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Food Security Status in Agroforestry Landscapes of Way Betung Watershed, Indonesia and Molawin Dampalit Subwatershed, Philippines

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Abstract

Indonesia and Philippines are homes of biodiversity in Southeast Asia. In recent years, however, there has been a decline in biodiversity brought about by land use change. This condition poses threat on the food security of communities around the watersheds. The type and volume of main food items depend on the ecological and physiological conditions of the watersheds, in this case, Way Betung and Molawin Dampalit. When edible food is sufficient and available in an area, there is higher livelihood that the communities are food secured. This paper argues based on research which has been conducted in May to November 2015 that the food security of communities in the selected agroforestry landscapes in Way Betung and Molawin Dampalit have moderate. Levels of its food security based on four dimensions, namely: food availability, food accessibility, food stability and food utilization. Amounted 261 Indonesia farmer's respondents and 106 Philippine's respondents mentioned that the farm households generally practice agroforestry where the production of short-term and medium-term agricultural crops, woody perennials and livestock are deliberately combined. The type of crops grown by farm households contribute to the level of food security.

Keywords: agroforestry, food availability, food accessibility, food stability, food utilization, watershed

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Introduction

Primary tropical forests have complex ecosystems (de Castro et al., 2015). However, biodiversity in Southeast Asia is highly threatened, especially in Indonesia and Philippines. Baliton et al. (2017) said there are already 686 vulnerable species of vascular plant, many species in critically endangered as follows 691 fish species, 428 reptile species, 023 species of amphibian, 5147 mammal species and 7116 species of bird. It needs mitigating further habitat degradation that would improve the threatened big mamals and others (Smith et al., 2018).

Loss of biodiversity in Southeast Asia is attributed to deforestation; natural calamities such as climate change; conversion of agricultural lands to other economic purposes; and continued dependence on forest resources for growing community's livelihood (Hughes, 2017). Jones (2017) also stated that implication of global diets may be influenced by the decline of food supplies worldwide and diversity of agricultural production. These all boil down to the raid ecological, social and economic changes that the world faces. In most cases, the forest dwellers are as blamed as culprits of biodiversity loss because of their continued dependence on the forest resources for fulfillment of their economic and livelihood activities (Baliton et al., 2017). According to the Head of Indonesia Science Centre Organization (*Lembaga Ilmu Pengetahuan Indonesia/LIPI*), Indonesia is at the 6th level of biodiversity threat (Kompas, 2019).

Two watersheds in Southeast Asia are the Way Betung Watershed in Indonesia and Molawin Dampalit

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Subwatershed that located in Makiling Forest Reserve (MFR) in the Philippines have similar conditions which have problem on forest encroachment. Setiajiati et al. (2017) state that human activities conducted in protection area included in watershed can have negative and positive impacts on the conservation functions. Those locations actually should be free from dwellers occupancy. First area, Way Betung Sub-Watershed is 5,260 ha and 51% classified as the forest park area, and the remaining 49% is classified as agricultural areas (Figure 1). Majority upland of farmers in Way Betung watershed is engaged in agroforestry, specifically combining the major fruit tree species such jackfruit, durian, mangosteen, integrated with coffee, cacao, rubber and other forest trees such as Alstoria, mahogany and other forest species.

At second area, a 4,244 ha in MFR (Philippines) is multiple use forest reservation (Figure 2). In 1994 early, about 45% area (out of 1,924 ha of the total land) of MFR is occupied by 754 farmlots and its area being maintained by 623 individuals (Baliton et al., 2017). All farmers in MFR included at Molawin Dampalit Subwatershed practice agroforestry, specifically multi-story system. They make it combines the production of fruit trees, coconut and agricultural crops. Given these situations, therefore the critical research question as follows: Can these agroforestry practices describe food status level and meet the food requirements/needs of the upland farmers within the two watersheds? According to Mota et al. (2019), FAO's estimates indicate 842 million people were unable to meet their food.

