Farming system of food crop keep going to produce on a time climate change and COVID-19 Pandemic in Timor - Indonesia

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Abstract. Each body needs some foods to consume every day. But to produce food in all region face many factors as challenges. Challenges that farmers always face in the dryland region are limited water for supplying to crop, and the soil has low fertile and low input production into manage farming system. In addition, producing food crops on the COVID-19 Pandemic face new challenges like the availability of input production, distribution, and marketing of products. However, food production should be prepared to fulfil human needs. The research objectives are (1) to know farmers' activity on the food crop farming system. (2) to know the way farmer's availability input production, distribution, and marketing of product. And (3) to know the productivity of food crops on the COVID-19 Pandemic. This research used to survey and observation Method to the farming system that farmers do. This research shows that farmers always are doing their farming system of food crop despite happen climate change, especially have no rain for a long time and the COVID-19 Pandemic. For doing their farming intensively, farmers should get input production from distribution agents. And farmers' success in selling their product in the local market. However, products that should be sold on the other island or products for the industry market often face challenges, especially transportation.

1. Introduction

COVID-19 had affected all sectors living all over the world. Each leader of the nation had done a judicious strategy to protect its nation. Social Restrictions on a big scale (Pembatasan Sosial Berkala Besar) of nation cause growth economic weakened. Logistic distribution of food among location in Indonesia have constrained. It's a special strategy to fight the COVID-19 Pandemic [1]. However, people should consume every day without considerable problems.

Each body needs some foods to consume every day. But to produce food in all region face many factors as challenges. Challenges that farmers always face in the dryland region are limited water for supplying to crop, and the soil has low fertile and low input production into manage farming system [2,3], without input production sufficiently, farmers get low production of food crop. In addition, producing food crops on the COVID-19 Pandemic face new challenges like the availability of input production, distribution, and marketing of product. And according to [4] the COVID-19 Pandemic reduce the workforce across all economic sector. Even though for a farming system of food crop to remain productive and sustainable to prepare food for fulfilling human needs every day.

On the COVID-19 Pandemic, everybody's concern prevents its transmission is shown through the attitude and behavior of the community, including the farmers. Health protocol should always be obeyed for all without exception. During it, the farmers should do them farm and maintain for getting...
high productivity of food crop. The farmers must do their farm for food crop as a priority of livelihood.

The research objectives are: (1) to know farmers' activity on the food crop farming system. (2) to know the way farmer's availability input production, distribution, and marketing of product. (3) to know the productivity of food crops on the COVID-19 Pandemic.

2. Materials and methods
This research had been done in dry season 2020 on the time COVID-19 Pandemic. This research was chosen based on some criteria: (1) Farmers is running farm for food crop on the time COVID-19 Pandemic, (2) Farmers use water resource for irrigating the farm of food crop on the dry season 2020. Base on the criteria above was chosen Naibonat Village was the location of this research. This research used to survey and observation Method to the farming system that farmers are doing on dry season 2020. This research conduct in farmer's fields by the farmers [5]. Farmers are grouped according to the food crop which is cultivated. In each village should cultivate a minimal one food crop. Respondent of this research as much 15 farmers which consist of farmers plant maize crop, farmers plant mungbean crop, and farmers plant vegetable crop. The variables and observations of this survey include types of food crops, the scale of farming, input production, labor, production, farm management, product distribution, marketing, and income. Measurement variables in this study consist of available in production, farmer's activity during the farming system are running, productivity, and marketing product. Data be collected at each stages and then analyze with averages analysis [6].

3. Results and discussion

3.1. Overview of climate in the research location

The site location is being in dryland and dry climate. So that climate effect all condition include agriculture sector. Climate condition in the site research as below table 1.

| Month    | Rainfall (mm) | Number of rain days |
|----------|---------------|---------------------|
| January  | 151           | 18                  |
| February | 97            | 12                  |
| March    | 92            | 10                  |
| April    | 27            | 3                   |
| May      | 12            | 1                   |
| June     | 0             | 0                   |
| July     | 0             | 0                   |
| August   | 0             | 0                   |
| September| 0             | 0                   |
| October  | 7             | 2                   |
| November | 270           | 11                  |
| December | 110           | 17                  |
| Average  | 64            | 6.2                 |

3.2. How in put production be provided by farmers

For doing farming intensively, putting production as a main factor should be available on time in the farming. Input production consists of seed, fertilizer, insecticide for each commodity, maize, mungbean, and vegetable. The Farmers prepared input production through a transaction with a distribution agent, but especially seed of mungbean was provided by farmers from the last harvest in the farming. In this case, all of the farming were conducted in the dry season on the COVID-19 Pandemic, so farmers should add special input production, namely water for irrigating the farming.
available water in the farming particularly in dryland farmers should pump water from deep well and distribute to farming. Description of available in production as table 2 below.

