Women, Rainfall Anomalies and Sources Utilization of Corn Farmers' Households in Babar Islands, Southwest Maluku Regency

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Abstract

The anomaly of rainfall has an impact on the growing season and the corn farming process. This study aims to analyze the position of women in the utilization of household sources of income for corn farmers' household livelihoods when facing anomaly of rainfall. Data analysis was carried out descriptively qualitatively on research data in Babar Islands with Emroing Village and Letsiara Village as sample villages. The results showed that the fishery sector only contributed 11.1% to the household income of farmers, the service sector contributed (18.5%), and the agricultural sector contributed 70.4% to household income. The high contribution of the agricultural sector was contributed by food commodities of 46.3 percent. Women acitivities in agricultural sectors include palnting, tending, and harvesting. It turns out that the food commodity is dominated by corn which is akways attempted to maintain production, seed aviability, and household income to sustainability.

Keywords: *women, anomalies, rainfall, livelihoods, corn farmers.*

Introduction

Climate change has a direct impact on the agricultural sector in Indonesia. The most obvious impact is crop failure for farmers, as a result of farmers' mistakes in determining the appropriate planting season and planting patterns to overcome local weather anomalies that occur (Rosen, 2021). According to Ruminta (2018), that very food commodity production influenced by a normal climatic conditions . During an El Nino event, water availability decreases, thereby reducing plant production and productivity. On the other hand, in a La Nina event, water availability is excessive and causes flooding. In very extreme conditions both have the potential to cause crop failure (Amare, 2018).

Various scientific studies such as those reported by Laimeheriwa et (2020) that in Indonesia, especially in Maluku Province in recent years, has shown drought conditions due to the El Nino phenomenon . The reduction in soil water content (drought) due to this phenomenon has a further impact on reducing the planting season period, planting intensity and crop production. The research results of Nangimah et al . 2019) on Buru Island, Maluku Province, shows that the La Nina rainfall anomaly has an impact on excessive water surplus, especially during the rainy season. This condition has an impact on flooding/inundation on agricultural land and further impacts on disruption of plant growth and production.

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These frequent and sporadic extreme rainfall anomalies make it increasingly difficult to predict when they will occur in a region. This fact causes public has its own way of dealing with it anomaly climate, which occurs cannot be predicted beforehand. This community way became known as Local Wisdom . The impact of climate change also threatens people's lives, because it affects the level of household income, so it is necessary to build an adaptation pattern through household livelihood strategies, so that fulfillment steady income sustainable (Guido, 2020b).

Research by Cabuy (in Aniah, 2019) in Jogjakarta places local wisdom as an important part of the lives of local communities who utilize plants and local environmental conditions in agricultural businesses. Pattiselanno et al, (2015) as a coastal community, the local economy is dominated by the agricultural and fisheries sectors. In the agricultural sector, cultivation of food crops, especially tubers, beans, corn, vegetables and field rice, is found in all types of farming businesses. The method of clearing land for fields/gardens is the Slash and Burn System, using traditional local techniques and technology, and is generally still influenced by customs that regulate the relationship between humans and the land/land that will be cultivated (Kabote, 2018).

BPS MBD (2019, 2020), shows that Babar Islands is the sub-district that has the highest corn production in MBD Regency. Research by Sopamena et al (2018), shows that the people of Tomra Village, Leti District, MBD Regency, anticipate rainfall anomalies through various livelihood strategies, especially by intensifying on-farm activities by cultivating livestock, off-farm activities as livestock workers, and non-farm activities. with activities in the service sector (Serumaga-Zake, 2020). However, this research does not yet describe the local wisdom implemented by the community, especially in cultivating corn commodities during conditions of prolonged rainfall anomalies.

Referring to various research results and BPS data on corn production in MBD Regency, it can be seen that even though corn production on the Babar Islands remains the highest, it is not yet known how the community anticipates rainfall anomalies by utilizing their household sources of income (Liru, 2020). Therefore, this research aims to analyze the position of women in utilizing household sources of income in relation to rainfall anomalies on the Babar Islands, Southwest Maluku Regency.

