

Food Security Program towards Community Food Consumption

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Food Security Program towards Community Food Consumption

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3 Abstract

The purpose of this study was to examine the use of home yard in supporting food security program in rural areas. Two groups of farmers in Sidawa village, Bangli, were involved in the study and each group had 20 cooperators. Four models have been developed in the study, namely cultivation model in very narrow, narrow, medium, and wide home yard. Data were analyzed by examining some variables observed on plants which included several agronomic components (e.g. production), economic aspects of R/C ratio analysis, and food consumption adequacy analysis (e.g. energy adequacy ratio (EAR) and desirable dietary pattern (DDP)). Results of the study show that the highest average production was eggplants, then followed by tomatoes, local chilies, and chili peppers. Furthermore, agribusiness done in home yard gained favorable profit with the average of $R/C > 1$. The community's consumption pattern was not as satisfactory as the ideal one, or mostly less than the ideal pattern. Two food groups were consumed for more than the ideal consumption, such as grains, oil, and fat, which are harmful to health. The use of home yard impacted some food groups, namely vegetables and fruits, to exceed the desirable dietary pattern. On the other hand, tuber crops, oily fruits or seeds, and legumes were less than the desirable dietary pattern.

Keywords: Food Security; Crops; Viticulture; Consumption; Yard; Agribusiness;

I. INTRODUCTION

Food security initiative is an integral part of national development as food can affect society, nation, and state life in order to ensure social and political stability, which are necessary for national economic growth and defense [1-6].

Food security is an important part of rights for food, the main pillar of human rights [7]. Food security is also a very important part of national security. In this case, right for food should get equal attention in the effort of upholding the human right pillars. Hunger and food insecurity are the worst forms of poverty faced by people. Therefore, the efforts of establishing food security development cannot be separated from efforts in addressing poverty [8].

One of the natural resources that have the potential to support our national food security program is the utilization of home yards. If a home yard is intensively managed based on its compound potential, it will be able to meet the needs of household food consumption, as well as contribute to the household income.

Indonesia has some potential site-specific biological resources which are very rich with various types of crops, such as grains, tuber crops, legumes, vegetables, fruits, and animal source food. Similarly, various types of herbal plants and medicines can grow and develop easily in the archipelago. However, the big potency has been in contrast with the realization of our community food consumption, which was less than the recommended nutrition and diversification program promoted by the government since the old regime. This notion has been suggested by the score indicator of Desirable Dietary Pattern (DDT) which was relatively low for the national context [9]. Moreover, the idea is also supported by the Center for Assessment and Technology Development of Agriculture, wherein 2009, the national DDT could only reach 75.7% of the 95% target planned in 2014.

The higher the score of the food, the more diverse the food situation and the better the composition and nutritional quality. If the DDT is known, not only fulfillment of nutritional adequacy which will be discovered, but also nutritional balance that is supported by taste, digestibility, community acceptance, quantity, and affordability which will be considered [10].

Home yard area has long been known having multipurpose functions, such as to produce food ingredients in addition to the harvest of farmers' rice fields and fields, vegetables, and fruits, poultry, small livestock and fish, herbs, spices, fragrant herbs, crafts materials, as well as cash [11]. Moreover, another advantage of the home yard is sustainably provided daily needs for the farmers [12]. This opinion was supported by [13] who states that plants and animals in the home yard contribute to family income. Meanwhile, a study that was conducted by [14] elaborates that income gained each month by farmers in Sambirejo village, Ngawen district, Gunung Kidul since they cultivated their home yard ranged from Rp. 335,000 to Rp. 2,246,428. However, with the better arrangement on the home yard, farmers could earn up to Rp 3,236,821 per month or Rp 38,841,848 per year [15]. The research results prove that home yard can be used as an effective farmland to support family's food security program in urban and rural areas.

Development of Sustainable Food House Area (*Kawasan Rumah Pangan Lestari/KRPL*) in Kayen, Pacitan, East Java until August 2011 showed that each family head (*Kepala Keluarga/KK*) could reduce their household spending for about Rp. 125,000 to Rp. 445,000 per month and their Desirable Dietary Pattern (DDP) increased from 73.5% to 87.5%. Furthermore, it was said that to maintain the sustainability of the program, a plan update on the utilization of home yard by considering various programs which have been running was necessary. On the other hand, the government's commitment to involve Sustainable Food House Area, which is based on local natural resources and conservation of food crops for the future, should be actualized in re-introducing the "planting in the home yard" culture, both in urban and rural areas.

