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Farmers' Knowledge, Attitude and Practice (KAP) Regarding Nitrogen Fortified Organic Manure in Crop Production

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was carried out mainly to evaluate the knowledge, attitude and practice (KAP) of farmers regarding nitrogen fortified organic manure. Data were collected from purposive-randomly selected 120 farmers from Kharnia, Atalia, Maguraghona unions of Dumuria upazila under Khulna district of Bangladesh through personal interview using an interview schedule during January to February, 2019. There were eleven personal socioeconomic characteristics of farmers selected for the study which were age, educational qualification, family size, farming experience, organic farming experience, annual income, farm size, organizational participation, agricultural training, cosmopolitanism, extension contact regarding nitrogen fortified organic manure, were treated as independent variables, whereas knowledge, attitude, practice (KAP) and faced problems were considered as dependent variables. Majority (65%) of the respondents had high knowledge, most of the respondents (85.8%) had medium favorable attitude and majority of the respondents (65.8%) had medium practice, respectively, regarding nitrogen fortified organic manure. 65% of the respondents encountered medium problem while preparing and applying nitrogen fortified organic manures in the crop field. Although farmers usually use inorganic nitrogen fertilizer but they have favorable attitude regarding nitrogen fortified organic manure. On the basis of the response provided by the respondents' positive statements ranked first and negative statements ranked

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second in gross considerations. The 1st position was ranked by the individual statement “N fortified organic manure is good” on the basis of obtained highest score (532), which was followed by “soil health is maintained” (2nd, score 530) and “great source of income” (3rd, score 488). Among the selected characteristics of farmers, annual income showed negative significant relationship with attitude while farm size, agricultural training showed positive significant relationship; and family size showed negative significant relationship with knowledge of farmers regarding nitrogen fortified organic manure. Cosmopolitanism and extension contact showed positive significant relationship with practice; while agricultural training showed negative significant relationship with problem of farmers regarding nitrogen fortified organic manure. Thus, the high knowledge, medium favorable attitude and medium practice should be utilized to design appropriate extension strategies for production and application of the nitrogen fortified organic manures by the farmers in their agricultural fields for crop production. The encountered problems also should be addressed properly to ensure timely mitigation. Proper measures should also be undertaken to make nitrogen fortified organic manure popular day by day.

Keywords: Knowledge; attitude; practice; Nitrogen fortified organic manure.

1. INTRODUCTION

Agriculture sector plays an important role in overall economic development of the Bangladesh. According to National Accounts Statistics (2018) of Bangladesh Bureau of Statistics (BBS) [1], the agriculture sector contributes about 13.75% of the total Gross Domestic Product (GDP). It includes three subsectors namely (i) Crops and horticulture (ii) Animal farming and (iii) Forest and related services. The overall growth rate of the broad agriculture sector for Fiscal Year (FY) 2017-18 is provisionally estimated at 3.06% in real terms over FY 2016-17 [2].

According to “Fertilizer Recommendation Guide-2012” published by Bangladesh Agricultural Research Council (BARC) in 2012 [3], the agriculture of the country is facing lots of challenges due to the soil issues because of excessive use of chemical fertilizers. Soils are losing its health its health to support the crops and plants to grow. For this reason, use of nitrogen fortified organic manure could be a pathway to keep the soil productive and fertile for the crops and plants. Supply of adequate nitrogen to the soil is necessary for sustained crop production which is directly related to food security. Thus, to meet the existing food demand of the population and to maintain sustainable agriculture, using nitrogen fortified organic manure could be one of the possible ways.

Usually the farmers of Bangladesh produce and apply various types of organic manures in their agricultural fields though the amounts are not sufficient. However, they do not consider the scientific way of increasing the nitrogen content

in the produced and utilized organic manures. Nitrogen content of the manures might be increased by adding urea at the later stage of manure production, or by using leguminous plants as organic substrate, and so on. It is assumed that some of the progressive farmers are concerned about the nitrogen fortification of the organic manures in various ways, but, lion share of the farmers are not quite aware of the mentioned idea. In spite of greater potential of production of the nitrogen fortified organic manures, the farmers of Bangladesh are not adequately aware of the issue, and also the process is not free from problems during production and application in the agricultural fields. Thus, it is necessary to expedite the knowledge, attitude and practice (KAP) of the farmers in producing and utilizing the nitrogen fortified organic manures for crop production. Besides, the several faced problems in production of those organic manures, sometimes farmers fail to overcome, should also be found. By knowing these things appropriate extension measures could be formulated to support the production and application of those high quality nitrogen enriched manures for sustainable crop production and for conserving soil health. Considering these points in view the study was undertaken.

