Community income analysis in lake Tempe Area, Wajo Regency

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Abstract. In the Lake Tempe Area every rainy season is flooded. Where in the dry season the waters of Lake Tempe will experience drought and in the rainy season will experience overflowing water that causes flooding. Both seasons have an impact on the agricultural conditions of the community in the Lake Tempe Area. Due to the change of seasons is the dominant factor that causes local communities to adapt and interact with their environment which will also impact the income of people in the Lake Tempe Area. This study aims to analyze the income of people in the Lake Tempe Area Fishermen Farmers in farming activities, fishing and households, in Mallusesalo Village, Sabbangparu District, Wajo Regency and the results showed that during the period studied, namely from April to May 2019, the average household income of respondents in Mallusesalo Village in one year amounted to IDR 29,034,441 household income derived from agricultural and fishing income.

1. Introduction
Wajo Regency is an area known to have a wealth of land water resources because it has Lake Tempe. Lake Tempe is the largest lake in South Sulawesi that has considerable potential and has natural tourism potential [1]. The geographical position of the lake is located in four areas of district, namely Tempe District, Sabbangparu District, Tanasitolo District, and Belawa District. In the rainy season, the puddles in Lake Tempe merge with two other lakes, Lake Sidenreng in Sidrap Regency, and Crocodile Lake in Tanasitolo Kecematan, Wajo Regency. In the dry season, these three lakes are separated by strict boundaries. The existence of Lake Tempe and the surrounding area has important meaning for the people of Wajo Regency in general and the communities in the region in particular. The community of tempe lake area is a compound community that generally consists of fishermen, fish processors, traders, laborers, and transportation service providers [2].

The potential resources of Lake Tempe that have been managed and utilized since long time ago by the community adala fishery potential. Generally, people who live in the floating settlement of Lake Tempe are fishermen who are busy every day by fishing activities and processing wet fish into dried fish [3]. In addition, Lake Tempe is known for the production of freshwater fisheries and the fish products are marketed to the exit of Wajo Regency. The potential of this fishery has benefited the community and the government. Lake Tempe fishery production until the late 1960s is still known as the most important center of freshwater fishery production in Indonesia [4].
Agricultural conditions in the Lake Tempe Area are very promising for people living in the area. But in the Tempe Lake Area also almost every rainy season is flooded. The area that is always inundated during the rainy season is around Lake Tempe which is unable to hold water so that it overflows in the surrounding areas including the rice fields of the population. The rainy season that causes flooding is always routine every year, so the locals always fail to harvest rice.

Tempe Lake Area is quite potential for the development of agriculture, both in the form of food crops and perennials (annual crops). However, the unstable water condition of Lake Tempe so that people in the Tempe Lake Area should be able to make the most of the land in the Tempe Lake Area as a livelihood every year. In the dry season the land is used with gardening and farming and vice versa in the rainy season is utilized for fisheries. The potential resources of Lake Tempe that have been managed and utilized since long time ago by the community are the potential of fisheries and agriculture. Lake Tempe is known for its freshwater fishery production and the fish is marketed to the wajo regency. The fishery potential of Lake Tempe is still considerable, especially for fishing in lake waters.

Changes in the environment around Lake Tempe due to the changing seasons are the dominant factors that cause local communities to have to adapt and interact with their environment. Climate change poses a major threat to food security and nutrition, especially for households that are heavily dependent on agricultural production including fishermen. Erratic climate, rainfall irregularities, increased risk of crop pests bring negative impacts to farmers so they have difficulty determining the agricultural calendar and impact on the decrease in crop production and productivity that ultimately threatens the livelihoods of farmers as a whole. While droughts, floods and landslides due to high intensity rainfall will have an impact on land damage, decreased production and productivity and worsening food insecurity [5].

This can be seen by the changing seasons, namely the rainy season and the dry season. Where in the dry season the waters of Lake Tempe will experience drought and in the rainy season will experience overflow of water that forms a large waterhole that causes flooding. Both seasons have an impact on the agricultural conditions of the community in the Lake Tempe Area. What the people of Lake Tempe are doing in the face of changing seasons is to switch professions. The result of [6] studied shows that the people of Lake Tempe area in the rainy season become lake fishermen, while in the dry season they become farmers or farm laborers. So that the activities of catching fishery resources and agricultural activities are carried out alternately in accordance with the changing seasons. Based on this, this study aims to analyze the income of people in the Tempe Lake Area, Mallusesalo Village, Sabbangaru District, Wajo Regency.

