EFFECTIVENESS OF EXTENSION METHODS: A CASE OF WESTERN MID-HILLS IN NEPAL

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ABSTRACT

A study was carried out to assess the effectiveness of the extension methods used by IRRI-STRASA project in three municipalities namely Bhanu, Rainas and Sundarbazar of Lamjung and Tanahun districts. 101 sample households were taken purposively from beneficiaries of the project and survey design with structured questionnaire was used for data collection. The study showed that the participation of farmers in project was in increasing trend; mainly for technical support and assistance from the project. The group extension method was highly preferred by the farmers and it was found that the extension personnel contact under the project was satisfactory with methods like minikit, demonstrations and trainings having higher contact, thus helping in increasing social network of farmers. About 39 percent of study household had women participation at decision making level and 8 percent had socially mobilized level which was due to awareness and participation in the project activities. The adoption of the improved varieties was about 95percent in the households, the reason for such high adoption being increased yield, lower cost of production, climate adaptability, higher pest resistance and higher grain quality. Finally, the overall effectiveness index of project was assessed using five indicators and was found 0.64 implying that the project was effective and the methods were classified into two groups: effective methods (trainings, study visits and tours, minikit, group and demonstrations) and moderately effective methods (PVS, FFS and ICTs).

Keywords: extension methods, group method, women participation, adoption, effectiveness

INTRODUCTION

Rice is an important staple food crop in the world and will continue to be so in the coming decades owing to the targets of food security, youth employment, use of scarce resources, poverty alleviation and the adaptation to the impacts of climate change . Its global demand is expected to rise up to 551 million tons in 2030 due to the increased rate of population growth and declined production of rice with little scope for expansion of agricultural land (FAO, 2016). Similar is case in Asia including Nepal where the entire issue of food security is dependent on volume of rice produced which is in declining rate. Looking at the Nepalese agriculture, rice production covers a wide range of land from hills to terai in about 52 lacs hectares with production of around 15.25 lacs tons and productivity of 3.35 tons/ha (Krishi Diary, 2016). In 2016, rice solely contributed 16.33percent of total agriculture GDP shared by food and cash crops (which is 47percent of total agriculture GDP). This implies the importance of rice in Nepalese community and has special significance and economic importance in agricultural development and poverty reduction (Gumma, Gautam, Nelson, Pandey&Rala, 2011). Therefore, increasing rice productivity and production is essential to ensure national food security, reduce poverty and safeguard against volatility of the rice market. The development of improved high

yielding and hybrid varieties of rice has brought significant innovation in rice production (Adedeji *et al.,* 2013) and these varieties have created potential for higher yields and changes in price impacts (Chen Li-yun, Xiao, Tang & LEI, 2007).Also, these varieties have capacity of more productivity in less/limited land and spares additional resources (water, labor, land), thereby leading to sustainable production (Johnson & Vijayaragavan, 2011). However, adoption of new yield increasing rice varieties in Nepal is fairly low (40 percent) and its share in national contribution has been declining over the years (Pandey, Gauchan, Malabayas, Bool-Emerik & Hardy, 2012).

The major constraint of the country is the lowest productivity of cereal crops including rice. The poorest rice producers produce their crop under rainfed conditions, in which drought, submergence, salinity, iron toxicity, and cold reduce yields and harm their livelihoods. The productivity of rice under rainfed condition is very low that directly influence the livelihood of the people. The primary reasons for such low rice productivity could be ignorance of farmers regarding the use of latest improved technologies and their reluctance to change their traditional farming technologies. The risk in the prospect of obtaining a marginal surplus depending largely on weather conditions in the country and the fear of possible crop failure might have discouraged the farmers to accept the advanced technologies (Shaikh, Magsi & Qureshi, 2016). Even with favorable climate, soil conditions, availability of water for irrigation, use of pesticides, and the production of rice are not up to the mark. For increasing the yield and to protect the crop from insect pests, it becomes necessary to transfer latest technologies to farmers and also motivate them to adopt those technologies. During the last few years, new varieties of rice were introduced; however, it is not known whether farmers are actually benefitted by introduction of the new rice varieties (Binod, Paudel & Ghimire, 2012). The extension methods used for dissemination of these varieties is still supply driven, and is not able to best meet the need of farmers despite the various attempts to improve farmers livelihood through increased productivity and overall performance of rice production has been inadequate (Nzully, 2007). Matee (1989) pointed the prime reason for poor performance of these methods to be failure in influencing farmers for adoption. . Recent advances in genetics and breeding have made the development of rice varieties tolerant of such stresses feasible and their cultivation can substantially contribute to poverty alleviation of rice farmers in unfavorable environments and of poor rice consumers globally.

