



## RESEARCH ARTICLE

### KNOWLEDGE AND PRACTICES OF FOOD WORKERS BEFORE AND AFTER FOOD SAFETY TRAINING

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#### ABSTRACT

Many food recovery agencies depend on donated food, and its safety is critical for the health of vulnerable populations. A food safety curriculum was developed for agency volunteers of the Munshigong, Gazaria District. Examples of topics in the curriculum included: personal hygiene, food storage, transporting food safely, and HACCP. Food Safety Knowledge Pre- and Posttests (20 questions) were identical, and validity and reliability were established prior to use. Paired t-tests were performed to determine the effectiveness of the curriculum (n=190). A Food Safety Practices Survey (10 questions) demonstrating attitudes and behaviors regarding food safety practices in the agency and the home was given with the Food Safety Knowledge Posttest. The heading on the survey was, "After the food safety training today, I plan to," and possible responses were "already doing," "yes," or "no." A Food Safety Practices Delayed Survey was administered by mail to participants 3-6 months following the food safety training. The Food Safety Practices Delayed Survey was similar to the Food Safety Practices Survey except there were four possible answer choices-- "always," "most of the time," "sometimes," and "never." Food Safety Knowledge Posttest scores ( $19.0 \pm 0.1$ ) were significantly ( $p < 0.000$ ) greater than Food Safety Knowledge Pretest scores ( $16.6 \pm 0.2$ ). Food Safety Practices Survey results indicated that participants were already using proper food safety practices ( $5.8 \pm 0.2$ ), or that they plan to use appropriate food safety practices ( $4.0 \pm 0.2$ ). On the Food Safety Practices Delayed Survey (n=82), participants indicated that they "always" ( $8.8 \pm 0.2$ ) or "most of the time" ( $0.8 \pm 0.1$ ) follow proper food safety practices. Results demonstrated the food safety curriculum was used successfully to improve food safety knowledge. Food Safety Practices Survey results indicated that most food recovery agency personnel and staff were already using proper food safety practices in their agency or at home. In addition, the results from the Food Safety Practices Delayed Survey showed the participants retained the knowledge from the food safety training, and a majority was "always" following proper food safety practices.

#### INTRODUCTION

Food security, defined as access by all people to enough food for a healthy life, is an essential component of a healthy community [1]–[3]. The United States Department of Agriculture (USDA) monitors food insecurity and hunger through an annual survey of 50,000 households conducted by the U.S. Census Bureau [4]. This data, published in a series of reports called Household Food Security in the United States, summarizes the data from this research for each year, 2011 to 2016 [2]. Since the survey's inception in 1995, the Food Security Index has demonstrated a range of 9-12% of households in the U.S. is food- insecure [3], [5]. There have been fluctuations throughout these years, but the most recent food security data, which comes from Household Food Security in the United States, 2002 study shows that food insecurity and hunger are rising. The prevalence of food insecurity increased from 10.7% of households in 2001 to

11.1% in 2002 [6]. In 2002, there were 12.1 million food-insecure households in the U.S. Moreover, the prevalence of food insecurity with hunger increased from 3.3% to 3.5%. It is reported that 89% of American households were food secure during 2002 [4]. Food-insecure individuals or those living in poverty are particularly susceptible to food-borne illness because of the possibility of a compromised immune system and because they are more likely to frequent food recovery programs. According to the Centers for Disease Control (CDC), food-borne diseases cause an estimated 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the U.S. each year [7]. Children, the elderly, and the immune-compromised are the most affected by food-borne illness [8]. The objective of this study was to develop a strategy for preventing food-borne illness by promoting food safety practices in personnel and volunteers providing food to a vulnerable population in Munshigonj District who utilize food recovery programs.