While the forest's encroachment in these two watersheds is brought about by socially-constructed problems and becomes inevitable. It has reasonable that their presence could also help contribute to ecological stability but at the same time, harness to the land's potential particularly for their food production. Food systems are very rapidly transforming and transitioning very rapidly even in high, middle also low-income countries, with important implications for growing challenges in nutrition status, social and environmental sustainability issues (Bene et al., 2019). Its condition will influence their food security through their current farming system namely agroforestry. Wulandari et al. (2014) mentioned that agroforestry is a land use management system that combines the production of agricultural crops, woody perennials and/or animals or aquatic resources included honey bee for simultaneous purposes of production and conservation. Tolentino et al. (2010) and Wulandari et al. (2014) highlighted that plant diversity in agroforestry provides multiple benefits at different times in a year. These diverse combinations can help forest's community from the risk of price variability and their income loss, food security, crop failure also another unanticipated problem. Therefore biodiversity level at such land tillage will influence to food security level at that area (Wulandari et al., 2014; Baliton et al., 2017). Correlation of biodiversity level and food security level have also founded by Jones (2017) at other places such as Malawi, Ecuador, Burkina Faso. Those are research articles can be as claiming that agroforestry is a key strategy to ensuring food security among the smallholder farmers in the tropical countries Mbow et al. (2014)

As defined by USAID, food security is a state when all people at all times have both physical and economic access to sufficient food to meet their dietary needs in order to lead a healthy and productive life. According to the Food and Nutrition Technical Assistance (FANTA), the three components of food security include: availability or the sufficient quantities of appropriate, necessary types of food from domestic production, commercial imports or donors and are consistently available to individuals or are in reasonable proximity to them; access or when individuals have adequate incomes or other resources to purchase or barter to obtain levels of appropriate foods needed to maintain consumption of an adequate diet and nutritional level; an, utilization or when the food is properly used (http://www.fantaproject.org/focus/foodsecurity.html).

FAO (2006) highlights that food availability refers to the physical presence of the food because it has been grown, manufactured, imported and/or transported there. Food is

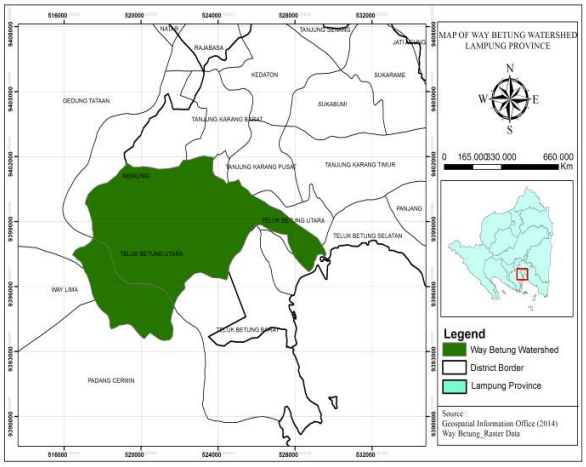

Figure 1 Way Betung Watershed, Indonesia.

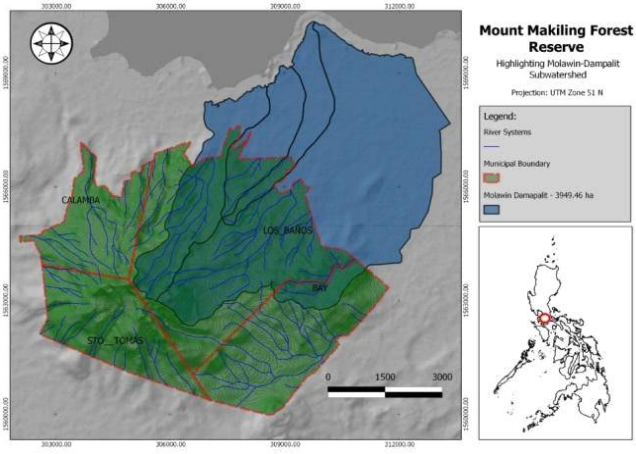

Figure 2 Makiling Forest Reserve highlighting the Molawin-Dampalit Subwatershed (Philippines).

