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CHALLENGES TO THE SCARCITY OF FARMWORKERS, IT'S INFLUENCE ON THE PRODUCTIVITY OF SUGARCANE CROP IN THE PHILIPPINES

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Abstract:

The present status of sugarcane farming in the Central Philippines has very low productivity, especially in areas with 10.0 hectares and below. Doloriel (2014) confirmed in her study that sugarcane farming is productive and profitable only for medium and large-sized farms. The findings further confirmed that small sugarcane areas are not profitable, which is 79.0% of 424,199 hectares, the total area planted for sugarcane for the whole Philippines.

The descriptive method of research aid in determining the relationship between the number of farmworkers and the productivity of sugarcane farmers in the Central Philippines. The 400 sugarcane farmers were randomly identified at the different locations. An instrument used was the Agency Extension Program Guideline which measures the productivity and the level of management of the farmworkers.

The result shows that the level of productivity of sugarcane farms in the Central Philippines was "high". Using an ANOVA shows a significant difference in the level of productivity of sugarcane farms when grouped as to the location ($F=3.482$, $p=.000<0.05$).

Furthermore, there is a significant difference (F-value 6.921, sig. at .000) between productivity and the number of farmworkers per hectare. Farmworkers were "moderately compensated" ($M=2.59$) and "moderately available" ($M=2.56$), too.

Overall, there is a strong relationship between the number of farmworkers and the farmer's productivity.

It is recommended that more studies should be conducted related to this subject, to contribute to the pool of knowledge related to the importance of farmworkers with the productivity

Keywords: Productivity, Farmworkers, Compensation, Availability, Recruitment, Sugarcane Farmers

1. INTRODUCTION

1.1. Background

In the Philippines, sugarcane is a valuable crop grown in approximately 250,000 hectares in the Central Philippines alone. World Bank (2021) reported that sugarcane had been declining in the 15 regions in the Philippines, except for Region VI (Western Visayas). The data suggest an increase in the specialization of the crop. The report further shows that the share value of the output of sugarcane in the region is 16.1 percent. [2]

At present, sugar statistics show that there are more than 80,000 farmers who are tilling the 424,199 hectares (out of the total land area of 30 million hectares) of sugarcane fields all over the country with an average production of 59 tons per hectare and LKG/TC of 1.98 (CY 2016-17). [3]

The total number of agricultural and industrial workers who are directly employed in the industry is about 700,000.

Relatively, the latest survey mentioned by Crisostomo (2018), indicates that sugarcane farms have a total of 32,000 laborers which is second to the banana plantation with 49,866 workers. An estimated 700,000 "sacada" (seasonal plantation workers) are working in sugar and other haciendas (estates) nationwide. [4]

The total employment generated by the agriculture, forestry, and fishing sector reached 162,669 in 2015. The survey further explained that out of the total workforce, 159,889 workers, or 98.30 percent were paid employees while 1.70 percent were working owners and unpaid workers. "Excluded from the figures shown above are child laborers and unpaid family workers who work in plantations with very little pay or none. [5]

The scarcity of labor had directly delayed the applications of inputs (fertilizers), removal of weeds and other farm debris, the cultivation operation for the majority of the sugarcane area, and the delay in the harvesting in the later part. The exact quantity, timely application, and the covering of fertilizers are a must to improve fertilizer intake,

Relative to farm mechanization and scarcity of labor as mentioned in the press release an assessment of mechanical and manual harvesting of the sugarcane was done in Sudan. [6] The rehabilitation works carried out in the Sennar Sugarcane Factory in Sudan, improved the rates of milling accompanied by the horizontal and vertical expansions of the farm compelled the Sennar factory to go for mechanical harvesting to solve the problem of labor shortage.

The result of their study revealed that manual harvesting (8.98 SDG/ton) is more expensive than mechanical harvesting (4.95 SDG/ton); the wages for the cane cutting labor represent 74.14% of the total cutting cost, 46% of the total manual harvesting cost, and 18.9% of the total harvesting cost.

The study revealed further that infield cane losses represent 4.72% and 4.22% of the actual yield for the manual harvesting and mechanical harvesting systems, respectively. Moreover, the results showed a significant difference between the two harvesting systems regarding the cane weight/trailer (ton/trailer) and trash percent.

