

Full Length Research Paper

Impact of school pond education programme conducted for adolescent students of Chitwan and Nawalparasi districts, Nepal

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Malnutrition consists of a deficiency, excess or imbalance of energy and other macro-and micro-nutrients that changes the body composition and function, resulting in poor clinical outcomes. This study aimed to analyze the effectiveness of behavioural-based nutrition education to increase fish consumption among school children using two types of pond in Province-3 and 4 of Nepal constructed in secondary level of four schools. The objective was to create awareness through establishing fish ponds in schools and educate adolescent students on the nutritional value of fish as a supplement to their regular diet. School community member selected 57 males and 64 females students including 2 teachers were trained during this programme. Results showed that the knowledge about the nutritive value and production system of fish in the pre-training was quite poor. At the end of the training, the knowledge of students on fish production and nutritive value of fish were significantly increased ($p < 0.05$). Number of students scoring < 40 decreased while number of students scoring 61-80 and > 80 increased after training ($p < 0.05$). Other observation was the significant increased consumption (times/year) of fish (13.1 ± 7.1) and its frequent inclusion in the diet post training as compared to before training (7.7 ± 3.3) ($p < 0.05$). After six months of project establishment awareness about nutritive value of fish, family members of 14.5% students also constructed their own fish ponds at their home around after getting training. Thus, development of school ponds increased awareness on the value of nutrition and fish consumption in rural households by teaching school children and teachers about Aquaculture.

Key words: School children, aquaculture, nutrition, women group, Nepal.

INTRODUCTION

Nepal is among the world's poorest countries, ranking 148th out of 189, with a Human Development Index (HDI) score of 0.574 in 2019. The United Nation World Food Programme (2020) estimated that 285 million people could face acute food insecurity by the end of 2020 up

from 135 million people before the crises, because of income and remittance losses.

Malnutrition has a multi-dimensional impact, from hindering individuals' capacities to affecting the overall socio-economic development of a country. Malnutrition

among children is a global health concern, especially prevalent in Asia and Africa (Panigrahi and Das, 2014). It is an alarming condition as every country is facing a serious public health challenge from malnutrition (IFPRI, 2014). Proper nutrition in school age children is essential for maintaining growth, cognitive development, and lifelong health (Tiwari et al., 2014; IFPRI, 2016). It is reported, that nearly half of all children less than 5 years of age in South Asia are undernourished (Cunningham et al., 2015). Poor dietary quality is of public health significance among adolescents in Nepal (Darrouzet-Nardi et al., 2016). Under nutrition in adolescents has a harmful consequence as it influences their ability to learn and work at maximal productivity (Rode, 2015). Low farm productivity, limited livelihood opportunities and weak market connection caused by poor infrastructure, together with geographical heterogeneity gender and caste disparities are considered as underlying causes of food insecurity and under nutrition in Nepal (MoALD et al., 2018). Though, Nepal experiences fastest recorded reduction in stunting from 2001 to 2011 in the world but still more to achieve the goal (Headey et al., 2015; Cunningham et al., 2017). Short stature of women reflects poor socio-economic conditions and inadequate nutrition during childhood and adolescence (MoH et al., 2017).

Women play an integral role in aquaculture and fisheries sectors all over the world. Even though women's roles and responsibilities are changing in some countries, there are constraints that limit female participation in aquaculture. Some constraints women face in aquaculture and fisheries include time, land ownership, and access to water, credit, training, and labour. Lack of training opportunities can trap women in vulnerable and poorly paid positions with no prospects of advancement (Jha et al., 2016). Besides, several health benefits of Omega-3 or N-3 fatty acids, protein, amino acids, folic acids, and vitamins are found in the fish of all age group (Gurung, 2016). Nepal being a landlocked country to fulfill the aquaculture needs must depend on fresh water products. Approximately, 5% of the total area of the country is known to be occupied by different freshwater aquaculture habitats in the form of river, lakes, swamps, ponds, and rice fields which occupy 389,000 ha. Out of such an area, Nepal's total production of fish was 8,3897 mt in the year 2017 (DoFD, 2017). There is a global concern that nutritious food must be supplied to women as well as their children during the first 1000 days of life. Fish provides valuable nutrients to the world's population, including high-quality proteins; balanced amino acids; vitamins A, D, and B12; iodine and selenium; and long-chain omega-3 polyunsaturated fatty acids. Fish bones, when eaten, are also an excellent source of calcium,

