Gender Adaptation Strategy to The Impact of Forest and Land Fire in Kelampangan Village Peatland, Sebangau, Central Kalimantan

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Abstract. Climate change that occurs in Central Kalimantan mostly caused by forest and land fire has led to season shifting and gender life order changing. Thus, it resulted in a poor impact on gender life sustainability that was difficult to be recovered in a short time. This research aims to identify and evaluate the adaptation of women to forest and land fires in Palangkaraya and to express solutions that can improve gender equality. The research was conducted in Kalampangan, Sebangau. This research applied an interview method with a purposive sampling technique and conducted a descriptive analysis that emphasized climate change conditions in recent years. Climate change caused land changing due to forest and land fire. Therefore, it was also able to change gender roles (women) to take responsibility to support family economic conditions. This condition created a double burden carried by women, so this condition required a choice of adaptation for women in dealing with it. The intended strategic choices were (1) surviving with these conditions and utilizing modest agricultural products; (2) changing land, using a traditional system while the restoration of burned land was processed; (3) forming post-fire farmer groups by gradually changing their mindset.

Key words: climate change, land fire, gender

1. Introduction

Global climate change effect in the current era is threatening human beings all over the world. Experts argue that the climate change effect in Southeast Asia, including Indonesia, will increase the threat toward food security, human healthiness, water supply, biodiversity, and sea level rising. Climate change in Indonesia is presented by season shifting and hydrology system changing [1].

Climate change that happens in Indonesia resulting in an unrecoverable natural disaster in a short time, like forest fires in Kalimantan. Forest fires in Kalimantan have a significant socio-economic impact, especially in terms of income for people who depend on agriculture for their livelihoods. The
subsequent impact is a decrease in community income as a result of increased household spending on health costs and a decrease in income from the transportation sector, especially transportation services due to disruption of business activities (business circle) [2]. Climate change greatly affects agricultural production, thus it is necessary to find a suitable adaptation strategy to reduce the impact losses [3].

Forest fires that occurred in Kalimantan had the most severe impact on the women's side due to the inequality factor and the special needs of women in disaster situations. Women are one of the considerations for determining roles in natural resource management known as gender roles [4]. As a result of forest fires in Kalimantan, farmers experience a decrease in income, so women also take responsibility for the household economy. The women have a double role to play in the impacts of climate change, such as helping to support the economy and being responsible for domestic work [5]. Therefore, gender mainstreaming and adapting strategies for women were needed. Various kinds of adaptations for women to survive; overcoming the decrease of income to survive, showing the role of women in facing the impacts of climate change in the Lamongan and East Lombok regions, are examples of gender adaptation in facing the impacts of climate change [6].

Gender mainstreaming in climate change policy places climate change in a gender perspective and becomes sociologically important because, in reality, climate change can contain gender relations [5]. The role of women (gender), which are very vulnerable to climate change, has been widely studied in various regions and parts of the country. The most attention in this research was the role of Kalimantan women who were accustomed to experiencing forest fires. Finding the steps that can help ease women's roles in dealing with forest fires that often occur is the concern of this study. Thus, it is required to find women's adaptation strategies in dealing with forest fires in Kalampangan Village, Palangkaraya. This research aims to identify and evaluate the adaptation of women to forest and land fires in Central Kalimantan and to present solutions that can improve gender equality.

2. Method
The research was conducted in Kalampangan Village, Sebangau, Central Kalimantan. Using the interview method with purposive sampling, interviews were conducted with 357 respondents in the village of Kalampangan. Field observations were carried out by observing the daily activities of female farmers. Then, a descriptive analysis was carried out which emphasized the conditions of climate change over several years and what women did to overcome the economic crisis at the moment and after forest fire disasters occurred. Data collection was also carried out through the Central Bureau of Statistics related to climate change, changes in forest areas, and changes and decreases in agricultural productivity to support the results of interviews conducted with gender in the Kelampangan area, Sebangau, Central Kalimantan.

