Enhancing food security in Indonesia through the United Nations’ Sustainable Development Goals

A discussion paper from the Lembaga Ilmu Pengetahuan Indonesia (LIPI) and The University of Queensland, Australia – November 2017
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Authors: Nina Hall, The University of Queensland, Karen Hussey, The University of Queensland, Esta Lestari, Indonesia Institute of Sciences, Tri Nuke Pudjiastuti, Indonesian Institute of Sciences, Lee Wilson, The University of Queensland.


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Overview: Food security and the UN SDGs in Indonesia

A workshop was conducted by The University of Queensland (UQ) in Indonesia, in partnership with Lembaga Ilmu Pengetahuan Indonesia (LIPI), in August 2017 to investigate the actions to enhance food security in Indonesia within the 2030 UN Agenda for Sustainable Development. Thirty participants working on aspects of food security from LIPI, Indonesian Government agencies and CSOs participated (see Figure 1). Further details on the workshop method and results are provided in the attached Background document.

Workshop aims: The workshop and this resulting discussion paper examine and model the interlinkages and cross-influences between SDGs relevant to food security in Indonesia from the perspective of policy makers and LIPI researchers working on these issues. The goal was identify issues key to enhancing food security in Indonesia using expert consultation and group discussion across scientific disciplines and government agencies to elicit novel insight into a complex problem.

Food security: The Food and Agriculture Organisation defines food security as ensuring physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs of a population. In Indonesia, the Government has recently recorded a decrease in food insufficiency, owing largely to increased production of rice, eggs, chicken and beef; increased fish catch (within the allowable quota); and increased nutritional status of pregnant women and infants. However, global trends associated with food security remain a challenge in Indonesia—namely malnutrition, climate change, governance, gender and culture, wealth, and urbanisation.

UN Sustainable Development Goals: Indonesia is a signatory to the UN SDGs, which provide an international focus on social, economic and environmental development. Of the 17 Sustainable Development Goals (SDGs) to be achieved by 2030, at least 11 are relevant to food security (see Error! Reference source not found.).
Important SDGs for food security: Using a systems approach, the workshop participants worked in groups representing a range of Indonesian Government agencies and LIPI research centres. They created three diagrams of interlinkages regarding SDGs of relevance to food security:

- Group 1 identified that reducing hunger (SDG 2) was the priority goal for food security, to be achieved through the provision of both sufficient quantity and nutritional quality food. The group determined that SDG 2 was directly and strongly influenced by the consumption and production of food (SDG 12), and through climate change (SDG 13)—which was noted to limit the production and availability of food (see Figure 3).
- Group 2 considered that gender equality (SDG 5) influenced all the other goals for food security. They identified that ending poverty (SDG 1) was the priority goal behind food security, as poverty limited access to nutrition, education, food, health and work. SDG 1 was perceived to be strongly influenced by economic aspects (SDG 8).
- Group 3 identified the main goal to be reducing hunger (SDG 2), which was strongly influenced by economics (SDG 8), water supply (SDG 6), and terrestrial (SDG 14) and marine environments (SDG 15). In turn, SDG 2 was noted to strongly influence poverty reduction (SDG 1). This group added the goal for education (SDG 4), due to its role in building awareness of nutrition within food security.

![Figure 3: Group 1’s diagram of interlinkages between food security SDGs (width of arrow denotes strength of influence)](image)

Keys to enhancing food security: The 30 Indonesian researchers and Government representatives in the workshop developed and agreed on three key areas that should be prioritised in order to address food security in Indonesia:

1. Progress agrarian reform to increase food availability.
2. Advance technology to increase the quality and quantity of food production.
3. Transfer technology and innovation to those involved in the food supply chain to increase the quality and quantity of food production.

For further details: Contact Dr Lee Wilson, The University of Queensland: l.wilson7@uq.edu.au, or Esta Lestari, Pusat Penelitian Ekonomi-LIPI, esta.lestari@gmail.com
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Introduction: Sustainable Development and Food Security in Indonesia

Food security is defined by the Food and Agriculture Organisation as:

‘A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’ (FAO, IFAD et al. 2015).