Various organizations including governmental and non-governmental are involved in distributing the new improved varieties of rice all over the country through different extension approaches. IRRI-STRASA project also have also been using different extension method like Participatory Varietal Selection (PVS), Trainings, Study tours and visits, Minikit distribution, Group method, Farmers' Field School, ICTs and printed media and Demonstrations. The paper focuses on these methods used by the project for dissemination of improved rice varieties. Although the result is assumed to be remarkable, however, question arises on how effective have these extension methods been in dissemination of improved rice varieties n farmers' level and what is the actual adoption status of these varieties?

In this regard, this paper tends to identify the major extension methods preferred by the farmers and the extent of its reach in farmers' level. It also studies the efficiency of these methods in terms of cost and time and analyzes how these methods have been influencing the adoption of improved rice varieties. The paper also highlights the gender aspects based participation level of women in the project and points out the methods most effective for them. Finally, the paper estimates an effective index for the project so as to assess the extent of its effectiveness.

MATERIALS AND METHODS

The successful research is based on the appropriate planning before taking any actions which includes the objectives and methods of study. The main objective of the study was to assess the effectiveness of the extension methods used by IRRI-STRASA project in disseminating and adoption of improved rice varieties in three municipalities of two midhill districts of Nepal, namely Rainas Municipality and Sundarbazar Municipality of Lamjung district and Bhanu Municipality of Tanahun district.

Judgmental Sampling technique was used for selection of 101 rice growers among the beneficiaries of the project in study area to ensure representation from different groups and key participants based on gender, socio-economic class and caste, where 32-35 respondents were selected from each municipality at random.

For primary data collection from the selected respondents, a structured interview schedule was prepared and its reliability and validity was ensured through experts' consultation and pretesting by interviewing five respondents so that the schedule covers the overall objectives of study. Detailed interviews were conducted and collected data were carefully managed and analyzed using Ms excel and STATA 12 using analytical tools like frequencies, mean, standard deviation, rank order and composite indexing.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents:

Table 1 represents the socio-economic characteristics of household heads of study villages, which includes age, sex, education levels, ethnicity and family size of the households surveyed. The study results show that more than two third of the household heads, 70.3 percent household heads in the study villages were economically active implying that they could take risks in agriculture. Therefore, they were more likely to try innovations, evaluate and adopt them if found promising (Nzully, 2014). Similarly, male headed households were found higher than female headed ones, 59.4 percent and 40.6 percent respectively in the study villages. It was found that majority of the respondents were Brahmin and Chhetri group (65 %) followed by the indigenous group (25.8 %) and Dalits were only about 9 percent in study areas.

On education level of the household heads, about 77 percent of them had school education (primary, secondary or above), and 12 percent of them had attended adult literacy classes, while 11 percent had not attended any education. Since a big proportion of the household heads had some formal education, it implies that most farmers would benefit from the information and trainings regarding the adoption of improved rice varieties; thus fostering its adoption. It was therefore, expected that they were good they could write, keep records and read various extension materials.

Occupation plays major role in the livelihood of the people. It was found that agriculture was major source of livelihood of people (56.5 %) which was lower than the national average (66.7 %). This might be due to diversification of income sources and outmigration of youth of family which was second major income source in study villages. The least priority income source was found to be business which is at 8.9 percent.