3. Result and Discussion
3.1. Gender impacts of climate change
Based on data from the BPS (Central Bureau of Statistics) presented in figure 1, it shows the average maximum temperature in the Central Kalimantan areas every month during the last 5 years. The results above show that the maximum changes and increases in temperature happened in November 2015 and October 2019, while the lowest maximum temperature happened along the year 2018. It is closely related to the extreme weather specially condition in the Central Kalimantan, and also related to the changes of forest area due to the forest fire. Changes in forest products based on BPS data shown in Tables 1 and 2, started with space and change from a forest area in the region. From both of the tables below, it shows the changes in the forest area in Central Kalimantan. In 2015, it was 15.331.000 ha including the natural sanctuaries while in 2019 it was 15.324.482, It means that there was a reduction of 6.158 ha.
Figure 1. Average maximum temperature of each month for the past 5 years

Table 1. Broad forest areas according to districts in the Central Kalimantan Province (ha) 2015

| Districts/city          | Protected forest | Production Forest | Total Land Area |
|------------------------|------------------|-------------------|-----------------|
|                         | Protected forest | Production Forest | can be converted | Total Land Area |
|                         | sta             | limited           |                 |                |
| Districts               | 1 388 608.93    | 1 603 084.90      |                 | 2 991 693.83   |
| 1. Kotawaringin Barat   | 8 945           | 50 343            | 253 053         | 155 804        |
| 2. Kotawaringin Timur   | 14 024          | 202 056           | 490 665         | 435 935        |
| 3. Kapuas               | 282 155         | 203 996           | 519 014         | 137 248        |
| 4. Barito Selatan       | 82 795          | 46 439            | 194 653         | 194 653        |
| 5. Barito Utara         | 34 843          | 255 993           | 310 694         | 245 606        |
| 6. Sukamara             | -               | 21 028            | 118 182         | 67 757         |
| 7. Lamandau             | 26 856          | 223 913           | 62 744          | 153 202        |
| 8. Seruyan              | 36 417          | 441 148           | 386 763         | 286 767        |
| 9. Katingan             | 47 130          | 339 267           | 568 795         | 387 504        |
| 10. Puluang Pisaau      | 220 928         | 12 421            | 288 877         | 62 867         |
| 11. Gunung Mas          | 59 073          | 259 117           | 369 547         | 251 992        |
| 12. Barito Timur        | -               | 15 851            | 34 336          | 37 498         |
| 13. Murung Raya         | 544 662         | 228 382           | 1 029           | 200 011        |

Table 2. Area forest products based on the spatial plan of the province (RTRWP) in Central Kalimantan, 2019

| Provincial Spatial Planning (RTRWP) | an area (Ha) |
|------------------------------------|--------------|
| A. Protected Forest Area           |              |
| 1. Protected Forest (HL)           | 1 388 608.93 |
| 8. Nature Reserve Areas and Nature Conservation Areas in Ex. PLG | 1 603 084.90 |
| **Total A**                         | **2 991 693.83** |
| B. Cultivation Area                |              |
Climate change caused enormous risks to human health, economic development, and food security. Losses resulting from forest fires had an impact on biophysical damage and reduced forest potential economic value [7]. It also had an impact on human resources due to changes in environmental quality, such as smoke pollution and erosion, as well as external costs due to forest fires and their impacts. The losses value that had direct impacts on humans (the value of public health, the value of the fisheries sector, agriculture, and air transportation sector) due to the contribution of smoke from inside the fire area were not too large if compared to the value of the potential damage to biophysics.

Climate change caused land changes due to forest and land fires so that this could change the conditions of gender roles (women) to take responsibility for supporting the economic conditions of the family. The impacts of climate change that were felt by the community had the most significant impacts on women. When the impacts of climate change happen such as forest fires, agricultural land is affected, and water sources are also decreasing. In this context, women do not only act as housewives but also play a double role in overcoming disasters, both taking care of the household and participating in supporting and arranging the family economy to survive. In this case, women are often called agents of change in society. Based on global economic progress and increasing household needs and decreasing income, women had a dual role in being responsible for household affairs and becoming workers such as farming or participating in trade [8].