On average, the cane weight (ton/trailer) is 6.88 for manual harvesting and 10.12 for a mechanically harvested cane. A 1% increase in the trash will lead to a decrease in sugar recovery by 0.1%. They recommended that Sennar Sugar Factory and other sugar factories in Sudan could increase the mechanical harvesting system and reduce the manual harvesting to less than 10% of the total area. The specialized cane cutter laborers should be employed in other agricultural operations during the off-season to ensure their availability at the start of the season.

Specifically, among the variables cost items, cutting and loading were the highest followed by man labor, fertilizer, man-machine, and man-animal labor. Comparing man-animal and man-machine labor, there is a difference of around 10 percent increase in man-animal labor, and output decreases by about 5.76 percent. This is bThe study further shows that this is because of the delays in man-animal labor than machine-animal labor due to wide coverage in large farms while man-machine labor saves time in farm operations contention of the author to improve the sugarcane farmers by managing well the farmworkers.

1.2. Objectives

1.2.1 The general objective of this study is to determine the number of farmworkers employed and its economic importance to the productivity of sugarcane farmers in all aspects of farm operations.

1.2.2 Specific objectives:

- **1.2.2.a** Determine the level of productivity based on average sugar production per hectare
- **1.2.2.b** Determine the level of productivity of the number of farmworkers at the different location
- **1.2.2.c** Determine the level of paying the compensation of farmworkers
- **1.2.2.d** Determine the level of the number of farmworkers employed per hectare and their sources.

1.3. Statement of the Problem

The sugarcane plant is one of the most important high-value crops in the Philippines. It is one of the major dollar income industries in the country. Challenges to the shortage of farmworkers are being experienced by the majority of the sugarcane farmers almost in all aspects of their farm operations. Hence, this study aims to review the economic importance of managing the farmworkers and its relationship to increasing the sugarcane productivity in the Central Philippines.

2. MATERIALS AND METHODS

2.1. Research Method

The descriptive correlational was used in this study. It focuses on the importance of managing the farmworkers and the level of productivity of sugarcane farmers in the area of Central Philippines.

2.2. Research Environment

The study was conducted in different locations in the area of Central Philippines.

2.3. Respondents

The respondents of the study were the sugarcane farmers in the area of Central Philippines. Employing the *Slovins formula*, out of 29,151 sugarcane farmers from the different locations, the sample size of 400 farmers was

randomly selected as the actual respondents of the study. The distribution of the respondents and the number of sample per location is indicated in Table 1.

Table 1. Distribution of Respondents per Location

Location Code	Frequency	Percentage
ILO	60	15.00
CAP	30	8.00
BOG	20	5.00
ORM	20	5.00
TOL	50	13.00
BAS	70	18.00
BIS	55	14.00
LAC	35	8.00
VIC	35	8.00
SAC	25	6.00
Total	**400**	**100.00**

2.4. Research Instrument

The instrument used in the gathering data was the government agency Extension Program Guideline with eight parts. It includes the measurement of the level of management of farmworkers and its relations to the productivity of sugarcane farmers in the area of Central Philippines.

2.5. Data Gathering Procedure

The researcher personally administered the gathering of the survey instruments to the respondents with the assistance of government Technical Personnel at the different locations. Upon retrieval of the accomplished research instrument, the researcher had encoded and analyzed the data using the Statistical Package for Social Sciences (SPSS) software under the closed supervision and guidance of the statistician.

2.6. Statistical Tool

In the analysis of data, the following statistical tools were used by the nature of the specific problems raise and their corresponding hypotheses.

Frequency and percentage were used to describe the distribution and the socio-economic profile of the farmers.

The mean was used to determine the level of productivity. The mean was solved using the following procedures, the highest and lowest rating was determined first.

Then the lowest score of one (1) was deducted from the highest rate of 5. The subtrahend was divided by five (5) which was adapted from Likert's rating. The addition of quotient started from the lowest rate and ended at the highest rate. The numerical ranges and corresponding description, 5.00 being the highest interpreted as "Very High" and 1.00 being the lowest interpreted as "Very Low".

Mean was also used to determine the payment of compensations, number, and souces of recruiting the farmworkers.