Bangli is a regency in Bali, which has no coastal areas, with an area of 52.81 hectares or 9.25% of the total area of Bali Province (563,366 hectares) [16], where its 36,370 hectares have been used as agricultural lands. The development of various innovations related to home yard has not been developed much as what was expected [17]. Therefore, the purpose of this study was to examine the use of farmers' home yard in supporting food security programs in rural Bangli.

II. METHODS

Two groups of farmers in Sidawa village, Bangli, participated in the study. Twenty cooperators from both groups were also determined. Four models which have been developed in the use of home yard based on farmer's group level in the rural area are presented in Table 1:

Table 1
Some Cultivation Models were based on farmer's group level

No	Farmers' Area of Home Yard	Cultivation Model	Native Commodity
1	Very narrow area	Verticulture (hanging model and paste)	Vegetables Family medicinal plant
		Pottery/polybag	Vegetables Family medicinal plant
2	Narrow area (<120m ²)	Verticulture (hanging model and paste)	Vegetables Family medicinal plant
		Pottery/polybag	Vegetables Family medicinal plant,
		Direct planting	Fruit
3	Medium area (120-400m ²)	Pottery/polybag	Vegetables Family medicinal plant,
		Direct planting	Fruit
		Cage	Livestock
		Beds, <i>Surjan</i> , Multistory	Intensification yard, Vegetables/Fruit/Bulbs/Nut

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		Multistory	Intensification fence, Tiger's claw, Grass, Banana, Pineapple, Gnomon,
4	Wide area (>400 m ²)	Beds, Pottery/Polybag	Vegetables Family medicinal plant
		Beds, <i>Surjan</i> , Multistory	Intensification yard, Vegetables/Fruit/Bulbs/Nut
		Multistory	Intensification fence, Tiger's claw, Grass, Banana, Pineapple, Gnomon,

Types of plants that were developed such as food crops, eggplant, tomatoes, chili peppers, and local chilies.

Data collected in this study was gained after the introduction of an integration model of cattle and food crops in home yards, namely: production, costs and acceptance of farm crops in the yard area, the average amount of consumption and household spending per day, figures of energy adequacy, DDP, and a comparison of actual food consumption with the expected consumption.

Data analysis was conducted on the observed variables of the plant namely agronomic components e.g. production. From the economic aspect, an analysis of R/C ratio towards the four models were developed. Further analysis of food consumption adequacy is described as follows:

- a) Analysis of DDP refers to data of the amount of energy consumption per food group and a number of respondents.
- b) The actual energy was analyzed based on actual amount of energy consumption based on the DDP code divided by the number of respondents.
- c) The actual percentage of energy for each food group which was analyzed by comparing the energy of each food group with the total energy consumption of the entire food group multiplied by 100.
- d) Percentage of Energy Adequacy Ratio (EAR) was analyzed by comparing the actual energy consumption of each food group with the average of the EAR, that is 2000, then multiplied by 100.
- e) Actual score and score of the EAR were analyzed by their percentage then multiplied by its weight. The weights have been assigned with basic principles of 3 benefits of food (*Tri Guna Makanan*) namely building substance, regulator, and energy substance.

III. RESULTS AND DISCUSSION

1) Plant production on very narrow home yard area

On the very narrow home yard area, the plant was cultivated in polybags through vermiculture system. The area, in fact, can be utilized to plant vegetables such as tomatoes, eggplants, chili peppers, and local chilies with up to four times harvesting. Thus, the very narrow yard can provide everyday food for family members of the cooperators. This notion supports the research findings of [18] that the increase of agricultural production on narrow area could be done through agricultural diversification with an integrated farming system approach. Eggplant production reached 52.4 kg, with the average harvest reached 13.1 kg, and followed by tomatoes and local chilies for 21.6 kg and chili peppers for 20.5 kg.

2) Plant production in narrow home yard area (less than 120 m²)

In the narrow area, plant development was still done by using vermiculture system with mixed media soil and organic fertilizer in polybags. The crop production was calculated based on harvests done. In the narrow area, the farmers could harvest their crops up to four times. The first harvest result was lower than the second and, subsequently, the third and the fourth harvesting were lower than the second. The highest total production was 47.4 kg of eggplant, then followed by 30 kg of tomatoes, 20 kg of chili peppers, and the lowest was local chili with 19.8 kg of harvest.