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## Literature Review

Islam (2010) has shown in his book named "Rural Women's Empowerment through Self-income Generating Activities: A Study on NGOs Credit Programs in Bangladesh" that independent women who are not controlled by their husband or family guardians more likely successful. Besides, the women who are dependent on those persons are opposed to the first one. Women's empowerment has been pointed out as an indispensable condition to reduce poverty in developing countries of the world. In this regard, this paper aims to consider the multi-layered actually of the issue of rural women's empowerment in Bangladesh, especially for economic development. The study deals with the empowerment of rural women through self-income generating activities and the NGOs credit programs in Bangladesh. The qualitative study was conducted in the central region of Bangladesh. The real information has been revealed that the exact conditions of women getting the services of NGOs study are qualitative also. Successful women are capable of changing their life through the credit program and credit program and credit plus approach of NGOs. But who are not capable of changing and still depends on their husband and family guardians, they are the unsuccessful women pointed out that they now found themselves in a difficult situation due to the debt that they had accumulated? This finding demonstrates that after taking out the loan, all women have increased their freedom of movement, but only successful women improved their standard of living and social recognition [9].

Guerin and Palier (2005) mentioned the relation between microfinance and empowerment of clients into their book, named "Microfinance Challenges: Empowerment or Disempowerment of the poor?" Is the increasing commercialization of microfinance justified? This book examines the complexity of links between microfinance and the empowerment of clients. The book combines theoretical reflections and case studies to investigate changes in microfinance that are occurring in India, especially in South India [10]. Chhay (2011) demonstrates in his book "The Economic Empowerment of Women through microfinance" that analyzing microfinance as a strategy for the economic empowerment of women. This report describes the objectives, events, and conclusions drawn at a workshop on the economic empowerment of women through microfinance. The workshop was designed to analyze the strengths and weaknesses as a strategy for the economic empowerment of women. In addition to that parliamentarians to define their role in that approach. It was attended by 40 participants, primarily from West African countries, and included presentations and project visits to represent two microfinance schemes [11].

Different approaches are taken to empower a woman in the rural areas of Bangladesh that are shown in the "Annual Report of BRAC (2011)". The Bangladesh Rural Advancement Committee (BRAC) takes a holistic development model that has revolutionized income-generating opportunities for rural communities. Though its handicraft and fashion section, BRAC has developed a sustainable national. The initiative was dedicated to creating economic opportunity for disadvantaged artisans and rural women through the revival and promotion of their traditional handicrafts [12]. In another study, shows that RDP of BRAC has had some notable achievement, particularly in primary health care, non-formal primary education, and income and employment generation and credit assistance to

the rural poor. BRAC activities have shown to yield a positive impact on the beneficiaries. This positive impact has been for both income and non-income indicators of household welfare [13]. BRAC activities help rural people in changing their previous traditional lifestyle. Now group members of BRAC earn more money for their lifestyle [14]. The credit program of BRAC provides group members with a loan. They established many income-generating projects. Their living standard is increasing day by day [15]. The first comprehensive impact assessment study on BRAC's RDP was conducted in 1993-94 [16]. The findings of the study showed the positive economic impact RDP on its p-participants. Several other studies were conducted on different aspects of RDP's impact on the participant. Ahmed's study on economic empowerment of the rural poor found a significant gain in income and other household members over those of comparison households [17].

Specifically mention the definition, framework, and indicators of measuring women's economic empowerment in her article "Understanding and Measuring Women's Economic Empowerment." Economically empowering women is essential both to realize women's rights and to achieve broader development goals such as economic growth, poverty reduction, health, education, and welfare [18]. Sultana and Hasan (2011) show in their article in "Impact of Micro-Credit on Economic Empowerment of Rural Women" that the impact of micro-credit on rural women's economic empowerment [19]. The study was conducted in Bariyali, Teknogra, and Naga villages of Basan and Kayaltia union under Gazipur Sadar Upazila of Gazipur District. A total number of 90 respondents were selected as samples using a stratified random sampling technique. Out of 90 respondents, 45 women were involved with the Bangladesh Rural Advancement Committee (BRAC) micro-credit program [20].

## METHODOLOGY OF THE STUDY

**Principle Method:** A cross-sectional descriptive study was conducted in Munshiganj (Gazaria Union). The objective of such a study design aimed to focus on cross-cutting issues that come across for assessing the level of satisfaction regarding food safety knowledge and practice.

**Research Area:** This study was conducted at the Munshiganj (Gazaria Union).

**Population and Unit of Analysis:** The study populations were the food recovery agency workers who usually receive training from Munshiganj (Gazaria Union). The unit of analysis was "sample food recovery agency workers."

**Sample and Sampling:** The purposive sampling method was used to identify 100 food recovery agency workers who usually receive training from Munshiganj (Gazaria Union).