phosphorus, and fluorides (Jha, 2013). The immediate need is to increase awareness among rural communities of the potential for backyard fish farming, while in the long term, commercial aquaculture should be encouraged (Bhujel et al., 2008). Also, fish contribution to household food and nutrition security depends upon availability, access, and cultural and personal preferences (Beveridge et al., 2013). The National Nutrition Policy and Strategies (2004) also has provision for training the farmers about food safety, food processing, and cooking demonstrations to prepare local nutritious food.

Although several studies have been done to enhance nutritional status of adolescent children, there are very limited studies involving secondary school children to create awareness on nutritional value of fish and practical hands-on training for farming fish. Thus, the present study was undertaken by establishing fish ponds in schools and educating adolescent students on the nutritional value of fish as a supplement to their regular diet and methods of aquaculture. In this context, a lesson that is intertwined with the classroom cannot be expected to be conducted effectively and efficiently in a confined environment within classroom walls. For this reason, outdoor education should be seen as a necessity, not as an alternative, and should be employed with good planning in education. In addition to educating individuals who are aware of the nature consciousness and environment they live in, approaches that are based on the idea that learning is not confined only to classroom or school walls, but covers the whole of human life, which allows knowledge gained to be used in daily life are taken into consideration (Ministry of National Education (MoNE), 2017).

MATERIALS AND METHODS

Study area

This study was conducted during April 2015 to April 2016 in Chitwan (latitude 27°36'21.60" North, longitude 84°22'47.28" East) and Nawalparasi (Latitude 27° 46' 1" N, Longitude 84° 10' 45" E) districts of Central and Western Development Regions of Nepal.

Selection of schools

A list of secondary level public schools was gathered from the District Education Office of Chitwan and Nawalparasi districts. After visiting many schools, four schools were selected, two in each ofm Chitwan and Nawalparasi districts, based on site suitability, water availability and interest of school management (Figure 1). The names of selected schools were Nepal Higher Secondary School, Tandi, Chitwan; Kathar Higher Secondary School, Kathar, Chitwan; Priithivi Secondary School, Pragatinagar, Nawalparasi; and Janta Higher Secondary School, Kawasoti, Nawalparasi. Before starting

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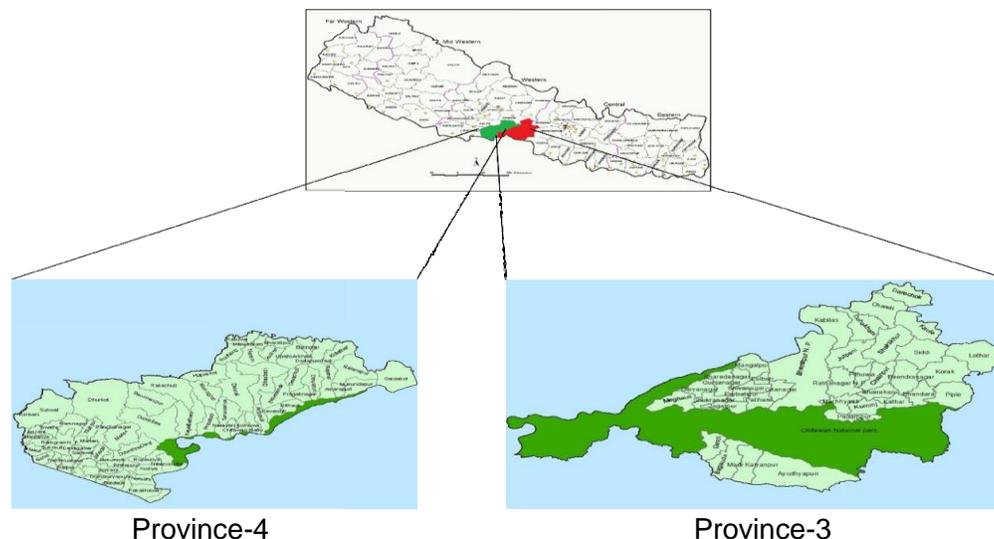