RESEARCH METHODS

This research was carried out on the Babar Islands, which are included in the administrative area of Southwest Maluku Regency (Gordon, 2019). Astronomically, Babar Island with an area of 1,585 km ^{2} is located around 07°58' South Latitude and 129°46' East Longitude. Imroing Village and Letsiara Village are the sample villages, because they have the highest corn production in the Babar Islands District.

Figure 1. Research Locations and Interview Process on Babar Islands

In the initial stage of this research, to obtain information, the researcher will ask key informants, namely the Village Head or Hamlet Head, as the head of government as well as the traditional head at the research location in Pulau-Pulau Babar District, who really understands the implementation of local wisdom in corn farming when facing rainfall anomalies (Makokha, 2021). Informants were then determined using the Snowball Technique, as explained by Moleong (1989).

Miles and Huberman (in Mekonen, 2022), explained that there are 3 (three) lines of qualitative data analysis, namely: data reduction, data presentation, drawing conclusions to analyze the use of livelihood sources for corn farmer households. Rainfall anomaly analysis was carried out using Babar Island rainfall time series data for the last 30 years period 1993-2022 and referring to ONI (Oceanic Nino Index) values sourced from sea surface temperature (Sea Surface Temperature, SST) measurements by (National Oceanic and Atmospheric Administration USA [NOAA], 2023) (Tume, 2021).

RESULTS

Rainfall Distribution and Anomalies

The results of analysis of Babar Island rainfall data for 30 years (1993 – 2022 period) show that annual rainfall in this area ranges from a low of 1040 mm in 1997 to a high of 2845 mm in 2010 with an average rainfall value annual (normal) of 1,670 mm (Figure 2)
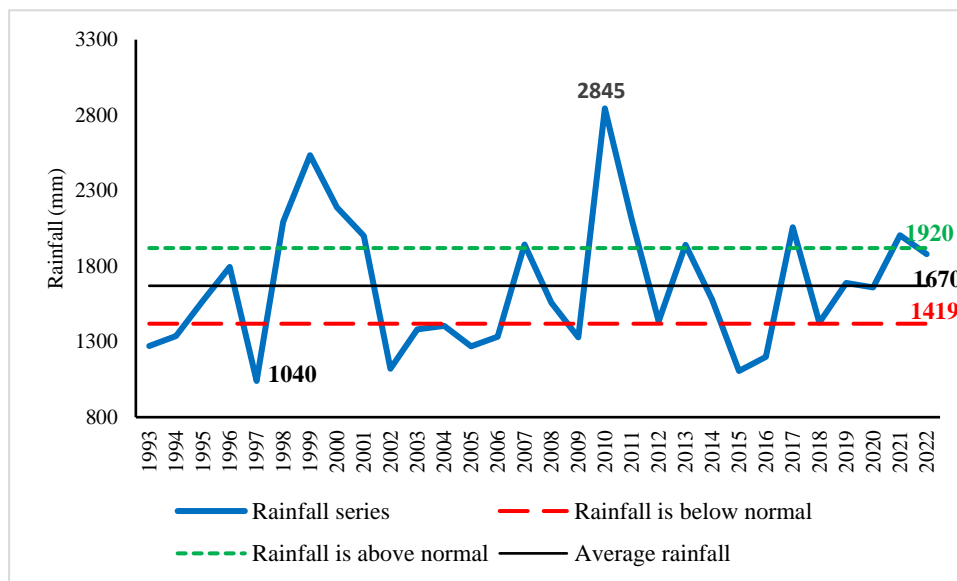

Figure 2 . Distribution of Annual Rainfall on Babar Island

It can be seen in Figure 2 that during the 30 year period there were deviations in rainfall 19 times (63.3%); where rainfall is less than normal conditions by 9 times, and rainfall exceeds normal conditions by 10 times. Meanwhile, rainfall was within the normal interval of 11 times or 36.7% (Table 1).