This definition is further described as having four dimensions:

1. Availability of food;
2. Access to food (both economic and physical);
3. Use of food; and
4. Resilience and stability of food supplies (FAO, IFAD et al. 2015).

Trends and influences on food security

The issue of food security is affected by a range current and emerging trends. Each of these trends affects the long-term trajectory of food supplies, through production to equitable consumption. Several trends are described below.

Nutrition: Insufficient nutritional contribution from food is known as malnutrition, and can be manifested in three ways. Firstly, food insecurity and unavailability can cause undernutrition. Although the trend of undernutrition is decreasing, currently 793 million people are affected. Secondly, overconsumption of calorie-dense food can result in obesity and related health conditions. There is an increasing global trend towards obesity, which has doubled since 1980, to now affect 13 percent of the global population (600 million adults). Finally, malnutrition from micronutrient deficiencies in the food consumed, such as vitamin A, iron and zinc, can limit the growth and negatively affect the health of individuals (Tian, Bryksa et al. 2016).

Climate change: Climate change can affect food security in a range of ways, including production, transport and distribution, and pricing. In terms of production, the effects of climate change may manifest as reduced yields from reduced rainfall, extreme weather events, and changed climatic conditions that promote pest and weed infestations. These effects are anticipated to reduce crop yields as well as well livestock and fish stocks. Food prices are anticipated to increase as an outcome from reduced yields and availability, as well as potential increases in petroleum prices (used in fertilisers and pesticides) (CDC 2014).

Governance: Governance is the process by which countries, organisation or societies are managed at the highest level, and the systems to conduct this process (CUP 2017). With regard to food security, three governance trends can be noted. Firstly, government agencies in many countries operate in isolation on topics that are better managed through cross-agency collaboration and engagement, due to the cross-cutting nature of these topics and the range of perspectives and data required. This includes consideration of agriculture, biodiversity, water, and health issues. Secondly, accurate and non-aggregated data at a country-level is required to provide a baseline understanding and track progress on food security improvements. Finally, political tendencies for short-term funding can be insufficient to create long-term transformations, such as changes to land-use, livestock management and ecosystem conservation (Schmidt-Traub 2017).

Gender and culture: The role of women in agriculture can provide a means to increase production and ensure adequate nutritional food consumption. However, many cultures maintain traditions that limit the ability for women farms regarding land ownership, and limit access to education, information, finance, and technology. However, women farms ae needed to provide crucial role models for a future gender change in the agricultural workforce (CCAFS 2012).

Food and wealth: Increasing wealth, often through an urbanising population earning wages as well as increasing population, has increased global consumption of meat and dairy products. Global meat consumption in 1963 was 72 mill t, which increased to 258 mill t in 2007, and is projected to reach 455 mill t by 2050 (FAO 2012). However, consumption differs per country. Figure 4 displays meat consumption in 2015 across several countries, with Indonesian consumption at 7 kg per capita (mainly of chicken, pork and sheep meat), while Australian consumption...
is 42 kg per capita (consisting of chicken, beef, pork and sheep meat) (OECD 2016). This meat consumption contributes to higher water and energy embodied per kilogram of meat produced; this is high than for plant-based protein (Vanham, Mekonnen et al. 2013).

Figure 4: Meat Consumption 2015 (kg per capita) (OECD 2016)

**Urbanisation**: The shift from rural to urban-based living is an increasing trend. In 2014, 54 percent of the world’s population lived in urban areas- an increase from 30 percent in 1950-- and is projected to increase to 66 percent by 2050 (UN DESA 2014). This trend has a range of implications on food security, both in the labour force and in individual nutrition. Fewer people are working in agricultural labour roles, and the increasing consumption of processed foods have increased employment in the food supply chain, including transport, wholesale and retail (FAO 2017). In addition to increased consumption of meat and dairy, increasing financial income and longer working hours, as well as cultural trends in urban populations, have seen increased consumption of processed ‘fast’ or ‘convenience’ (FAO 2017). These foods are often higher in salt, fat and sugar, with implications for malnutrition and obesity (FAO 2017).

