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ADOPTION OF BRRI Dhan28 IN THE COASTAL AREAS OF BANGLADESH

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ABSTRACT: *The main purpose of this study was to determine the adoption of BRRI dhan28 in coastal areas of Bangladesh. The study was conducted in three villages (Shimulbaria, Balitha and Fingri) of Fingri union under Satkhira Sadar Upazila of Satkhira district. In this study, 75 farmers were selected as sample following simple random sampling technique, compiled, coded, analyzed and interpreted as per objectives.Majority of the respondents were middle aged (50.7%), had primary level of education (64%), small family size (49.3%), and large farm size (64%). The respondents had medium income (66.7%), medium extension contact (62.7%), and low farming experience (53.3%). It was also found that majority of the respondents had medium knowledge (81.3%) on rice cultivation which helped them to adopt and carry on the BRRI dhan28 technology. Majority of the respondents had medium adoption (77.3%) of BRRI dhan28 in coastal areas. Out four rice varieties (BRRI dhan28, BRRI dhan50, Super miniket dhan and BRRI dhan47) BRRI dhan28 ranked first in respect of extent of adoption (54.92%). On the other hand comparative profitability of BRRI dhan28 was more than other varieties on the basis of area under cultivation, average yield, average selling price and average net income. High market price and non- complexity of cultivation procedure were two most important benefits of adopting BRRI dhan28. So it is concluded that if policy-maker and extension organizations concentrate on these factors, they are more likely to succeed in making the respondents more favorably disposed to adopt BRRI dhan28 in coastal areas of Bangladesh.*

KEYWORDS: Adoption, BRRI dhan 28, Coastal area

INTRODUCTION

The current world population is over 6 billion and will reach 8 billion in 2030. Meanwhile, the annual loss of land to other use is 10 to 35 million ha, with half of this lost land coming from cropland. Facing such severe situation of population growth pressure plus cropland reduction, it is obvious that the only way to solve food shortage problem is to greatly enhance the yield level of food crops per unit land area through advance of science and technology (Longping, 2004).

The coastal saline soils are distributed unevenly in 64 upazillas of 14 districts, covering 8 agro-ecological zones (AEZ) of the country. The coastal area covers about 20% of the country and over seventy percent of the net cultivable area. It extends inside up to 150 km from the coast. But this vast area of land could not have contributed in agricultural production or development. The increasing salinity of this area is the main cause behind it (Habibullah *et al*., 1999). Agricultural land use in these areas is very poor, which is roughly 50% of the country's average (Petersen and Shireen, 2001). Salinity is a year-round problem in the coastal Bangladesh but its intensity reaches peak during the dry season (January- May) and as such *Boro* rice crop suffers the most.

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BRRI dhan28, saline-resistant paddy has been introduced in the coastal districts of Bangladesh in 1994. This has the potential to withstand 4.1-4.3 dS/m of soil salinity at the initial stages as compared to the conventional HYV that are below 4 dS/m. Growing season of BRRI dhad28 is Boro. Its plant height (cm) is 90 cm, size and shape is medium slender, growth duration is 140 days, and average yield is 6 t/ha. Over a million hectares of the 2.5 million hectares of the coastal area has been affected by different levels of salinity. The rice grown on soil with high salinity levels is of poor quality and is therefore sold at a lesser price than the conventional rice in the coastal community markets i.e. less than 50 US cents per kilogram. However, the saline resistant paddy will enable poor farmers to sell their produce at the same price as conventional rice, thereby providing them with sustainable incomes in the future. In addition, the saline resistant paddy will enable poor farmers to secure their landholdings that have been leased at cheap prices to large shrimp farmers. According to the 2001 census, there were around 37 million people living in the coastal districts of Bangladesh. A large percentage of the farmers from these districts migrate to cities and work as day laborers. Adoption of saline resistant paddy will generate employment opportunities as compared to shrimp farming and thereby limit the migration of poor and landless farmers to urban centre (Suryanarayanan, 2010). In order to accomplish the purpose of the study, the following specific objectives were formulated.