Table 1. Rain characteristics on Babar Island for the period 1993 - 2022

The Nature of Rain	Year Event
Normal	11 times: 1995, 1996, 2003, 2004, 2008, 2012, 2014, 2018, 2019, 2020, 2022
Below Normal _	9 times: 1993, 1994, 1997, 2002, 2005, 2006, 2009, 2015, 2016
Above normal _	10 times: 1998, 1999, 2000, 2001, 2007, 2010, 2011, 2013, 2017, 2021

Source : processed from Babar Island rainfall data for the period 1993-2022

Various study results show that deviations in rainfall from normal conditions in a region are related to the extreme rainfall phenomena of El Nino and La Nina. An El Nino event causes a decrease in rainfall to below normal, which poses a risk of drought or water shortages, whereas a La Nina event causes an increase in rainfall to above normal, which poses a risk of flooding/inundation (Kiumbuku, 2018).

On Babar Island, of the 9 years where rainfall was less than normal conditions, 6 of them coincided with El Nino events in Indonesian territory, namely in the years: 1994, 1997, 2002, 2006, 2009, and 2015. The most extreme (rainfall far below normal) on Babar Island occurred in 1997 and 2015 with annual rainfall of 1040 mm and 1106 mm respectively, a reduction from the normal situation of 564 - 630 mm or 34 - 38%. The reduction in soil water content due to this incident has further impacts on the shortening of the planting season, disruption of growth and crop production and even the threat of crop failure (Yiridomoh, 2022).

Of the 9 rainfall events above normal on Babar Island, 8 of them coincided with La Nina events which generally occur in Indonesia, namely in the years: 1998, 1999, 2000, 2007, 2010, 2011, 2017, and 2021. Lani Nina events the most extreme of normal conditions occurred in 2010 with rainfall of 2845 mm; increased by 1175 mm or 44% compared to normal conditions. Based on the amount of extreme rainfall during a La Nina event which takes place in a relatively dry area, this will have an impact on increasing soil water levels, extending the planting season, increasing planting intensity, and increasing harvest area and crop production.

Planting Season on Babar Island

Various research results show that recently extreme climate events have become more frequent, both in terms of intensity and frequency. Climate changes can occur every month, thus affecting shifts in the planting season. The food crop farming system is very vulnerable to the impacts of climate change with indications of a high level of danger in terms of reduced production and even crop failure due to changes in rainfall patterns. For this reason, strategic adaptations need to be made to anticipate and prevent a decline in production and harvest area. The adaptation program is more focused on the application of adaptive technology, especially on food crops, such as determining the correct planting season and planting calendar, adjusting cropping patterns, using superior varieties adaptive to drought and early maturity, and others (Call, 2019).

The planting season is a period when plants can grow and develop potentially based on local land conditions. Determining the planting season in an area is intended to choose the right planting time, at which time climate and soil factors are not limiting factors. This planting season is primarily focused on short-lived crops and long-lived plant seeds that will be planted in the field. These types of plants are more sensitive to drought stress when compared to long-lived plants over one year old which are able to survive if drought occurs, partly because their root systems are capable or better at absorbing water (Syeda, 2022).

There are various methods for determining the planting season in a region; one of which is proposed by FAO (1978). This method determines the planting season using rainfall and potential evapotranspiration input data. The results of the analysis of the growing season on Babar Island under 3 rainfall conditions (normal, El Nino, and La Nina) are shown in Table 2 .

Table 2 shows that under normal rainfall conditions the planting season on Babar Island lasts 8 months and 26 days (01 November to 26 July; 268 days). During the period from August to October it is not recommended to carry out planting activities; unless there is another source of water besides rain. October can be used as a land preparation period and the start of planting can be done in November (Qian, 2020).

Table 2. Determination of the planting season on Babar Island under three rainfall conditions

component	January	Feb	Mar	April	May	June	July	Ags	Sept	Oct	Nov	Dec
0.5 ETp (mm)	60.0	55.7	59.2	56.7	57.8	53.1	58.7	68.7	69.9	76.0	69.8	60.8
CH_Normal (mm)	242	230	213	231	156	119	47	16	eleven	30	105	271
CH_El Nino (mm)	287	297	102	110	16	47	24	7	0	0	6	146
CH_La Nina (mm)	231	159	105	484	150	308	103	70	173	343	268	390
MT_Normal	(green)	(green)	(green)	(green)	(green)	(green)	0	0	0	0	(green)	(green)
MT_El Niño	(green)	(green)	(green)	(green)	0	0	0	0	0	0	0	(green)
MT_La Nina	(green)	(green)	(green)	(green)	(green)	(green)	(green)	(green)	(green)	(green)	(green)	(green)