2. Research methods

This site of the research conducted in Mallusesalo Village, Sabbangparu District, Wajo Regency, South Sulawesi Province. Location selection is done by purposive sampling (intentionally) with the consideration that the location is one of the majority of the population is fishing farmers as their livelihood and this area is an area that almost every year there is flooding in Wajo Regency. In this study, the authors determined the sample by Probability sampling technique, the population in this study is 152 fishermen farmers. Sampling or respondents in the study were fishing farmers with the number of 30 people, which is 20% of the total population. Data analysis techniques used in this study to find out the income of fishermen farmers using income analysis of farmers and fishermen.

2.1. Cost analysis

To find out the cost used by farmers and fishermen in conducting their business using cost analysis [7]:

\[ TC = TFC + TVC \]  

Information:

- \( TC \) = Total Cost (IDR/Period)
- \( TFC \) = Total Fixed Cost (IDR/Period)
TVC = Total Variable Cost (IDR/Period)

2.2. Revenue analysis
To calculate the income earned by farmers and fishermen in conducting their business activities using income analysis that is [7]:

$$TR = P \times Q$$  \hspace{1cm} (2)

Information :
- $TR$ = Total Revenue (IDR/Period)
- $P$ = Price (Per/kg)
- $Q$ = Quantity (kg/Period)

After the total income is known, the income of farmers and fishermen can be calculated using the formula [7]:

$$\pi = TR - TC$$  \hspace{1cm} (3)

Information:
- $\pi$ = Income
- $TR$ = Total Revenue
- $TC$ = Total Cost

2.3. Calculation of household income
How to calculate household income, namely from fishery and agricultural business income after deducting by expenditures measured in rupiah/year. The calculation of household income is used as a formula formulation as follows:

$$Y = Y1 + Y2 - Y3$$  \hspace{1cm} (4)

Information
- $Y$ = Total Household Income (IDR/Year).
- $Y1$ = Family income from fishing businesses (IDR/Year).
- $Y2$ = Family income from farmer businesses (IDR/Year).
- $Y3$ = Household Expenses (IDR/Year).

3. Results and discussion

3.1. Analysis of rice production and revenue of the first season in the area of Lake Tempe
Production costs in farming are divided into fixed costs and variable costs. Fixed costs include land tax costs and tool depreciation costs while variable costs include the cost of seeds, fertilizers, pesticides and labor. The small amount of production greatly affects the income level of the farm. Agricultural income is the difference between the revenue obtained and the production costs incurred by farmers. The small amount of income received by farmers is strongly influenced by the amount of production and production costs incurred in one production process. The analysis of rice farming coastal areas of Lake Tempe can be seen in table 1. So the total cost incurred by respondent farmers is IDR 11,490,799,-/ha per season, so that the average income obtained by respondent farmers in Mallusesalos Village is IDR 17,763,261,-/ha per season.

3.2. Analysis of rice production and revenue of the second season in the Lake Tempe area
The small amount of income received by farmers is strongly influenced by the amount of production and production costs incurred in one production process. The analysis of rice farming in the coastal area of Lake Tempe can be seen in table 2.
Table 1. Production, production cost and average income of rice farming farmers respondents (/ha) first season in Mallusesalo Village, Sabbangparu District, Wajo Regency, 2019.

| No. | Description                  | Volume | Price (IDR/Unit) | Value (IDR/ha) |
|-----|------------------------------|--------|------------------|----------------|
| 1.  | Production (Kg)              | 6,095  | 4,800            | 29,254,061     |
| 2.  | Variabel Cost                |        |                  |                |
|     | a. Seeds (Kg)                | 33.53  | 10,000           | 243,852        |
|     | b. Fertilizer (Kg)           |        |                  |                |
|     |   - Urea                     | 48.00  | 1,800            | 81,298         |
|     |   - TSP                      | 10.00  | 2,000            | 18,333         |
|     |   - KCL                      | 6.00   | 2,300            | 14,822         |
|     |   - ZA                       | 50.00  | 1,400            | 71,209         |
|     |   - Phonska                  | 26.00  | 2,200            | 57,222         |
|     | c. Pesticides                |        |                  |                |
|     |   - Gramoxone (l)            | 0.88   | 69,000           | 73,511         |
|     |   - Spontan (l)              | 1.10   | 60,000           | 66,082         |
|     |   - Kensida (l)              | 0.84   | 22,000           | 18,450         |
|     |   - Kovinplus (bks)          | 3.75   | 6,000            | 22,509         |
|     | d. Labor                     |        |                  |                |
|     |   - Processing               | 10.18  | 100,000          | 1,017,879      |
|     |   - Planting                 | 4.73   | 100,000          | 439,911        |
|     |   - Fertilization            | 2.52   | 50,000           | 132,311        |
|     |   - Spraying                 | 1.36   | 50,000           | 68,182         |
|     |   - Harvesting               | 2.09   | 100,000          | 1,808,545      |
|     |   - Transport of Results     | -      | 12,500           | 573,417        |
|     | **Total Variabel Cost**      |        |                  | **4,636,305**  |
| 3.  | Fixed Cost                   |        |                  |                |
|     | a. Land tax                  | -      | 70,000           | 70,000         |
|     | b. NPA                       | -      | -                | 769,469        |
|     | c. Tractor Rental            | -      | 1,300,000        | 736,667        |
|     | d. Pump                      | -      | 20%              | 6,156,800      |
|     | **Total Fixed Cost**         |        |                  | **7,732,876**  |
| 5.  | **Total Cost (2+3+4)**       |        |                  | **11,490,799** |
| 6.  | **Revenue (1-5)**            |        |                  | **17,763,261** |

