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Research Article

Farmers' Knowledge and Perception on Major Insect Pests of Rice and their Integrated Management in Gorkha, Nepal

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Abstract

Rice (*Oryza sativa* L.) is the major staple crop of Nepal. Various insect pests cause high yield loss in field and storage condition. The study was carried in September-October 2018 to assess farmer's knowledge and perception on major insect pests of rice and their integrated management in Gorkha, Nepal. Respondents were selected randomly from among the study area. 120 samples were taken from 750 sampling population. Household survey was used to collect information by using a semi-structured questionnaire. The collected data were processed and analyzed by using MS-Excel and SPSS. The study revealed that rice gundhi bug, yellow stem borer and grasshopper were the major rice field pest while rice weevil and rice Angoumois moth was the major storage pest of rice in the study area. Biological practices were the least adopted practice. Use of resistant variety, use of well decomposed fertilizer, crop rotation, adjustment of planting date were the least adopted cultural practices while use of traps, rouging and clipping were the least adopted mechanical practice. All of the respondents were found to use chemical method without using all the protective wearing and safety measures. Only, few respondents had the knowledge of IPM and attended training on IPM.

Keywords: Insect Pest; IPM; Perception; Pesticide and Socio-demographics

Introduction

Agriculture is the backbone of Nepalese economy contributing 28.89% of its GDP [1]. Rice is the largest crop industry of South Asia including Nepal, playing significant role in economic and agricultural development [2]. It ranks first among the cereals in terms of area and production [3]. It alone supplies 40% of the food calorie intake and contributes nearly 20% to the AGDP and 7% to GDP [4].

Gorkha has managed only a productivity of rice of 2.83 MT/ha [5] which is lower than that of national average productivity and far behind the potential productivity at field condition which may not be sufficient for aggrandizing population. The productivity of rice has been decreased from 3.23 t/ha to 2.83 t/ha from 2073 to 2074 B.S [5]. This huge gap in the attainable yield and actual yield at field and decreased trend of productivity may be the result of non-crop factors such as insect, pests, diseases, weed and other environmental stresses. Insect pests constitute one of the major yield reducing factors in rice production. Further, there has been huge storage loss due to the inefficient store house and severe storage pest attack. Annual crop loss due to insect and vertebrate pests is estimated at about 25% to 38% [6]. Insect pests not only reduce the yield but also increase the production and storage cost causing both quantitative and qualitative losses.

Further, the preference of farmers towards susceptible variety, high use of chemical fertilizers, use of impure seeds, unhealthy cultivation practices has added fuel for the growth and development of rice pests such as yellow steam borer, rice gundhi bug, brown plant hopper and grasshopper causing devastating yield loss in rice. Similarly, farmers of this region are unaware about the appropriate management practices to control these insect pests and thus are using chemical pesticides haphazardly. The random use of chemical pesticides has killed beneficial insects too which the

farmers exactly are unknown of. Thus insect pests have created both economic as well as ecological problems in this region

The current sluggish growth rate in yield can only be accelerated by using stress tolerant activities like sound Integrated Pest Management (IPM) practices that helps to create food security by increasing the productivity of rice [7]. It is the central idea of this research. This research is an attempt to picturize the knowledge level of farmer regarding the insect pests of rice and their management practices which would be helpful in finding out the lags and intervention points for reducing the huge yield loss due to insect pests. It would also be helpful in the identification of major and minor insect pests causing high yield loss in field and storage condition. Sound pest management practices adopted by the farmers can be promoted and the wrong practices could be eradicated by the study of prevailing practices. The extent of use of chemical pesticides in the study site could be known by the help of this research which could be the baseline for formulating organic agriculture promotion programs. It could thus be helpful for the policy makers and stake holders for formulating integrated pest management trainings and programs based on farmer's knowledge and perception. Further, it may also be helpful for finding out the research topic of establishing eco-friendly and economic management of insect pests of rice specific to this region.

Objectives of the Study

Broad objective

To assess the farmer's knowledge and perception on insect pests of rice and their management in the study area.

Specific objectives

- To identify the major insect pests of rice field and storage.
- To find out the adoption status of IPM practices in rice field and storage.
- To identify the extent of chemical pesticide use in rice field and storage.