Information:

ETp=evapotranspiration potential; CH=bulk Rain; MT=season plant

(green) : Planting Season Period

0 : Fallow Period; groundwater limited For fulfil need plant

Climate anomalies (extreme rainfall; El Nino and La Nina) have an impact on shifts in the growing season in a region. When the El-Nino phenomenon occurs, the planting season on Babar Island only lasts 5 months and 27 days (1 December to 27 May; 178 days); reduced by around three months (90 days) compared to normal conditions. During the El-Nino event, the start of the planting season was a month late and the end of the planting season was two months earlier than normal conditions. In general, during El-Nino, the groundwater draining process starts in March and ends in November-December (Ghodszad, 2022). Under these conditions, the intensity of planting for several food crops such as corn and beans is only once a year. The start of planting, which farmers usually do in November-December, will be delayed until December-January when rainfall is sufficient to moisten the soil. To avoid the risk of failure when El Nino occurs, November-December can be used as a land preparation period and initial planting can be done in January.

DISCUSSION

Position of Women

Women on the Babar Islands occupy an important position, because they play an important role in utilizing household sources of income (Mariuzza, 2022). Women have a good enough mindset not to completely depend on the agricultural sector for their living (on-farm) but also choose other alternatives such as doing their own marketing (off-farm) in order to ensure that they can maintain the survival of their household. The more farmers' mindsets develop, the more farmers will tend to carry out various kinds of activities as alternatives to meet their needs (Nendissa, 2021).

Agriculture in a broad sense is still an option for the majority of households on the Babar Islands . Most women consider farming to be their main job, although there are also those who consider farming only as a side job. The data obtained illustrates the reason why women work to help their husbands, because natural conditions act as incentives for women and men to work together in agricultural business. Men are on duty help make beds, lift soil and replace existing soil on the land, because they consider the old land no longer productive to produce, and carry water to be used to water the plants .

Location agricultural business This describe location utilized farming _ women on the Babar Islands . In general, there are 2 (two) household business locations on Babar Islands, namely in the yard and in the garden (lutur) at different distances. Determining the location affects the size of the production produced later. T four businesses in the yard tend to be used to meet household food needs (Lodeiros, 2018). If there are any extras, just sell them around the house. Farming carried out in the garden (lutur) is not carried out alone but together with other women. Gardens (lutur) are generally privately owned, but some are also owned by other people (food crop farmers). For those who use someone else's garden, when the owner of the garden (lutur) wants to use his garden to plant cashews or corn (food crops) then naturally these women vegetable farmers have to leave and look for another garden (lutur) to continue their farming. The choice of lutur is also not just random, but what is chosen is a garden (lutur) that is close to a water source or well.

Activities carried out by women when farming include:

1.   Planting

Planting is carried out by women using stakes (wood or iron) as a tool to make planting holes. Planting is carried out using a triangular method, namely left, right and front at a distance of 50x50 cm with the number of seeds per hole totaling 3-4 seeds (especially for corn plants) .

