

An adaptation strategy of sandland peasants in Yogyakarta toward climate change

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Abstract. This study aims to explore and describe the adaptation strategies of sandland peasants toward climate change. Qualitative research method was employed and the data were collected through observation. In addition, the recording of the data, interview and the validity of data were determined by triangulation of sources. The results of the research showed that the adaptation strategies of sandland peasants toward climate change were; (1) the adjustment of crop varieties, (2) the utilization of productive crops as wind breaking, and (3) the irrigation system using “sumur panthek”.

1. Introduction

Sandland is a marginal area having low productivity because of a low water savings factor, infiltration and high evaporation, fertilization and organic material and also low water efficiency [1]. However, it has a great potency to support development in the agribusiness sector with its strength as a large area, flat, less flood, great sunshine quantities, and also the shallowness of sand water depth. This sand land potency is substantial when correlated to the potency of Indonesia as a maritime nation with the longest coastal line in the world [2].

Coastal sand land in *Kulon Progo* Regency, *Yogyakarta* Province is a coastal sand land developed for farming activity with 1.753 hectares, spreading in four sub-districts: Panjatan, Galur, Wates, and Temon. Coastal sand land peasants try to cultivate food plants, horticulture, plantation, and livestock suitable for the land characteristics. Chili is a primary farming plant on coastal sand land that is cultivated by the peasants, intercropped with watermelon and horticulture commodity. The objective of this research is to describe the adaptation strategies of coastal sand land peasants in facing the climate change.

2. Material and method

This study was a descriptive research with a qualitative approach. The primary and secondary data were garnered by an interview, observation, and document and archive study. The location of this research was selected purposively, based on the criteria of coastal sand land peasants in *Kulon Progo*, *Yogyakarta*. Data validation was carried out using data source triangulation. The informant and information exploration in this research are presented in table 1.

The data were analyzed using qualitative analysis in the first research and during the research process. The data collected were then processed systematically, starting from the interview, observation, editing, classification, reduction, data presentation, to drawing conclusions. This research employed the following interactive model of data analysis.



Table 1. Informant on research

No	Informant	Information
1	Coastal Sandland Peasant	The history of coastal sand land, productive behavior, attitude join group activity
2	Agriculture Department of Kulon Progo	Data of Chili production in Kulon Progo, the existence of coastal sand land agriculture in government's view, agriculture department role
3	Chairman of Peasant (farmer) Group	Peasant behavior, agriculture system of coastal sand land, chairman of peasant group role
4	Seller	Quality of farming product from coastal sand land
5	Agricultural Extension Agent	The role of Agricultural Extension Agent

Source: Field Data

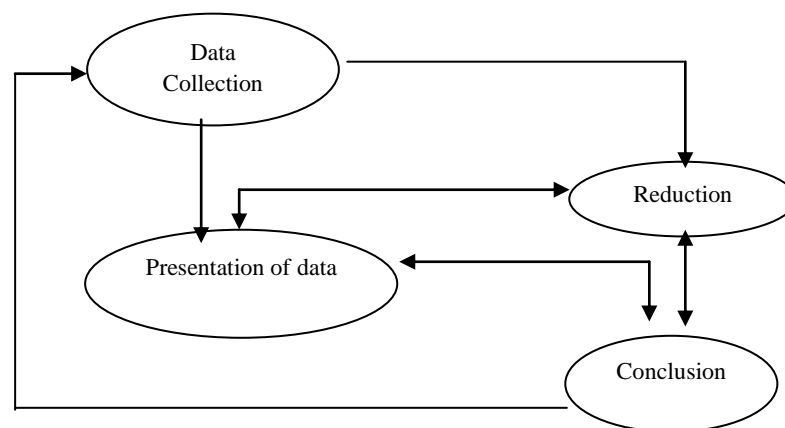


Figure 1. Interactive model of data analysis

3. Results and discussion

3.1 The history of coastal sand land agriculture in Yogyakarta

Kulon Progo Regency, Yogyakarta has approximately 116-120 hectares of coastal sandland in each village spreading from Wates (Karangwuni), Panjatan (Garongan, Bugel, Pleret), Galur (Karangsewu) to Trisik (Banaran). Coastal sand land in Panjatan district, Kulon Progo regency spreads in three villages: Bugel, Garongan, and Pleret. The coastal sand land has been used by the society as productive farmland since 1980.