3) Plant production plant on medium home yard area (120-400 m²)

The plant development on this type of home yard was done by using polybags. The crop production was calculated based on the crop harvest. Harvesting could be done four times. Each harvest yielded an average of 10.1 kg of eggplant, 6.7 kg of tomatoes, 5.6 kg of local chilies, and the lowest was 4.6 kg of chili peppers. The total production of each crop was 26.8 kg of tomatoes, 40.6 kg of eggplants, 22.3 kg of local chilies, and 18.4 kg of chili peppers. Based on the amount of production, it can be concluded that eggplants yielded the highest production in the home yard with a medium area.

4) Plant production on wide home yard area (> 400 m²)

The highest plant production was obtained on eggplants, reaching 48 kg with four times of harvest with an average of 12 kg per harvest and the average production per plant was 96 gr. If compared to other crops, such as tomatoes, the total production reached 30.8 kg and was resulted in four times of harvesting, with an average production reached 7.7 kg, and the average production per plant reached 61.0 gr. The next position was chili peppers. Its total production reached 22.4 kg with four times of harvesting. Its average production of more than 5.6 kg and the average production per plant reached 44.8 gr. The lowest position was local chilies. Its total production reached 22.1 kg with four harvesting, with an average production of 5.5 kg and the average production per plant reached 44.8 gr.

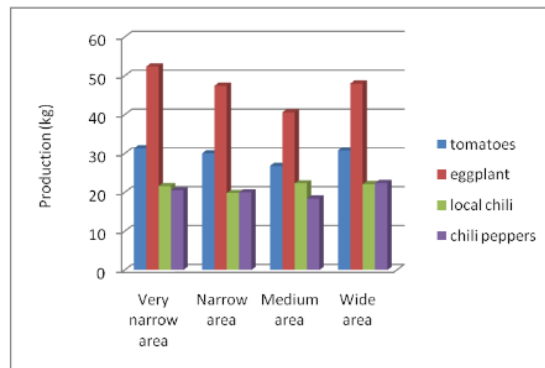


Figure 1. Plant production on farmers' home yard in Sidawa village, Bangli.

Figure 1 shows that the plant production on some level of farmers' home yards, namely very narrow, medium, and wide area of the home yard. It is obvious that the average production of eggplants was the highest compared to tomatoes. The plant production of chili peppers and local chilies were quite similar. These results suggest that eggplants have the highest potential to be cultivated in the farmers' home yard. Moreover, the utilization of home yard to protect the food security of these four plants were great, as their productions were good and they could be harvested continuously, or up to four times, in a single planting season. Hence, it extremely supports the national food security program in rural areas.

5) Analysis of R/C Food Crops Farming on Home Yard

The number of plants cultivated on the four levels of the home yard was 500 plants. Costs spent for the development of crops on home yards included the cost of seeds, organic fertilizer (compost), NPK (fertilizer), polybags, and, specifically for very narrow and narrow home yard, it includes viticulture costs. The entire cost included the cost of labor, starts from preparing seedlings and creating planting media in polythene bags with a capacity of 5 kg which consists of a mixture of 3.5 kg soil and 1.5 kg of organic fertilizer. To calculate the viticulture costs, shrinkage of viticulture value in a single planting season was used. the average costs of the same home yard area were Rp 1,250 for wide and medium yard and Rp 1,400 for very narrow and narrow yard since there was an additional cost of viticulture for about Rp 150,000. In fact, the cost of medium and wide home yard could be decreased if their cultivated plants were planted directly in several small square plots without using polybags. Thus, the spending on polybags could be reduced.