So the total cost incurred by respondent farmers is IDR 17,902,877,-/ha per season, so that the average income obtained by respondent farmers in Mallusesalo Village is IDR 18,096,519,-/ha per season. In the second season only 11 respondents planted this because farmers were afraid to take risks in the event of sudden flooding.
Table 2. Production, production cost and average income of rice farming farmers respondents (/ha) first season in Mallusesalo Village, Sabbangparu District, Wajo Regency, 2019.

| No. | Description                  | Volume | Price (IDR/Unit) | Value (IDR/ha) |
|-----|------------------------------|--------|------------------|----------------|
| 1.  | Production (Kg)              | 6,379  | 4,800            | 30,619,504     |
| 2.  | Variabel Cost                |        |                  |                |
|     | a. Seeds (Kg)                | 29.14  | 10,000           | 188,248        |
|     | b. Fertilizer (Kg)           |        |                  |                |
|     | - Urea                       | 37.99  | 1,800            | 67,551         |
|     | - TSP                        | 6.64   | 2,000            | 12,121         |
|     | - KCL                        | 3.03   | 2,300            | 6,970          |
|     | - ZA                         | 58.64  | 1,400            | 82,901         |
|     | - Phonska                    | 4,273  | 2,200            | 94,000         |
|     | c. Pesticides                |        |                  |                |
|     | - Gramoxone (l)              | 1.16   | 69,000           | 65,472         |
|     | - Spontan (l)                | 1.60   | 60,000           | 100,826        |
|     | - Kensida (l)                | 0.88   | 22,000           | 19,348         |
|     | - Kovinplus (bks)            | 4.19   | 6,000            | 25,157         |
|     | d. Labor                     | 9.15   | 100,000          | 915,427        |
|     | - Processing                 | 3.75   | 100,000          | 357,333        |
|     | - Planting                   | 2.44   | 50,000           | 124,862        |
|     | - Fertilization              | 1.34   | 50,000           | 67,011         |
|     | - Spraying                   | 2.10   | 100,000          | 3,752,727      |
|     | - Harvesting                 |        |                  |                |
|     | - Transport of Results        | -      | 12,500           | 859,091        |
|     | Total Variabel Cost          |        |                  | 6,379,045      |
| 3.  | Fixed Cost                   |        |                  |                |
|     | a. Land tax                  | -      |                  | 70,000         |
|     | b. NPA                       | -      |                  | 769,469        |
|     | c. Tractor Rental            | -      | 1,300,000        | 1,134,545      |
|     | d. Pump                      | -      | 20%              | 9,189,818      |
|     | Total Fixed Cost             |        |                  | 11,163,832     |
| 4.  | Total Cost (2+3+4)           |        |                  | 17,902,877     |
| 5.  | Revenue (1-5)                |        |                  | 18,096,519     |

3.3. Analysis of the cost and benefits of fishermen in the Lake Tempe Area

Business income analysis is used to find out the benefits that fish fishermen get per year. Each fisherman has a different amount of profit because in the calculation of profit is influenced by the total cost component and the receiving component. For more details the average profit of fish fishermen in one year can be seen in table 3.