**Techniques of Data Collection:** Data was collected through a structured questionnaire and checklist. The baseline information of the questionnaire were socio-demographics, satisfaction towards services received from the union, and the satisfaction towards the behavior of the providers.

**Data Processing and Statistical analysis:** Data analysis was carried out using SPSS (version 14). Categorical variables were reported as proportion, while continuous variables were reported as means and standard deviations when distributions

are considered approximately normal. The chi-square test statistic was used to assess the statistical significance of the bivariate associations. T-tests were done when necessary to detect any difference between continuous variables.

**Ethical Consideration:** For the smooth conduction of the study, the respondents were informed about the purpose of the study. There was no loss of working hours of the respondents; about 20 minutes was required for each interview. Before the interview, the respondents were briefed about the objectives of the study, and their voluntary participation was sought. Before interviewing, written, informed consent was obtained from the respondents, and they were assured that the collected data would be kept confidential. No identification as per respondents was disclosed in the final report.

**RESULTS**

Overall (n=190), i.e., combining the data from all three states, the absolute mean difference between Food Safety Knowledge Pre- and Posttest scores was  $2.4 \pm 0.2$ , and this difference was significantly different ( $p < 0.000$ ) from zero. The mean Food Safety Knowledge Posttest score was  $19.0 \pm 0.1$  out of 20 and more significant than the mean score of  $16.6 \pm 0.2$  out of 20 for the Food Safety Knowledge Pretest. Results from the Food Safety Practices Survey overall (n=182) indicated that most participants were "already doing" proper food safety practices ( $5.8 \pm 0.2$  out of 10 statements), or that "yes" they plan to use an appropriate food safety practices ( $4.0 \pm 0.2$  out of 10 statements). Results from the Delayed Food Safety Practices Survey are only available from Louisiana and Mississippi. Overall, the participants (n=82) indicated that they "always" ( $8.8 \pm 0.2$  out of 10 statements) or "most of the time" ( $0.8 \pm 0.1$  out of 10 statements) follow proper food safety practices.

**Table 1. Food Safety Knowledge (Means  $\pm$  SEM)**

	Food Safety Knowledge Pretest	Food Safety Knowledge Posttest
Overall (n=190)	$16.6 \pm 0.2$	$19.0 \pm 0.1^*$
Louisiana (n=103)	$16.0 \pm 0.3$	$18.7 \pm 0.2^*$
Mississippi (n=58)	$17.3 \pm 0.3$	$19.0 \pm 0.2^*$
Arkansas (n=29)	$17.3 \pm 0.6$	$19.5 \pm 0.2^*$
Volunteer (n=49)	$16.5 \pm 0.5$	$18.9 \pm 0.3^*$
Staff (n=142)	$16.7 \pm 0.2$	$19.0 \pm 0.1^*$
Urban (n=113)	$16.7 \pm 0.3$	$19.0 \pm 0.2^*$
Rural (n=78)	$16.6 \pm 0.3$	$18.9 \pm 0.2^*$

When analyzed by the state, the results were similar to the overall results. The absolute mean differences between the Food Safety Knowledge Pre- and Posttest scores were significantly ( $p < 0.005$ ) different from zero for all three states (Louisiana  $2.8 \pm 0.2$ , Mississippi  $1.7 \pm 0.2$ , Arkansas  $2.2 \pm 0.6$ ). Louisiana (n=103,  $18.7 \pm 0.2$  vs.  $16.0 \pm 0.3$ ), Mississippi (n=58,  $19.0 \pm 0.2$  vs.  $17.3 \pm 0.3$ ), and Arkansas (n=29,  $19.5 \pm 0.2$  vs.  $17.3 \pm 0.6$ ) Food Safety Knowledge Posttest scores were greater than Food Safety Knowledge Pretest scores. The majority of the participants in Louisiana (n=95,  $5.5 \pm 0.4$  out of 10 statements), Mississippi (n=58,  $6.2 \pm 0.4$  out of 10 statements), and Arkansas (n=29,  $6.1 \pm 0.6$  out of 10 statements) indicated on the Food Safety Practices Survey that they were "already doing" or that "yes" they planned to use proper food safety practices (Louisiana  $4.2 \pm 0.3$ , Mississippi  $3.7 \pm 0.4$ , Arkansas  $3.8 \pm 0.6$ ). Results from the Food Safety Practices Delayed Survey indicated that the majority of participants in Louisiana (n=48,  $8.7 \pm 0.2$  out of 10 statements) and Mississippi (n=34,  $9.0 \pm 0.3$

out of 10 statements) "always" or "most of the time" (Louisiana  $1.0 \pm 0.2$ , Mississippi  $0.6 \pm 0.2$ ) followed proper food safety practices.