One-way Analysis of Variance (ANOVA) was used to determine the difference in the level of productivity when respondents were grouped according to the location of the farm, average rainfall received, the average size of landholding, type of soil planted to sugarcane, the topography of the area, average rainfall received, and the distance of the farm to a sugar mill.

Pearson r Moment Correlation was utilized to determine the significant relationship between the number of farmworkers and the productivity of sugarcane farmers.

3. RESULTS AND DISCUSSION

The socio-economic distribution of the farmers

Table 2 revealed the farmer's profiling of the different locations in the Central Philippines in terms of gender, age, level of education, and the number of years in sugarcane farming, the Crop Year 2016-2017.

The findings reveal that out of 400 farmers involved in the study, there were more males (f=229, 57%) than females (f=171, 43%).

Furthermore, the findings show that the majority of the farmers were either medium-aged or old 36-60 years old (f=204, 51%), young farmers aged 35 years old and below (f=41, 10%), and those aged 61 years old and above labeled as old (f=155, 38%).

As to the educational attainment, the majority of the farmers were high school level (f=225, 56%) and the least had the vocational attainment (f=2, .5%).

For the number of years in sugarcane farming, the table shows that most of the farmers were considered as a medium for 11 to 20 years (f=173, 43%), and few belonged to old as 20 years and above (f=93, 23%).

The finding in Table 2, implies the farmers at the different locations in the area of Central Philippines were majority male, aged 36-60 years old, in high school level, and have been in sugarcane farming for 11 to 20 years.

In connection with this finding, a study by Gallen (2015) which is using Danish matched employer-employee data, the paper estimates the relative productivity of men and women and finds that the gender "productivity gap" is 8 percent implying that just under two-thirds of the residual wage gap can be accounted for by productivity differences between men and women. The productivity gap was measured by estimating the efficiency units lost in a firm-level production function if a worker is female, holding other explanatory covariates such as age, education, experience, occupation, and hours worked constantly. Furthermore, both mothers and non-mothers are paid less than men, but the (low) relative pay of mothers is completely explained by productivity for women without children. [7]

Table 2. The Socio-Economic Distribution of the Farmers

Variables	Frequency	Percentage
Gender		
Male	229	57.00
Female	171	43.00
Age		
Young (35 yrs old and below)	41	10.25
Medium (36 - 60 years old)	204	51.00
Old (61 yrs old and above)	155	38.75
Level of Education		
Elementary	87	21.75
High School	225	56.25
College	86	21.50
Vocational	2	00.50
Number of Years in the Sugarcane Industry		
New (10 yrs and below)	134	33.50
Medium (11 - 20 years)	173	43.25
Old (21 yrs and above)	93	23.25
Total	**400**	**100.00**

1. a Productivity Indicators

Level of productivity of the sugarcane farms in the Central Philippines

Table 3 shows the level of productivity of sugarcane farms in the Central Philippines using the mean. The results revealed that the level of productivity of sugarcane farms in the Central Philippines (M=3.20) was "high".

Specifically, the level of productivity of sugarcane farms in the Central Philippines was "high" under cane tonnage production in the following areas: 64.01 tons and above (M=3.19), 59.01-64.00 tons (M=3.20), 59 tons (M=3.19), 54.00-58.99 tons (M=3.22), and 53.99 tons and below (M=3.15).

Also, the level of productivity of sugarcane farms in the Central Philippines was "high" under sugar rendement in the following areas: 2.50 LKG/TC and above (M=3.24), 1.99-2.49 LKG/TC (M=3.20), 1.98 LKG/TC (M=3.21), 1.93-1.97 LKG/TC (M=3.22), and 1.92 LKG/TC and below (M=3.21).