In order to proper direction to the research the following specific objectives were formulated:

- i. To describe the socioeconomic characteristics of nitrogen fortified organic manure producing farmers.
- ii. To determine the knowledge, attitude and practice (KAP) of the farmers in producing nitrogen fortified manures.

- iii. To explore the relationships between socioeconomic characteristics of the farmers and KAP.

2. METHODOLOGY

The study was conducted in three unions (Kharnia, Atalia, Maguraghona) of Dumuria Upazila in Khulna District of Bangladesh. Khulna is the third largest metropolitan and second port city in Bangladesh, which is located at the southwestern region of the country. Dumuria Upazila under Khulna District possesses 454.23 sq. km of area, bounded by the latitude from 22°39' to 22°56' north latitudes and in between 89°15' to 89°32' east longitudes. The primary data were collected through the use of interview schedule. In total 120 (one hundred twenty) farmers were selected for interview. The number of sample at Maguraghona union was kept purposively lower (17) for the ease of data handling. Purposive random sampling technique was used for sampling from the population. Sampling plan for the study is given in Table 1.

In this study selected 11-personal, economic and social characteristics of the farmers were considered as independent variables such as age of the farmers, family size, educational qualification, farming experience, organic farming experience, annual income, farm size, organizational participation, agricultural training, cosmopolitanism, extension contact. It was assumed that the focus issues (dependent variables) of the present research could have been influenced and/or determined by these characteristics of the farmers. Knowledge, attitude, practice (KAP) and problems of the farmers regarding nitrogen fortified organic manure were considered as dependable

variable. The independent variables as well as dependent variables were computed and measured following standard procedures suggested by [4,5,6,7,8] (Table 2).

Knowledge of a respondent on nitrogen fortified organic manure was measured by assigning 2 marks for each response for fifteen questions. For correct answer to a question, a respondent could get a score of 2, and for partial correct answer, score of 1 was assigned, and for wrong answer to a question a respondent could get a score of 0. The cumulative score could range from 0 to 20, where "0" meaning "no" knowledge and "20" meaning "very high" knowledge on organic farming.

Attitude of the farmers towards nitrogen fortified organic manure was measured by a scale with 5 options of 20 items. Farmers responded against both the positive and negative statements on attitude towards nitrogen fortified organic manures which helped to understanding their actual mental affiliation on nitrogen fortified organic manure. In case of positive statements, the score "1" stands for highly disagree, "2" for disagree, "3" for undecided, "4" for agree and "5" for highly agree. On the other side, for negative statements those scores were reversed except undecided "3" and other were given 1, 2, 4 and 5 for highly agree, agree, disagree and highly disagree, respectively. The score could range from "20 to 100", where "20" meaning unfavorable attitude and "100" meaning highly favorable attitude towards nitrogen fortified organic manure.

The extent of attitude showed by farmers towards nitrogen fortified organic manure was determined by using AS (Attitude score) and AI (Attitude index) against each of the statements

Table 1. Sampling plan for the study

Upazila	Union	Block	No. of selected farmers
Dumuria	Kharnia	Kharnia	51
		Bamundiya	
		Tepna	
	Atalia	Atalia	52
		Chuknagar	
		Boratia	
	Maguraghona	Maguraghona	17
		Batagram	
		Kansonpur	
Total			120

for both positive and negative individually. The score for extent of individual statement could range from “120” to “600”. Then these statements were ranked on the basis of obtained scores.

$$AS = (N_1 \times 1) + (N_2 \times 2) + (N_3 \times 3) + (N_4 \times 4) + (N_5 \times 5)$$

where,

AS = Attitude Score

N_1 = No. of respondents who highly disagreed

N_2 = No. of respondents who disagreed

N_3 = No. of respondents who undecided

N_4 = No. of respondents who agreed

N_5 = No. of respondents who highly agreed

$$\text{Attitude index} = \frac{\text{Observedscore}}{\text{Possible highest score}} \times 100$$

Practice of nitrogen fortified organic manure was determined through considering the involvement of farmers in 10 different selected activities that is related to nitrogen fortified organic manure. A 4-point rating scale as “regularly”, “occasionally”, “rarely” and “not at all” which were scored as 3, 2, 1 and 0, respectively. Score of the respondents could range from “0” to “30”, where 0 indicating no practice and above 30 indicating regularly practice.