In 1980, the people in southern coastal areas of Kulon Progo Regency, particularly those living in Panjatan Sub District began to utilize the existence of beach sand areas as one of productive land for farming. The farmers' accidentalness of finding chili plants that can flourish on beach sand land inspired the peasants to plant chili by following the chili planting pattern in a rice field. In fact, chili plants can flourish with fertilization and irrigation like in the rice field. Then, from this chili commodity, the peasants in Panjatan develop melon and watermelon plants with a very good result as well. Considering the experience, many peasants living in the area near Panjatan Sub District imitate this innovation. Afterwards, this innovation is disseminated along the south coastal areas of Kulon Progo Regency with red chili as a typical commodity.

The width of coastal sand land utilized by the peasants is ± 1500 hectare along the coastal area of Kulon Progo in 2017 with the average chili productivity of 15-20 ton/hectare, and ± 150 hectares in a rice field with the productivity of 5-8 ton/hectare. The result of chili marketing through auction market is, on average, 2.5-4 ton red chili per day in every auction group. Until today, the auction market has

accommodated around $\pm 70\%$ of peasants' chili marketing, while the rest of 30% are sold through the local seller.



Figure 2. Peasant activity in coastal sand land of Kulon Progo, Yogyakarta

3.2 Sandland peasants' strategy of adapting to climate change

3.2.1. Adjustment of Plant Variety. From their 30-year experiences, the sand land peasants conclude that Lado, Kyo and Helix varieties of chili can grow well in the sand land of Kulon Progo. This variety choice is made based on the chili cultivated widely by peasants so far. Actually, there is no provision related to this chili variety; however, because chili selling is conducted collectively in the group in auction market (chili will be mixed by variety), the chili variety not cultivated widely by peasants will be sold collectively in a small quantity so that it cannot be auctioned. The peasants receive some offers of other varieties, but based on the demplot tryout or planting by the peasants themselves, other varieties cannot grow as well as those three varieties. This chili variety adaptation, in addition, related to compatibility and land adaptation, is also adjusted with the auction market need as the marketing medium in the group.

In this chili cultivation, to result in a good chili, the peasants should fulfill the need for chili plant in order to get maximum production. The measure is manifested in choosing adaptive variety, using fertilizer, irrigating, maintaining, and harvesting. Rusdiyana [3] mentioned the gain of sand land peasants' productive behavior in Kulon Progo as shown in Table 2.

From Table 2, it can be found that overall, the percentage of peasants' productive behavior is 81.55% with the total mean score of 23.65. This figure shows that chili peasants' productive behavior belongs to the high category; in other words, the peasants perform a productive behavior to achieve good chili harvest. Since in chili agribusiness, in profitable time, the broker requires a good quality of chili, the good quality and optimum production are achieved through good productive behavior.

In addition to having a stipulation in planning the chili variety, the farmer group of coastal sand land also has a consensus dealing with the time of planting, corresponding to a planting calendar based on the peasants' local wisdom calculation. Chili planting is conducted simultaneously in the ninth season (*mangsa kesanga*) usually occurring in March. The planting is conducted simultaneously based on the approved time. If the peasants plant the chili before the date, they will be imposed with a sanction in the form of the removal of plant existing on the land. Every year during climate condition change, the peasants hold a "pranata mangsa" meeting to determine the date of planting season beginning that should be approved by sand land peasants along the coastal line of Kulon Progo.

Asosiasi Pasar Tani (ASPARTAN) (Farmer Market Association), as a means of managing chili auction market in Kulon Progo, has had a time calculation to determine the opening of the auction market in each area and it has been socialized well in each of farmer groups. It is ASPARTAN that serves as a sand land peasant consensus institution in the coastal line of Kulon Progo. When there is a change of time-related to chili harvest different from the prior condition (postponed/longer), the auction market opening schedule will be reviewed to determine the time when the auction is reopened.

Table 2. Gain of chili peasants' production behavior

No	Indicator	Score Interval	Gain Score	Gain Level (%)
Fertilization				
1	Using compost for fertilizing chili	0-3	2.90	97
Land cultivation				
2	Cultivating the land before planting chili	0-4	3.73	93
Chili planting				
3	Establishing contact with farming laborer	0-2	1.18	59
4	Planting chili corresponding to planting pattern approved by the group	0-4	3.61	90
Weeding, Spraying, Watering and Harvesting				
5	Establishing contact with farming laborer to weed grass	0-3	1.14	38
6	Weeding	0-4	3.36	84
7	Spraying to anticipate disease's attack against chili plant	0-3	2.29	76
8	Watering chili everyday	0-3	2.87	96
9	Establishing contact with chili harvesting laborer	0-3	2.57	86
Total		0-29	23.65	81.55

Source: Rusdiyana [3]



(a)



(b)

Figure 3. Farmer group meeting in the attempt of socializing planting season (a) and opening group auction market (b)