The gender inequality problem caused vulnerability for women from climate change that occurs every year, especially in terms of social and economic impacts on society. The fires in Indonesia spread and are always re-occurred every year and have an impact between economic sectors and showed an impact that reduced the level of people's income [9]. Structurally, it was found that there was a close relationship between the forestry sector and agriculture-based sectors in rural areas. On the other hand, it resulted in a societal loss in general [10].

The phenomenon of climate change eventually created a strategy for the society that had an impact, especially on gender, namely an adaptation strategy to survive and pass these conditions. An adaptation strategy was a person's way of maintaining his situation when problems arise in his life. The adaptation involved adjusting oneself in behaving against uncertain conditions. The adaptation was strongly influenced by certain socio-economic and ecological conditions [11].

However, some risks could not be avoided, such as floods, extreme drought, storms, and also global warming. In this case, it showed that we were indeed vulnerable to weather and climate events. The actions and the risk taken would determine what risks we would face in the future. Early action was more likely and also tends to have plenty of time to adapt to possible impacts. However, we also had limitations to adapt beforehand, some risks might occur later and we could not just rely on adapting continuously. All people in Indonesia, both those who live in cities or those who live in rural areas, would experience the impact of climate change. So, we needed to plan and adapt to limit the risks that would occur in the future.

One of the climate studies that has been carried out in the Indonesian region was a risk assessment as well as adaptation, and the need to further examine the role of women and support through post-disaster reconstruction. The efforts of women's roles in dealing with disasters in Indonesia, that is by women must have and be given a role and support in dealing with disasters in Indonesia in general [12]. Therefore, women can participate in reducing disaster risks and participate in disaster mitigation starting from recovery, rehabilitation, and also post-disaster reconstruction. Women had to be equipped also with knowledge and skills, so the negative impacts of natural disasters, especially forest fires, could be
suppressed. These results could support adaptations that would be described in the results of research conducted in Central Kalimantan related to forest fires.

3.2. Adaptation to climate change strategy
In general, climate change caused a significant risk. But with good risk management, the worst impacts of climate change could be minimized. A combination of adaptation strategies would reduce risk. The level of adaptation carried out depended on the success of mitigation activities. Communities could adapt by preparing to face some of the risks from climate change. Strategies that could be carried out in these conditions created a double burden that had been carried by women so that in this condition, a choice of adaptation strategies for women in dealing with it and a solution for gender equality was required. The strategy presented in this survey was based on interviewing gender in Kalampangan village.

3.3. Survival strategy by utilizing modest agricultural yields
When climate change occurs, natural disasters such as floods and forest fires automatically arise as a result of reduced rainfall and a lack of water resources. Central Kalimantan is an area dominated by peatlands, when the seasons change, the rainfall decreases. The peatlands are very vulnerable to be burned and being affected by forest fires. As a result of forest fires, many people who depend on farming are also affected because during the dry season the need for water which is usually used for farming is minimal. Moreover, agricultural land that is included in the forest area is also affected by the fire. Forest fires cause various losses for the people of Indonesia including health, social, ecological, economic, and also reputation problems [13].

As a result of forest fires, the economic activities of the community, especially the underprivileged people who depend on agriculture and agricultural laborers. This loss arises due to the cessation of all kinds of economic activities for some time and even causing large losses in terms of agricultural products, plantation, and land for daily laborers in forested agricultural land [14].

In this condition, one of the several strategies that can be done by the community is to survive with these conditions and utilize the available agricultural products. In this case, it will naturally change the conditions of gender roles (women) to take responsibility for supporting the economic conditions of the family. This condition creates a double burden that must be borne by women. This condition requires choices of adaptation strategies for women in dealing with it. The first choice of an adaptation strategy that is usually taken by people in areas prone to forest fires is to survive these conditions and utilize the available agricultural products. This strategy is a passive strategy that aims to save costs, namely by reducing costs that are concentrated on the costs of food, clothing, and education [15].