The participants were asked to indicate their problem on selected 10 aspects related to using nitrogen fortified organic manures. Each respondent was indicated her extent of practice with a 4-point rating scale as “extreme”, “moderate”, “rarely” and “not at all” which were scored as 3, 2, 1 and 0 respectively. Score of the respondents could range from “0” to “30” where score “0” indicating no problem and score “30” indicating higher level of problem faced by rural women during using nitrogen fortified organic manure.

The researcher collected data through face to face interview during the free time of the respondents. Statistical treatments such as range, means, standard deviation, maximum, minimum, rank order etc. were used to interpret data. Correlation(s) test was used to ascertain the relationships (for ratio data Pearson’s product moment correlation score “ r ” and for ordinal data Spearman’s rank order correlation score “ ρ ” was used) between the concerned independent variables and the dependent variables. Statistical Package for Social Science (SPSS) version 20.0 was used for data analysis.

3. RESULTS AND DISCUSSION

3.1 Selected Characteristics of the Farmers

Data revealed that middle aged farmers (60.0%) were highly involved in farming followed by young aged (20.0%) and old aged farmers (20.0%). Thus the possibilities of the middle aged farmers are of high potential to be involved in nitrogen fortified organic farming. Researchers [9] found in their study that highest portion of respondents (46%) were middle aged who were involved in organic farming, and [8] also found similar results. Major proportion (55.0%) of respondents had secondary level of education while 24.2% farmers had primary level of education, 11.7% of respondent had higher secondary level of education, 5.7% farmers were illiterate, 1.8% farmers could sign only and both 0.8% farmers had BSc and MSc degree. The higher percentage of higher secondary level of respondents came to farming operation because these types of farmers might have considerable quality of knowledge; however, they cannot find jobs easily due to high qualification demand of the institutional job providers. [9] found that highest portion of respondents (40%) had secondary level of education. Maximum numbers (56.7%) of families in selected areas were medium in size followed by small size (21.7%) and large size (21.7%) family. [9] found that highest portion of respondents (50.8%) also had medium size family. Majority of respondents (72.5%) had high farming experience, fewer portions of farmers (22.5%) had medium farming experience and a few farmers (5.0%) had low farming experience. Majority of the respondents (70.0%) had higher experience where small portion of respondents (23.3%) had medium experience and only few respondents (6.7%) possessed higher experience about organic farming (Table 2). Experience in organic farming was considered as the use of organic manure, use of biopesticides, use of mechanical insect-pests & weed control, and so on.

55.8% the respondents’ family member had lower annual income followed by medium (35.8%) annual income and high (8.3%) annual income. More than half (54.2%) of the respondents had small farm size and only a few portion of respondents (2.5%) had large farm size. However, medium portion (38.3%) of the respondents had medium farm size and very few

Table 2. Distribution of farmers according to their selected characteristics (N= 120)

Parameter	Categories	Score	Respondents(N=120)		Mean	SD	Min.	Max
			Number	Percentage				
Age(Years)	Young	≤35	24	20.0	43.18	10.63	22	85
	Middle	36-55	72	60.0				
	Old	>55	24	20.0				
Education(Schooling years)	Illiterate	0	7	5.7	7.54	3.36	00	20
	Sign	0.50	2	1.8				
	Primary	1-5	29	24.2				
	Secondary	6-10	66	55.0				
	HSC	11-12	14	11.7				
	BSc	13-16	1	0.8				
	MSc	>16	1	0.8				
Family size(No. of members)	Small	≤4	26	21.7	5.78	1.83	2	10
	Medium	5-7	68	56.7				
	Large	>7	26	21.7				
Farming experience(Years)	Low	≤10	06	05.0	28.80	10.42	1	50
	Medium	10-20	27	22.5				
	High	>20	87	72.5				
Organic farming experience(Years)	Low	≤10	08	06.7	28.50	10.92	1	50
	Medium	10-20	28	23.3				
	High	>20	84	70.0				

Table 2. Continued...