Relative to the result, Bombio [8] and Velasco [9] noted that one of the most economical approaches to increasing the yield per unit area is planting high-yielding and disease-resistant varieties. Furthermore, on sugarcane, studies showed that the use of high-yielding varieties gives an average increase of 12 bags per hectare compared to planting an ordinary (old) sugarcane variety [10]. Sulaiman and his company (2015) had recommended that to boost production and demand for the crop; there is a need for supplying of improved variety of the sugarcane sett (cane points). [11]

Table 3. Mean result on the Productivity of sugarcane (average production per hectare) in the Central Philippines

Level of Productivity Indicators	Mean	Description
1. Cane Tonnage Production (tons/ha)		
64.01 tons and above (>6+)	3.19	High

59.01 - 64.00 tons	(>5)	3.20	High
59.00 tons	(Visayas average)	3.19	High
54.00 - 58.99 tons	(<5)	3.22	High
53.99 tons and below	(<6)	3.15	High
2. Sugar Rendement (LKg/TC)			
2.50 LKG/TC and above	(>0.6+)	3.24	High
1.99 – 2.49 LLKGTC	(>0.5)	3.20	High
1.98 LKg/TC	(Visayas average)	3.21	High
1.93 – 1.97 LLKGTC	(<0.5)	3.22	High
1.92 LLKGTC and below	(<0.6)	3.21	High
Total		**3.20**	**High**

The difference in the level of productivity of the sugarcane farms in the Central Philippines when grouped by location

The data in Table 4 presents the difference in the level of productivity of sugarcane farms in the Central Philippines when grouped by location using One-way ANOVA. It further revealed that there is a significant difference in the level of productivity of sugarcane farms in the Central Philippines area when grouped by location (F=3.482, p=0.000 <0.05).

This means that the level of productivity of sugarcane farms in the Central Philippines when grouped by location is not comparable.

Table 4. One-way ANOVA Test Result on the difference in the level of productivity of the sugarcane farms in the Central Philippines when grouped by location

Location Code	Mean	F	Sig.	Decision
Central, Philippines	**3.46**	3.482	0.000	Reject H_o
ILO	3.47			
CAP	3.45			
BOG	3.46			
ORM	3.45			
TOL	3.44			
BAS	3.45			
BIS	3.46			
LAC	3.48			
VIC	3.47			
SAC	3.46			

P< 0.05, Significant

Level of productivity in sugarcane farming of the different locations in Central Philippines in terms of indicators

Table 5 shows the level of productivity of sugarcane farming in the different locations in the Central Philippines in terms of indicators such as the size of the farm, type of soil, land topography, average rainfall received the distance of the farm to the sugar mill, farming innovations, farmworkers' availability and expenses per hectare using the mean. It further revealed that the level of productivity of sugarcane farming in the different locations in the Central Philippines (M=1.98) was at "low productivity". This means that the productivity of sugarcane farming in the different locations was below average.

Specifically, the level of productivity of sugarcane farming in the different locations was at "low productivity" when grouped as to the size of the farm (M=1.95). The type of soil (M=1.95), land topography (M=1.95), average

rainfall received (M=1.95), the distance of the farm to the sugar mill (M=1.95), and farming innovations (M=2.11), farmworkers' availability (M=2.01) and expenses per hectare (M=1.96).

Table 5. Mean result on the productivity of sugarcane farming at the different locations in terms of indicators

Productivity Indicators	Mean	Description
Size of Farm	1.95	Low Productivity
Type of Soil	1.95	Low Productivity
Topography of the Land	1.95	Low Productivity
Average Rainfall Received	1.95	Low Productivity
Distance of the Farm to the Sugar Mill	1.95	Low Productivity
Farming Innovations	2.11	Low Productivity
Farmworkers Availability	2.01	Low Productivity
Expenses per Hectare	1.96	Low Productivity
Total Mean	**1.98**	**Low Productivity**

Differences in the level of productivity of the sugarcane farmers (in tons/hectare) among the different locations when they are grouped according to indicators

Table 6 presents the difference in the levels of productivity in the different locations in the Central Philippines when they are grouped according to the size of the farm. The type of soil, land topography, average rainfall received distance of the farm to the sugar mill, farming innovations, farmworkers' availability, and expenses per hectare using One-way Analysis of Variance.

Results revealed that there is a significant difference in the level of productivity when grouped to the average size of the farm ($F=40.857$, $p=0.000 <0.05$). The land topography ($F=7.784$, $p=0.000 <0.05$), the distance of the farm to the sugar mill ($F=18.293$, $p=0.000 <0.05$), farming innovations ($F=12.194$, $p=0.000 <0.05$), workers' availability ($F=6.921$, $p=0.000 <0.05$), and expenses per hectare ($F=6.864$, $p=0.000 <0.05$). Thus the levels of productivity in the different locations in the Central Philippines when are grouped according to the size of the farm, land topography, the distance of the farm to the sugar mill, farming innovations, farmworkers' availability, and expenses per hectare vary.