**Planetary boundaries relevant to food**
A framework termed ‘planetary boundaries’ was developed in 2009 to describe the ‘safe operating space’ on earth that are influenced by nine key biophysical-regulating processes (Rockström, Steffen et al. 2009). Five of these processes are key to food security:

1. **Ocean acidification**, affecting marine plankton, with implications up the food chain.
2. **Biogeochemical flows**, predominantly regarding use of Nitrogen as crop fertiliser, with residue reaching waterways, coastal zones, as well as the atmosphere and biosphere.
3. **Freshwater use**, where over-extraction and pollution affect water required to support ecosystem services that support biodiversity, freshwater fish stocks, climate regulation for terrestrial and aquatic ecosystems.
4. **Land-system change**, particularly the distribution and intensity of land-system use.
5. **Chemical pollution**, where direct exposure to chemicals by air, water or soil can bioaccumulate or biomagnify up the food chain (Rockström, Steffen et al. 2009).
This framework was revisited in 2015. Biogeochemical flows are now a high risk, as displayed in Figure 5, with a direct influence on food production (Steffen, Richardson et al. 2015). The authors of the planetary boundary framework recommended that this framework, or similar, is required to be implemented in parallel with the SDGs to ensure stable functioning of the earth’s processes and system and ensure adequate production and supply of food (Steffen, Richardson et al. 2015).

![Figure 5: The ‘planetary boundary’ framework, displaying the operating spaces as safe (green), uncertain (yellow) and high-risk (red) (Steffen, Richardson et al. 2015)](image)

Food security in Indonesia

The Indonesian Government has analysed its progress towards food security in a recent and voluntary report to the United Nations on SDG progress. Of note, this report particularly focused on three SDG, all of reliance to food security: achievements in the health sector (SDG 3), food security and sustainable agriculture (SDG 2), and education (SDG 4) (Republic of Indonesia 2017). The report noted recent data that indicated reduced food insufficiency in Indonesia: rice, egg, chicken and beef production have all increased. Newly-developed strains of rice, soybean and maize (corn) have been made available to increase production, and further agricultural technology research has been commissioned. Regarding marine food resources, fish catch has increased (while remaining below the allowable quota), and an intentional Government program has increased the awareness of the nutritional benefits from fish consumption (Gerakan Memasyarakatkan Makan Ikan) (Republic of Indonesia 2017).

In reflection of increased food availability, the report notes that the nutritional status of pregnant women and infants has increased to reduce stunting in young children. This has been achieved in part through increased exclusive breastfeeding of babies up to at least six months of age. There is an awareness and action by Government agencies regarding the link between education, sanitation and poverty on nutrition. These efforts are part of the implementation of the First 1000 Days of Life Movement (Hari Pertama Kehidupan) (Republic of Indonesia 2017).

Sustainable Development Goals for Food Security

The United Nations’ Sustainable Development Goals provide a frame and an international focus for efforts towards food security, including in Indonesia. In September 2015, the United Nations (UN/ PBB) launched the ‘2030 Agenda for Sustainable Development’, an ambitious “plan of action for people, planet and prosperity”, aiming to “transform
This Agenda covers a range of ambitions that contribute to a healthier environment and population, with a vision of three ‘pillars’ of sustainable development: social, economic and environmental, with strong governance supporting their attainment. Within the Agenda are 17 Sustainable Development Goals (SDGs), with targets to be achieved by 2030; see Appendix for details (UN 2015).

The 17 SDGs are a part of a new UN Agenda, following the closure of the Millennium Development Goal period (2000-2015). These eight earlier UN goals were predominantly focused on health-related issues. While the achievements were significant under the MDGs, the new UN Agenda clarifies that there remains ‘unfinished business’ on these topics. The UN Agenda states:

“We recognize that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. We are committed to achieving sustainable development in its three dimensions – economic, social and environmental – in a balanced and integrated manner. We will also build upon the achievements of the Millennium Development Goals and seek to address their unfinished business’ (UN 2015).

The structure of the SDGs is in three parts: an overarching goal, formulated as a vision. Below each goal, a number of targets provide details about the nature of the issues to be addressed. Under each of the 169 targets are up to two indicators. These indicators provide clarity on the specific data to be collected to evaluate the achievement of the targets (Hall, Abal et al. 2016).

