

# Food security assessment in the coastal area of Demak Regency

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**Abstract.** Food security is an issue of national and global level. Food is a basic human need to live. Without food will threaten human life. This research was conducted in coastal area of Demak Regency. This research is to understand the potential of human resources, natural resources and assess the level of food security of coastal communities. The data used are primary data through interviews with the local community. Also used secondary data from government agencies. Data analysis used qualitative and quantitative descriptive methods through graphs, tables and maps. The results showed that potential of human resources in Demak coastal area (Wedung, Purworejo, and Sidogemah villages) is low. It can be indicated from education level of respondents in Demak are elementary school and junior high school. Beside, total households income are about 2-4 million. This study found that the households sampled are 90% is food insecure households. The most of households in Demak coastal area are about 90% households include on insecure food category.

## 1. Introduction

Coastal is an area that stretches in the interior of the sea, especially the first topographic changes on the surface of the mainland (1). Defines coastal areas as a land-and-sea encounter zone in which there is a relationship between human activity and the land and sea environment (2). The main features of the coastal area is (3) :

1. Coastal areas include land and sea
2. Land and sea boundaries determined by the level of land influence on the sea and the influence of the sea on land
3. Does not have uniform width, depth, and altitude

The problem that often arises in coastal areas is flood (4). The presence of tidal floods directly has an impact to human activity because it can damage the dwelling, roads, and other infrastructure (5). Tidal floods disaster has an impact on the socioeconomic life of the community. The presence of the tidal floods causes disruption of human economic activity. One of the sectors affected by tidal floods is the agriculture sector such as rice fields and ponds due to tidal floods that cause the decline in people's incomes.

In this regard food security is an interesting issue to study. Food security is everyone's access at all times in the foods sufficient for healthy living (6). Food security according to UU No.7 of 1996 is the condition of the fulfilled of food needs for the household which is reflected in the availability of adequate food, both quantity and quality, safe, equitable and affordable.

According to the definition of food security in Food Law. 7 of 1996, food security can also be interpreted as:



- a. Fulfillment of food with adequate conditions, good food derived from plants, livestock and fish to meet the needs of carbohydrates, proteins, fats, vitamins and minerals that are beneficial to human growth and health
- b. Fulfillment of food with safe conditions in which the food is free of biological, chemical, and other contaminants that can interfere harm human health
- c. Fulfillment of food evenly throughout the country
- d. Fulfillment of food with affordable conditions or easily obtainable at an affordable price

Based on the definition of food security, there are 5 element which is must be met :

- a. Oriented on household and individual
- b. Time (food is available and accessible at all time)
- c. Emphasize on food access of household and individual on physical, economic, and social
- d. Oriented on nutrition fulfillment
- e. Intended for healthy and productive life

Food insecurity is a condition of society in an area that has the inability to obtain adequate and appropriate food for healthy living include the poor, affected communities by disaster, and communities that are live on inaccessible places (*UU Republik Indonesia No. 18 Th. 2012 Tentang Pangan*). Food insecurity condition can be seen through the measurement of food sufficiency. Food sufficiency at the household level is a condition where every household has a sufficient quantity of food to meet the nutritional needs required by all family members (9).

## 2. The Method

Demak Regency, Central Java is an area bordering the Java Sea and is affected by the tidal floods that result in social activities of the community. This study was conducted in 3 villages in a coastal area of Demak. Wedung, Purworejo, and Sidogemah villages were chosen because these three areas are affected by tidal floods. The data used in this study consist of primary data and secondary data. Primary data obtained by interview method. Secondary data are obtained from related institutions.

Respondents in this study are households located in coastal areas of Demak. Sampling is done by using sampling quota. Fulfillment of the number of samples used in this study is based on expert assessment of researchers. The study used 30 randomly selected respondents from each village so the total sample was 90.

Data analysis method in this research is descriptive statistic. Descriptive statistic used to analyze data by describing data that has been collected without intending to make conclusions that apply to the public or generalization.

The interview data were used to assess socio-economic characteristics. Secondary data were used to describe potential of natural resources. Food security analysis was conducted with secondary data and primary data. Secondary data is used to determine the adequacy of food in the study area. Food sufficiency is known from the ratio between food availability and food needs (11).

