

Correlation between Farm Type Diversity and Farmer's Household Diet Diversity Score in Taebenu District, Kupang Regency

Abstract

By

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Diversification of agricultural production has the potential to influence household dietary diversity, but the magnitude of the association tends to vary. Studies that analyze the relationship between agricultural diversification and dietary diversity can use several indicators of food diversity including the House Hold Dietary Diversity Score (HDDS). The objectives of this study are: 1). To find out the diversity of farming types in taebenu district, kupang regency, 2). to find out the diversity of farming types and household dietary diversity scores, and 3) to find out the relationship between farm type diversity and household diet diversity scores in Taebenu sub-district

The population in this study were farmers in Taebenu Subdistrict, Kupang Regency, the sample was determined by stratified proportion random sampling technique, which the population was grouped into several strata with certain criteria, then the sampling was selected as many as 30 farmers consisting of 13 group members and 17 non farmer group members. Data collection is done by 1. Qualitative approach is done by interviewing respondents. 2. Quantitative approach is done by using a questionnaire that has been prepared, and *crosstab* analysis is used to determine the relationship between the variable diversity of farming types with household dietary diversity scores.

The results showed that: 1. Agricultural characteristics in Taebenu Subdistrict of Kupang Regency were characterized by dryland agriculture (farms), yards, rain-fed rice fields, irrigated and mixed rice fields known as Mamar (traditional agroforestry), 2. Diversity of farming types are located in the category of less diverse to quite diverse, and the average score of the diversity of food consumption of respondents was 4.17 or is at the level of low dietary diversity. 3. *Kendall's tau_b* test results showed no relationship ($p = 0.653 > 0.05$) between the diversity of farming types and household dietary diversity scores.

Keywords: Type of farming, dietary diversity, household

1. Introduction

Diversification of agricultural production has the potential to influence the diversity of farmers' diets, but the magnitude of the association tends to vary based on the context and underlying causal mechanisms. Studies that analyze the relationship between agricultural diversification and dietary diversity can use several indicators of food diversity including the House Hold Dietary Diversity Score (HDDS). To measure agricultural diversification, using the total number of plant species, vegetables and fruits, the number of food plant species only, or species richness index, studies conducted (Hayat, 2018) find strong evidence of a positive relationship between agricultural diversification and diet diversity. Analysis of other factors shows that market access, agricultural commercialization, diversification of income to sources

outside agriculture and empowerment of women also have positive and significant effects on household food diversity. These results are in line with Waha et al., (2018), who in their research showed that diversification would have an important role to play in ensuring food security and stabilizing food production, at the household scale, indicating that households with greater agricultural diversity were more successful in meeting consumption needs, but only to a certain extent per hectare of agricultural land and more often if food can be purchased from off-farm income or from agricultural sales.

Diets with larger food variations or food groups are often associated with more adequate nutrition. Sibhatu and Qaim (2016) state that when measuring agricultural diversity in terms of simple calculations of plant and livestock species produced, found a positive relationship with household food diversity, and these results are in accordance with previous findings (Sibhatu et al., 2015; Jones et al. ., 2014; Pellegrini and Tasciotti, 2014; Keding et al., 2012). However, as also reported by Sibhatu et al. (2015), the effect of this diversity of production on diversity of consumption is relatively small. So the results of this study conclude that subsistence agriculture with diverse production contributes less to food quality than cash income generated through market sales, because most of the food diversity consumed by farm households is bought from the market. On the other hand, increasing the number of food groups produced in independent agriculture market incentives will encourage subsistence, reduce cash income, and thus somewhat worsen the quality of eating patterns, so that from a nutritional perspective increasing market access is more important than agricultural diversification. Likewise, Termote et al. (2012) found that environments with high biodiversity did not contribute to improving the quality of diets because wild food was rarely consumed even though it was available.