Indonesia is one of the 193 UN member countries that signed up to the SDGs (UN 2015). The official UN SDG website indicates that the two Indonesian Government ministries with reporting responsibilities to the UN on SDG progress are the Ministry of Foreign Affairs of the Republic of Indonesia (Kemlu) and the National Development Planning Agency of the Republic of Indonesia (Bappenas) (UN 2016).

Several researchers have examined the SDGs in terms of food security. One of the authors of the Planetary Boundaries framework published a representation of ‘food in the SDGs’, stating that all 17 SDGs are relevant directly or indirectly to providing sustainable and healthy food (Rockström and Sukhdev 2016). As shown in the ‘wedding cake’ image in Figure 6, these 17 SDGs can be divided into four separate but interacting levels to deliver sustainable food. At the foundation level is the ‘biosphere’ containing four SDGs of relevance to environmental aspects. Above this, eight SDGs relating to societal factors are noted to affect food production. Further above this are four SDGs of relevance to economic sustainability. To bring these together, the final SDG regarding partnerships (SDG 17) is positioned above the other layers.
Method

A workshop was held in Jakarta on August 29 2017 and facilitated by two UQ researchers. It was attended by 30 participants, including 19 LIPI researchers and 11 Government agency representatives, including from the SDG Secretariat of the National Planning and Development Ministry (BAPPENAS), the Indonesian National Committee on Family Farming (KNPK), Directorate of Fisheries Resources Management (PSDI-KKP), and the Peatland Restoration Agency (BRG). The full list of attendees’ organisations is provided in the Appendices.

Each workshop session contributed to a section in this resulting discussion paper on food security and UN SDGs in Indonesia by 2030. Discussion occurred in English, in which all participants held high level, working fluency. The final document was co-authored by UQ, LIPI and other participating agencies. The workshop had three parts:

1. **Context:** A short presentation was delivered by UQ on research regarding food security in Indonesia, the United Nations’ Sustainable Development Goals (particularly those relevant to food security), and the interaction between LIPI, government policymakers on food, civil society and other organisations, and the SDGs.

2. **Creating a diagram of relevant SDGs for food security in Indonesia:** This activity sought to identify the SDGs and targets of relevance to food security in Indonesia. This was achieved by selecting targets and goals that featured a word of relevance to food security, namely those responding to a search of food-relevant keywords, namely food, agriculture, nutrition, farm, hunger, natural resources, climate, environment, soil, water, marine, fish, biodiversity and production. This resulted in the identification of 11 relevant SDGs: 1 (no poverty), 2 (zero hunger), 3 (health and wellbeing), 6 (water and sanitation), 8 (work and economic growth), 11 (sustainable cities), 12 (consumption and productions), 13 (climate action), 14 (life under water) and 15 (life on land). These are displayed in Figure 7. The full lists of relevant goals and targets are provided in the Appendices.
The workshop participants then considered the relevant Indonesian government agencies and other organisations that could progress the SDGs on food security. In a simplified form of policy analysis (Wilson 2006), a list of the 11 relevant SDGs was circulated, and the small groups completed the organisations that they considered to have responsibility or relevance.

To display the influences and connections between the SDGs in a systems approach, a simplified Bayesian network approach was selected (Cain 2001, Nadkarni and Shenoy 2004). This corresponded to previous scholars using approaches to present these complex and dynamic systems (Le Blanc 2015). The selected approach produces a graphical diagram that displays the links between ‘nodes’, also known as directed acyclic graphs (Cain 2001). The workshop participants sought to construct a diagram that reflected the determinants and descendents of all 11 SDGs of relevance to food security in Indonesia, among the goals and targets (Cain 2001, Nadkarni and Shenoy 2004). Each group was provided with 11 cards that featured the relevant SDGs, and created a physical diagram in the order in which one might directly influence the next. Figure 8 displays the mixed-participant groups creating their diagram through discussion and consideration of the topic and relevant SDGs.
The final stage of the systems approach was to ascribe the strength of influence between the goals and targets, using a form of expert judgment to develop estimates known as expert elicitation (Kuhnert, Martin et al. 2010). The workshop participants reviewed the diagrams, and indicated the strength between each goal and target in terms of mild or strong. The resulting diagrams were displayed connecting arrows of influence between the SDGs in different widths, where wider lines reflected a stronger influence.