On the other hand, the results implied that there is no significant difference in the level of productivity when grouped as the soil type ($F=0.137$, $p=0.999 <0.05$) and average rainfall received ($F=1.834$, $p=0.061 <0.05$). Hence, the levels of productivity in the different locations in Central Philippines when they are grouped according to the type of soil and average rainfall received do not vary.

Climatic factors that influence sugar yields are rainfall precipitation (which greatly affects soil moisture), temperature range, light intensity, and duration, photoperiod, and occurrence of typhoons or long droughts. Likewise, edaphic or soil factors are soil type, pH, and organic matter content [12]. In harvesting "carrying-farmworkers" and equipment for transport are the main two reasons that affect productivity [13].

Table 6. ANOVA results in the level of productivity among the different locations in terms of indicators

Productivity Indicators	F	Sig	Description
Size of Farm	420.857	0.000	Reject Ho
Type of Soil	0.137	0.999	Accept Ho
Land Topography	7.748	0.000	Reject Ho
Average Rainfall Received	1.834	0.061	Accept Ho
Distance of the Farm to the Sugar Mill	18.293	0.000	Reject Ho
Farming Innovations	12.194	0.000	Reject Ho

Farmworkers Availability	6.921	0.000	Reject Ho
Expenses per hectare	6.864	0.000	Reject Ho

P< 0.05, Significant

The difference in the level of productivity among different locations in terms of the number of farmworkers employed per hectare.

Table 7 presents the difference in the level of productivity among the different locations in terms of the number of farmworkers employed per hectare (F-value 6.921, sig. at .000). The results implied that there is a significant difference between productivity and the number of farmworkers employed per hectare thus the null hypothesis stated that there was no significant difference in the degree of the number of farmworkers employed per hectare and the productivity is hereby rejected.

Relative to the findings, in Pakistan, sugarcane production is a very important source of income and employment for the farming community [14].

Table 7. The Difference in the level of productivity among the different locations in terms of the number of farmworkers employed per hectare

Location Code	Overall	
	Mean	Description
ILO	2.32	LOP
CAP	2.52	MOP
BOG	2.53	MOP
ORM	2.66	MOP
TOL	2.60	MOP
BAS	2.67	MOP
BIS	2.65	MOP
LAC	2.64	MOP
VIC	2.71	MOP
SAC	2.56	MOP
Total Mean	**2.58**	
Description	**Moderately Productive**	
f-value	**6.921**	
Sig.	**.000**	
Interpretation/Decision	**Significant** ***Null hypothesis rejected***	

P< 0.05, Significant

3. b Farmworkers Management Indicators

Level of farmworkers' management indicators of the sugarcane farmers in different locations in the Central Philippines

Tables 8, 9, and 10 present the level of farmworkers' management indicators of the sugarcane farmers in the Central Philippines. Generally, the level of farmworkers management indicators is moderately compensated (m=2.50) in three indicators described as moderately compensated such as (WMCP) Compensation Paid to Farmworkers (m=2.59), (WMVL) Available of Farmworkers per Hectare (m=2.56), and the (WMRC) Sourcing of Farmworkers (m=2.50).

The findings implied that the sugarcane farm workers were "Moderately Compensated" as indicated in their level of farmworkers management indicators, particularly in three areas of concern such as WMCP, WMVL, and the WMRC.

About the result of the study, to keep the sugarcane industry sustainable, the government must eliminate the tariff on inputs to reduce the costs of production such as fertilizers regarding lower prices. The local sugar industry is in a state of disarray because local sugar is priced higher than imported sugar. This is due to the high cost of inputs. Lowering the domestic costs of production would make the price of local sugar competitive in the world market [1]

In Thailand, sugarcane farmers continue to be mainly dependent on human labor in fertilizing the fields. The main problem that comes with this is that the fertilizers are not evenly distributed, and the cost is high. Farmers have to pay 30 baht for labor costs per bag of fertilizer. Workers have to fertilize the field quickly so that they earn more in a day, but then the quality of work is not good. In most cases, some areas are over-fertilized. Many times, that fertilizer is left on the leaves, not on the ground, and the sugarcane is not able to use the fertilizer immediately but has to wait for the rain to wash the fertilizer down. After fertilizing, the workers do not plow the land again, causing a

high loss of fertilizer. Some farmers had to hire someone else to plow the land after fertilizing, which costs them more than a hundred baths per rai (hectare) [15].