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available if it is found in the market, it is produced in local farms, land or homegardens, or because it arrives as part of the food aid. Food availability means the food is visible in the area. Meanwhile, food accessibility is the way by which available food is obtained. Food access is ensured when individuals and communities have adequate resources such as money to obtain the appropriate food for the nutritious diet. Access depends on the income available o the households, distribution of income within the households, and the price of food. Food utilization is the way people use the available food, depending on the quality of food, nutritional knowledge and health status of the individual consuming the food.

The food security status in Molawin-Dampalit Sub-Watershed of MFR and Way Betung could become significant considerations towards promoting sustainable forest management. Several studies related to biodiversity and watershed sustainability have been conducted in the previous years, but a dearth of literature is found on studies related to the food security status of the communities within those watershed areas. This article centers on the food security status of the communities in the two selected watershed areas in the Philippines and Indonesia. Research results will serve as basis in devising development programs and strategies that would address both ecological and socioeconomic dimensions.

Methods

Study area The study was conducted in May to November 2015 in Way Betung Watershed, Lampung in Indonesia and Molawin Dalampit Subwatershed within the MFR in the Philippines. Way Betung Subwatershed has a land area of 5,260 ha, of which 51% is classified as forest park (Wulandari et al., 2014). The remaining 49% of the watershed is classified as agricultural area (Figure 1). Majority of the upland farmers in Way Betung Watershed are engaged in agroforestry, specifically combining the major fruit tree species such jackfruit, durian, mangosteen, integrated with coffee, cacao, rubber and other forest trees such as Alstoria, mahogany and other forest species (Wulandari et al., 2014). On the other hand, the study site in the Philippines is part of the MFR which covers a total of 4,244 ha, and is classified as a multiple use forest reservation (Figure 2). In the early 1990s, about 45% of the total land area (out of 1,924 ha of the total land) of MFR was occupied by 754 farmlots which are being maintained by 623 individuals (Baliton et al., 2017). All farmers in MFR including Molawin Dampalit Sub-watershed practice agroforestry, specifically multi-storey system, which combines the production of fruit trees, coconut and agricultural crops.

Farming systems and respondents selection Characterization of agroforestry systems and its community's socio-economic conditions was done through these methods, namely:

(1) *Transect mapping* for vegetation identify and other land uses of the farm, such as agroforestry system that is being practiced.
(2) *Semi-structured interviews* with the farmers based on questionnaires for gathering their socioeconomic information, and views also perceptions about their agroforestry practices, including the historical agroforestry systems evolution and its practices.

The farmer-respondents for the semi-structured interviews were selected using random sampling, making use of Slovin's formula as shown as Equation *[1]*

$$n = \frac{N}{(1 + Ne^2)} \qquad [1]$$

note: n = number of samples; N = total population; e = error tolerance (5%).

The research team has identified 106 farmer-respondents across the landscape of the Molawin-Dampalit Subwatershed in the Philippines and 261 farmer-respondents in Way Betung Watershed in Indonesia.

Food security analysis Food security analysis centered on the four indicators of food security, namely: food stability, food availability, food accessibility, and food utilization.

(1) Food stability was measured by asking all respondents whether the farming system that they employ produces multiple crops throughout the year; whether the crop components in their farms could withstand or cope with typhoons, drought and pests and diseases. Food stability has found in research location whether the agroforestry system can produce multiple crops throughout the year; whether the agroforestry systems can withstand or cope with the climatic changes and variability and changes in the market policies and trade including globalization that related to food stability; whether the agroforestry system could produce crops in the future for example for next five years. Each affirmative answer is given two points while negative answer was given one point The weighted score for each item was computed by determining the frequency count for each item, divided by the total number of respondents. The sum of the weighted scores for each item was divided by the number of items to get the average score: Food stability score is 1.50–2.00: Food is highly stable, 1.00–1.49: Food is moderately stable, and <1.00: Food is not stable.
(2) Food availability was measured by asking the respondents the level of food availability in their households, which ranged from “always available”, “sometimes available” and “not always available”; eating frequency of the household members per day; experiences of food shortage; experiences of skipping meals and hunger; having no balanced diet; and, the sources of the basic food needs of the household. Its called food available whether the farm produce is available to the farmers and local people throughout the year; whether the farm produce could be sold to the market considering that there are smallholder farmers who maximize the land use of their small farms to produce crops that can be sold to the market. Each item was weighted. The weighted score for each item was computed by determining the frequency count for each item, divided by the total number of respondents. The sum of weighted scores for each item represents the food availability score: Food availability scores i.e.