3. **Development of recommendations**: The final workshop activity was for small groups of attendees from a mixture of organisations to discuss and record recommendations from these activities regarding the ‘next steps’ to implement the UN SDGs for food security in Indonesia.
**Results: Interlinkages between the UN Sustainable Development Goals for Food Security**

This section presents the findings of the workshop regarding two aspects of food security:

1. Identification of the government agencies with relevance for progressing attainment of SDGs (see Table 1). This table includes and extends the list of organisations identified by the Indonesian Government’s planning documents for the SDGs (Presiden Republik Indonesia 2017).

2. Identification of the priority SDGs for food security in Indonesia, the influences between these goals and targets, and the strength of these influences. This is provided from the perspective of three groups of participants.

**Table 1: Indonesian government agencies with relevance to food security SDGs (drawing from (Presiden Republik Indonesia 2017))**

<table>
<thead>
<tr>
<th>Goal name</th>
<th>Government agency relevant or responsible for this SDG issue/topic</th>
<th>Reason for inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDG 1. End poverty in all its forms everywhere</td>
<td>Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Sosial; Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi; Kementerian Pendidikan dan Kebudayaan; Kementerian Agama; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Badan Nasional Pengendalian Bencana; Kementerian Kesehatan; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Kementerian Energi dan Sumberdaya Mineral; Kementerian Lingkungan Hidup dan Kehutanan; Kementerian Agraria dan Tata Ruang/BPN; Kementerian Perindustrian; LIPI; BPPT; Kem Ristekdikti; private banks; Tim Nasional Percepatan Pengentasan Kemiskinan (TNP2K); Implementing agencies at the subnational level: Bappeda Provinsi and Bappeda Kab/Kota.</td>
<td>These ministries are responsible for addressing poverty, including access to basic needs, and to reduce vulnerability to extreme events.</td>
</tr>
<tr>
<td>SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture</td>
<td>Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Pertanian, Badan Ketahanan Pangan, Kementerian Keuangan; Kementerian Kesehatan; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kementerian Kelautan dan Perikanan; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Kementerian Lingkungan Hidup dan Kehutanan; Kementerian Sosial; LIPI Ministry of Agriculture has a research agency to maintain food availability; LIPI develops technology for applied use.</td>
<td></td>
</tr>
<tr>
<td>SDG 3. Ensure healthy lives and promote well-being for all at all ages</td>
<td>Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Kesehatan; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kementerian Perindustrian; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Badan Pusat Statistik (BPS)</td>
<td>Ministry of Health has a survey to monitor indicators related to health to set relevant targets related to the baseline data.</td>
</tr>
<tr>
<td>SDG 5. Achieve gender equality and empower all women and girls</td>
<td>Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Pemberdayaan Perempuan dan Perlindungan Anak; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Badan Pusat Statistik; Kementerian Koordinator Bidang Polhukam; Kementerian Sosial; Kemenko Pembangunan Manusia dan Kebudayaan; Kementerian Pendidikan Kebudayaan; dan research academics from universities</td>
<td>BPS has responsibility to monitor the land ownership data.</td>
</tr>
<tr>
<td>SDG 6. Ensure availability and sustainable management of water and sanitation for all</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Kementerian Keuangan; Kementerian Ketenagakerjaan; Kementerian Perindustrian; Kementerian Perdagangan; Kementerian Pertanian; Kementerian Pariwisata; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kementerian Kesehatan; Kementerian Energi dan Sumberdaya Mineral</td>