Materials and Methods

Site of the study

Gorkha is one of the hilly district of western region lying between 28° 28' 35.04" N latitude and 84° 41' 23.28" E longitude. The district is 228m to 8,163m above mean sea level. It is characterized by maximum average temperature of 32.7°C and minimum average temperature of 4.4°C with an average annual rainfall of 1127mm. It holds 47.7% of cultivable land and 46.67% cultivated land of the total area of 3,61,000ha [5]. With 2,32,828 numbers of agriculture dependent population, the major crops grown are rice, wheat, maize, barley, lentil, chick pea, pea, black gram, pigeon pea, mustard, linseed, sunflower and ground nut. Rice dominates the cultivated area and production with 76,840 ha and 2,38,958 MT respectively [5].

Selection of the study area

The study was conducted in major rice growing region of the district that is one municipality and two rural municipality namely Palungtar Municipality, Ajirkot Rural Municipality and Siranchowk Rural Municipality respectively. These areas were purposively selected for the study.

Sampling procedure and sample size

Commercial Rice growers having more than 0.7 ha of rice cultivation area and members of three farmers' group of study area were the target population for the study. For this, DADO profile report and farmers' group report were analyzed and listed. Among the 750 farmers meeting above two criteria, 120 households were selected based on simple random sampling. For this, 50 households from Palungtar municipality, 35 from Ajirkot and 35 from Siranchowk rural municipality were selected based on rice farmers' distribution in study area. In order to avoid the biasness in the selection of the sample, a simple random sampling technique was adopted as this provides an equal chance for a selection of the elements from the sampling frame [8].

Instrument for data collection

The data collected for this study were obtained from primary and secondary sources. Primary data was collected from the field survey through the administration of pre tested semi-structured questionnaire which was used to solicit information from the respondents on issues related to objectives of the study.

Secondary data were collected from the various sources. District annual report, district profile, annual progress report and statistic book of DADO, Gorkha, rice profile book of DADO, various report from Ministry of Agriculture Development (MoAD), Central Bureau of Statistics [9], cooperatives, bulletins, books, publications from different governmental and non-governmental organizations, journals, proceedings of various NGOs and INGOs were the sources of secondary information for the study.

Data analysis

Quantitative and qualitative data obtained from the survey was analyzed and interpreted by using SPSS and MS-excel. The results were presented using descriptive tools like mean, standard deviation, frequency, percentage, bar diagrams and pie charts. Indexing was used in the ranking of important insect pests of rice.

Results and Discussion

Socio-demographic characteristics of the respondents

Variables	Frequency	Percent	Mean
Age (years)			
Less than 30	12	10	38.4
30 - 40	60	50	
41 - 50	30	25	
51 - 60	12	10	
More than 60	6	5	
Gender			
Male	102	85	
Female	18	15	
Education level			
Illiterate	9	7.5	
Primary level	18	15	
Secondary level	48	40	
Higher secondary level	36	30	
University level	9	7.5	
Farming experiences in yrs.			
Less than 10	12	10	18.49
10 to 15	24	20	
15 to 20	42	35	
20 to 25	18	15	
More than 25	24	20	
Major occupation			
Agriculture	72	60	
Trade	12	10	
Service	24	20	
Others	12	10	
Farm size in ha			1.54
Greater than 2	42	35	
1 to 2	54	45	
0.7 to 1	24	20	

Table 1: Socio-demographic characteristics of respondent rice farmers in study area, 2018.

Total number of rice farmers under survey is 120 for all variables.

Results presented in table 1 illustrate the socio-economic characteristics of rice farmers in Gorkha, Nepal. The results showed that the mean age of respondents was 38.4 years. The implication is that the rice farmers in the study area are fairly young. The mean age of farmers in Nepal is usually between 43 - 47 years [10]. As revealed by table 1, the majority (85%) of the farmers were male. This implies that rice farming business is male dominated in the study area. This may be due to the high degree of human energy and physical exertion associated with farming activities, as it is evident from significantly low frequency of involvement of women in rice cultivation.