Participants were asked to indicate their tests and surveys if he/she was a volunteer or a staff member. Similar to overall results, the absolute mean differences between the Food Safety Knowledge Pre- and Posttest scores were significantly ( $p < 0.000$ ) different from zero for both volunteers ( $2.4 \pm 0.4$ ) and staff ( $2.3 \pm 0.2$ ). Volunteer (n=49,  $18.9 \pm 0.3$  vs.  $16.5 \pm 0.5$ ) and staff (n=142,  $19.0 \pm 0.1$  vs.  $16.7 \pm 0.2$ ) Food Safety Knowledge Posttest scores were greater than Food Safety Knowledge Pretest scores. The majority of the volunteers (n=49,  $6.5 \pm 0.4$  out of 10 statements) and staff (n=134,  $5.6 \pm 0.3$  out of 10 statements) indicated on the Food Safety Practices Survey that they were "already doing" or that "yes" they planned to use proper food safety practices (volunteer  $3.4 \pm 0.4$  and staff  $4.2 \pm 0.3$ ). Responses on the Food Safety Practices Delayed Survey indicated that the majority of the volunteers (n=17,  $8.8 \pm 0.4$  out of 10 statements) and staff (n=60,  $8.9 \pm 0.2$  out of 10 statements) "always" or "most of the time" (volunteer  $0.8 \pm 0.2$ , staff  $0.8 \pm 0.1$ ) followed proper food safety practices.

**Table 2. Food Safety Practices Survey (Means  $\pm$  SEM)**

	Already Doing	Yes	No
Overall (n=182)	$5.8 \pm 0.2$	$4.0 \pm 0.2$	$0.2 \pm 0.0$
Louisiana (n=95)	$5.5 \pm 0.4$	$4.2 \pm 0.3$	$0.3 \pm 0.1$
Mississippi (n=58)	$6.2 \pm 0.4$	$3.7 \pm 0.4$	$0.1 \pm 0.1$
Arkansas (n=29)	$6.1 \pm 0.6$	$3.8 \pm 0.6$	$0.1 \pm 0.1$
Volunteer (n=49)	$6.5 \pm 0.4$	$3.4 \pm 0.4$	$0.1 \pm 0.1$
Staff (n=134)	$5.6 \pm 0.3$	$4.2 \pm 0.3$	$0.3 \pm 0.1$
Urban (n=113)	$5.4 \pm 0.3$	$4.3 \pm 0.3$	$0.3 \pm 0.1$
Rural (n=70)	$6.4 \pm 0.4$	$3.4 \pm 0.4$	$0.1 \pm 0.1$

Table 2 summarizes the participants' responses to the questions on the Food Safety Knowledge Pre- and Posttests. When each question was analyzed individually, questions 10, 14, 15, 17, and 19 showed a large qualitative improvement ( $> 18.9\%$ ) from Food Safety Knowledge Pre- to Posttest. The topics for these questions included the following: HACCP, calibrating food thermometers, hand washing, cooking foods to the correct internal temperature, and cooling methods for leftovers, respectively (see Appendices B and C). Questions 4, 6, 7, 9, 11, and 20 showed little qualitative improvement ( $< 2.1\%$ ) from Food Safety Knowledge Pre- to Posttests. The topics addressed in these questions were hand washing, personal hygiene, and cleaning and sanitizing. Participants missed question 19 (64.2% correct) most often on the Food Safety Knowledge Pretest. This question asked methods of cooling large quantities of food more quickly.

Table 3 summarizes the participants' responses to each question on the Food Safety Practices Survey. The items with the most "yes" answers ( $> 59.3\%$ ) were items 6 and 7, which inquired about calibrating food thermometers and cooling foods more quickly (see Appendix D).