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2.00–3.00: Food is highly available in the household, 1.00–1.99: Food is moderately available in the household, and <1.00: Food is not available in the household.

(3) Food accessibility was measured by asking the respondents whether farm produce are used for their home consumption; able to meet their basic food needs and whether the market is accessible for food items that may not be available in their farms. The definition of food accessibility whether the farm produce could be accessed by the low-income families; whether the farm produce could reach farther communities and markets within the town; whether the products are sold to local food retailers**.** Food accessibility score as follows 1.50 – 2.00: Food is highly accessible, 1.00 – 1.49: Food is moderately accessible, and <1.00: Food is not accessible.

(4) Food utilization was measured by asking the respondents whether their farm produce are consumed by their household; by the local communities; and those outside the community. Food utilized whether the farmers consume their produce; whether the farm produce are utilized by the other members of the local communities, and those outside the community. The scores of food utilization of 1.50–2.00: Food is highly utilized, 1.00 – 1.49: Food is moderately utilized, and <1.00: Food is not utilized.

The average score of food security status was computed by adding up the scores in each of the four indicators divided by the total number of indicators. Scoring was based on the following: 8.00–9.00: High level of food security, 7.00–7.99: Moderate level of food security, 6.00–6.99: Low level of food security, and < 6.00: Food insecure.

Formula for food stability, food availability, food accessibility and food utilization as shown as Equation *[2]*:

$$\frac{n}{N} \times score \qquad [2]$$

note: n = number of respondents who choose an optional answer; N = total number of respondents; score = score of optional answer that chosen by n

Results and Discussion

Socioeconomic characteristics of the farmers in the study sites Socioeconomic characterization results indicate that most (73%) of the farmer-respondents in the two study sites are male. This finding also founded by Long (2013) that in general a male-dominated farming activity in major agriculture field works. Most (90% in Indonesia and 75% in the Philippines) were married, with an average household size of five (5). According to Tolentino et al. (2010), number of family members influence the access and control to community forest management. The household size also influences the food availability produced from the forests..

While farming in both sites is the major source of income of most (70%), there are also households whose secondary occupation is non-farm activities such as *ojek*, *tukang bangunan* (builder), teacher and employment in government. In general, the farmers cultivating in the two study sites were smallholder farmers as more than half (54%) of them cultivate lands with less than a hectare of size. This research finding is supported by the study of Tolentino et al. (2010), where farmers who practice agroforestry in the different parts of the Philippines affirmed this system ensures food security to the whole family. Despite the small farm size, the farmers were able to send their children to elementary and high school and for a college education (Tolentino et al., 2010). In contrary, even government budgetary allocation to community in South Africa increase but the overall impact is small only (Aliber & Hall, 2012).

Agricultural expansion is not possible as most (91%) of the farmer-respondents do not own the lands that they cultivate. In the Philippines, only 9% reported owned the lands that they cultivate. MFR is generally a forest reserve and public land, which should not have been inhabited by the people. Similarly, Way Betung Watershed is a state forest. Hence, the two study sites are bound with the policies and regulations on occupancy.

Current status of farming systems in the study sites Around 41.51 % of the farmer-respondents cultivate in high elevation areas, while 64.75% farm in low elevation village (Table 1). Majority of the farmer-respondents are engaged in multiple cropping (20%) and agroforestry (77%) across those two watershed landscapes as shown in Table 2. Almost all (94%) of the respondents employed multiple cropping and agroforestry. Therefore, food is reportedly available throughout the year because of the diverse crops and multiple farm produce. This result is consistent with that of Mbow et al. (2014). Because their agricultural areas are found in the watershed areas, the farmer-respondents were not allowed to cut trees and were being encouraged to intensify tree planting. Hence, diversity of trees and other crop species contribute to their food security.