(a)



(b)

Figure 4. Chili marketing through group auction market (a) and chili sorting process in auction market (b)

3.2.2. The utilization of productive plant as a windbreaker and intercropping plant. The characteristic of the coastal area is, among others, high wind exposure, either onshore wind or sea breeze. This challenge becomes heavier since the wind often brings sand or water material with it, leading to the plant collapse and the failed conception. The adaptive strategy that the coastal sand land peasants take is to utilize hard plants as a windbreaker aiming to reduce the speed of wind that will pass through the plant cultivated. The plants chosen for this function has strong roots and stems, and thick leaves. The hard plants utilized by peasants include bushes and casuarina tree in the forefront. Then, close to the land, there are kelor and coconut trees. A kelor plant row is covered with creeping plants, like squash. On the other hand, peasants plant intercropping plants like cassava, tomato, eggplant, and etc. It means that peasants have a strategy of adapting to wind and weather challenge through wind breaking system with the production plants. The product of wind breaking plant becomes a vegetable source for self-consumption and by-product sold to the middleman (as additional income).



Figure 5. Wind Breaking Plant (Coconut, Kelor, Pare) in Peasant Land (a) and Dry Coconut Leaves and Bushes (b)

3.2.3. Irrigation with *sumur panthek* (artesian well) system. Hot sunlight exposure and irrigation water source existence become the challenge to coastal sand land farming. In the beginning of coastal sand land farming in the 1980s, the peasants created an ordinary well by constructing a tube well. Water was drawn from the well and poured onto chili plants by using a pail or watering can. Such technique needs strong laborers and too long time recalling that the manual water transportation speed with human energy is often limited by the width of the land to be watered. In 2000, the peasants found an irrigation system called as a “*sumur panthek*” (artesian well) system. The well is constructed with a drilling system using a pipe and hose to flow the water into farmland. This drilled well modification has an advantage in term of watering system speed and watering affordability because the long hose facilitates the farmers to afford the wide land. Watering becomes important in the high temperature of sand land, especially in the dry season. The adaptation strategy using the artesian well benefits the peasants as they can water the plant twice a day to meet its irrigation need.

The adaptation strategy of the coastal sand land peasants in Kulon Progo can provide sand land farming sustainability for about 37 years. Local wisdom patterns in adapting to nature are even institutionalized strongly through a group consensus and agreement binding its members. Through the local wisdom of adapting to the environment, peasants organize themselves in a consensus to ensure the environment-friendly sustainable farming. It is in line with Umstot [4], Ife and Tesoriero [5] and Putnam [6] finding that a group has the power to control its members’ behavior. The strongest way is the norm, that is, the behavioral rule that should be obeyed and implemented by individual members. As the member of farmer (peasant) group, peasants are expected to attend some activities supporting the sustainability of coastal sandland farming activity.

In a theory suggested by Ife and Tesoriero [5], a consensus is not only equality but also pertains to the consensus established in a group. Moreover, the consensus is a commitment in which group or

society is committed to trying to look for a solution or a series of action acceptable to and owned by everyone and decision made and approved by those within it for mutual interest. The consensus-based community development is better than the conflict-based one. As suggested by Putnam [6] the establishment of structure and process in the society is very desirable to perpetuate the life existing in the society. It is intended to realize a sustainable farming system as expected by Roling and Wagemakers [7] and Maunder [8].

To achieve a sustainable farming, according to Roling and Wagemakers [7], a process or procedure is required. The following are the procedures of realizing sustainable farming: (a) improving the economy and environment efficiency, (b) integrating new technology and strengthening it (regenerative technology), and (c) ordering the sustainable farming community life requiring self-regulatory in managing the ecological system and plant diversity. In addition, the society should be independent (self-reliance) in its planning attempt. The coastal sand land peasants have performed four matters suggested by Roling and Wagemakers [7] as indicated by the presence of local wisdom that has been institutionalized in the group rule.

Social Action theory, according to Maunder [8], has been adjusted to the present paradigm, community's active participation, in which society is not in given position. This theory assumes that in rural society, the role of legitimacy institution is still very substantial. Nevertheless, the image of a legitimizer should refer to the village elders who not only always lead a customary rite but also can be opinion leader or agent of change in the village. This implementation is very strategic to be performed by the chiefs of farmer groups serving to bridge innovation and to lead their members to keep being subjected to the specified consensus.

4. Conclusion

The results of the research showed that the adaptation strategies of sandland peasants in Yogyakarta toward climate change were:

- The adjustment of crop varieties,
- The utilization of productive crops as wind breaking, and
- The irrigation system using the artesian good system.

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