Parameter	Categories	Score	Respondents(N=120)		Mean	SD	Min.	Max.
			Number	Percentage				
Annual income(BTD)	Low	≤120000	67	55.8	151966.67	147141.73	50000	120000
	Medium	120001-180000	43	35.8				
	High	>180000	10	8.3				
Farm size(ha)	Landless	<0.02	0	0.0	1.05	0.91	0.04	6.15
	Marginal	0.02-0.20	6	5.0				
	Small	0.21-1.0	65	54.2				
	Medium	1.01-3.0	46	38.3				
	Large	>3	3	2.5				
Organizational Participation(Score)	Low	≤6	110	91.7	4.30	1.59	1	11
	Medium	7-12	8	6.7				
	High	>12	1	0.8				
Agricultural training(No. of training)	No	0	109	90.8	0.85	1.29	0	6
	Low	≤3	08	6.7				
	Medium	4-5	00	0.0				
Cosmopolitanism(Score)	High	>5	03	2.7	8.01	2.58	3	16
	Low	≤8	73	60.8				
	Medium	9-16	46	38.3				
Extension contact(Score)	High	>16	01	0.8	10.87	2.77	6	19
	Low	≤11	82	68.3				
	Medium	12-22	38	31.7				
	High	>22	00	0				

Table 2. Continued...

Parameter	Categories	Score	Respondents(N=120)		Mean	SD	Min.	Max.
			Number	Percentage				
Knowledge(Score)	Low	<7	00	00	16.31	1.90	13	20
	Medium	8-15	42	35				
	High	>15	78	65				
Attitude(Score)	Low	≤46	0	0	67.07	5.58	54	86
	Medium	47-73	103	85.8				
	High	>73	17	14.1				
Practice(Score)	Low	≤10	5	4.2	17.98	4.01	3	26
	Medium	11-20	79	65.8				
	High	>20	36	30				
Problem(Score)	Low	≤10	15	12.5	17.03	4.65	4	25
	Medium	11-20	78	65.0				
	High	>20	27	22.5				

*SD- Standard deviation, Min. - Minimum, Max. - Maximum Source: Field survey, 2019

Table 3. Relative position (Rank order) of the selected 2-aspects along with 20-statements of farmers in case of attitude towards nitrogen fortified organic manure based on attitude score (AS) and attitude participation index (AI) (N=120)