1. To determine the extent of adoption of BRRI dhan28 in the selected study area.

2. To find out the socio-demographic characteristics of the respondents.

3. To find out the relationships between socio-economic profile of the respondents and their adoption of BRRI dhan28.

METHODOLOGY

The study was conducted in Satkhira Sadar Upazila of Satkhira district. However, the study was conducted in Shimulbaria, Balitha and Fingri village of Fingri union under Satkhira Sadar Upazila. Sadar Upazila of Satkhira district was selected as because BRRI dhan28 is widely cultivated in this area. All the BRRI dhan28 cultivators of the selected three villages of Fingri union were the population of the study. Total numbers of the BRRI dhan28 cultivators in the three villages were 590. In this study, 75 farmers were selected as sample following simple random sampling technique. Data were collected using interview schedule during April to June 2013. Age, Education, Family size, Farm size, Farming experience, Annual income, Extension media contact, Training experience, Innovativeness and Knowledge on rice cultivation technology, were the independent variable and Extent of adoption of BRRI dhan28 in coastal areas was the dependent variable of the study.

Extent of Adoption was estimated by using the following formula, based on Hedayet, 2011

$$\text{Extent of Adoption} = \frac{\text{Area under BRRI dhan28 cultivation by a respondent}}{\text{Potential area under rice cultivation by a respondent}} \times 100$$

Based on their extent of adoption respondents were classified in three categories as similar with Hedayet, 2011.

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Categories	
Low adoption	
Medium adoption	
High adoption	

RESULTS AND DISCUSSION

Selected Characteristics of the Farmers:

Ten characteristics of the farmers were selected to find out their relationships with the adoption of BRRI dhan 28. The farmer's characteristics were age, education, family size, farm size, farming experience, annual income, extension contact, training received, innovativeness and knowledge on rice cultivation technology. These characteristics of the farmers are described in this section. The results on the selected characteristics with the farmers are presented in Table 1

Table 1. Salient features of the respondents with their characteristics

Variable	Measuring unit	Categories	Range obtained	Farmers		Mean
				No	%	
Age	Actual year	Young (up to 35)	25-70	12	16.0	47.05
		Middle (36-50)		38	50.7	
		Old (above50)		25	33.3	
Education	Year of schooling	Illiterate (0)	1-8	0	0	4.48
		Primary (class 1-5)		48	64	
		Secondary (class 6-10)		27	36	
		Higher secondary (above class 10)		0	0	
Family size	Actual number	Small (2-4)	2-7	37	49.3	5.85
		Medium (5-7)		21	28	
		Large (above 7)		17	22.7	
Farm size	hectare	Small (0.02-1.01 ha)	1.62-6.48	0	0	3.59
		Medium (1.01-3.03 ha)		27	36	
		Large (>3.03 ha)		48	64	
Farming experience	Year of farming	Low (up to 20 years)	1-50	40	53.3	20.89
		Medium (20-30 years)		24	32.0	
		High (above 30 years)		11	14.7	
Annual income	Unit score	Low (Up to TK 110000)	78000-930000	24	32.0	134878
		Medium (TK 110001 –TK 240000)		50	66.7	
		High (Over TK 2400000)		1	1.3	
Extension contact	Scale score	Low (up to 3)	7-9	18	24.0	5.35
		Medium (4-7)		47	62.7	
		High (above 7)		10	13.3	
Training received	Year of training	No (0)	0-6	16	21.34	2.61
		Poor (1-3 years)		45	60.00	
		Medium (4-5 years)		13	17.33	

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		High (above 5 years)		1	1.33	
Innovativeness	Scale score	Low (4th year after demonstration)	1-4	15	20.00	2.4
		Medium (3rd year after demonstration)		30	40.00	
		High (2nd year after demonstration)		25	33.33	
		Very high (1st year after demonstration)		5	6.67	
Knowledge on rice cultivation technology	Scale score	Low (up to 22)	18-36	8	10.7	26.15
		Medium (23-30)		61	81.3	
		High (above 30)		6	8.0	