2.   Plant care

Plant care is carried out by removing weeds and woody shoots (akila). This is done twice, the first time, namely on 2 week old plants and the second stage, namely on 6 week old plants.
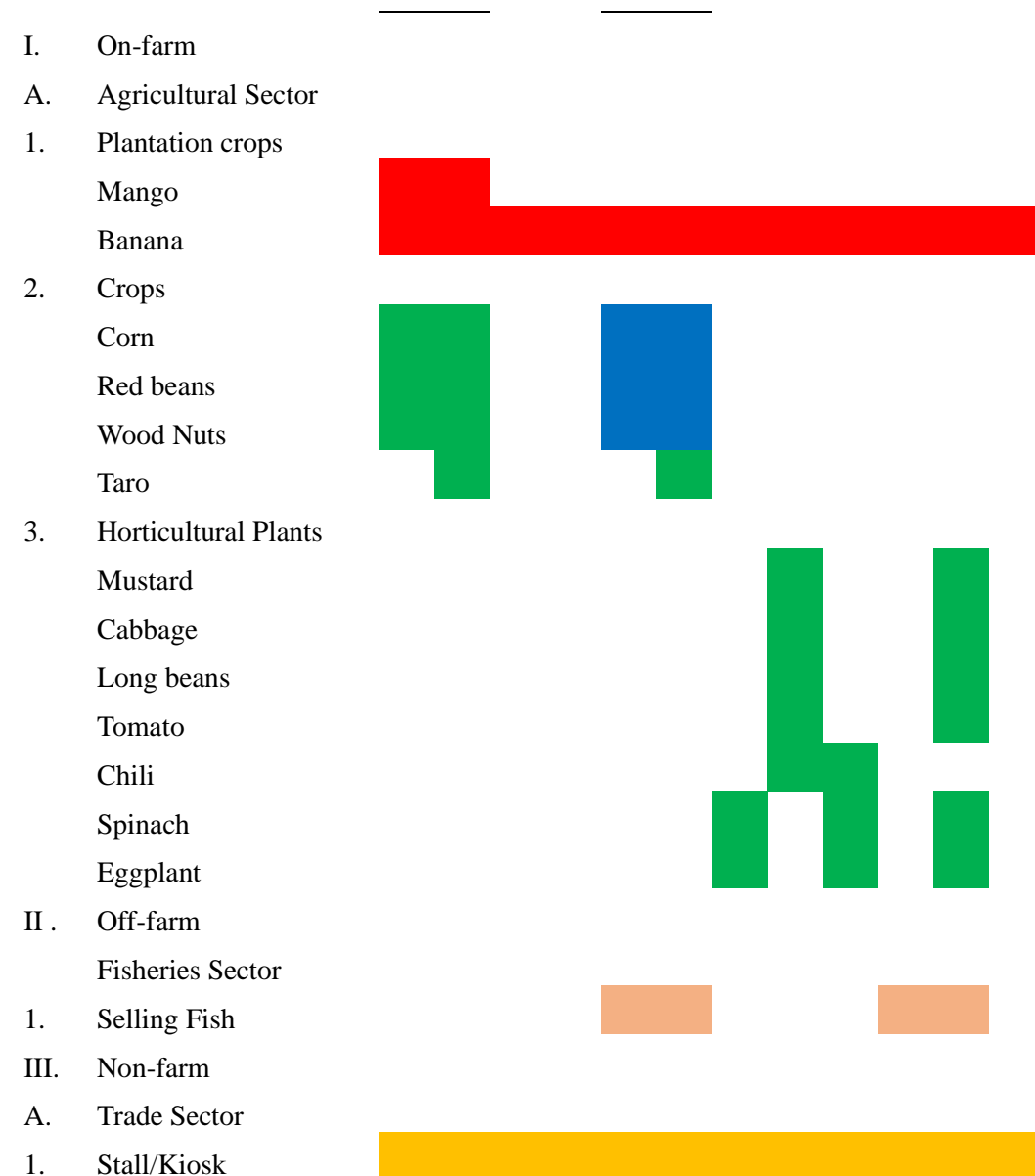
3.   Harvesting

Harvesting is carried out directly by women, then processed to be stored as food reserves, prepared as seeds for the next planting season, and immediately processed as food that can be consumed directly in the short and long term.

Figure 2. Women's activities in processing agricultural products

Table 3. Calendar of Women's Activity Patterns in Various Business Sectors as a Source of Livelihood on Babar Islands

No.	Business Sector	Month											
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov

I.   On-farm

A.   Agricultural Sector

1.   Plantation crops

Mango

Banana

2.   Crops

Corn

Red beans

Wood Nuts

Taro

3.   Horticultural Plants

Mustard

Cabbage

Long beans

Tomato

Chili

Spinach

Eggplant

II .   Off-farm

Fisheries Sector

1.   Selling Fish

III.   Non-farm

A.   Trade Sector

1.   Stall/Kiosk

Source: Processed Research Results (202 2)

Information :

■ :   Planting patterns for all food commodities and vegetables

■ :   Special planting patterns for corn, red beans and wood nuts

Source of Living

The sources of livelihood for farming households in areas that are mostly sea are very diverse or varied. Utilization of natural resources is a choice for people who are dependent on natural resources. Most of the commodities cultivated are corn as a staple food which is inherited from their ancestors and has become part of the community's culture.