<td>These ministries manage water delivery and infrastructure, water quality, sanitation, groundwater, data, and provision of water for agriculture.</td>
</tr>
<tr>
<td>SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Ketenagakerjaan; Kementerian Perindustrian; Kementerian Perdagangan; Kementerian Pertanian; Kementerian Pariwisata; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota;</td>
<td>These ministries coordinate programs, development plans, regulation of working conditions, education, and various support and information for industry, people and economic aspects.</td>
</tr>
<tr>
<td>SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Kementerian Dalam Negeri; Kementerian Agraria dan Tata Ruang; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota;</td>
<td>These ministries manage financial systems, development of cities and external areas, planning of new cities, and management of waste.</td>
</tr>
<tr>
<td>SDG 12. Ensure sustainable consumption and production patterns</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Lingkungan Hidup dan Kehutanan; Kementerian Perindustrian; Kementerian Pekerjaan Umum dan Perumahan Rakyat; Kementerian Pariwisata; Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kementerian Kelautan dan Perikanan; Kementerian Kesehatan; LIPI; Kementerian Pendidikan dan Kebudayaan; Badan Restorasi Gambut.</td>
<td>These organisations regulate plans for production and provision, oversee quality and social consumption, provide education for consumers, and remediate land to enable food production.</td>
</tr>
<tr>
<td>SDG 13. Take urgent action to combat climate change and its impacts</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Badan Nasional Penanggulangan Bencana; Kementerian Dalam Negeri; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kementerian Lingkungan Hidup dan Kehutanan; Kementerian Pertanian; Kementerian ESDM, Kementerian Perhubungan; BNPB; LIPI.</td>
<td>KLH provides a focal point for the Intergovernmental Panel on Climate Change; Kementan is tasked with mitigation and adaptation to climate change—which is supported by LIPI research.</td>
</tr>
<tr>
<td>SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development</td>
<td>Kementerian Koordinator Bidang Kemaritiman; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Kelautan dan Perikanan; Pemerintah Daerah Provinsi; Pemerintah Daerah Kabupaten/Kota; Kemenko. Maritim; Kementerian ESDM; LIPI; Kementerian Pendidikan dan Kebudayaan.</td>
<td>KKP oversees marine resource issues; LIPI provides relevant marine research; Kemendikbud provides relevant education.</td>
</tr>
<tr>
<td>SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</td>
<td>Kementerian Koordinator Bidang Perekonomian; Kementerian Perencanaan Pembangunan Nasional/Bappenas; Kementerian Keuangan; Kementerian Lingkungan Hidup dan Kehutanan; Pemerintah Daerah Provinsi; Kementerian Kesehatan; LIPI; Universities; Kementerian Pertanian.</td>
<td>Ministry of Health considers health-related issues from environmental pressures; LIPI provides responsive research; KLHK monitors biodiversity; and Kementan supports food crop cultivation.</td>
</tr>
</tbody>
</table>
Three groups of participants, each of which was multidisciplinary and multi-agency, worked to create diagrams of the interlinkages regarding SDGs of relevance to food security. Of interest is the difference in the conceptual models produced by each group of the relationships between the respective SDGs, the path dependencies of the goals and their relevance to food security. Each group was comprised of both policy makers and researchers with a working knowledge of some aspect of food security, including comprehension of Indonesian government policy on the matter. However, each of the groups prioritised the goals and identified the interlinkages in creative and novel ways, underlining the value of the SDGs as “good to think with” in attempting to grapple with complex developmental goals such as food security, and planning pathways for policy outcomes to achieve these goals.