Table 1: Socio-economic characteristics of respondents

Variable	Study sites				χ^2
	Bhanu Municipality (n=34)	Rainas Municipality (n=32)	Sundarbazar Municipality (n=35)	Total (N=101)	
Age of HHH					
18yrs-30yrs	1(2.9)	0(0)	1(2.8)	2(2)	8.91*
31yrs-45yrs	13(38.2)	7(21.9)	10(28.6)	30(29.7)	
46yrs-60yrs	13(38.2)	17(53.1)	9(25.7)	39(386)	
>60yrs	7(20.7)	8(25)	15(42.9)	30(29.7)	
Sex of HHH					
Female	12(35.3)	14(43.8)	15(43.6)	41(40.6)	0.6
Male	22(64.7)	18(56.2)	20(56.4)	60(59.4)	
Education level of HHH	4(11.7)	0(0)	7 (20)	11(10.9)	
No education	14(41.2)	12(37.5)	14(40)	12(11.9)	8.77*
Adult literacy classes	3(8.8)	6(18.8)	3(8.6)	40(39.6)	
Primary school education	13(38.3)	14(43.7)	11(31.4)	38(37.6)	
Secondary school education or above					
Ethnicity of households	14(41.2)	20(62.5)	32(91.4)	66(65.3)	26.17**
Brahmins and	18(52.9)	7(21.9)	1(2.9)	26(25.8)	
Chhetris	2(5.9)	5(15.6)	2(5.7)	9(8.9)	
Indigenous groups					
Dalits					
Income Source					
Agriculture	16(47.1)	23(71.9)	18(51.4)	57(56.5)	13.94*
Service	4(11.8)	5(15.7)	5(14.3)	14(13.9)	
Business	5(14.7)	1(3.1)	3(8.6)	9(8.9)	
Remittance	4(11.8)	3(9.3)	8(22.6)	15(14.8)	
Others	5(11.7)	0(0)	1(2.9)	6(5.9)	

Figure in parenthesis represents percentage. *Source: Field Survey, 2018*

**Significant at 5 percent level of significance*

***Significant at 1 percent level of significance*

The average land holdings was found 8.42 ropani across study villages. Since, Nepalese agriculture is incomplete without rice cultivation, it covered all regions including the study villages. All farmers of the sites were engaged in rice cultivation and had enough experience in rice cultivation. The average years of rice cultivation of respondents was found to be 24 years which could be included in category of experienced farmers, however the experience individually ranged from as low as 7 years to as high as 50 years.

Participation in the project

The years of participation of farmers in the IRRI-STRASA project varied from 2 years to 11 years, the mean year of participation was 6 years. The study found out that farmers were involved in the project on voluntary basis and were selected mainly by involving farmers groups in collaboration with extension workers, and lead farmers, who are adhered to the set criteria for selection. According to Hoffmann (2002), the use of selection criteria in selecting farmers might reduce conflicting interests

and complaints from the community members. The use of selection criteria makes it easier to identify those who are willing and able to teach the technology to other farmers. According to the study done by Mlozi (2005), it was found out that farmers' willingness to learn has some influence on the adoption of improved technologies and practices to occur. The prime reason for participation were found to be informational purpose, technical assistance, quality inputs, attraction and impressed by the attributes of innovations (rice varieties), persuasion from fellow farmers and extension personnel and establish strong linkage and bond with IRRI and IAAS.

Extension method ranked on basis of preference:

Among the different extension methods used by the project to reach farming community, the respondents were asked to rate these methods on 5 point scale (1 for least preferred and 5 for most preferred). The extension methods were then ranked by calculating their weightage as shown in Table 2.

Table 2: Preference ranking of different extension methods used by IRRI-STRASA Project

Methods used by STRASA Project	Mean Score	Rank
Participatory Varietal Selection (PVS)	0.15	VII
Trainings	0.54	III
Study visits and tours	0.42	V
Minikit	0.71	II
Group	0.78	I
Famer's field school (FFS)	0.14	VIII
ICTs and printed media	0.20	VI
Demonstration	0.47	IV

Source: Field Survey, 2018

The group approach/ method of innovation dissemination was highly preferred by the respondents due to increased interactions among themselves and assistance regarding selection of new rice varieties followed by minikit, trainings, demonstrations, study visit and tours, printed media and ICTs, participatory varietal selection and lastly the Farmers' field school. Similarly trainings, demonstrations and study tours were preferred as they somewhat helped farmers in discovering new information and ideas regarding rice cultivation. Being effective method in itself, farmer's field school (FFS) was least preferred in the study villages due to the reason that it was not organized quite as often as other methods and not all were accessible to FFS in contrast to Farmers' groups and minikit distribution of varieties which were accessible to almost all farmers of study villages.