In Ethiopia, the labor for harvesting was negative (-0.06) and has no significant impact on sugarcane productivity, which indicated that a one percent increase in the labor for harvesting cost would decline the profits by 0.06% [16].

Table 8. Mean Result of Compensation Paid to the Farmworkers

Level of Compensation Paid to Farmworkers	Mean	Description
Paying 11% and higher than the minimum	3.12	Moderately compensated
Paying 10% higher than the minimum	1.62	Very low compensation
Paying within the minimum	2.98	Moderately compensated
Paying 10% lower than the minimum	2.60	Moderately compensated
Paying 11% and lower than the minimum	2.64	Moderately compensated
Total Mean	**2.59**	**Moderately compensated**

Table 9. Mean Result of Number of Available Farmworkers per Hectare

Number of Farmworkers Available per Hectare	Mean	Description
High – employing 11-15 farm workers per operation/hectare	2.66	Moderately available
Medium – employing 6 to 10 farm workers per operation /hectare	2.11	Lowly available
Low – employing less than 5 farm workers per operation /hectare and/or most of the operation is done by the family or their immediate relative only	2.92	Moderately available
Total Mean	**2.56**	**Moderately available**

Table 10. Mean Result of Sourcing of Farmworkers

Sourcing of Farmworkers	Mean	Description
High – 100% of farmworkers are hired within the farm or the same village	1.64	Very low available
Medium – 50% of farmworkers are hired within the farm or the same village, the other 50% are hired outside	2.83	Moderately available
Low – 100% of the farmworkers are hired outside the farm or village	2.56	Moderately available
Total Mean	**2.34**	**Lowly available**

3. c Relationship between the number of farmworkers and the level of productivity

The data in Table 11, showed the relationship between the number of workers employed per hectare and the productivity in the different locations using *Pearson's r*. It could be deduced from the data that there was a significant relationship between the number of workers employed per hectare and the level of productivity ($r=0.188$ $p=0.380 < 0.05$). Therefore, productivity is greatly affected by the number of farmworkers employed per hectare.

As a remedy to the finding, increasing farm mechanization due to a shortage of labor supply was one of the recognized opportunities identified by the government to improve the Philippine sugarcane industry [17]. In Bangladesh, a recommendation was for the farmers to reduce laborers (farmworkers) per acre to increase their profit [18].

In the Philippines, the problem with the effect of smuggling agricultural goods and the Filipino workers is a big challenge both, for the farmers and the farmworkers. There is an opinion that the overall un-competitiveness and inefficiencies of the agricultural sector had aggravated the dismal conditions of more than three million Filipinos who are involved in farming. This sector comprises at least 40% of the total number of domestic workers, who desperately struggle to survive. They will not be able to deliver the needed food security to the country nor uplift their material well-being. [19]

Table 11. Correlation analysis between the number of farmworkers and the level of productivity

Variables Compared	Pearson r	Sig	Description	Strength of Relationship
Number of Farmworkers Productivity	0.188	0.380	Reject Ho	Very strong

P< 0.05, Significant

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

1. The average productivity of sugarcane per hectare in the Central Philippines was "High".
2. The level of productivity at the different locations in terms of the number of farmers employed per hectare was significant (p< 0.05).
3. As to the compensation, the farmworkers were "Moderately Compensated".
4. The farmworkers were "Lowly Available" in terms of sourcing them, wherein most of them came within the same farm or village or only the members of the family are working on the farm.
5. There is a significant relationship between the number of farmworkers and the level of productivity at p< 0.05.

4.2. Recommendations

1. The government should subsidize the industry in terms of farm mechanization, farm inputs, irrigation facilities, crop insurance, and increase farmworkers' wages.
2. The government should provide full benefits to farmworkers in terms of social security, health, and prioritizing the purchase of their products.
3. Government should provide full scholarships to the children of farmworkers.
4. The government and private organizations should conduct skill training for farmworkers as well as for the members of their families.

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