The items 6 and 10 regarding calibrating food thermometers and storing raw meat and ready-to-eat foods in the refrigerator. The Food Safety Practices Survey showed that participants were already washing fruits and vegetables thoroughly, cleaning and sanitizing cooking utensils, and washing their hands before preparing food and after handling raw meat or poultry by most often ( $> 67.6\%$ ) responding "already doing" to items 3, 4, and 5 respectively.

**Table 3. Summary of all participants' responses to individual questions on Food Safety Knowledge Pre- and Posttest**

Question	Food Safety Knowledge Pretest		Food Safety Knowledge Posttest	
	Number Correct *	% Correct °	Number Correct *	% Correct °
1	164	86.3	183	96.3
2	159	83.7	173	91.1
3	138	72.6	163	85.8
4	184	96.8	186	97.9
5	170	89.5	186	97.9
6	183	96.3	185	97.4
7	182	95.8	181	95.3
8	161	84.7	179	94.2
9	185	97.4	186	97.9
10	140	73.7	176	92.6
11	189	99.5	190	100.0
12	180	94.7	185	97.4
13	146	76.8	169	88.9
14	93	48.9	172	90.5
15	143	75.3	187	98.4
16	165	86.8	184	96.8
17	132	69.5	180	94.7
18	149	78.4	171	90.0
19	122	64.2	182	95.8
20	183	96.3	187	98.4

**Table 4. Summary of all participants' responses to individual questions on the Food Safety Practices Survey**

Item	Yes		No		Already Doing	
	Number *	% °	Number *	% °	Number *	% °
1	61	33.5	1	0.5	120	65.9
2	70	38.5	3	1.6	109	59.9
3	55	30.2	1	0.5	128	70.3
4	58	31.9	1	0.5	123	67.6
5	39	21.4	0	0.0	143	78.6
6	132	72.5	10	5.5	43	23.6
7	108	59.3	5	2.7	69	37.9
8	79	43.4	2	1.1	101	55.5
9	56	30.8	7	3.8	119	65.4
10	61	33.5	9	4.9	112	61.5

## Recommendation

Proper food safety practices for food handlers are important, especially when the food is served to the food-insecure population of the Munishugonj District, Gazaria Union. Food safety education has been shown to be effective in increasing knowledge of Participants in this study and previous studies (20, 75, 76, 77). Food safety training has also been shown to be effective in the adoption of safe food handling behaviors by food service workers; however, these studies did not observe the actual food safety practices of the food handlers. The results were based on participants' self-reported practices. It has been reported that when food handling behaviors are observed, food safety knowledge does not always correspond with proper food safety practices. It is essential to explore further if food safety training leads to improvement in safe food handling behaviors by observing the food handlers during food preparation. In addition, the adoption of safe food handling behaviors may not increase the safety of the food served to this vulnerable population. Without microbial analyses and time/temperature checks of the food, etc., it is impossible to determine if the food safety curriculum and delivery of the program made the food served by the food recovery agencies safer for those receiving assistance. Perhaps further exploration and testing the safety of the food is needed.

## Conclusion

The results of this study support the hypothesis that the development and delivery of a food safety education program for participating food recovery agency personnel and volunteers will increase food safety knowledge and an

indication of the adoption of safe food handling behaviors. This will presumably decrease the risk and incidence of food-borne illness in those receiving assistance. The overall goal of the project was to develop a strategy for preventing food-borne illness by promoting food safety practices in personnel and volunteers providing food to a vulnerable population in the Lower Mississippi Delta who utilizes food recovery programs. The results of the study suggest this goal was achieved. The improvement, statistically (Food Safety Knowledge Pre- and Posttest) and qualitatively (Food Safety Practices Survey and Delayed Survey) of the knowledge and the willingness on the part of food handling personnel and volunteers of food recovery agencies to change (Food Safety Practices Surveys) food handling practices, support the continued use of the food safety curriculum in the district.

## REFERENCES

- [1] A. Coleman-Jensen, M. Nord, M. Andrews, and S. Carlson, "Household food security in the United States in 2011," in *Food Insecurity Among Disabled Adult Households*, 2013.
- [2] A. Coleman-Jensen, M. P. Rabbitt, C. Gregory, and A. Singh, "Household food security in the United States in 2014," in *U.S. Household Food Security: Statistics and Analysis for 2014*, 2016.
- [3] A. Coleman-Jensen, M. Nord, and A. Singh, "Household food security in the United States in 2012," in *U.S. Household Food Security: Statistics and Analysis for 2012*, 2014.
- [4] S. Nord, Mark; Andrews, Margaret; Carlson, "Measuring Food Security in the United States," *Security*, no.