Information furnished in table 1 also revealed that the majority (77.5%) had attended secondary level or more education. This implies that rice farmers in the study area are educated and could be trusted to adopt any innovation that could enhance rice farming practices. Okunlola [11] stated that educational level is one of the factors that influence adoption of new technology by farmers. The majority (35%) of respondents, had between 15 - 20 years farming experience. The mean farming experience of respondents was 18.49 years. Of the 120 respondents, major occupation of the respondents of the study site was agriculture (60%). The average landholding of the respondents was 1.74 hectares which was higher than the national average (0.68 hectare) [10]. Similarly, the average rice growing area was 1.54 hectare in the study area.

Farmers' knowledge and perception on rice insect pests

Major rice insect pests of the study area

Mode of damage	Insect	Index	Rank
Leaf damaging insect	Rice grasshopper	0.739	III
	Rice leaf folder	0.607	V
	Rice hispa	0.527	VI
	Army worm	0.327	VII
Sap sucker	Brown plant hopper	0.619	IV
	Green plant hopper	0.261	VIII
Stem/heart damaging insect	Yellow stem borer	0.881	II
Root feeding insect	Mole cricket	0.123	IX
Grain damaging insect	Gundhi bug	0.954	I

Table 2: Ranking of rice field insect pests by respondents in study area (2018).

When asked to rank rice insect pests based on their importance, respondents ranked Gundhi bug (grain damaging insect) as the first and Yellow stem borer (stem/heart damaging insect) as the second most detrimental insect pests on rice field as shown in table 2.

Major storage insect pests of rice

Figure 1 shows that majority of the respondents (45%) perceived Rice weevil as the major storage pest of rice while 28.3% perceived Angoumois moth as the major storage pest. However, 26.7% of the respondents perceived both of these insects as major storage insect pests of rice.

Adoption status of integrated management of rice insect pest

From table 3, it was observed from this research that almost all the respondents adopted the cultural practices like deep tillage (98.3%) and flooding (96.7%). The other cultural practices mostly

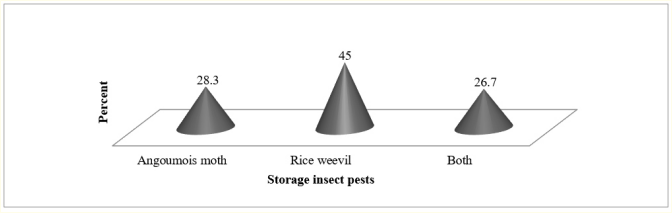

Figure 1: Major storage insect pests of rice in study area (2018).

Various practices	Yes	No
Cultural practices		
Field sanitation/Removal of crop residue	98 (81.7)	22 (18.3)
Deep tillage	118 (98.3)	2 (1.7)
Use of well decomposed FYM	36 (30.0)	84 (70.0)
Adjust planting date	42 (35.0)	78 (65.0)
Use of resistant variety	32 (26.7)	88 (73.3)
Seed treatment	40 (33.3)	80 (66.7)
Adjust spacing	50 (41.7)	70 (58.3)
Recommended seed rate	60 (50)	60 (50)
Recommended dose of fertilizer	64 (53.3)	56 (46.7)
Flooding	116 (96.7)	4 (3.3)
Alternate Wetting and Drying	46 (38.3)	74 (67.7)
Stubble burning	96 (80.0)	24 (20.0)
Crop rotation	38 (31.7)	82 (68.3)
Mechanical practices		
Handpicking	52 (43.3)	68 (56.7)
Shaking	60 (50.0)	60 (50.0)
Rouging	36 (30.0)	84 (70.0)
Clipping	38 (31.7)	82 (68.3)
Use of traps	8 (6.7)	112 (93.3)
Winnowing	118 (98.3)	2 (1.7)
Physical practices		
Sun dry	110 (91.7)	10 (8.3)
Moisture maintenance	52 (43.3)	68 (56.7)
Biological practices		
Bio-pesticides	20 (16.7)	100 (83.3)
Conservation of natural enemies	8 (6.7)	112 (93.3)

Table 3: Adoption status of various practices to control rice insect pests in study area (2018).

Figures in parenthesis indicate percentage.

followed were field sanitation (81.7%), stubble burning (80%). Field sanitation is a primary cultural practice that helps to reduce the chance of infestation of majority of insect pests in the field [12]. Similarly, mostly used mechanical practice to control rice insect pest was winnowing (98.3%) which is used to control storage rice insect pests. Likewise, some physical methods include sun drying and different measures of moisture maintenance to control storage insect pests of rice. Also, very few (6.7%) of the respondents conserved natural enemies and only 16.7% respondents used bio-pesticides for insect pest control. It was found from the research that almost all the people are unknown of the biological control method of rice insect pest control. The other reason for the low use of biological method is due to exorbitant price of bio-pesticides.