When forest fires happen, the economic condition of the community decrease and agricultural products are almost failed. Then, the women in the Central Kalimantan region who earn income from farming experience a very heavy burden. How cannot they experience it? Women have to take care of the household, share financial results to survive due to the impact of forest fires, and participate in supporting and supporting family finances. At that time, based on the results of interviews in Palangkaraya, some women chose to stay with their savings and hoped there would be a little help from the government during this condition.

This is also related to the lack of education level of the farming community in forest areas which has an impact on their choice of survival, in which they expect government assistance when the impact of climate change that causes forest fires happens. Economic development has become a development that deserves attention and knowledge needs to be reinforced so that individuals and groups from a region or country can survive the impact of the economic crisis on national economic performance and poverty [16].

On the other hand, women face the impacts of forest fires by surviving these conditions due to the lack of information obtained by the community regarding climate change information. However, some consider this as something commonly regularly happens, so they try to survive as in previous cases and prepare themselves to face the impacts of forest fires. It is because forest fires have become a familiar
thing for the people of Kalimantan, especially the people of Palangkaraya. Besides, the adaptation strategy that is also carried out by gender in dealing with forest fires is changing land.

3.4. Changing land using the traditional system while waiting for the restoration of burned land

Central Kalimantan with a forest area reaching 10,294,853.52 ha [17] in which from generation to generation, most of the people become farmers and manage forest land as a source of income. It can be seen from the data of APL (forest use area) in the forest products from the interviews. In the past, the ancestors who lived in Kalimantan carried out agricultural activities by moving land (from land to other lands) to get maximum results and larger land expansion. Following this, when forest fires occur, some women work as farmers who choose to change land while waiting for land restoration after the fire. By doing this, they can continue to be productive to support the economic needs of the family and help ease the burden on their husbands. Several options in preventing forest and land fires, one of which is changing fields or land for cultivation [18]. Because forest fires cause a decrease in community income, it can become a burden for families. Changing fields for communities is carried out on land that is far from the area of forest fire and national park.

In this condition, only some of the men support this adaptation. Why are women more affected by these peatland fires? Because the majority of men will migrate in search of new sources of livelihood [19]. Then, only women and children live in the village. For Kalimantan women, especially those who work as farmers, moving land activity is an effective solution so that they can still have income when forest fires occur. This has been hereditary as the teachings of their ancestors for survival methods. What is the relation between shifting cultivation and gender roles? Referring to the results of research [20] conducted on local community wisdom in shifting cultivation activities, men are too complicated in the process, including determining the location, managing land and restrictions (such as; the area is side by side with the land that is being abstained and when the cultivation process is ongoing; and, from the initial process until the rice harvested is finished being brought back to the village or the house of the cultivator, the community must not destroy the nature around the location of the field).

The shifting fields are an ecologically sustainable cultivation system, the length of the cultivation period of existing land is the key factor in maintaining soil fertility in the field farming system [21]. When a forest is cut and burned, there is an initial nutrient input into the soil that comes from the burning ash of the fields. Once the lands are cleared, the minerals will naturally release from the soil by the rain. Soil nutrients are also driven by plant growth. If the fields are small and surrounded by primary forest or regenerating forest, a lot of the soil and nutrients of the land are washed away and will be captured by the vegetation at the boundaries of the fields. In this case, women are more detailed about troublesome things like this. It is one of the most difficult adaptations that can be done during a forest fire disaster. Another adaptation strategy to the impact of forest fires on women is the formation of post-fire farmer groups by gradually changing the mindset.