Agricultural business is the main source of income for farmers in the Babar Islands District (Vashisht, 2018). However, agricultural businesses are very vulnerable to crop failure due to various factors, therefore farmers have other alternatives as a source of household income . The fisheries sector itself is also a legacy, considering that most areas in Maluku are coastal areas which cannot be separated from the fisheries sector

(fishermen) . If the catch is large, it is usually sold by women around where they live. If it is small, then it is focused on meeting household food needs.

Table 4 illustrates that the agricultural sector contributes 70.4 percent to farmer household income. This indicates that the agricultural sector is able to meet household needs (Chrysargyris, 2021). However, women still have other alternatives as a source of income as well as a safety valve in the event of failure in the agricultural business especially corn as a leading commodity on the Babar Islands (Jain, 2020).

The service sector, especially trading businesses, contributed (18.5 %). This matter Because stall business can obtained reception every the day without must depend on condition weather, season or even risk fail harvest like on farming (Deribe, 2021). No only That's a stall business considered No need heavy power _ like when operate farming carried out from stage processing land until harvest, nor going to sea is risky big, so part Woman choose open a shop business as choice in fulfil need household (Addharu, 2022).

The fisheries sector only contributes 11.1 % to farmers' household income, and this is done by women by selling fish when fish production is abundant . Revenue from the fisheries sector depends on the amount of production which is influenced by weather conditions and seasons. Entering the eastern season, fishermen do not dare to go to sea or continue to go to sea but produce little. During the western season, production generally increases so that there is activity in selling fish by women (Islam, 2020).

The reality at the research location is in line with research results, namely that livelihood assets owned and utilized by farming households in Pulau-Pulau Babar District are related to activities what they do for a living (Zeng, 2022). Likewise, research results (Sopamena and Pattiselanno, 2018) show that family resilience tends to refer to the coping process, namely the actions taken by the family to overcome difficulties and adapt within the family.

Table 4 .   Women's Activities as a Source of Household Income and Their Utilization

No	Sector	Reception (Rp/Month)	Contribution (%)	Direction of Use
1	Service			
A	Roadside stall	5 00,000	18.5	Food and Education
	Sub-Total	5 00,000	18.5	
2	Fishery			
A	Selling Fish	30 0,000	11.1	Food and household needs
	Sub-Total	30 0,000	11.1	
3	Agriculture			
A	Plantation crops	4 00,000	14.8	Food and savings
B	Crops	1.25 0,000	4 6.3	Food and savings
C	Horticultural Plants	25 0,000	9.3	Food
	Sub-Total	1.90 0.000	70.4	
	Total	2,700,000	100.0	

Source: Processed Research Results (202 2)

Table 5 . Source of Average Household Income from the Agricultural Sector

No	Source	Reception (Rp/Month)	Contribution (%)
1	Plantation crops		
A	Mango	2 00,000	10 .5
B	Banana	200,000	10.5
	Sub-Total	4 00,000	2 1.0
2	Crops		
A	Corn	7 00,000	36.8
B	Peanut	300,000	1 5.8
C	Kasbi	1 00,000	5.3
D	Taro	150,000	7.9
	Sub-Total	1. 2 50,000	65.8
3	Horticultural Plants		
A	Various vegetables	25 0,000	13.2
	Sub-Total	250 000	13.2
	Total	1,900,000	100.00

Source: Processed Research Results (2022)

CONCLUSION

During the El-Nino event, the start of the planting season was a month late and the end of the planting season was two months earlier than normal conditions. In general, during El-Nino, the groundwater draining process starts in March and ends in November-December. In fact, the fisheries sector only contributes 11.1 % to farmer household income, the service sector contributes (18.5 %), and the agricultural sector contributes 70.4 % to household income. The high contribution of the agricultural sector includes food commodities contributing 70.4 percent. It turns out that this food commodity is dominated by corn which has implemented local wisdom to maintain production, seed availability and sustainable revenue household farmer corn on the Babar Islands .

The high contribution of the agricultural sector is supported by the position of women who play a role in corn farming through planting, care and harvesting activities. These women's activities also contribute to the contribution of food commodities to household income . Although, apart from the agricultural sector, it turns out that women also open stalls and sell fish.

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