**Table 2. Description of available in put production.**

| In put production       | Distribution agent | Mechanism transaction       |
|-------------------------|--------------------|-----------------------------|
| Maize seed (Hibrid)     | Agent              | Direct cash transaction     |
| Maize seed (Composite)  | Breeder seed       | Direct cash transaction     |
| Mungbean                | Farmers            | Paid from farmer to farmer  |
| Mungbean                | Breeder seed       | Direct cash Transaction     |
| Vegetable seed          | Agent              | Direct cash Transaction     |

3.3. How in put Production be provided by Farmers

Farmers would get the seed of food crops from an agent if the seed did not produce last period. In table 2, we can see that farmers from the last harvest can provide only the seed of mungbean, and maize seed is gotten from the local breeders. Transaction of the seeds both in the agent distribution and breeders always obeys health protocol. When farmers go to the agent for buying seed must use a mask, and in the agent had provided washing hand and had arranged social distance. It was very difficult for all people to do it the first time, but now it becomes a new habit for all people and has been doing until now.

3.4. Activity of Farmers in Production Process

The production process of food crops in dryland always had become the main activity to fulfill a family's food for a certain period. Community in dryland usually prepare food security for each family through doing farming during the rainy season. This way had been going routinely every year. In the rainy season, all of the recourses be moved only for food security. And how about farming's activity on dry season, especially in dryland and on the time of COVID-19 Pandemic. It can be seen in the table 3-5 below.

**Table 3. Description of the production process of mungbean crop.**

| Stages production | Description                                                                 |
|-------------------|-----------------------------------------------------------------------------|
| Commodity         | mungbean                                                                    |
| Land preparation  | Minimum tillage through apply herbicide                                     |
| Seed preparation  | Seed of mungbean prepared by farmers or to get from other farmers          |
| Planted           | Planting the food crop according to the protocol namely space 40 cm X 20 cm, each hole planted 2 seed. |
| Fertilizer        | Farmers apply liquid fertilizer as much as 1-2 liter.                      |
| Weed control      | Apply manual weed control                                                  |
| Pest control      | Base on the observation and usually apply to the first growth and phase of generative |
| Harvest           | Harvesting will be done if the pod have been dry up                        |
| Irrigation        | Some stages to do for irrigating namely before planting, and regularly every two week/time |
**Table 4.** Description of production process of maize crop.

| Stages     | Description                                      |
|------------|--------------------------------------------------|
| Commodity  | Maize                                           |
| Land prep. | Minimum tillage for maize                       |
| Seed prep. | Seed of maize prepared by farmers and be obtained from breeders seed and distribution agent |
| Planted    | Planting the food crop according to each protocol, namely space of planted 80 cm X 40 cm and each hole planted 2 seed |
| Fertilizer | Farmers apply Urea and NPK fertilizer as much as 100 kg urea and 100 kg NPK |
| Weed control | Apply manual weed control and herbicide selective |
| Pest control | Base on the observation and usually apply to the first growth and phase of generative |
| Harvest    | Harvesting will be done if the grain has been dry up |
| Irrigation | Some stages to do for irrigating, namely before planted, and regularly every week/time |

**Table 5.** Description of the production process of vegetable crop.

| Stages     | Description                                      |
|------------|--------------------------------------------------|
| Commodity  | Vegetable                                       |
| Land prep. | Perfectly to prepare                            |
| Seed prep. | Seed of vegetable prepared by farmers and be obtained from breeders seed and distribution agent |
| Planted    | Planting the food crop according to each protocol, namely space of planted 80 cm X 40 cm and each hole planted 2 seed |
| Fertilizer | Farmers apply Urea and NPK fertilizer as much as 50 kg urea and 50 kg NPK |
| Weed control | Apply manual weed control                        |
| Pest control | Base on the observation and usually apply to the first growth and phase of generative |
| Harvest    | Harvesting will be done if the fruits have been mature |
| Irrigation | Some stages to do for irrigating, namely before planted, and regularly every week/time |

In table 3-5, we can see that water management in dryland is very important at the time, and without it, the farming system isn't run. Its cause of has no rain during the dry season. Therefore farmers use water resources which be there as one potential in dryland. Water resources usable for irrigating farming systems as long as the dry season [7]. So that water resources play a key role in the dryland farming system during the dry season.