3.5. The formation of farmer groups after a fire and gradually change the mindset of the community

In this globalization era, access to news and information is easy to obtain. Therefore when a disaster occurs, the public can access it. Likewise, the impact of forest fires that have occurred for years has begun to be reached in remote villages. This third strategy can also be used as a good solution in this globalization era in dealing with the impact of natural disasters such as forest fires. The importance of increasing public knowledge and awareness of the impact of land fires, increasing community capacity in land management, improving skills community in efforts to control land fires, improving facilities and infrastructure for tackling land fires, and developing plantation commodities that are suitable for the land as well as training for farmer groups in rural areas [22]. This should have been tried by the government and it can be seen in the gender development index in Table 3.

In this chapter, the role of women in dealing with situations caused by forest fires has begun to be conveyed and supported by the central government and the private sector with technology and counseling. Therefore, gender can be an agent of change as well as an environmental improvement as well as support for the economic conditions of the family. One of them is by forming a group after forest
fires and providing additional knowledge such as farming in the home environment, for example growing hydroponic vegetables, mushrooms, and secondary crops that do not require large areas of land. Based on the results obtained, the increasing development of information sources, the community was introduced and assisted in the form of mushroom cultivation innovations to increase income and farming expertise without having to use large and open land [23].

Table 3. Gender development index Central Kalimantan

| Districts/City     | IPG  | 2019    | 2018    | 2017    |
|-------------------|------|---------|---------|---------|
| Kotawaringin Barat|      | 91,69   | 91,76   | 91,76   |
| Kotawaringin Timur|      | 87,91   | 87,74   | 87,73   |
| Kapaus            |      | 95,51   | 96,26   | 96,59   |
| Barito Selatan    |      | 92,04   | 92,35   | 93,02   |
| Barito Utara      |      | 87,15   | 85,89   | 85,16   |
| Sukamara          |      | 90,84   | 91,45   | 91,24   |
| Lamandau          |      | 91,90   | 91,88   | 91,97   |
| Seruyan           |      | 89,44   | 89,46   | 88,64   |
| Katingan          |      | 85,57   | 85,70   | 85,51   |
| Pulang Pisau      |      | 92,12   | 91,72   | 91,70   |
| Gunung Mas        |      | 92,10   | 91,89   | 91,74   |
| Barito Timur      |      | 88,76   | 88,41   | 88,36   |
| Murung Raya       |      | 83,41   | 83,23   | 82,92   |
| Palangka Raya     |      | 94,96   | 94,66   | 94,42   |
| Kalimantan Tengah |      | 89,09   | 89,13   | 88,91   |
| Indonesia         |      | 91,07   | 90,99   | 90,96   |

Source: The regional development planning board, research, and development of Central Kalimantan province

Cultivation of mushrooms can be an alternative for victims of natural disasters, such as what the people of the Java island did during the eruption of Merapi where natural disasters stopped many agricultural and trading activities in particular [24]. The availability of training and assistance to community groups during a disaster, especially during forest fires that makes women need to think hard to sustain economic conditions, can be slightly resolved.

There were also groups formed and given training in purun packaging. Purun itself is a flooded swamp plant that is found in many areas of Kalimantan, especially Central Kalimantan which is the area with the second-largest swamp in the world. In the event of forest fires, the people of Kalimantan can still have income through handicrafts from purun such as making mats and straws [24]. Of course, this can all happen if there is support and assistance from the local government. Thus gender equality can be raised as well as the economic income of the community and also the region. Efforts for a gender adaptation strategy after forest fires by forming groups have been carried out, such as the craft of purun mats for the community group leader Aisyiyah Kuala Pembuang Seruyan [13].

The groups formed for women after forest fires to sustain economic conditions and solutions for the family economy are expected to become a base for gender equality and increase gender knowledge.

4. Conclusion

Women must also be equipped with the knowledge and skills to face the negative impacts of natural disasters, especially forest fires. The choice of the most dominant and profitable strategy that contributes to gender equality is the strategy of forming farmer groups after the forest fire and changing people's mindsets. The strategy of survival and land changing may be still the main strategy of some genders.
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