### Food Availability

#### Rice

$$P_{net} = (P \times (1 - (B + P_k + T))) \times C \quad (1)$$

Description:

- P : Rice production  
 B : the value of seeds (0.0088)  
 P<sub>k</sub> : Feed (0.02)  
 T : wasted (0,054)  
 C : coefficient of paddy into rice (0.632) (10)

Corn, cassava, sweet potato

$$M_{net} = P \times (1 - (B + P_k + T)) \quad (2)$$

$$C_{net} = P \times (1 - (B + P_k + T)) \quad (3)$$

$$SP_{net} = P \times (1 - (B + P_k + T)) \quad (4)$$

Description:

B : value of the seeds (corn (0.009), cassava (0), sweet potato (0))

Pk : Feed (corn (0.06), cassava (0.02), sweet potato (0.02))

T : Wasted (corn (0.05), cassava (0.0213), sweet potato (0.1))

$$T_{net} = 1/3 \times (C_{net} + SP_{net}) \tag{5}$$

Description:

Tnet : net production of cassava and sweet potatoes

Cnet : net production of cassava

Spnet : net production of sweet potato

$$P_{food} = R_{net} + M_{net} + T_{net} \tag{6}$$

Description:

Pfood : Food production cereals

Rnet : Net production of rice

Mnet : Net production of corn

Tnet : Net production of cassava and sweet potato

Food Cereals Availability

$$F = \frac{P_{food}}{t_{pop} \times 365} \tag{7}$$

Description:

F : Food cereals availability

Pfood : Food production cereals

tpop : Midyear population

Ratio of Food Availability

$$I_{AV} = \frac{F}{C_{normatif}} \tag{8}$$

Description:

I<sub>AV</sub> : Food availability ratio

C<sub>normatif</sub> : Consumption normative (300 gram)

F : The availability of food cereals

**Table 1.** Classification Ratio of Food Availability [11].

Ratio of Food Availability	Classification
$R < 0,90$	Prone to Food
$0,90 \leq r \leq 1,14$	Enough Food
$R > 1,14$	Surplus Food

Analysis food security conducted with primary data obtained from the proportion indicator of food expenditure on total household expenditure. Proportion of food expenditure can be calculate by [11]:

$$\% \text{ food expenditure} = \frac{P \text{ food expenditure}}{\text{Total household expenditure}} \times 100 \tag{9}$$

Status of food insecurity indicators

Insecurity food : If presentation of food expenditure > 60%

Security food : If presentation of food expenditure ≤ 60 %

### 3. Result and Discussion

#### 3.1. Socio-economic Characteristic

The socio-economic condition of a society characterizes the resource potential of people residing in a region. Better socio-economic condition of a society reflects higher quality or potential of human resources. In this study, the benchmark of human resource potential as characterized by the quality of human resources is education level, employment, and purchasing power of the community can be assessed from the average level of household income. The higher education level a person affecting to higher quality of human resources he has.

**Table 2.** The Education Level of the Communities.

No	Education Level human	Wedung (%)	Purworejo (%)	Sidogemah (%)
1	Didn't/never School	0	0	6.7
2	Didn't Pass from Elementary School	0	17.2	6.7
3	Elementary School	70	55.2	46.7
4	Junior High School	16.7	17.2	20
5	Senior High School	13.3	6.9	20
6	College	0	3.4	0

Table 2 shows that the average of education level of the communities in Purworejo, Wedung, and Sidogemah Villages are elementary school. This condition is in accordance with the results of research showing that the average (63.3%) of coastal community education in North Minahasa region is primary school. This is indicating that education participation of the communities in Demak is still relatively low. Coastal communities prefer work to add household income rather than pursuing education.

**Table 3.** The Employment of Households Members.

No	Main Activity Households Members	Wedung		Purworejo		Sidogemah	
		N	(%)	N	(%)	N	(%)
1	Fishery	15	14.02	29	27.10	2	1.96
2	Commerce	6	5.61	14	13.08	6	5.88
3	Private employees	2	1.87	4	3.74	8	7.84
4	PNS/TNI/Polri/pensioners	0	0	0	0	1	0.98
5	Local honorarium employee	1	0.93	0	0	0	0
6	Labor	18	16.82	3	2.80	37	36.27
7	Service/self employee	1	0.93	4	3.74	5	4.90
8	Industry	0	0	2	1.87	0	0
9	House wife	26	24.30	21	19.63	19	18.63
10	Student	33	30.84	28	26.17	18	17.65
11	Unemployed	5	4.67	2	1.87	6	5.88
Total		107	100	107	100	102	100

The type of work of community members in coastal areas of Demak is known from the main types of household members' activities. The main activities of household members in this study site show varied activities. In the Wedung village most household member activities are as housewife as much as 24.30% and student as much as 30.84%. In Purworejo village the main activities of household members are dominated in fisheries and student, respectively 27.10% and 26.17%.