Farmer's inclination towards group method might be the result of contacts and interactions made and group method being practical-oriented and motivating farmers to take initiative by bringing significant change in his attitude. The method was perceived to improve coordination and enhance adoption of technology. Similar result was reported by Okunade (2007).

Frequency of contact of project personnel with the farmers:

Extension personnel contact can also play important role in adoption of new innovation by farmers (Lukkainen, 2015). Thus, the frequency of contact of extension personnel of the STRASA project with the respondent farmers was assessed by using 5 point scale ranging from no contact at all, seldom, sometimes, often and always.

While the extension personnel contact was good for trainings, minikit, FFS and demonstrations. It was found satisfactory for study visits and tours, PVS and ICTs and printed media while it was poor in farmers' method. The overall analysis shows that the extension personnel need to increase their

contact with the farmers so as to foster the effective adoption of the rice varieties. This extension agent contact of the overall project was converted to index which had value of 0.59, means the extension agent contact with farmers was satisfactory.

Table 3: Extent of project personnel contact with farmers under different methods

Methods used by STRASA Project	Score (1 for most frequent)					Weight	Index	Rank
	1	0.8	0.6	0.4	0.2			
PVS	0	0	5	3	1	4.4	0.49	VII
Trainings	7	20	22	20	4	45.0	0.62	IV
Study visits and tours	6	19	15	12	8	36.6	0.61	V
Minikit	5	37	48	11	0	67.8	0.68	II
Group	2	0	20	40	28	35.6	0.39	VIII
FFS	0	17	11	0	0	20.2	0.73	I
ICTs and printed media	0	7	32	11	0	29.2	0.58	VI
Demonstration	7	12	43	13	0	47.6	0.63	III

Source: Field Survey, 2018

Women's Participation level in respondent Household:

Figure 1 presents the level of women participation in study households. It was found that about 39 percent of the households had women participation of decision making level meaning that the female members were allowed to take decisions regarding household and cultivation activities like selection of varieties, etc. This high percent of female in decision making level was, as perceived by respondents, due to the awareness and their participation in the project activities. Consultation level of participation was found in 18 percent households where the female members were consulted and their views was addressed during decision-making. It was then followed by instrumentalization level of participation in about 14 percent households i.e. important decisions were made by male members. It might be due to illiteracy of women members and patriarchal system existing in the study villages. Similarly, community owned initiative (social mobilization) level of participation was found in 8 percent households.

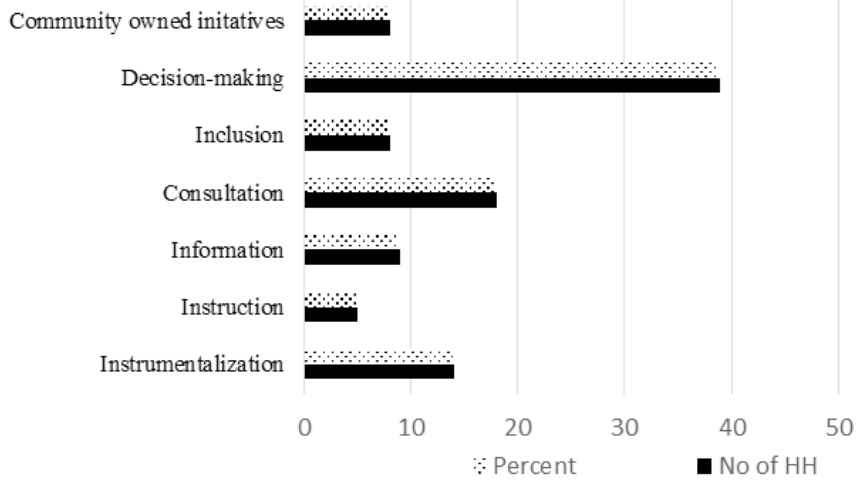

Figure 1: Women Participation in households

Adoption status and extension methods influencing adoption:

The adoption status was studied under four criteria, namely acceptability of the varieties, future adoption of varieties, extension methods influencing the adoption of varieties and farmers' to farmers spread of adoption which is presented in Table 4.

