers' waste. Moreover, intensive dairy cows are fed concentrates that enable them to produce much greater volumes of milk than they could manage from a roughage-only diet (FAO 2011).

The share of meat production by major livestock species indcates that poultry has the major share nearly 67 percent of total meat produced in Indonesia with increasing growth. This share was compensated by the decline in the share of small rumiants and mostly swine, while share of beef has been stable at around 20 percent (Table 6). This implies that the national program on beef self-sufficiency is supported by the domestic production performance, hence, it will complement with the national food security policy from availability of protein from local animal sources

Table 5. Progress of daily per capita energy and protein consumption, 2005-2011

Items	Per capita daily consumption							Growth (%)
	2005	2006	2007	2008	2009	2010	2011	
Energi (cal)	1,997	1,927	2,015	2,038	1,927	1,926	1,952	-0.32
Protein (g)	55.23	53.66	57.65	57.49	54.35	55.05	56.25	0.39
Score PPH	79.1	74.9	82.8	81.9	75.7	77.5	77.3	-0.22

PPH=Desirable Dietary Pattern

Source: CBS (2005; 2008; 2011); Calculated by Food Security Agency, MOA (2012)

Tabel 6. Share of main meat producers in Indonesia, 2006-2011

Year	Cattle and buffalo		Sheep and goats		Poultry		Swine	
	(000 ton)	(%)	(000 ton)	(%)	(000 ton)	(%)	(000 ton)	(%)
2006	439.7	21.3	140.2	6.8	1,284.7	62.3	196.0	9.5
2008	431.5	20.2	113.0	5.3	1,380.5	64.6	209.8	9.8
2009	443.9	20.1	128.0	5.8	1,430.4	64.9	200.1	9.0
2010	472.4	20.0	113.7	4.8	1,565.6	66.2	212.0	9.0
2011	503.3	20.4	115.6	4.7	1,642.8	66.6	204.6	8.3

Source: DGLAHS (2011)

viewpoints. Beef is known as high income elastic commodity, with income elasticity of demand of 1.64 percent (Kustiari et al. 2010) meaning that for every 1 percent increase in income of the consumers the household will spend 1.64 percent of its income to purchase beef. This implies that the demand for beef will continue to increase as per capita income rises and economy grows. However, domestic beef production has been managed by almost 97 percent by the smallholder farmers who keep only 1 to 3 cattle per household. They utilized traditional techniques, keep their animals as a live saving and market them anytime when cash are needed (Soedjana 2012).

The most recent livestock statistics and livestock census DGLAHS 2011 indicates that by 2010 dairy cattle population reached 597,213 heads, which is considerably small compared to the total human population. Most of the dairy stock (99.2%) are found on the island of Java among 192,160 farm households, with average farm size of 3-4 heads per household with average daily milk production around 11.5 l/head of milking cow. Of these households engaged in dairy farming, 183,189 were involved in dairy husbandry, 7,986 households dealt with breeding while 985 households were dairy cattle traders.

SUSTAINABILITY OF LIVESTOCK PRODUCTION

Competition in the provision of food, including food of animal origin will continue due to population and income growth. Competition will be determined by the level of efficiency in the production and that the growth of large-scale enterprises is not inevitable. However, the observations made by various international research institutes concluded that besides improving the nutritional intake of the people, the traditional animal husbandry also provide economic growth through the provision of stability in the form of cash collateral and saving animals against inflation. Thus, future policy options must involve a variety of market-oriented approach for the traditional animal husbandry to align themselves with the large-scale commercial farms in terms of productivity, quality and efficiency. Because animal husbandry in Indonesia is dominated by traditional scale enterprises mostly in rural areas, the policy options aimed at increasing production and productivity of livestock should include the role and functions of livestock farming systems prevail in the rural areas (Soedjana 2011). However, most small scale operations continue to face limits to intensification, although few have managed to upscale or specialize to a point where they can advance economically, and many depend partly on off-farm employment for their food security.

Most livestock farmers in the rural areas are survived by managing a mix of different crops and livestock activities, creating synergy when crop residues are used to feed animals and the manure from the animals is used to fertilize the crops. The different enterprises may be concentrated into the same small space or on separate farm plots. Other forms of mixed farming include grazing under tree crops, in the form of integrated tree crop and livestock. The prevalence of mixed farming varies by country and region, in many countries including Indonesia, the majority of agricultural land is occupied by mixed farming systems. Therefore, livestock contribute to food availability, access and stability. In some cases, direct provision of food is their primary contribution while others, consider income is the main motivation for keeping them. Livestock's contribution to the income of mixed farming households ranges from a very small percentage to over 30 percent, with no consistent pattern according to the wealth of the family. Other studies show contributions of up to 50 percent at any given time (FAO 2011).