Data presented in Table 1 indicated that the majority 50.7% of the respondents were middle aged, compared to 33.3% were old aged and remaining 16.0% were young age category. The average was 47.05 years. Data indicated that 84% of the respondents belonged to middle and old aged. Middle and old aged are the decision makers of the farm families, but they normally take any decision about the adoption of any technology. On the other hand the young are generally dependent upon aged family member in decision making. It helps them to become more aware and conscious about agricultural and environmental issues as well as to develop favorable response to adopt BRRI dhan28 in coastal saline areas. The 64% respondents had primary level education and 36% respondents had secondary level education, although no respondents were illiterate of the study area. The literacy of the respondents is an important factor, which determines their adoption behavior.The highest proportion 49.3 % of the respondents had small family size compared to 28% had medium family size and 22.7% had large family size. Data indicated that average family size 5.85 of the respondents in the study was higher than the national average of 4.9 of Bangladesh (BBS, 2008). The highest proportion 64% of the respondents possessed large farm size and 36% possessed medium farm size. The average farm size of the respondents' farmers was 3.59 hectare, which is higher than the national average (0.81 hectare). Finding of this table also indicates that 100% of the respondents had medium to large farm size. It might be an indication that medium to large farmer were involved in adopting BRRI dhan28 in coastal areas. Satkhira is famous for shrimp farming. This special farming requires bigger land area. Although rice is not their main farming practices. But they have bigger land. The overwhelming majority of the respondents 98.7% had low to medium annual income. Majority of the respondents of the study area were heterogeneous in nature based on their annual income. Most of the respondents of this area cultivated rice but their income were not solely dependent upon these farming sources. They also participated in diversified income sources like shrimp culture, job/service, small business, and some other self-employed works. Moreover, adoption of BRRI dhan28 also may increase the respondents' annual income. Majority 81.34% of respondents in the study area had almost no training or poor training experience on rice cultivation. Hence, Department of Agricultural Extension (DAE) and other extension service provider may give more emphasis to train farmers to improve their skills on the rice cultivation. The highest proportion 40.0% of the respondents had medium innovativeness and 33.3% had high innovativeness, 20% had low innovativeness and 6.67% had very high innovativeness. The innovativeness of farmers of the study area was satisfactory because of their communication with the technical person, input dealer, demonstration, print and electronic media. The majority 62.7% of the respondents had medium extension contact, compared to 24% had low extension contact and 13.3 % high extension contact. Extension contact pertains to one's contact with multifarious sources of knowledge

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and information. The findings clearly indicate that major portion of the respondents had low to medium extension media contact, which is not fully encouraging for extension service providers for transferring any technology. The majority 53.3% of the respondents had low farming experience which is up to 20 years, compared to 32 % had medium farming experience and only 14.7 % had high farming experience. Farming experience helps to improve the knowledge and skill of the respondents. The findings clearly indicate that the respondents had an average of about 21 years farming experience, which is encouraging for extension service providers for transferring any technology. The highest proportion 81.3 % of the respondents had medium level knowledge, compared to 10.7 % had low level knowledge and 8 % had high level knowledge. About 92% respondents had low to medium Knowledge on rice cultivation technologies. This knowledge helped the respondents to adopt and carry on the BRRI dhan28 technologies.

Extent of Adoption of BRRI dhan28

The possible range of extent of adoption of BRRI dhan28 by the respondents ranged from 33.33 to 100%. The mean adoption score was 55.66. Based on observed range of extent of adoption, the respondents were classified into three categories as presented in Table 2.

Table 2. Distribution of the respondents according to their extent adoption of BRRI dhan28

Categories	Number	Percent	Mean (%)	SD
Low adoption (up to 33 %)	0	0	55.66%	15.04
Medium adoption (33 to 66 %)	58	77.3		
High adoption (above 66 %)	17	22.7		
Total	75			

Information contained in Table 2 revealed that majority 77.3% of the respondents had medium adoption of BRRI dhan28 compared to 22.7 % high adoption of BRRI dhan28. Findings clearly indicated that majority of the respondents had medium to high adoption of BRRI dhan28 cultivation. Though the initiation of BRRI dhan28 is not so new but its expansion is not so satisfactory, this general scenario has been reflected in the present study. Thus, it may be mentioned that respondents are progressing comparatively medium towards the adoption of BRRI dhan28 varieties.