Different with Sidogemah village, the main activities of household members are dominated as a laborer as much as 36.27% and housewife respectively 18.63%. The more members of the household work the more income will be generated.

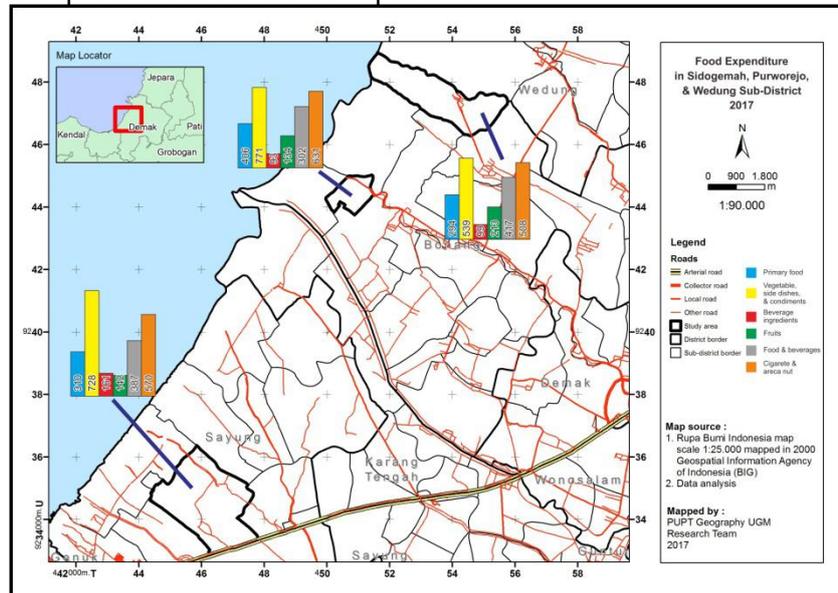
**Table 4.** Average Household Income.

No	Village	Average Income (in Indonesian Rupiah/IDR)
1	Wedung	2,774,833.33
2	Purworejo	3,848,833.33
3	Sidogemah	3,075,333.33

Household income is an indicator of household economic level. Table 4 show the average total income household in Demak coastal area. In each village, has different condition. Average household income in Wedung village is the lowest value IDR 2,774,633.33. The highest average total households

income in Purworejo village is IDR 3,848,833.33. While average total household income in Sidogemah village is IDR 3,075,333.33.

The fulfillment of the needs of the community is known from proportion household expenditure divided into food expenditure and non food expenditure.



**Figure 1.** Map of Proportion of Food Expenditure in Demak Coastal Area.

Figure 1 shows proportion of food expenditure in the Wedung, Purworejo, and Sidogemah village. The highest proportion of food expenditure is for vegetables, side dishes & condiments in each village. The interesting thing that found in this study is consumption of cigarette is high (58.89% of the total respondents). Even some respondent who is a smoker saying that better didn't eat than didn't smoke. This condition causes expenditure for cigarette is more than expenditure of primary food.

**Table 5.** Average Non-Food Expenditure in Demak Coastal Area.

No	Non-Food Expenditure	Average		
		Wedung (IDR/year)	Sidogemah (IDR/year)	Purworejo (IDR/year)
1	Rent / Contract	43,263	41,933	34,333
2	Account Electricity, gas, kerosene, firewood, and others.	884,207	1,235,466	1,045,933
3	Home maintenance and repair	0	135,000	554,800
4	Drinking water, minerals	367,266	538,000	539,600
5	Various Goods and Services	559,466	852,133	775,200
6	Cost of education	2,216,433	1,406,133	1,946,733
7	Health Fee	134,136	208,333	227,866
8	Household equipment	156,000	18,600	338,433
9	Communication	497,666	583,333	709,666

Non-food expenditure in three villages showed a uniform condition, where the highest non-food expenditure is the cost of education.