2. Research Methods

2.1. Research design

The method used in this research is descriptive survey form (Survey Studies). This research has been carried out in 2019, in Kupang Regency, namely in Taebenu Subdistrict, the sample was determined by Purposive and simple random with criteria for determining based on Farming Characteristics of the Subdistrict concerned. The variables measured in this study consisted of: Farmer characteristics include: age, level of education, number of family dependents, and experience in farming. Farming characteristics such as: type and amount of crop production, land use and maintenance patterns, land tenure patterns; diversity of farm types; Household dietary diversity score (HDDS), measured at the household level, using 7 or 12 groups of foodstuffs (not including seasonings), with a recall period = 24 hours. The population of the research is farm households that live and work as farmers in Taebenu sub-district, Kupang Regency, as many as 182 families (Tebenu in Figures 2018). The sample of this study was taken as many as 30 respondents consisting of members of the Eden farmer group and non-farmer group members. Because the members of the Eden farmer group consist of 13 HHs, there are 17 HH members who are randomly assigned to the field. Descriptive statistical analysis techniques used include: Presentation of data in tabular form or frequency distribution and cross tabulation. With this analysis, it will be known the tendency of research findings, whether included in the category of low, medium or high. Presentation of data: in the form of diagrams and graphs. Calculation of the size of the central tendency (mean, median), and subsequently, crosstab analysis is used to obtain a picture of the relationship between the dependent and independent variables

2.2. Data analysis

Analysis of the data used in this study are:

1. To answer the objective 1 of the analytical method used is the calculation of the total number of plants and livestock that farmers try and then categorized based on the calculation of the size of the central tendency.
2. To answer the second objective, namely for the measurement of Household Diet Diversity Scores using the scoring method and subsequently the Household Diet Diversity is categorized according to the recommended IFPRI (International Food Policy Research Institute) ie using the following threshold:
 - 6+ High = good food diversity
 - 4.5 - 6 Medium (medium) = moderate food diversity
 - < 4.5 Low (low) = low food diversity
3. To find out the relationship between farm type diversity and household dietary diversity score, a crosstab analysis is performed to obtain a picture of the relationship between the dependent and independent variables.

3. Results and discussion

3.1. Characteristics of Respondents

- Respondent Education

The education of respondents from the results of this study is at the lowest level not graduating from elementary school to Diploma3 (D3), as shown in Figure 1.

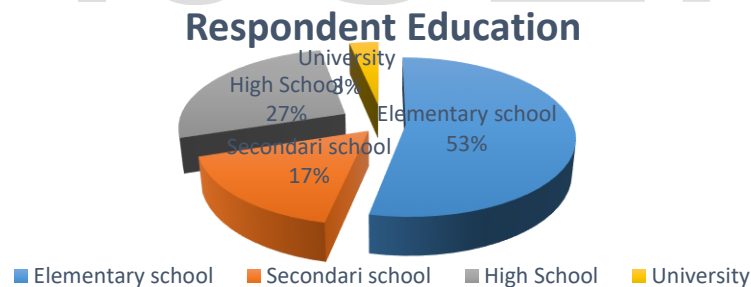


Figure 1. Respondents Education (Source : Primary Data, 2019)

From figure 1, it can be seen that the education level of the respondents is relatively low with the number of elementary school educators being equal 16 people (53.33%), junior high school graduates as many as 5 people (16.67%) and only 8 secondary or high school education (26.67%) and University 1 person (3.33%). Education as stated by Lidia (2004) which states, education is the most strategic means to improve human quality. This means that through education, human quality can be improved, and with quality that increases individual productivity will increase, then with a low level of education will certainly affect the farms that are managed by respondents, and subsequently will affect the production.

- Age of Respondents

The average age of respondents is 46.60 years, with a range between 29 - 68 years. In table 1, can be seen the distribution of respondents by age. Workers will be more productive in the age range between 15-55 years and at the age of under 15 years are categorized as not productive, while those aged over 55 years are considered no longer productive (Soekartawi, 1995).

Table 1. Distribution of Respondents by Age

No	Age (Year)	Category	Number Respondents	Percentage
1	15-55	Productive	24	80,00
2	≥ 56	Not Productive	6	20,00
Total			30	100,00

Source : Primary Data, 2019

From the table above it can be seen that 80.00% of respondents are of productive age. Nevertheless, the results of interviews revealed that respondents who were not included in the criteria of productive age with age > 56 years still carry out their farming activities well.

- Number of Family Members

Household size is the number of family members consisting of husband, wife, children and other family members who live together (BKKBN,1998 in Hendrik,2017),. Based on the number of household members, large households are grouped into three, namely small, medium and large households. A small household is a household with a number of less than or equal to 4 people. Medium households are households that have members of between five to seven people, while large households are households with a number of members of more than seven people. The following table shows the distribution of respondents based on the number of family members.