Table 3 shows that the farmer-respondents in Molawin-Dampalit Subwatershed who cultivate a variety of crop components, while only fruit trees and forest trees are being cultivated in Way Betung Watershed. This is explained by the fact that in Indonesia, the upland farmers are only allowed to cultivate fruit and forest trees. Eventhough they have only two crop components, the farmer-respondents have reported having enough food for the family because of the income from the sales of fruits like durian (*Durio zibethinus* Murr.) and its derivate, for example *pinang* (*Arecha catechu* L.) and brown sugar. Based on research of Wulandari et al. (2014), there are three agroforestry patterns across the Way Betung watershed. These include (a) cacao-coffee-wooden plants, and fruits, (2) coffee-rubber-wooden plants and fruits, and (3) cacao-rubber -wooden plants and

Table 1 Distribution of farmer-respondents in the two study sites

Number of farmer respondents in the two study sites			
Molawin-dampalit sub-watershed	Number	Way betung watershed	Total
Higher elevation villages	44	24	68
Mid-elevation villages	22	68	90
Lower-elevation villages	40	169	209
Total	106	261	367

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fruits. Therefore, the community is constrained to produce food crops that would satisfy the daily food needs. Wulandari et al. (2018) argue that sustainability of this area is being attained because of the people's commitment to sustain the forest park of the Way Betung Watershed Area.

Food security status of the farmers in the study sites The food security status of the smallholder farmers in Molawin-Dampalit Sub-Watershed and Way Betung Watershed was obtained using the four dimensions as follows:

1 Food availability

Table 4 indicates that food is available in almost all of the farm households in the two study sites. The majority eat three times a day (in Philippines: 52 out of 106 respondents and in Indonesia is 256 out of 261), and even some eat more than four times a day, particularly the 45 farmers in Molawin-Dampalit Subwatershed. This finding suggests that the individual family/household has available food at all times. It is good to note that almost all of the farmer-respondents sourced their food from their crop production.

As discussed earlier, the primary purpose of their agricultural production is for home consumption. Meanwhile, most of the respondents also source their food from the market. This is true in cases when the farmers do not produce basic food needs, particularly rice, which is the staple food among the Filipinos and Indonesians. Arifin & Saliem (2017) stated this condition actually common at several areas which has rice as not staple food such as in Maluku, Indonesia.

The food security status of almost all of the farmer-respondents in Molawin-Dampalit Subwatershed in terms of score of food availability is 2.29 and in Way Betung Watershed is 2.72 (food is highly available in the households). That score is based on average sum of total scores of subtotal food availability at home, subtotal of eating frequency, subtotal experience of food shortage, subtotal of experience of skipping meals, subtotal of having no balance diet, and subtotal experience of hunger.

2 Food stability

Research results indicate that the food stability of the agroforestry systems in both study sites is highly stable having scores of 1.52 in Philippines and 1.63 in Indonesia as shown in Table 5. This could be because of the practice of agroforestry, which is a combined production of agricultural crops and woody perennials. The farmers engaged in agroforestry have short-term, medium-term and long-term crop components, which ensures a year-round supply of farm produce. Karmini et al, (2017) and Wulandari et al. (2014) noted that agroforestry produced a variety of products to the communities, which therefore, makes their food more stable. Agroforestry supports food stability through direct provision of tree foods for example vegetables or fruits also staple crop productions, increasing of farmer's income by sale of tree products or crops, providing of biofuels for farmer cooking and supporting of good availability of ecosystem services such as various plants that support bee polination (Jamnadass et al., 2013).

Meanwhile, Iskandar et al. (2018) said that such ethnic will have hard efforts to fulfill their stability food through mix culture adaptation, particularly from outer people who stay at their area.