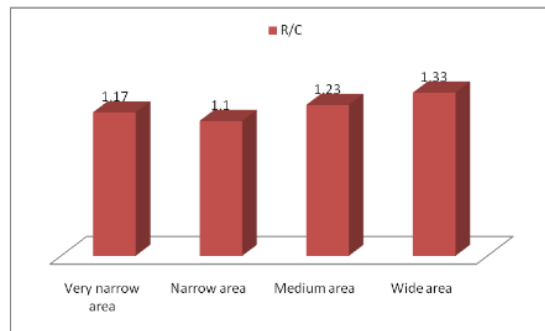


Figure 2. R/C ratio of farming in home yards area

The acceptance of home yard farming consists of the production of tomatoes, eggplants, local chilies, and chili peppers multiplied by the price of each plant on the day the survey was conducted. The average acceptance of local chilies on the four home yard areas was the highest. It may happen since the price of local chilies was increasing up to Rp 35,000 per kg. Price of eggplants was the lowest which was only Rp 2,000 per kg. The total acceptance of the very narrow home yard was quite high, Rp 1,637,800, compared to the acceptance on the medium home yard that is Rp 1,539,700. However, the R/C ratio on the medium home yard was higher, that is 1.23, as presented in Figure 2, compared to the very narrow home yard (R/C of 1.17). The ratio was caused by an excess of cost for making viticulture on the very narrow home yard. The highest r/c was found in the wide home yard which reached 1.33, where it means that every Rp 1,000 spent would be gained back for Rp 1,330. On the wide home yard, plant production number was high with lower cost as no cost for viticulture was needed. The same thing happened to the medium home yard. From the four model of cultivation implemented, the average ratio of R/C was more than 1, which indicates that home yard farming was beneficial. It supports the research [19] which states that farming on home yards are profitable and it can increase the income of farmers.

6) Food consumption and Household Spending of Farmers

The average spending of farmers on food is shown in Table 2 and Table 3, or about Rp 47,938 per day. The highest spending was on the consumption of grains, which was mainly rice reaching 38.32% of the average farmers spending on food consumption. Furthermore, it was followed by spending on animal source food consumption which reached 26.40%. Spending on fruits and vegetable purchase was in the third highest position. Moreover, spending on oily fruits and seeds consumption was not found.

Table 2
The average spending of farmers for everyday food consumption

No	Type of consumption	Total consumption (gr)	Price (IDR)	Percentage (%)
1	Grains	1,670	18,370	38.32
2	Tuber crops	2,524	3,670	7.66
3	Animal source foods	291	12,655	26.40
4	Oil and Fat	185	3,185	6.64
5	Oily fruits or seeds	0	0	0.00
Total		4,670	37,880	79.02

The price of rice when the survey was conducted was Rp 10,000-11,000/kg. Food consumption, including energy and protein intake, was strongly influenced by a person's purchasing power and public awareness regarding food and nutrition. This is in line with a research conducted by [20] which found that the community spending on food consumption was affected by their economic condition and demographic characteristics to reach for maximum utilization.

Table 3
The average spending of farmers for everyday food consumption

No	Type of consumption	Total consumption (gr)	Price (IDR)	Percentage (%)
1	Legums	27	1,500	3.13
2	Sugar	70	786	1.64
3	Vegetables and fruit	355	5,250	10.95
4	Others	24	2,522	5.26
Total		476	10,058	5.26
		5,146	47,938	100.00

Explanation*) is total Table 2 and Table 3

The average family in Sidawa village consumed 1,670 gr of rice. Vegetable and fruit were the third highest consumption came after grains. Considering these amounts of consumption, prior to the study, the farmers must pay Rp 5,250 per day for vegetables and fruits consumption. After the study was conducted, they could save up to Rp 157,500 per month for vegetables and fruits consumption. Furthermore, the types of vegetables and fruits consumed could be more varied.

7) Energy Adequacy Ratio (EAR)

The actual food consumption was less than expected. This is in accordance with a research done by [21], which discovers that 15% of households in the village relatively faced food insecurity. It can be seen from the ratio of ideal consumption with the actual consumption in Figure 3, the food with a "lack of difference" was more than the "more difference". The ideal energy consumption was calculated from the percentage of contribution then multiplied by the average of the EAR, that is 2,000. The energy contribution from the consumed food was mostly insufficient in fulfilling the EAR. Most of the food consumed was less than the needs. From the survey results, both before and after the study, the consumption pattern in Sidawa village, in particular, was not suitable for the ideal food pattern in the DDP. This is in line with a study carried out by [22] in the middle part of Ghana, which states that 60% of food consumption of family households were not insecure.

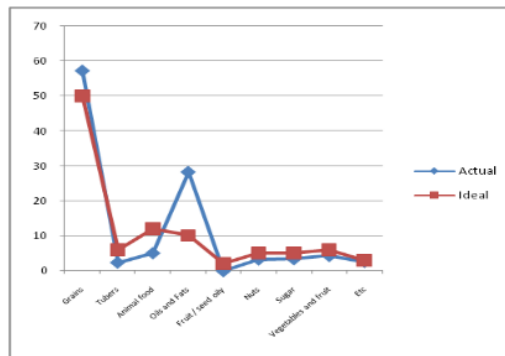


Figure 3. Graph of Energy Adequacy Ratio (EAR) of the community

The consumption of grains (e.g. rice, corn, and wheat) was still dominant, where the energy consumption of grains should only be 50% while in fact, it was 57.25%. In contrast, the energy source from tuber crops was only about a half of the suggested amount. In Sidawa village, various types of tuber crops with a relatively low price were available. This is supported by a research conducted by [23] which states that the consumption pattern of Indonesian people was not in accordance with the pattern of the DDP, where grains consumed in villages were 60.7% and 63.9% in cities, where the energy consumption of this group should be 50%. Yet, the consumption of oil and fat source are the ones which should be taken care of by the community since they were consumed excessively. Excess of fats and oil will bring negative impacts to our health, especially the degenerative diseases, such as high blood pressure, heart disease, and diabetes.