Comparative Adoption of Different Rice Variety

Respondents in the study area are cultivating different rice varieties such as BRRI dhan28, BRRI dhan47, BRRI dhan50, Super miniket dhan. Comparative adoption was computed based on total average area covered as presented in Table 3.

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Table 3. Comparative adoption of different rice varieties

Name of rice variety	Cultivated area (ha) under each variety (a)	Potential area under cultivation (ha) each variety (b)	Extent of adoption (a/b X 100)(%)	Rank
BRRI dhan28	81.61	44.82	54.92	1st
BRRI dhan50	81.61	16.54	20.27	2nd
Super minicat dhan	81.61	11.44	14.02	3rd
BRRI dhan47	81.61	6.49	7.95	4th

Findings in Table 3 shows that among the total rice cultivated area, BRRI dhan28 was covered 54.92% of extent of adoption and ranked first position whereas 20.27 % was covered by BRRI dhan50 as compared to14.02 and 7.95 % area were covered with Super miniket dhan and BRRI dhan47 varieties respectively.

Comparative profitability of Different Rice Variety

Comparative profitability was computed based on total average area covered as presented in Table 4.

Table 4. Comparative profitability of different rice varieties

Name of rice variety	Total area (ha)	Average yield (t/ ha)	Average sales (Tk)	Average production cost (Tk)	Average Net Income (Tk)
BRRI dhan47	6.49	1.17	23945.71	8700	8184.10
BRRI dhan28	44.82	3.13	73986.27	23300	53799.50
BRRI dhan50	16.54	1.34	28977.50	11700	14627.45
Super miniket dhan	11.44	1.01	26734.26	10900	14455.68

Information contained in Table 4 revealed that total area of BRRI dhan28 was 44.82 ha, compared to total area of BRRI dhan50, Super miniket dhan and BRRI dhan47 was 16.54**,** 11.44 and 6.49 ha respectively and average yield of BRRI dhan28 was 3.13 t/ha, compared to average yield of BRRI dhan50, BRRI dhan47 and Super miniket dhan was 1.34, 1.17and 1.01 t/ha.

Average selling price of BRRI dhan28 was 73986.27 Tk, compared to average selling price of BRRI dhan50, Super miniket dhan and BRRI dhan47 was 28977.50, 26734.26 and 23945.7 Tk**.** Average production cost of BRRI dhan28 was 23300 Tk, compared to average production cost of BRRI dhan50, Super miniket dhan and BRRI dhan47 was 11700, 10900 and 8700 Tk.

Average Net Income of BRRI dhan28 was 53799.50 Tk, compared to average Net Income of BRRI dhan50, Super miniket dhan and BRRI dhan47 was 14627.45, 14455.68 and 8184.10 Tk respectively. So it was found from this table that performance of BRRI dhan28 was more satisfactory as compared to BRRI dhan50, Super miniket dhan or BRRI dhan47 variety in

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respect of yield, average selling price and net income. Thus the respondents earned more profit by cultivating BRRI dhan28 variety in the study area.

Respondents' Perceived Benefit of adopting BRRI dhan28

Respondents' perceived benefit of adopting BRRI dhan28 against nine anticipated benefits has been presented in Table 5. These statements were compiled and Perceived Benefit Index (PBI) was count and percentage was measured and finally rank wise arranged.

Table 5. Respondent's perceived benefit of adopting BRRI dhan28

Statements of benefit for adopting BRRI dhan28	Extent of benefit (N=75)										PBI	Rank
	SA (5)		A (4)		NO (3)		D (2)		SD (1)			
	N	%	N	%	N	%	N	%	N	%		
High market price	44	58.6	29	38.7	0	0	2	2.7	0	0	340	1st
Non- complexity of cultivation procedure	40	53.3	35	46.7	0	0	0	0	0	0	340	1st
Enhanced social status	33	44	42	56	0	0	0	0	0	0	333	2nd
Higher yield	35	46.6	38	50.7	0	0	2	2.7	0	0	331	3rd
Availability of quality seed	38	50.6	32	42.7	1	1.3	4	5.4	0	0	329	4th
Short duration variety	28	37.3	45	60.0	0	0	2	27	0	0	324	5th
Improved livelihood status through high income	23	30.6	52	9.3	0	0	0	0	0	0	323	6th
Better grain quality	45	60	30	40	0	0	0	0	0	0	300	7th
Tolerable to high level of salinity	1	1.3	0	0	23	30.7	34	45.3	17	22.7	159	8th