The asset value of livestock is important to household resilience and food stability because it provides collateral to expand or diversify farming operations and gives households a capital item that can be sold in times of great need for cash. Livestock might act as a buffer stock, allowing farmers to allocate part of their resources to relatively risky but high-return activities which financial institutions are willing to

finance. Imai (2003) found that having a higher value of livestock assets enables households to invest more into high risk activities such as estate crop production. Another use of assets is to sell them for income smoothing at times when other enterprises are not providing income. Small animals provide more flexibility than large ones in these cases, since they do not require their owners to liquidate such a large proportion of their capital.

Animal power allows the cropping area to be extended beyond what would be possible with hand cultivation, and allows land to be ploughed when it is dry in preparation for planting immediately after the first rains. Manure is most likely to be used for crops where animals and crops are in close proximity, although as explained previously, there are competing demands for manure and it can be in short supply.

Synergy with other livelihood enterprises is most evident with scavenging livestock. Income from these animals is low, but they often provide "something for nothing" by eating crop residues, insects, scraps and rubbish found within the community and requiring very little labour, equipment or housing.

Livestock play an important role in the economy, both at the rural and national level. A very important factor is that of added security to food supply and production. Livestock provide liquid assets to the farmers as a hedge against inflation and a means of reducing the risks associated with crops in mixed farming systems. A remarkable characteristic, important for the national global food security, is the capacity of the livestock sector to draw on many different types of feed resources, and to expand with resources availability and market demand. Sales of livestock products provide purchasing power and thus, access to food. In fact, the value added through livestock production and processing is often the only outlet of smallholders in rural communities to the monetary economy (FAO 1996).

CONCLUDING REMARKS

Indonesia as a country gives high priority to the efforts of achieving sustainable food security and has committed to achieve its food security policy and to put agriculture as one of the important development agenda. This commitment will be implemented through optimal utilization of local resources, application of innovative technologies and taking advantage of market opportunities. The government of Indonesia's development priority program on agriculture, has targeted 2014 to achieve sustainable food security by producing 75.70 million tons of rice, 29 million tons of corn, 2.7 million tons of soybeans, 4.81 million tons of white sugar, and 0.55 million tons of beef. This target is considered not too excessive from the viewpoint of the fact that each region in Indonesia has its potential and capability for developing strategic food commodities.

Most farmers in rural areas of Indonesia are survived by managing a mix of different crops and livestock activities, creating synergy when crop residues are used to feed animals and the manure from the animals is used to fertilize the crops. Other forms of mixed farming include grazing under tree crops, integration of tree crops and livestock. These approaches were considered in line with the current national policy to push beef production to achieve beef self-sufficiency status by 2014. In addition, the prevalence of mixed farming varies by region throughout Indonesia where the majority of agricultural land is occupied by mixed farming systems. Small-scale mixed farms remain enormously important because of the large number of rural households they feed and provide work opportunity for the livelihoods.

Livestock play a role in food security which covers food production, stability of supply and access to food. Livestock also makes a significant contribution to food production through the provision of high value protein-rich non-replaceable animal products. Indirectly, livestock support crop production through draught power and manure for fertilizer, and significant source of income and store of wealth for smallholders. While livestock products are not absolutely essential to human diets, they are still desirable, since meat, milk and eggs in appropriate amounts, are valuable sources of complete and easily digestible protein and essential micronutrients. Therefore, livestock can increase the world's edible protein balance by converting protein found in forage, that is inedible to humans into forms digestible by humans.

Another important factor which livestock play in the economy, both at the rural and national level, is that of added security to food supply and production. Livestock provide liquid assets to the farmers as a hedge against inflation and a means of reducing the risks associated with crops in mixed farming systems. A remarkable characteristic, important for the national global food security, is the capacity of the livestock sector to draw on many different types of feed resources, and to expand with resources availability and market demand. Sales of livestock products provide purchasing power and eventually provide a stronger access of the households to food, as a necessary condition toward achievement of national food security policy.

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