### 3.2. Food Security

To assess the food security is done by using secondary data (serelia productivity data and population). The scope of the study in 3 sub-districts in Demak District is Sayung (Sidogemah), Bonang (Purworejo) and Wedung (Wedung) sub-districts. Based on the calculation of food availability and

population in the study area indicates that the three areas are food insecure. This means that agricultural production is not able to meet the needs of people living in the area. An area is said to be food insecure if the food sufficiency index is less than 0.90. Table 6 shows the highest level of food insecurity in Sayung District, while the lowest is in Wedung Sub-district.

**Table 6.** Food Sufficiency Level in Demak Area.

Sub-district	F (ton)	F (gram)	C	I <sub>AV</sub> (Food Availability Ratio)	Classification
Sayung (Sidogemah)	0.00006	55.13	300	0.18	prone to Food
Bonang (Purworejo)	0.00016	164.36	300	0.55	prone to Food
Wedung (Wedung)	0.00024	240.10	300	0.80	prone to Food

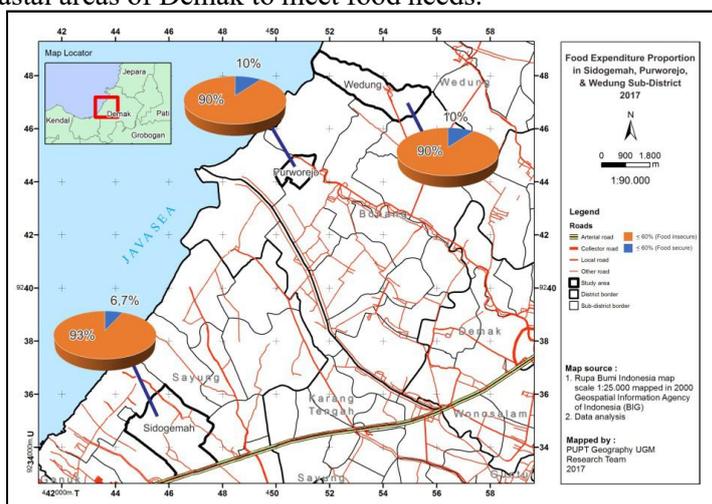
Table 7 shows the average household expenditure in the Wedung, Purworejo, and Sidogemah village. The average monthly household expenditure is about IDR 2 million which is divided into food and non-food expenditure. The proportion for food expenditure is more than non food expenditure. The proportion for food expenditure in the three villages are above 70%, while the non food expenditure in Wedung village is 21.76%, in Purworejo village is 21.48%, and in Sidogemah village is 19.63%. Food insecurity condition was presented by proportion of food expenditure per total expenditure. The results show that Wedung, Purworejo, and Sidogemah villages are included in the category food insecurity.

**Table 7.** Expenditure of Food and Non Food.

Description	Wedung	Purworejo	Sidogemah
Expenditure (IDR/month)	2,006,212	2,478,634	2,241,133
a. Food	1,571,433	1,946,120	1,801,300
b. Non Food	434,799	532,514	439,833
Proportion of food expenditure to total expenditure (%)	78.33	78.52	80.37
Proportion of non food expenditure to total expenditure (%)	21.67	21.48	19.63
Criteria	Food insecurity	Food insecurity	Food insecurity

Figure 2 show the percentage of household in the Wedung, Purworejo, and Sidogemah villages are in insecurity food. In the Wedung and Purworejo villages the households are in insecurity food as much as 90%, while 10% in security food. Different in Sidogemah village the households are in insecurity food as much as 93%, while 6.7% in security food.

Access to household economy in obtaining food on the coast of Demak is low. This is because the coastal conditions are often hit by flood tides. So that the fields and ponds are intrusive so as not to be productive. The impact is that people have to supply food from other areas with difficult accessibility. This condition indicates that government attention is needed to help communities in coastal areas of Demak to meet food needs.



**Figure 2.** Map of Food Security in Demak Coastal Area.

#### 4. Conclusion

Wedung, Purworejo, and Sidogemah are sample of villages in the Demak coastal area affected by tidal floods. The socio-economic characteristic of people in three villages have similar characteristic. The education level of the community is elementary school. Total household income are about IDR 2-4 million per month. The result of the research show is about 90% households in Wedung, Purworejo, and Sidogemah are in insecurity food.

#### 5. Acknowledgment

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