Figure 1. Map of Chitwan and Nawalparasi districts showing the study area.

the programme, there were consultative meetings at selected schools, which were attended by school principals, village leaders, teachers, school children, fisheries officers, and scientists from Fishery stations/universities.

Pond construction and fish stocking

A pond of 76 to 264 m² in size was constructed in each school. These school ponds were used to demonstrate a complete cycle of fish production. Carps and tilapia of 5 to 10 g size were stocked in each pond at 10,000 fish/ha (7000 carps and 3000 Nile tilapia/ha). Among Carp species, silver carp, bighead carp, common carp, grass carp, rohu and mrigal were stocked at the ratio of 2:2:2:1:2:1. Fish feeds and other necessary items were provided to each school. The ponds were managed by students and teachers throughout culture cycle. Fish harvesting was done after 5 months of stocking (Figures 2 to 5).

Training of students and teachers

A course of study was developed for students and teacher education on fish culture. About 30 students of class 8, 9, and 10 and 2 teachers were selected from each school to receive training on fish culture and nutritive value of fish. Training of teachers and students included different fish pond construction techniques, fish pond management as well as harvesting techniques of fish, and nutritive value of fish. Monthly training (3-4 h) was conducted in all 4 different schools.

Training workshop of parents (Women group)

Two women's fish farming groups were formed in the school community for each district. A workshop was organized in each district for men's groups to expand understanding of the value of fish production and consumption for their families. A linkage was developed so that women's fish farming groups could ultimately work with teachers and students in each school to ensure the long-term sustainability of the school ponds. A total of 58 women received training on the school pond along with the importance of

fish for human nutrition and income, and fish farming techniques problems and prospects. Seminars involved the fisheries women group participating and tackling problems herself and then working out solutions together.

Pre and post-training survey of students and parents

Two surveys were designed to test the knowledge of students and parents in fish pond production, benefits of fish nutrition, changes in fish consumption and production. The surveys were administered before and after training in each school system. A semi-structured questionnaire was prepared to collect baseline information about fish and fish pond production during training period from students, teachers, and parents as well as household consumption.

Statistical analysis

Simple statistical analysis was carried out using Microsoft Excel and Statistical Package for the Social Sciences (SPSS) Software Packages (Ver.16.0) (Table 1).

RESULTS AND DISCUSSION

Constructed ponds in each school in Chitwan and Nawalparasi districts which differed in design due to land available for a pond, location within the school, and soil permeability conditions. The construction and operation of these ponds was a very exciting event for the school communities. Often, few adults showed up for events like stocking and harvesting, as well as visits during our training exercises. In fact, the ponds were so popular that a neighbouring farmer constructed several similar ponds in Kawasoti within few months of our school pond construction, and the local people wanted advice and materials to construct a community pond on school Nawalparasi districts which differed in design due to land

Table 1. Name of schools, location, size and type of fish pond type.

S/N	School name	Address	Pond size (m ²)	Pond type
1	Nepal Higher Secondary School	Province-3, Chitwan	91	Earthen pond with plastic lining
2	Kathar Secondary School	Province-3, Chitwan	116	Earthen pond with plastic lining
3	Prithivi Secondary School	Province-4, Nawalparasi	76	Concrete tank
4	Janta Higher Secondary School	Province-4, Nawalparasi	264	Earthen pond with plastic lining

Table 2. Knowledge of students on fish production and nutritive value of fish at different schools before and after training. Data indicates the mean per cent response of the participant students getting different range of scores.