Table 2. Distribution of Respondents respondents based on the number of family members.

Family member	Category	Number of respondents	Percentage
≤ 4	Small	16	53,33
5 - 7	Medium	14	46,67
>7	Large	0	0,00
Total		30	100,00

Source : Primary Data, 2019

From the table it can be seen that from a total of 30 respondents included in the category of small or low number of family members (53.33%), medium-large 14 people (46.67%). More or less family members related to the utilization of family labor in running and managing farming.

- Farming experience

The analysis shows that the average of farming experience of the respondent is 23.40 years with a range between 5-50 years. Experience in conducting farming can be categorized as less experienced when working in the field of work for less than 5 (five) years, quite experienced when working in the field for 5-10 years and experience if it has been in the field for more than 10 years, (Soehardjo and Patong, 1984), In table 3, it can be seen the data of the farming experience distribution of respondents.

Table 3. Distribution of Respondents Farming experience

Farming Experience (year)	Category	Number of respondents	Percentage
≤ 5	Less experienced	2	6,67
5-10	Quite experienced	3	10,00
≥10	Good experience	26	83,33
Total		30	100,00

Source : Primary Data, 2019

From the table it can be seen that around 83.33% of the respondents have a long time engaged in the experienced category. The length of farming which is the period of time undertaken by the respondent as a farmer is a benchmark of farming experience, so it is expected that the longer a farmer does his farming activities, the more experienced he is in running his farm and the better he will be in managing his farm.

3.2. Farming Characteristics

- Land Use Patterns

These lands are generally owned for generations and are managed by family workers in addition to mutual cooperation from the farmer groups that are followed. The average area of land owned by respondents is 45.00 acres of rice fields, 40.80 acres of fields (ladang) and Traditional agroforestry (mamar) 20.80 acres. Distribution of land use patterns and the average area of respondents' land as in the following table.

Table. 4. Land Use Patterns and Average Land Area

Land Name	Average area (acres)	Number of Respondents	Percentage (%)
Yard	21,4	30	100,00
Rice field	45,00	25	83,33
Ladang	40,80	28	93,33
Mamar	20,80	12	40,00

Source : Primary Data, 2019

Farming patterns carried out by respondents are wetland or wetland farming patterns and dry land farming patterns with, types of plants cultivated are rice, corn, cassava, vegetables, long beans, rice beans, papaya, bananas, coconut, cashew nuts .. Planting patterns for rice, maize, peanuts and vegetables are generally planted with intercropping / intercropping, where two or more plants are planted on the same land in the same time period without different row arrangement. In addition to planting with intercropping, raising livestock is also carried out by respondents, this pattern provides a variety of products that are sufficient to feed family members in households with less land.

The smallest respondents owned land is 21 acres, and the largest is 240 acres with an average land ownership area of 108.47 acres. From the land area data owned by the respondent, it can be categorized into small, medium and broad land categories as in the following table:

Table 5. Distribution of Respondents by Land Area Category

Land Area Category	Land area (acre)	Number of respondents	Percentage (%)
Small	< 50	9	30,00
Medium	50 - 200	16	53,33
Broad	≥ 200	5	16,67

In the table above it can be seen that the largest area of land currently owned by 5 respondents (16,67%), have a medium land area of 16 respondents (53,33%) and respondents with land in the small category are 9 people (30,00%) .

- Diversity of Food Plants and Livestock

Respondents work on various types of plants, in addition to plants which are types of plants that produce staple foods such as rice, corn and cassava, respondents also produce from types of vegetables such as greens mustard, kale, cabbage, pumpkin, long beans, rice beans, tomatoes, eggplants, chillies and onions and types of fruits such as papaya, banana and dragon fruit. In addition, respondents also plants such as cashew nuts, coconuts. The types of plants cultivated by respondents are as in the following table:

Table 6. Types of Food Plants and livestock

Plant /livestock	Types of Plants	Number of Respondents	Percentage (%)
Food Plants	Paddy	24	80,00
	Maize	26	86,67
	Cassava	9	30,00
	Banana	15	50,00
	Coconut	13	43,33
	Cashew nuts	8	26,67
	Greens mustard,	19	63,33
	Kale	6	20,00
	Cabbage	6	20,00
	Carrot	5	16,67
	Pumpkin	5	16,67
	Vigna unguiculata (long beans)	6	20,00
	Bean	4	13,33
	Tomatoes	18	60,00
	Eggplants	11	36,67
	Chillies	18	60,00
	Onions	10	33,33
	Papaya	14	46,67
	Dragon fruits	5	16,67
	Livestock	Cattle	15
Pig		20	66,67
Poultry		11	33,33

Source : Primary Data, 2019

Rice and corn which are the staple foods most respondents who planted were each who planted rice as many as 24 people (80.00%) and who planted corn as many as 26 people (86.67%), followed by the number of respondents as many as 19 respondents (63.33%) must grow cabbage, tomatoes and chili each 18 respondents (60.00). While the smallest number of respondents was for those who planted rice beans 4 respondents (13.33), and dragon fruit,

pumpkin and carrots each as many as 5 people (16.67%). Most respondents keep pigs as many as 20 people (66.67%), followed by those who keep cows as many as 15 people (50.00%) and chicken as many as 11 respondents (36.67%), with the highest number of livestock being livestock as many as 95 chickens, 37 pigs and 28 cattle.

The highest number of species of plants and livestock that are cultivated by Resoponden is 14 species, and the fewest are 6 species, with an average of 9.23 species of plants and livestock being cultivated. From the data above, the diversity of food crops that are managed by respondents can be arranged according to less diverse categories. quite diverse and good diverse as in the following table:

Table 7. Distribution of Respondents Based on Diversity of Farming Types

Category	Diversity	Number of respondents	Percentage (%)
Less diverse	<7,00	6	20,00
Quite diverse	7,00 – 11,00	16	53,33
Good Diverse	≥11,00	8	26,67
Total		30	100,00

Source : Primary data analysis results, 2019

The analysis showed that the average farm diversity score was on quite diverse, with the distribution of diversity: 6 respondents (20.00%) were in the less diverse farming category, 17 respondents (53.33%) were in the category farming is quite diverse and 8 respondents (26.67%) in the category of farming are good diverse. From the data it can also be seen that 73.33% of respondents are in the less diverse to quite diverse categories, this is because respondents generally have a land that is narrow-medium as many as 27 respondents (90%), besides the purpose of farming which is more aimed at fulfilling the family's own needs for food (sub sisten farming)

3. Types of food consumed

The results of data analysis showed the type of food consumed by respondents consisted of rice, tempeh, tofu, vegetables, fish, meat and fruits. The distribution of respondents based on the type of food consumed is arranged based on 7 food groups as in the following table:

Table 8. Distribution of Respondents by Type of Food Consumed

Food groups	Number of respondents	Percentage (%)
Cereals, roots, and tubers	30	100,00
Pulses and legumes	5	16,67
Vegetables	30	100,00
Fruits	8	26,67
Meats, fish, seafood, and eggs	22	73,33
Dairy products	0	0,00
Oils and fats	30	100,00

Source : Primary data , 2019

The average score of diversity of food consumption of respondents is 4.17 or is at the level of diversity of low dietary diversity. This diversity rate is measured based on the consumption of 7 food groups consisting of: 1. Cereals, roots, and tubers, 2. Pulses and legumes, 3.

Vegetables, 4. Fruits, 5. Meats, fish, seafood, and eggs, 6. Dairy products, 7. Oils and Fats. In the following table can be seen the distribution of respondents based on the score of diversity of food consumption.

Table 9. Distribution of Respondents Based on Food Consumption Diversity Score

Dietary diversity category	Score	Number of respondents	Percentage (%)
Good dietary diversity)	>6	0	0,00
Medium dietary diversity	4,5 - 6	12	40,00
Low dietary diversity)	<4,5	18	60,00

Source : Primary data analysis results, 2019

4. Relationship between Diversity of Farming Types and Land Types

The types of land owned by the respondents consisted of yards, paddy fields, fields and mamar, with the lowest type of land owned by 2 types of land and the highest 4 types of land, and an average of 3.17. The results of cross tabulation between the diversity of farm types and land types as in the following table:

Table 10. Diversity of Farming Types and Land Types

Number of land types	Diversity of Farming Types			Total
	Less diverse	Quite diverse	Good diverse	
2	1	1	1	3
3	5	10	4	19
4	0	5	3	8
Total	6	16	8	30
Percentage (%)	20.0%	53.3%	26.7%	100%

Source : Crosstabulation analysis of Primary data results, 2019

The results of the cross tabulation analysis showed that respondents with a diversity of farming types in the less diverse category were 6 people, consisting of having 2 types of land 1 person, 3 types of land 5 respondents, respondents with a diversity of types of farming quite diverse as many as 16 respondents, consisting of has 2 types of land 1 respondents, 3 types of land 10 respondents and 4 types of land 5 respondents, respondents with a good diversity of farming types as many as 8 respondents, consisting of owning 2 types of land 1 person, 3 types of land 4 respondents and 4 types of land 3 respondents .

Kendall's tau_b test results showed that the number of ownership of land types did not correlate with the diversity of farm types ($p = 0.209 > 0.05$), this was partly due to respondents generally planting plants of the same type on mamar land (traditional agroforestry).

5. Correlation between Farm Type Diversity and Household Diet Diversity Score

The results of the analysis by the cross tabulation method that is to quantitatively analyze the relationship between variables, diversity of types of farming with household dietary diversity scores to understand the correlation between the two variables as in the following table:

Table 9. Results of Tabulation Analysis of Diversity in Farming Types * HDDS

Farmers group member	Diversity of Farming Types	HDDS		Total	Percentage (%)
		Medium dietary diversity	Low dietary diversity		
1	Good diverse	2	3	5	38,46
	Quite diverse	2	5	7	53,85
	Less diverse	0	1	1	7,69
Total		4	9	13	100,00
0	Good diverse	3	0	3	17,65
	Quite diverse	6	3	9	52,94
	Less diverse	5	0	5	29,41
Total		14	3	17	100,00

Source : Primary data analysis results, 2019

From the table it can be seen that, of the 13 respondents who were members of farmer groups, 5 respondents (38.46%) were in good diverse categories types of farming with medium HDDS 2 respondents and low HDDS 3 respondents; 7 respondents (53.85%) are quite diverse types of farming with moderate HDDS 2 respondents and low HDDS 5 respondents; while 17 respondents were non members of farmer groups, 3 respondents (17.65%) were in good diverse types of farming categories with medium HDDS 3 respondents and no respondents at low HDDS; there are 9 respondents (52.94%) at quite diverse types of farming category with 6 moderate HDDS and 3 low HDDS; types of farming less diverse 5 respondents (29.41%) all at medium HDDS.

Kendall's tau_b test results showed that there was no significant relationship between the diversity of types of farming with HDDS ($p = 0.653 > 0.05$). This result is in line with the results of research which shows that, even in certain situations where farmers mainly produce to meet their own needs (subsistence), most of the food consumed is bought from the market (Luckett et al., 2015; Sibhatu et al., 2015 in Sibhatu and Qaim, 2016). Farmers' subsistence orientation is primarily a response to risks and various other market failures. Reducing this failure and supporting a higher level of market integration can contribute to higher incomes and better nutrition in farm households. On the other hand, increasing the number of food groups produced on independent agriculture market incentives will encourage subsistence, reducing income cash, and thus somewhat worsen the quality of eating patterns and conclude that from a nutritional perspective increasing market access is more important than agricultural diversification (Sibhatu and Qaim, 2016), whereas Demeke et al, 2017, finds diversification of production positively and significantly associated with diversification of household diets, with poultry ownership most strongly correlated.

Conclusions

From the results and discussion, some conclusions can be drawn as follows:

1. The characteristics of agriculture in Taebenu Subdistrict, Kupang Regency are characterized by dryland farming (farming fields), yards, rain-fed rice fields, irrigated and mixed rice fields known as Mamar (traditional agroforestry)

2. The diversity of types of farming is in the less diverse category until quite diverse, and the average score of the diversity of food consumption of respondents is 4.17 or is at the level of low food consumption diversity (low dietary diversity).
3. There is no significant relationship between the diversity of types of farming with household dietary diversity scores ($p = 0.653 > 0.05$)
- 4.

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