- September 1999, pp. 1–20, 2006, [Online]. Available: [www.ers.usda.gov](http://www.ers.usda.gov).
- [5] A. Coleman-Jensen, M. P. Rabbitt, C. Gregory, and A. Singh, “Statistical supplement to household food security in the United States in 2014,” in *U.S. Household Food Security: Statistics and Analysis for 2014*, 2016.
- [6] M. A. Rahman, N. Akter, and S. M. Saleh, “Health Data Mining : Machine Learning Approach,” *Univ. South Asia J.*, vol. 3, no. 1, pp. 89–97, 2017.
- [7] E. Odell, T. Kippenbrock, W. Buron, and M. R. Narcisse, “Gaps in the primary care of rural and underserved populations: the impact of nurse practitioners in four Mississippi Delta states,” *J. Am. Assoc. Nurse Pract.*, 2013, doi: 10.1111/1745-7599.12023.
- [8] S. Mayfield-Johnson, R. S. Mohn, A. K. Mitra, R. Young, and E. M. McCullers, “Attitudes on Barriers and Benefits of Distance Education among Mississippi Delta Allied Health Community College Faculty, Staff, and Students,” *Community Coll. J. Res. Pract.*, 2014, doi: 10.1080/10668926.2011.567155.
- [9] I. Rafiqul, “Rural Women’s Empowerment through Self-income Generating Activities: A Study on NGO Development Programs in Bangladesh,” *J. Glob. Citizsh. Equity Educ.*, vol. 1, no. 1, pp. 96–123, 2011.
- [10] ISABELLE GUERIN, and JANE PALIER, “Microfinance and the Empowerment of Women: Will the Silent Revolution Take Place?,” *Yale Law J.*, no. 25, pp. 76–82, 2006, doi: 10.2307/20455680.
- [11] D. Chhay, “Autonomisation économique des femmes à travers le microfinancement au Cambodge,” *Dev. Pract.*, vol. 21, no. 8, pp. 1122–1137, 2011, doi: 10.1080/09614524.2011.606891.
- [12] BRAC., “Annual REPORT 2011:,” 2011.
- [13] A. I. L. M. A. R. T. Rahman, “Mining Weighted Association Rules Using Probabilistic and Combinational Approach,” *Int. J. Sci. Res.*, vol. 6, no. 2, pp. 475–479, 2017, doi: 10.21275/ART20163652.
- [14] Mohammed Ashikur, Rahman *et al.*, “Socio-demographic Characteristics & Pattern of Disease among Patients attending in Alternative Medical Care-----A Cross-sectional Analysis Bangladesh Journal of Public,” *Bangladesh J. Public Heal.*, vol. 01, no. 01, pp. 59–61, 2016.
- [15] M. Al Amin, “NGO roles in economic empowerment of rural women in Bangladesh,” 2014.
- [16] A. M. M. Husain, “An Impact Assessment Study of BRAe ’ s Rural Development Programme : Lessons from Methodological Issues BRAe,” no. September, 1998.
- [17] M. A. Rahman, S. M., and S. Maruful, “Intrusion Detection System for Wireless ADHOC Network using Time Series Techniques,” *Int. J. Comput. Appl.*, vol. 162, no. 1, pp. 38–42, Mar. 2017, doi: 10.5120/ijca2017913408.
- [18] S. Laszlo, K. Grantham, E. Oskay, and T. Zhang, “Grappling with the challenges of measuring women’s economic empowerment in intrahousehold settings,” *World Dev.*, 2020, doi: 10.1016/j.worlddev.2020.104959.
- [19] M. A. Rahman and T. Rahman, “Proposed Machine Learning Model to Predict Child Birth Process,” *Univ. South Asia J.*, vol. 3, no. 1, pp. 117–124, 2017.
- [20] S. Sultana and S. Hasan, “Impact of Micro-Credit on Economic Empowerment of Rural Women,” *Agric.*, 1970, doi: 10.3329/agric.v8i2.7576.

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