Tabel 3. Cost and benefits of fishermen in the Lake Tempe area

| No. | Season | Total Revenue (IDR) | Total Cost (IDR) | Profit (IDR) |
|-----|--------|---------------------|------------------|--------------|
| 1   | Rainy  | 15,199,600          | 4,306,417        | 10,893,183   |
| 2   | Dry    | 10,553,600          | 5,344,417        | 5,209,183    |
|     | Total Revenue | 25,753,200        | 9,650,834        | 16,102,366   |
The total profit of fish fishermen in Mallusesalo Village in one year is IDR 16,102,366. The highest profit was IDR 10,893,183.00 and the lowest was IDR 5,209,183. During the rainy season the total income is higher than during the dry season because during the rainy season the fish catch is abundant compared to the dry season.

3.4. Respondents household revenue in the Lake Tempe area
Household income, namely from fishery and agricultural business income after deducting the expenses measured in rupiah/year. For more details, the respondent’s household income in one year can be seen in table 4.

Tabel 4. Annual respondent income in Lake Tempe Area in Mallusesalo Village, Sabbangparu District, Wajo Regency, 2019.

| No | Farm Income (IDR) | Total (Person) | Percent (%) |
|----|-------------------|----------------|-------------|
| 1  | 5,000,000 - 30,000,000 | 20             | 66.67       |
| 2  | 30,000,000 - 100,000,000 | 8              | 26.67       |
| 3  | > 100,000,000       | 2              | 6.67        |
| Total |                     | 30             | 100         |

| No | Fisherman Income (IDR) | Total (Person) | Percent (%) |
|----|------------------------|----------------|-------------|
| 1  | 5,000,000 - 15,000,000 | 12             | 40          |
| 2  | 15,000,000 - 30,000,000 | 14             | 46.67       |
| 3  | > 30,000,000           | 4              | 13.33       |
| Total |                     | 30             | 100         |

| No | Total Revenue (IDR) | Total (Person) | Percent (%) |
|----|---------------------|----------------|-------------|
| 1  | 5,000,000 - 30,000,000 | 20             | 66.67       |
| 2  | 30,000,000 - 100,000,000 | 8              | 26.67       |
| 3  | > 100,000,000        | 2              | 6.67        |
| Total |                     | 30             | 100         |

The highest farm income of more than IDR 100,000,000 consists of two people with a percentage of 6.67%, while the highest income for fishermen is above IDR 30,000,000 consisting of four people with a percentage of 13.33% and the highest household income is above IDR 100,000,000 consists of two people with a percentage of 6.67%.

The people in the Lake Tempe area make the best possible use of agriculture in the Lake Tempe area as their livelihoods every year. In the dry season the land is used for gardening and farming and vice versa in the rainy season it is used for fish fisheries so that it can get satisfactory results.

So the expenditures incurred by farmers’ households in Mallusesalo Village are relatively small because the cost of food is more often obtained from managed agricultural businesses, household income in Mallusesalo Village is obtained from the income of farming and fishing.

4. Conclusion
The average farm income obtained by farmers in Mallusesalo Village in the first season was IDR 17,763,261/ha per season and IDR 18,096,519/ha in the second season. The total profit of fishing in Mallusesalo Village in one year amounted to IDR 16,102,366. The highest profit was IDR 10,893,183.00 and the lowest was IDR 5,209,183. So that the average household income of respondents in Mallusesalo Village in one year amounted to IDR 29,034,441 household income obtained from the income of farmers and fishermen.

References
[1] Nadjib M 2016 Problematika prinsip manajemen kolaboratif dalam kerangka penyelamatan Danau Rawapening J. Masy. dan Budaya 18 487–502
[2] Surur F 2014 Analisis dan arahan pengembangan kawasan Danau Tempe, Provinsi Sulawesi
Selatan dengan Mempertimbangkan Kearifan Lokal Inst. Pertan. Bogor

[3] Naing N, Santosa H R and Soemarno I 2009 Kearifan lokal tradisional masyarakat nelayan pada permukiman mengapung di Danau Tempe Sulawesi Selatan Local Wisdom J. Ilm. Kaji. Kearifan Lokal 1 19–26

[4] Jumawan F; Suhartina. 2018 Identifikasi rumah nelayan dalam pembagian zonasi permukiman di kawasan Danau Tempe J. Techno Entrep. ACTA. 1

[5] Dewan Ketahanan Pangan 2015 Peta Ketahanan dan Kerentanan Pangan Indonesia Food Security and Vulnerability Atlas of Indonesia Jakarta

[6] Hamka I M and Naping H 2019 Nelayan Danau Tempe: Strategi adaptasi masyarakat dalam menghadapi kondisi perubahan musim ETNOSIA J. Etnogr. Indones. 4 59–72

[7] Bangun W 2010 Teori Ekonomi Mikro Bandung PT. Refika Aditama