Knowledge and perception on chemical method

Frequency of application

Pesticide application	Frequency	Percent
Once	18	15.0
Twice	28	23.3
More than twice	46	38.4
At the time of insect attack	28	23.3
Total	120	100.0

Table 4: Frequency of application of chemical pesticides in study area (2018).

The data in the table 4 reveals that most of the rice growers (38.3%) of the study site applied pesticide more than twice a growing season and 23.3% of the respondents applied pesticides twice a season and at the time of insect pest attack. Only 15% of the respondents applied pesticide once a rice growing season. This shows the heavy use of the pesticide in the study site.

Dose of application

It was evident from the research that majority (58.3%) of the respondents applied pesticide randomly while 30% of the respondents applied the dose as per the suggestion of the seller (Table 5). Very few (11.7%) respondents were followed the doses provided in the label.

Protective wearing

The research revealed that none of the applicators followed all the recommended safety measures which have shown that higher

Dose	Frequency	Percentage
As prescribed by seller	36	30.0
As written in label	14	11.7
Randomly	70	58.3
Total	120	100.0

Table 5: Dose of pesticide application in study area (2018).

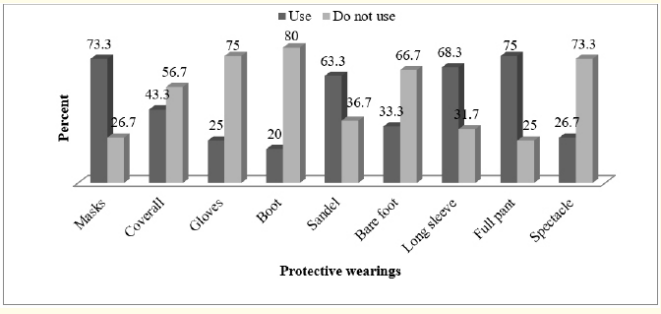

Figure 2: Use of protective wearing during pesticide spray in study area (2018).

number of farmers is exposed to the pesticide risks and health hazards. The majority of the respondents used full pant (75.0 percent), masks (73.3 percent) and sandal (63.3 percent) as protecting wearing against pesticide use while very few farmers used other protecting wearing as shown in the bar diagram.

Knowledge on IPM

Information on IPM

Heard about IPM	Frequency	Percent
Yes	22	18.3
No	98	81.7
Total	120	100.0

Table 6: Information of IPM in study area (2018).

Table 6 reveals that only 18.3 percent of the respondents had heard about the IPM while 81.7 percent of the respondents had not heard about IPM. This may be due to the poor extension of IPM technology in the study area.

Training on IPM

Table 7 reveals that only few (11.7 percent) respondents had attended training on IPM while rest of 88.3 percent of respondents had not got the chance of taking training on IPM.

IPM training	Frequency	Percent
Yes	14	11.7
No	106	88.3
Total	120	100.0

Table 7: Status of IPM training in study area (2018).

Conclusion

Rice gundhi bug, Yellow stem borer and Grasshopper are the major insect pests of rice and rice weevil and Angoumois moth are the major storage pests of rice. Among the various IPM practices, adoption of biological practices was poor. The practices like crop rotation, use of resistant variety, use of well decomposed FYM, seed treatment, use of traps, clipping were adopted by only few farmers. All the respondents used chemical method of insect pest control. Most of the farmers applied pesticide randomly without using all protective wearing and knowing all safety measures. Majority of farmers had not heard about IPM and only very few farmers had taken training on IPM.

Suggestion

For the control of rice insect pests, quality seeds should be distributed to the farmers. Location specific insect pest control research should be conducted and the effectiveness of the control measures should be promoted through FFS. Efficient extension programs should be conducted for the promotion of IPM practices in rice field and storage. Heavy use of chemical pesticide should be controlled and replaced by safe methods. Farmers should be made aware about health hazards and environmental hazards of random use of chemical pesticides through extension programs. Policies and programs aiming the reduction of use of chemical pesticides need to be formulated.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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