Table 4: Adoption status of rice varieties

Variable	Study villages				
	Bhanu Municipal (n=34)	Rainas Municipal (n=32)	Sundarbazar Municipal (n=35)	Total (N=101)	χ^2
Acceptability of variability					
Accepted	31 (91.2)	29(85.3)	32(91.4)	92(91.2)	9.25*
Moderately accepted	3(8.8)	0(0)	0(0)	3(2.9)	
Rejected	0(0)	3(14.7)	3(8.6)	6(5.9)	
Future adoption of varieties					
No adoption	3(8.8)	0(0)	3(8.6)	6(5.9)	9.95*
Partial adoption	5(14.7)	15(46.7)	12(34.3)	32(31.7)	
Total adoption	26(76.5)	17(53.1)	20(57.1)	63(62.4)	
Methods perceived as influencing adoption					
PVS	5(14.7)	0(0)	1 (2.8)	6(5.9)	8.11**
Trainings	14(41.2)	23(71.9)	15(42.8)	52(51.5)	5.37*
Study visits and Tours	17(50)	7 (21.9)	11 (31.4)	35 (34.6)	7.95**
Minikit	3(8.8)	30(93.7)	29(82.8)	62(61.4)	53.67**
Group	27(79.4)	19(59.4)	25(71.4)	73(72.3)	6.44*
FFS	7(20.6)	8(25.0)	12(34.3)	27(26.7)	1.58NS
ICTS and printed media	9(26.5)	12(37.5)	11(31.4)	32(31.7	0.39NS
Demonstrations	19(55.9)	13(40.6)	12(34.3)	44(43.6)	4.88*

Figure in parenthesis denotes percentage *Source: Field Survey, 2018*

**Significant at 5 percent level of significance*

***Significant at 1 percent level of significance*

It was found that 92 percent respondents were accepting the improved varieties of rice distributed by the project while 2 percent moderately accepted and 6 percent totally rejected the varieties. While the rejecting respondents were clear of no adoption in future, 31 percent of respondents said that the varieties would be partial replacement for the existing ones while 62 percent said that it would be total replacement. The major reasons for respondents adopting the disseminated improved varieties of rice were increased rice yield per unit area, efficient irrigation and reduced water requirement, reduced time, labor, cost and drudgery, inadequate and traditional technologies that needed to be replaced and the improved varieties well adapted to changing climatic conditions etc. While the rejection of varieties were result from poor performance of specific varieties like Sukhadhan 3 and 5 in farmers' field.

On the other hand, there were statistical significant differences on the approach that influenced respondents' decisions to apply the innovations. The methods except FFS and printed media were statistically significant in influencing the adoption of the improved rice varieties. While 5 percent respondents found PVS influencing their adoption, 51 percent, 34 percent, 61 percent 70 percent, 26 percent, 31 percent and 43 percent of total respondents found trainings, study tours and visits, minikit, group, FFS, ICTs and printed media and demonstrations influencing their adoption respectively.

Also, the respondents' opinions on the spread of improved rice varieties to other farmers who were not involved in the project showed that the majority of the respondents (75 %) agreed that innovations had spread to other farmers in and out of the project, while 12 percent felt that there was no spread of varieties and 13 percent of them were not sure.

Effectiveness index:

The major challenge of the study was to assess the effectiveness of the extension methods used by the project and overall project itself in the perspective of the respondents. This was done by generating the effectiveness index that comprised of 5 parameters as shown in Table 5.

Table 5: Overall effectiveness of Project as perceived by respondents

Effectiveness	1	0.8	0.6	0.4	0.2	weight	index value	Effectiveness index
Timeliness of information						**59.5**	**0.59**	
Agronomic info	4	39	54	4	0	69.2	0.69	
Varietal information	4	44	50	4	0	70.8	0.70	
Pest and disease management information	0	15	62	24	0	58.8	0.58	
Weather related info	0	10	50	37	3	53.4	0.53	
Post-harvest info	0	11	48	40	2	54	0.53	
Market info	0	6	43	49	3	50.8	0.50	**0.645**
Quality of variety						**68.5**	**0.68**	
Quality seed	1	83	16	1	0	77.4	0.77	
Pest resistance	0	29	63	9	0	64.6	0.64	
Climate change adaptation		30	63	29	0	73.4	0.73	
Post-harvest storage	0	9	73	19	0	58.6	0.58	
Utility						**66.56**	**0.66**	
Relevance to FS	1	68	32	0	0	74.6	0.74	
Suitable for small and large farmers	0	53	48	0	0	71.2	0.70	
Resource saving (Time, labor, inputs)	0	13	83	5	0	62.2	0.62	
Increased benefits	0	8	81	12	0	59.8	0.59	
Adaptation to field condition	0	27	69	5	0	65	0.64	
Ease of understanding						**66.05**	**0.65**	
Clear and understandable language	2	55	41	3	0	71.8	0.71	
Technical terms understood by farmers	0	5	64	32	0	55.2	0.55	
Clear and understandable content	0	35	62	4	0	66.8	0.66	
Helps in decision making	0	52	46	3	0	70.4	0.70	
Satisfaction in farmers						**64.36**	**0.64**	
Cost effectiveness	0	21	70	10	0	62.8	0.62	
Specific services provided as required	0	16	57	28	0	58.2	0.58	
Strong linkage with IRRI personnels	2	8	51	40	0	55	0.54	
Solved farm problem	0	33	64	4	0	66.4	0.66	
Overall satisfaction	17	62	21	0	1	79.4	0.79	