Positive Statements	Degree of agreement					AS	AI	Rank (20 statements)
	Highly agree(5)	Agree(4)	Undecided(3)	Disagree(2)	Highly Disagree(1)			
i. N fortified organic manure is good	60×(5)	54×(4)	4×(3)	2×(2)	0×(1)	532	88.67	1 st
ii. Soil health is maintained	62×(5)	48×(4)	8×(3)	2×(2)	0×(1)	530	88.33	2 nd
iii. It's renewable and biodegradable	21×(5)	79×(4)	18×(3)	2×(2)	0×(1)	479	79.83	5 th =
iv. It's ecofriendly	18×(5)	72×(4)	22×(3)	4×(2)	4×(1)	456	76	7 th =
v. Helps in soil aeration	26×(5)	74×(4)	20×(3)	0×(2)	0×(1)	486	81	4 th =
vi. Great source of income	22×(5)	84×(4)	14×(3)	0×(2)	0×(1)	488	81.33	3 rd
vii. It is a time demanding technology	36×(5)	54×(4)	30×(3)	0×(2)	0×(1)	486	81	4 th =
viii. Soil holds its moisture properly	19×(5)	67×(4)	30×(3)	4×(2)	0×(1)	461	76.83	6 th
ix. It reduces N leaching loss in soil	25×(5)	55×(4)	32×(3)	7×(2)	1×(1)	456	76	7 th =
x. Application is easy	48×(5)	41×(4)	19×(3)	6×(2)	6×(1)	479	79.83	5 th =
\bar{X} of A	Rank-1					485.3		
Negative Statements	Degree of agreement					AS	AI	Rank
	Highly agree(1)	Agree(2)	Undecided(3)	Disagree(4)	Highly Disagree(5)			
i. An extra hazardous to prepare	14×(1)	23×(2)	38×(3)	41×(4)	4×(5)	358	59.67	9 th
ii. Slowly release nutrients than fertilizer	3×(1)	39×(2)	26×(3)	46×(4)	6×(5)	373	62.17	8 th
iii. Application management is still difficult	6×(1)	44×(2)	30×(3)	30×(4)	10×(5)	354	59	11 th =
iv. Give less yield compared to inorganic fertilizer	4×(1)	40×(2)	34×(3)	42×(4)	0×(5)	354	59	11 th =
v. Hard to maintain proper yield quantity	10×(1)	44×(2)	28×(3)	29×(4)	9×(5)	343	57.16	12 th
vi. Marketing facilities for organic product is not so better	15×(1)	31×(2)	42×(3)	27×(4)	5×(5)	336	56	14 th
vii. Using of large amount of N fortified organic manure is problematic	5×(1)	55×(2)	29×(3)	20×(4)	11×(5)	337	56.16	13 th
viii. High knowledge is needed to produce N fortified organic manure	2×(1)	54×(2)	35×(3)	26×(4)	3×(5)	334	55.67	15 th
ix. Weed problem is serious	36×(1)	30×(2)	24×(3)	26×(4)	4×(5)	292	48.67	16 th
x. GO' and NGO's support is less	20×(1)	25×(2)	27×(3)	34×(4)	14×(5)	357	59.5	10 th
\bar{X} of B	Rank-2					343.8		

Table 4. Computed correlation coefficient between the selected characteristics of the farmers and their focus variables

Independent Variables		Dependent Variables				Correlation type
		Knowledge	Attitude	Practice	Problem	
i.	Age	0.087	0.018	-0.073	-0.146	r
ii.	Education	0.084	0.021	0.070	0.005	r
iii.	Family Size	-0.205*	-0.057	0.024	0.052	r
iv.	Farming experience	-0.003	-0.067	-0.038	-0.004	r
v.	Organic farming experience	-0.008	-0.079	-0.016	0.024	r
vi.	Annual income	0.145	-0.181*	0.152	0.053	r
vii.	Farm size	0.226*	-0.084	0.036	0.045	r
viii.	Organization participation	0.021	-0.107	0.020	0.091	p
ix.	Agricultural training	0.304**	0.149	-0.24	-0.383**	r
x.	Cosmopolitanism	0.046	0.051	0.224*	-0.113	p
xi.	Extension contact	0.063	-0.008	0.206*	-0.031	p

** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed), r = Pearson's product moment correlation co-efficient, p = Spearman's rank order co-efficient of correlation

(5.0%) of the respondents had marginal farm size and only no respondents were land less farmers. Nearly all the respondents (91.7%) had low participation in different social organizations, small portion of respondents (6.7%) respondents had medium participation and very few respondents (0.8%) had high participation. Most of the respondents (90.8%) had no training and small portion (6.7%) of the respondents had received low (≤ 3) training and only a few portion (2.7%) of respondents had high number (> 5) of training. Researchers [10] found that highest portion of respondents (85.0%) had no training in their study. Majority (60.8%) of the farmers had low cosmopolitanism compared to less farmers (38.3%) and a few (0.8%) having medium and high cosmopolitanism respectively. Around two-third of the farmers (68.3%) had low extension contact and 31.7% had medium extension contact whereas there were no farmers who possessed higher extension contact (Table 2). [10] found in their study that highest portion of respondents (40%) had low access to extension services.