The EAR was still less than expected. It can be seen in Table 5 and Table 6 in a column of ratio that there were only six food groups with a score above the EAR needed, while the other three food groups were lacking. This confirms the opinion of [24] that some food consumption exceeded and there was a

group of food, which was consumed less. Preceded the study, the EAR score which was far away from the DDP were animal source food and vegetables and fruits. Meanwhile, the food group consumed more than the expected amount were oil and fat and grains. After the study was conducted, the score of the EAR from vegetables and fruits exceeded the DDP. The weight of food consumed by the community was also less than the DDP. To fulfill the tuber crops consumption with low DDP score consumption amount of 65.77 gr is needed. Meanwhile, grains and oil and fat were suggested to reduce as there was an excess of their consumption for about 1,157 gr and 157 gr. On the other hand, vegetables and fruits were consumed by more than 121 gr.

Table 4
The Ratio of the Actual and Ideal DDP (Desirable Dietary Pattern) Score

No	Food Group	The DPP Score			The Estimated Weight (gr)		
		EAR	Ide- al	Differ- ence	Actu- al	Ide- -al	Differen- ce
1	Grains	29.37	25	4.37	1,432	275	1,157
2	Tuber crops	1.24	2.5	-1.26	24	90	-65.77
3	Animal Source foods	10.07	24	-13.93	197	140	57
4	Oil and Fat	13.36	5	8.65	182	25	157
5	Oily fruits or seeds	0	1	-1	0	10	-10
	Total	54.33	57.5	-3.17	1,835	54	1295.23

In the DDP concept, each food group in forms of energy has a different weight, depending on food roles for human growth and development. For instance, the weight of grains, tuber crops, and sugar was only 0.5 as they only act as energy sources for human growth. On the contrary, animal source food and legumes are protein sources which serve for growth and human development and they weight 2. Vegetables and fruits are sources of vitamins, minerals, fiber, and others, thus they are weighted 5 [25]. By multiplying the proportion of energy by its weight, the concept of the DDP will obtain a score of 100. It means that the appropriate food diversification score based on the DDP is 100.

Table 5
The Ratio of the Actual and Ideal DDP (Desirable Dietary Pattern) Score

No	Food Group	The DPP Score			The Estimated Weight (gr)		
		EAR	Ide- al	Differ- ence	Actu- al	Ide- al	Diff- erence
1	Legumes	6.72	10	-3.28	25	35	-10
2	Sugar	1.71	2.5	-0.79	67	30	37
3	Vegetables and fruit	22	30	-8	351	230	121
4	Others	0	0	0	22	15	7
Total				-			
		30.43	42.5	12.07	465	310	155
		84.7*	100	-	2,30	850*	1450.
			*	15.24	0*		23*
				*			

Explanation*) is total Table 4 and 5

IV. CONCLUSION

The research findings discover that the average production of eggplants was the highest, followed by tomatoes, local chilies, and chili peppers. The benefit of home yard farming was $R/C > 1$ on average. The food consumption pattern of the society was not suitable for the ideal one, even many of community members consumed food less than the ideal one, such as grains, oil, and fat. It is dangerous for their health. The utilization of home yard impacted towards some food groups namely vegetables and fruits, more than the DDP. Meanwhile, the other food groups, e.g. tuber crops, oily fruits or seeds, and legumes, were less consumed compared to what the DDP suggests. To fulfill the DDP, additional consumption of 65.77 gr of tuber crops plus 10 gr of oily fruits and seeds and legumes are compulsory. On the other hand, grains, oil, and fat should be less consumed as there was an excess of 1,157 gr and 157 gr of each. Finally, the other food groups, such as vegetables and fruits, were exceeded the DDP to about 121 gr.

Availability of data and material

The article detailing where the data supporting the findings can be found in the groups of farmers in Sidawa village, Bangli, Bali, Indonesia.

Competing interests: None

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Authors' contributions

The authors hope the present research has a positive reference for the farmers for the entire world, especially the Balinese farmers.

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