Importing thing which is obeyed on the Covid-19 Pandemic namely should use a mask and social distance, washing hand to prevent transmission of COVID-19. Social distance can prevent the
transmission of Covid-9 [8]. Therefore, each farmer makes transactions with other people or conducts activity both in agent and farmers always obey the health protocol. When farmers make a transaction with a distribution agent to get in put production, both seed, fertilizer, and pesticide should obey health protocol.

This research shows that farmers always are doing their farming system of food crop despite happen climate change, especially have no rain for a long time and COVID-19 Pandemic.

3.5. Production
Farmers do the farming system as long as the dry season up to the farmer wants to conduct any activity on the dry season. However, farmers keep in mind the marketing prospect of the commodity for selling their product. Description of the commodity that the farmers do in the field is as follows: table 6.

**Table 6. Description of commodity of food crop.**

| No. | Name of Farmers | Commodities          |
|-----|----------------|----------------------|
| 1.  | Filomena Soares| Land spinach, Cucumber|
| 2.  | Rafael Freitas | Mungbean, Maize      |
| 3.  | Rhicardo       | Maize, Shallot, Mungbean|
| 4.  | Manuel         | Mungbean, Pumpkin    |
| 5.  | Ito            | Mungbean             |
| 6.  | Yohanes        | Maize                |
| 7.  | Pedro          | Maize, Mungbean      |
| 8.  | Maukinto       | Maize                |
| 9.  | Manuel II      | Maize                |
| 10. | Manuel Bian    | Maize                |
| 11. | Antonio        | Maize                |
| 12. | Bento          | Maize, Kangkung      |
| 13. | Gregor         | Maize, Cucumber      |
| 14. | Ama Rafael     | Mungbean             |
| 15. | Sebastian      | Mungbean             |

The table above shows that farmers conduct farming systems for food crops suitable to their capacity and marketing prospect. For example, farmers choose mungbean to plant base on the reason namely mungbean very limit to use the water for normal growing and production, short growing period, high productivity and easy to sell in the local market [9].

Based on the table above, on the COVID-19 Pandemic, farmers will produce food crops to fulfil their need and sell in the local market.

3.6. Marketing of product
The priority product of food crop is to fulfil household consumption. However, farmers can be sold overproduction in the local market for getting cash income. Description of marketing product as follow in table 7.
Table 7. Description marketing of food crop.

| No. | Commodities | Market        | Description                                                                 |
|-----|-------------|---------------|-----------------------------------------------------------------------------|
| 1.  | Mungbean    | Local Market  | Traders make a transaction to buy mungbean both in the field, home, and market |
| 2.  | Maize       | Local Market  | Usually, Traders make a transaction to buy maize on a big scale 1-3 ton at home and distribute to some retailers in the local market |
|     |             |               | Farmers sell their product of maize in the local market and usually on a small scale |
| 3.  | Vegetable   | Local Market  | Farmers sell their product of maize in the local market                      |
|     | a. Cucumber | Local Market  | Farmers sell their product of maize in the local market                      |
|     | b. Pumpkin  | Local Market  | Farmers sell their product of maize in the local market                      |
|     | c. Shallot  | Local Market  | Farmers sell their product of maize in the local market                      |
|     | d. Land spinach | Local Market | Farmers sell their product of maize in the local market                      |

Based on the table above, on the COVID-19 Pandemic farmers succeed in selling their product in the local market to obey the health protocol. And farmers sell mungbean, maize, and various vegetable in the local market. Supply products into the local market are affected by the global COVID-19 Pandemic [10]. However, products that should be sold in the other island or product for the industry market often face challenges, especially transportation.

3.7. Prospect to develop foods crop on the COVID-19 Pandemic

Various challenges faced during the development of food crops in dryland and on the COVID-19 Pandemic affected all sectors, both available in production, transportation, and marketing. Even though the Food crop always keeps producing for fulfilling household consumption and selling in the local market. During the dry season (April - November), every year, especially in the dryland, usually have no rain for a long time. These are the main challenges that affect the agriculture sector in Timor Island. On the contrary, farmers wisely use the local potential, particularly water resources for producing food crops. Farmers spend their money to buy fuel to pump the water from deep wells and then irrigate the food crop in farming. This is done to avoid a lack of food and maintain the economy of the household. So that farmers keep going to produce food crop although face various challenges.

4. Conclusion

Based on the description, farmers still had been conducting their farming to produce food crops, although they face various challenges that are difficult to avoid. Farmers obey the health protocol in availability input production, distribution, and marketing of product. And finally, farmers get success running their farming to available food products on COVID-19 Pandemic.

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