Table 2 Agricultural production systems

Farming system	Molawin-Dampalit		Way Betung		∑	%
	Freq	%	Freq	%		
Monocropping	7	7	1	0.4	7	2
Relay rotation	4	4	0	0	4	1
Crop cropping	3	3	0	0	3	1
Multiple cropping	43	42	31	12	74	20
Agroforestry	45	43	229	87.6	274	77
Forest plantation	2	1	0	0	2	1
Total	106	100	261	100	367	100

Table 3 Crop production

Crop components	Molawin-Dampalit		Way Betung		∑	%
	Freq	%	Freq	%		
Vegetables	54	16	0	0	52	9
Corn	14	4	0	0	14	2
Rice	1	0.3	0	0	1	0.17
Root crops	56	16.7	0	0	56	9
Fruit trees	101	30	192	73.56	293	49
Ornamentals	40	12	0	0	40	7
Herbs	2	12	0	0	2	0.33
Forest trees	65	19	69	26.44	134	23
Total	333	100	261	100	594	100

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Table 4 Level of food availability in the two study sites

Food availability	Molawin-Dampalit	Weighted score	Way Betung	Weighted score
Food availability at home				
Always available (3)	102	(102/106)*3=2.88	261	(261/261)*3=3
Sometimes available (2)	3	0.06	0	0
Not always available (1)	1	0.01	0	0
Sub-total	106	2.95	261	3.00
Eating frequency				
Once per day (1)	2	(2/106)*1= 0.02	0	(0/261)*1=0
Twice per day (2)	6	0.11	5	0.04
Three times per day (3)	52	1.47	256	2.94
More than 3 times per day (4)	45	1.96	0	0
Sub-total	106	3.56	261	2.98
Experience of food shortage				
Yes (1)	29	(29/106)*1=0.27	46	(46/261)*1=0.18
No (2)	77	1.45	215	1.64
Sub-total		1.72		1.82
Experience of skipping meals				
Yes (1)	20	(20/106)*1=0.19	35	(35/261)*1=0.13
No (2)	86	1.62	226	1.73
Sub-total		1.81		1.86
Experience of having no balanced diet				
Yes (1)	19	(19/106)*1=0.18	10	(10/261)*1=0.04
No (2)	87	1.64	251	1.92
Sub-total		1.82		1.96
Experience of hunger				
Yes (1)	10	(10/106)*1=0.09	0	(0/261)*1=0
No (2)	96	1.81	261	2.0
Sub-total		1.90		2.0
Food availability		13.76		13.62
Average score		2.29		2.27

Table 5 Level of food stability in the two study sites

Food stability	Molawin-Dampalit	Weighted score	Way Betung	Weighted score
The farming system capacity to produce food throughout a year				
Yes (2)	59	1.11	228	1.75
No (1)	47	0.44	33	0.13
Sub-total		1.55		1.88
The farming system capacity to withstand natural calamities				
Yes (2)	0	0	0	0
No (1)	106	1.00	261	1.00
Sub-total		1.00		1.00
The farming system capacity to meet the basic food needs by the family				
Yes (2)	106	2.00	261	2.00
No (1)	0	0	0	0
Sub-total		2.00		2.00
Food stability		4.55		4.88
Average score		1.52		1.63

3 Food accessibility

Food accessibility is defined in this research as an indicator of farmers' access to basic food items either in their backyard or nearby market. As shown in Table 6, farm products and food sources are accessible to the farmer-respondents in both study sites. In terms of accessibility, the food is highly accessible in both study sites having a score of 1.78 in Molawin-Dampalit Sub-Watershed and 1.60 in Way Betung Watershed. Both research sites employed agroforestry, therefore, different levels of food plants are accessible for harvest (Iskandar et al., 2018; Karmini et al., 2017; Wulandari et al., 2014). There is a positive relationship between food attainability and tree-based land use system such as in Southwestern

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Ethiopia (Kebebew & Urgessa, 2011). The study site in Indonesia is located near the local market and the Provincial Center Market. Hence, the farmer-respondents could easily gain access on food items that are not available in their farms. Kebebew and Urgessa (2011) argued that food sources near the markets and/or planted along the backyard ensures communities' good access to food source. Food accessibility enables the community to become aware and help support the sustainability of food production areas (Wulandari et al., 2018).