SA = Strongly Agree, A = Agree, NO = No Opinion, D = Disagree, SD = Strongly Disagree

Data contained in Table 5 indicated that different statements were not equally important that the respondent's perceived benefit of adopting BRRI dhan28 cultivate. However, the important statements are high market price, non- complexity of cultivation procedure, enhanced social status, higher yield, availability of quality seed, and short duration variety. High market price and non-complexity of cultivation procedure was the first important statement for the respondent's perceived benefits of adopting BRRI dhan28. Enhanced social status was the second statement for the respondent's perceived benefits of adopting BRRI dhan28 cultivation. Higher yield, availability of quality seed, and short duration variety was the 3rd, 4th, and 5th statement for the respondent's perceived benefits of adopting BRRI dhan28 cultivation.

Relationship between the Selected Characteristics of the respondents and Their Adoption of BRRI dhan28

Correlation coefficient 'r' was calculated to find out the relationship between adoption of BRRI dhan28 and selected socioeconomic characteristics of the respondents**.** The summary of the correlation analysis has been shown in Table 6.

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Table 6. Relationships between of the selected characteristics of the respondents and their adoption of BRRI dhan28

Independent variable	Dependent variable	Coefficient of correlation (r)
Age	Adoption of BRRI dhan28	0.109
Education		0.273*
Family size		-0.051
Farm size		-0.244*
Extension media contact		0.275*
Farming experience		0.077
Annual income		-0.021
Knowledge		0.254*
Training		0.110
Innovativeness		0.114

* Correlation is significant at 0.05 level of probability

From the table 6 it is revealed that education, extension contact and knowledge of the respondents had positive significant relationship with the adoption of BRRU dhan 28. On the other hand farm size had significant but negative relationship with the adoption of BRRI dhan 28.

Education of the respondents and their adoption of BRRI dhan28

The correlation co-efficient between education of the respondents and their adoption of BRRI dhan28 was found positive and significant at 5 % level of probability (r = 0.273*) which led to reject the null hypothesis indicating that education of the respondents have significant positive relationship with their adoption of BRRI dhan28. Although BRRI dhan28 cultivation does not require any special knowledge compare to other HYVs, it requires some basic knowledge as the variety is new one for instance. However the respondents who were cultivating HYVs/ MVs/Hybrid were tended to migrate towards BRRI dhan28 cultivation. Therefore, educational attainment of the respondents could influence their adoption behavior regarding BRRI dhan28 cultivation.

Farm size of the respondents and their adoption of BRRI dhan28

The correlation co-efficient between farm size of the respondents and their adoption of BRRI dhan28 was found negative and significant. Innovation always involves some sorts of risks. So BRRI dhan28 cultivation on this area is not expected to this. Sometimes new technology used to fail in coping with new areas hence; there is a risk of failure. The farmers having large farm size can take this risk as trial basis and if they fail they can compensate through other rice varieties. On the other hand small farmers have no scope of taking risk for which they have to wait for a while in adopting new technology. Another fact is that the farmers couldn't always produce the quality seeds of modern rice varieties and depend on the seeds to be supplied from other sources. When the supply of seeds is limited, the farmers hardly continue its cultivation. It is obviously a risky situation especially for the small farmers. However, the medium and large farmers could take risk easily because of their diversified income source which compensate the loses. The similar findings were also observed for adopting of sugarcane (Pal,

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1995), cotton (Rahman, 1995), potato (Sarker, 1997; Hasan, 2003) and mungbean (Islam, 2008).

Extension media contact and adoption of BRRI dhan28

The correlation co-efficient between extension media contact and their adoption of BRRI dhan28 was found significant at 5% level of probability (r = 0.275*) which led to reject the null hypothesis indicating that contact with extension media have significant and positive relationship with adoption of BRRI dhan28. Using more number of information sources means accumulating more information, empowering with higher level of knowledge and technologies.