For Group 1, as shown in Figure 9, zero hunger (SDG 2) was the priority goal for food security for the participants. This was defined as ending hunger through the provisions of both sufficient quantity and nutritional quality of food. This goal was directly and strongly influenced by the consumption and production of food (SDG 12), and through climate change (SDG 13)—which was noted to limit the production and availability of food. In turn, SDG 12 was noted to be directly and strongly influenced by decent work (SDG 8) and water (SDG 6). Finally, Group 1 identified that climate change (SDG 13) is strongly influenced by terrestrial life (SDG 15) which can absorb greenhouse gas emissions.

Group 2 included a larger number of SDGs. They identified that ending poverty (SDG 1) was the priority goal, as poverty limited access to nutrition, education, food, health and work. SDG 1 was perceived to be strongly influenced by economic aspects (SDG 8), and mildly influenced by sustainable cities (SDG 11) and climate change (SDG 13). In turn, climate change was strongly influenced by terrestrial (SDG 14) and marine (SDG 15) environments, and patterns of consumption (SDG 12). They considered that the gender equality goal (SDG 5) influenced all the other goals for food security. This is displayed in Figure 10.
Finally, Group 3 created a diagram that identified the main goal to be the reduction of hunger (SDG 2). This is displayed in Figure 11. They displayed the influences as ‘inputs’ that influenced SDG 2, and the ‘outputs’ on which SDG 2 had influence. They considered that reducing hunger (SDG 2) was strongly influenced by economics (SDG 8), water supply (SDG 6), terrestrial (SDG 14) and marine environments (SDG 15). In turn, climate change (SDG 13) mildly influenced the SDGs for water (SDG 6), terrestrial (SDG 14) and marine environments (SDG 15). The ultimate output or influence from SDG 2 was noted to be poverty reduction (SDG 1). This was due to the strong influence of SDG 2 on food waste and food sustainability (SDG 12), which is in turn strongly influenced urban behaviours and food choices and consumption habits (SDG 11). Group 3 added the goal for education (SDG 4), due to its role in building awareness of nutrition within food security.
Issues key to implementing the UN SDGs for Food Security

Following the identification of the relevant government agencies and the relevant SDGs to attain food security in Indonesia, the workshop participants developed recommendations for implementation. Participants reviewed the range proposed, and collectively selected their three priority recommendations. These are detailed in Table 2.

Table 2: Recommendations to achieve food security in Indonesia

<table>
<thead>
<tr>
<th>Key to enhancing food security</th>
<th>Relevant agencies</th>
<th>Proposed action to address key issue</th>
<th>Proposed timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Progress agrarian reform to increase food availability (Percepatkan pelaksanaan reforma agrarian untuk mendukung ketersediaan pangan)</td>
<td>ATR-BPR; lintas-kementrian (cross-agency collaboration)</td>
<td>Prepare a petition for certification and redistribution of land to small farms (Penyusunan tata cara/ SOP permohonan sertifikasi dan redistribusi lahal untuk petani kecil)</td>
<td>2018</td>
</tr>
<tr>
<td>2. Advance technology to increase the quality and quantity of food production (Penerapkan adopsi teknologi pangan untuk meningkatkan kualitas usupan makan)</td>
<td>LIPI; Kementrian Kesehatan; Kementrian Perindustrian; Mentrian Desa</td>
<td>LIPI to meet with the health ministry to agree on relevant technologies to implement through a food program; LIPI to meet with the industry ministry to commercialise these technologies</td>
<td>2017/ as soon as possible</td>
</tr>
<tr>
<td>3. Transfer technology and innovation to those involved in the food supply chain to increase the quality and quantity of food production (Penginkatkan produksi pangan melalui inovasi dan teknologi dari hulu sampai hilia (teknologi dapat guna)</td>
<td>Kementerian Pertanian; LIPI; Kementrian Perindustrian; Kementrian Desa (Kemendes)</td>
<td>LIPI and relevant ministries to meet to plan technology transfer</td>
<td>2017/ as soon as possible</td>
</tr>
</tbody>
</table>

Acknowledgements

Thank you to the representatives of Government and LIPI agencies who participated in this workshop in Jakarta. Particular thanks to LIPI for hosting the workshop, and to The University of Queensland for supporting this activity. Thanks also to colleagues at The University of Queensland who contributed to the background research, including Dr Grace Muriuki and the authors of the related SDG discussion paper for Australia (Hall, Abal et al. 2016).
Appendices

United Nation’s Sustainable Development Goals and targets of relevance to food security in Indonesia

(nb These goals and targets were selected as being related to food security through a keywords search of the following terms: food, agriculture, nutrition, farm, hunger, natural resources, climate, environment, soil, water, marine, fish, biodiversity and production.)

SDG 1. End poverty in all its forms everywhere

1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters

SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries

2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility

SDG 3. Ensure healthy lives and promote well-being for all at all ages

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
SDG 5. Achieve gender equality and empower all women and girls

5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws

SDG 6. Ensure availability and sustainable management of water and sanitation for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead

SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

SDG 12. Ensure sustainable consumption and production patterns

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production

12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities
SDG 13. Take urgent action to combat climate change and its impacts

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 Integrate climate change measures into national policies, strategies and planning

13.3 Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

14.3 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

14.4 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

14.8 Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries

14.9 Provide access for small-scale artisanal fishers to marine resources and markets

SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.2 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

15.3 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

15.4 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species
15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems

Table: Participants of the 'Food security and sustainable development workshop' (August 29, 2017)

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