4 Food utilization

This research defines food utilization as the consumption of the farmers' farm produce by the local community members and those outside the community. As shown in Table 7, food is highly utilized in Way Betung watershed and Molawin-Dampalit sub-Watershed having mean scores of 1.96 and 1.91, respectively. Abiodun et al. (2018) has also recorded high food utilization in the communities in Africa, where nutrition and health are of primary concern. According to Cornelio (2010), appropriate use of food is important for sustainable development of such kind food. Sarvade and Singh (2014) has proved that agroforestry increases food productions and its efficient utilization in India. The food crop components of agroforestry systems also provide economic utilization for the communities (Wulandari et al., 2014).

5 Food security

Table 8 shows that the farmer-respondents in Molawin-Dampalit Subwatershed and Way Betung Watershed have moderate level of food security, having mean scores of 7.55 and 7.41, respectively. The agroforestry systems being employed by the farmer-

Table 6 Level of food accessibility in the two study sites

Food accessibility	Molawin-Dampalit	Weighted score	Way Betung	Weighted score
Farm products for home consumption				
Yes (2)	106	2.00	159	0.83
No (1)	0	0	102	0.60
Sub-total		2.00		1.43
Farm products enough to meet the basic food needs				
Yes (2)	49	0.92	76	0.43
No (1)	58	0.55	185	0.95
Sub-total		1.47		1.38
Food source not available in the farm are available in the market				
Yes (2)	92	1.73	255	1.83
No (1)	15	0.14	6	0.17
Sub-total		1.87		2.00
Food accessibility		5.34		4.81
Average score		1.78		1.60

Table 7 Level of food utilization in the two study sites

Food utilization	Molawin-Dampalit	Weighted score	Way Betung	Weighted score
Farm produce for marketing within the community/village				
Yes (2)	106	2.00	206	1.89
No (1)	0	0	51	0.10
Sub-total		2.00		1.99
Farm produce sold outside the village/community				
Yes (2)	95	1.79	199	1.70
No (1)	11	0.10	72	0.13
Sub-total		1.89		1.83
Farm produce is consumed at home				
Yes (2)	106	2.00	201	1.71
No (1)	0	0	60	0.19
Sub-total		2.00		1.90
Food utilization score		5.89		5.72
Average score		1.96		1.91

Table 8 Food security score of farmer-respondents in two study sites

Dimensions of food security	Molawin-Dampalit	Way Betung
Food availability	2.29	2.27
Food stability	1.52	1.63
Food accessibility	1.78	1.60
Food utilization	1.96	1.91
Food security score	7.55	7.41

respondents ensure their food security. This finding is supported by Magcale-Macandog et al. (2010), who argued that agroforestry ensures food security in the upland areas in the Philippines. Diverse food production through agroforestry improves food nutrition and community income. Therefore, agroforestry is an important factor in ensuring food security (Sarvede & Singh, 2014). Crop diversification could be one of the factors why the smallholder farmers in Molawin-Dampalit Subwatershed have higher score of food security. In Way Betung, community prohibited to plant horticulture or any plants for feeding. This rule is common for conservation or protected areas or forest in Indonesia.

In general, both research sites have moderate food security even though they have high level at each dimension. It has logic due to they have minimize score for each dimension and rigid to any chaos social and ecology condition (Wulandari & Budiono, 2015; Tanaka & Karapinar, 2019).

Conclusion

Food security score in Indonesia is 7.41 and in Philippines is 7.55 (moderate level). The agroforestry farms and practices at Molawin Dampalit Subwatershed and Way Betung Watershed promotes food security among the smallholder farmers. Food security score in Philippines higher than in Indonesia site due to Molawin Dampalit Subwatershed has higher plant diversity for food and community surrounded Way Betung forest prohibited to plant necessary species for feeding.

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