Knowledge on rice cultivation technologies and adoption of BRRI dhan28

The correlation co-efficient between knowledge and their adoption of BRRI dhan28 was found positive and significant at 5% level of probability (r = 0.254*). Higher knowledge of the respondents on rice cultivation technologies could inspire them to adopt BRRI dhan28. So higher knowledge in an individual inspire him to adopt new technology and help him to overcome various problems. Similar finding was reported by Hossain, 2003.

Besides the above mentioned characteristics, age, family size, farming experience, annual income, innovativeness and training experience had no significant relationship with the adoption of BRRI dhan28.

Problem faced in cultivation of BRRI dhan28

Respondents faced different problems in cultivating of BRRI dhan28, of which, 10 problems were identified as hindrance in adopting the variety. For clear understanding of the fact, a Problem Confrontation Index (PCI) were used which is Shown in Table 7.

Table 7. Ranking of the problems faced by the BRRI dhan28 growers

Sl. No.	Nature of problem	Degree of problem (N= 75)					PCI	RANK
		Too much (4)	Much (3)	Medium (2)	Low (1)	Not at all (0)		
1	Unable to tolerate salinity at mature stage	32	38	5	0	0	258	1st
2	Unable to cope with higher level of salinity	34	37	2	2	0	253	2nd
3	Unavailability of salinity testing equipments	30	37	8	0	0	247	3rd
4	Higher price and inadequate supply of inputs	33	27	12	3	0	240	4th
5	Lack of proper land management technologies	6	3	32	26	8	123	5th
6	Losses due to natural calamities	2	5	33	30	5	119	6th
7	Lack of rain or proper irrigation at tillage stage	0	10	23	38	4	114	7th
8	Shattering problem	6	2	23	31	13	107	8th
9	Less profitable in compare to shrimp cultivation	2	1	23	38	11	95	9th
10	Less yield than other popular varieties	2	2	25	31	15	95	9th

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Data contained in Table 7 indicated that major problem in cultivating BRRI dhan28 were unable to tolerate salinity at mature stage, unable to cope higher level of salinity, unavailability of salinity testing equipments, higher price and inadequate supply of inputs, lack of proper land management technologies and less yield than other popular varieties. Besides, susceptibility to lack of rain or proper irrigation at tillage stage due to natural calamities is also considered as a problem. Unable to tolerate salinity at mature stage was the first important problem for the respondents and its PCI was 258 and unable to cope with higher level of salinity was the second problem for the respondents and its PCI was 253. Unavailability of salinity testing equipments was the third important problem for the respondents and its PCI was 247. Less yield than other popular varieties and less profitable in compare to shrimp cultivation was considered the nine number problem for the respondents and its PCI was 95.

CONCLUSIONS

Majority of the respondents of the study area were middle aged, having small family size, large farm holding and had primary level of education with low to medium annual income and low farming experience. Most of them had medium extension contact media and almost no training or poor training experience on rice cultivation. More than 77.3% of the respondents had medium adoption of BRRI dhan28 with medium knowledge and the performance of BRRI dhan28 was more satisfactory as compared to BRRI dhan50, Super miniket dhan and BRRI dhan47 variety in respect of yield, average selling price and net income. The finding revealed that respondents had a moderate extent of adoption towards adaptability of BRRI dhan28 in coastal areas. High market price and non- complexity of cultivation procedure was the first important statement for the respondent's perceived benefits of adopting BRRI dhan28 cultivation and unable to tolerate salinity at mature stage was the first important problem for the respondents and unable to cope with higher level of salinity was the second problem for the respondents. Coefficient of correlation test indicated that farm size had negative and significant relationship with the adoption of BRRI dhan28 but education, extension media contact and knowledge had positive and significant relationship with the adoption of BRRI dhan28 in coastal areas of Bangladesh, that means higher the education, extension media contact and knowledge of the respondents, higher was their response to adopt BRRI dhan28 in coastal areas of Bangladesh.

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