About two-third (65%) of the farmers had high knowledge on organic farm activities compared to less portion of farmers (35%) having medium knowledge on nitrogen fortified organic manure respectively. Nearly most of the farmers (85.8%) had medium attitude towards nitrogen fortified organic manure whereas small portion of farmers (14.1%) had high attitude towards nitrogen fortified organic manure. Scientists [11] found highest portion of respondents (76.9%) had favorable attitude. Majority of respondents (65.8%) had medium practice, where about one-third of respondents (36%) had high practice and a small portion (4.2%) of the farmers still had low practice in using nitrogen fortified organic manure. [10] found that highest portion of respondents (73.2%) had low practice. Majority of farmers (65.0%) faced medium problem while using nitrogen fortified organic manure compared to 22.5% farmers faced higher problem and only 12.5% had faced low problem (Table 2).

3.2 Attitude index of farmers in selected 2-aspects (positive and negative) along with 20-statements of farmers towards nitrogen fortified organic manure

Attitude of respondents was measured by using five rating scale against which some positive and negative statement was given. To measure

the attitude of farmers the activities were arranged in twenty issues where Attitude Score (AS) and Attitude Index (AI) were calculated (Table 3).

Usually farmers use nitrogen fertilizers in their fields. But they have awareness about the advantages of using nitrogen fortified organic manure. So their attitude is becoming favorable day by day about nitrogen fortified organic manure. [11] also found somewhat similar types of attitude. They found that highest portion of respondents (76.9%) had favorable attitude towards organic farming.

On the basis of the response provided by the respondents' positive statements ranked first and negative statements ranked second in gross considerations. The 1st position was ranked by the individual statement "N fortified organic manure is good" on the basis of obtained highest score (532), which was followed by "soil health is maintained" (2nd, score 530) and "great source of income" (3rd, score 488). The least scores were obtained by the individual statements "weed problem is serious" (16th, 292), "high knowledge is needed to produce N fortified organic manure" (15th, 334) and "marketing facilities for organic products is not so better" (14th, 336). Most farmers know that nitrogen fortified organic manure is good for supplement of all nutrients. Thus the attitude of the farmers are quite favorable to design appropriate extension strategies for production and application of the nitrogen fortified organic manures by the farmers in their agricultural fields for crop production.

3.3. Relationship between the Selected Characteristics of the Farmers and their Knowledge, Attitude, Practice and Problem

This section deals with the relationship between eleven selected characteristics of the farmers and their knowledge, attitude, practice and problem on nitrogen fortified organic manure. To explore the relationships between the selected characteristics of the farmers and their knowledge, attitude, practice and problem on nitrogen fortified organic manure Spearman's rank order co-efficient of correlation (ρ) was used in case of ordinal data and Pearson's product moment correlation co-efficient (r) was used for ratio or interval data. These two correlation co-efficients were used on the basis of the used data in the present study.

Family size had negative significant correlation with knowledge regarding nitrogen fortified organic manure, whereas, farm size and agricultural training had positive significant correlation. Annual income had negative and significant effect on attitude of farmers. This might be due to rich people do not want to go only agriculture sector. Those rich people sometimes unnoticed the harmful effect of excess nitrogen fertilizers used. Family size had negative and significant effect on knowledge of farmers. It might be caused due to unwillingness of the family members to the available agricultural information source, whereas farm size had positive and significant effect on knowledge of farmers. Agriculture training had positive and significant effect on knowledge of farmers. It indicates that when farmers take more training, his knowledge will increase. Cosmopolitanism and extension contact had positive and significant effect on practice of farmers. Agriculture training had negative and significant effect on problem of farmers. So it indicates that if agricultural training can be given properly to farmers then automatically decrease the problems of farmers because usually their possible solution is given in agricultural training.

4. CONCLUSION

Based on the results and its logical interpretation it can be concluded that majority (65%) of the respondents had high knowledge, most of the respondents (85.8%) had medium attitude and majority of the respondents (65.8%) had medium practice, respectively, regarding nitrogen fortified organic manure. 65% of the respondents encountered medium problem while preparing and applying nitrogen fortified organic manures in the crop field. Although farmers usually use nitrogen fertilizer but they have favorable attitude regarding nitrogen fortified organic manure. Thus, the high knowledge, medium favorable attitude and medium practice should be utilized to design appropriate extension strategies for production and application of the nitrogen fortified organic manures by the farmers in their agricultural fields for crop production. The encountered problems also should be addressed properly to ensure timely mitigation. Proper measures should also be undertaken to make nitrogen fortified organic manure popular day by day.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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