Source: Field Survey, 2018

Each parameters contained other variables which are to be rated in 5 point scale ranging from 0.2 to 1 (1 for highest rating) by the respondents by help of which the effectiveness index was generated.

The study revealed that the overall effectiveness index of the project was 0.64, meaning the project was effective. While the respondents perceived that the project provided enough information regarding varieties and agronomic practices, however, it was comparatively inefficient in providing market, climate and post-harvest related information timely. Similarly, the respondents perceived that the varieties were superior in quality and cc adaptation whereas their pest resistance was relatively lower. Also, the farmers felt the varieties were highly suited to their field condition. Regarding the ease in understanding the information delivered by project under different programs, the farmers felt that though the language was clear and the content was field specific which helped in decision making, still the technical terms were little hard to understand for them. However, the farmers were highly satisfied with project efforts except some respondents feeling incompetent to create their linkage with the project personnel.

Table 6: Effectiveness of the extension methods as perceived by respondents

Extension methods	Effectiveness rating (1 for highly effective)						Effectiveness category	Average effectiveness index
	0.2	0.4	0.6	0.8	1	Mean score		
PVS	0	7	10	2	0	0.55	III	
Trainings	0	16	30	24	18	0.70	IV	
Study visits and tours	0	15	35	19	23	0.71	IV	
Minikit	5	16	20	23	17	0.68	IV	
Group	6	23	12	33	27	0.70	IV	0.64
FFS	18	9	28	16	7	0.56	III	
ICTS and printed media	13	22	32	16	0	0.52	III	
Demonstrations	0	13	28	34	9	0.69	IV	

Source: Field Survey, 2018

Also, the effectiveness of each methods was assessed by asking the respondents to rate in five point scale. The extension methods were then classified into five categories based on the mean score obtained ; namely ineffective (with mean score less than 0.2), less effective(mean score from 0.2 to 0.4), moderately effective (mean score from 0.4 to 0.6) , effective (mean score from 0.6 to 0.8) and highly effective (mean score 0.8 to 1).The methods, thus could be classified into two groups namely, moderately effective methods (which included PVS, FFS and ICTs and printed media) and effective methods (including trainings, study visits and tours, minikit, group and demonstrations). The PVS and FFS were comparatively less effective than other methods as they were not as regular as other methods and exclusion of larger portion of farmers. ICTs and printed media were less effective which might be owing to reason that respondent might not be interested towards its content or its content might not cover the issues and problems by them.

CONCLUSION

The study, thus, concluded that the extension methods used by the project and overall project itself were effective in the study sites. The project had addressed most of the issues used to define

effectiveness like cost effectiveness, resource saving, gender participation and inclusiveness, extent of contact with farmers, technical assistance and support to farmers. The timely delivery of essential information and quality seed highly suitable to their field encouraged the higher adoption of varieties in farmers. However, respondents also pointed some issues to be prioritized by project in coming future. Some of the important issues were proper market information and facility, assistance regarding vegetable and fruits farming, increasing intensity and involvement of actual marginal farmers in project activities, establishment of *Ghumti Kosh* for fluent flow of credit and financial resources and special focus to illiterate and incompetent farmers. Thus, it is of utter importance for the project personnel to address and solve these issues of farmers and deliver effective extension service to the farmers through appropriate extension methods.

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