School name	Score obtained (%)							
	Before training				After training			
	<40	40-60	61-80	>80	<40	40-60	61-80	>80
Nepal	80.0	17.1	2.9	0.0	0.0	23.0	57.0	20
Kathar	71.0	29.0	0.0	0.0	0.0	0.0	42.0	58.0
Prithivi	50.0	35.7	14.3	0.0	3.6	17.9	42.9	35.9
Janta	82.6	8.7	9.7	0.0	0.0	8.7	60.1	30.2
Mean	70.9±7.4 ^b	22.6±6.0 ^a	6.7±3.2 ^a	0.0±0.0 ^a	0.9±0.9 ^a	12.4±5.1 ^a	50.5±4.7 ^b	36.0±8.0 ^b

Mean values with different superscript in the same row of same score range are significantly different (chi-square test, $p < 0.05$).

Table 3. Household pond and fish consumption status of the participating students before and after training.

School name	Number of students (n)	Having fish pond (% response of n)		Fish consumption (times/year)	
		Before training	After training	Before training	After training
Nepal	35	5.7	8.6	4.3±4.1	7.7±4.3
Kathar	31	12.9	25.8	22.4±30.3	27.1±41.1
Prithivi	28	7.1	7.1	2.9±3.1	7.3±4.5
Janta	23	17.4	17.4	3.0±3.7	7.7±5.6
Mean	29.3±2.5	10.8±2.7 ^a	14.7±4.3 ^a	8.2±4.8 ^a	12.5±4.9 ^b

Mean values with different superscript in the same row are significantly different (Chi-square test $p < 0.05$).

communities. Often, few adults showed up for events like stocking and harvesting, as well as visits during our training exercises. In fact, the ponds were so popular that a neighbouring farmer constructed several similar ponds in Kawasoti within few months of our school pond construction, and the local people wanted advice and materials to construct a community pond on school property.

Training was provided for each child in all classes at each school. The pre- and post-training evaluation showed a dramatic increase of awareness, fish consumption rate and construction of fish ponds of participating students.

A total of 121 students were trained during this school pond programme survey results indicated that their knowledge about the nutritive value and production system of fish in the pre-training was quite poor. At the end of the training, the knowledge of students on fish

production and nutritive value of fish were significantly increased ($p < 0.05$; Table 2). Number of students scoring <40 decreased while number of students scoring 61-80 and >80 increased after training ($p < 0.05$) (Table 2). Another interesting observation was the significant increased consumption (times/year) of fish (12.5±4.9) and its frequent inclusion in the diet post training as compared to before training (8.2±4.8) ($p < 0.05$) (Figure 6 and Table 3). The reason behind this being increased awareness about nutritive value of fish. Surprisingly, family members of 14.5% students also constructed ponds after getting training.

Data indicates the mean percent response of the participant students getting different range of scores.

Another interesting observation was the significant increased consumption (times/year) of fish (12.5±4.9) and its frequent inclusion in the diet post training as compared to before training (8.2±4.8) ($p < 0.05$) (Table 3).



Figure 2. Fish pond constructed at Nepal Higher Secondary School.



Figure 3. Fish pond constructed at Kathar Higher Secondary School.



Figure 4. Fish pond constructed at Janta Higher Secondary School.

Malnutrition is a major public health problem in Nepal especially in rural area. It is evident that nutrition education plays an important role in reducing the problem. Cunningham et al. (2017) reported that maternal education plays an important role in reducing malnutrition.

The parent's education is the sole determinant of the adolescent health (Rode, 2015). It seems that there is a scope for improvement on nutritional status among adolescent children through educational awareness programme on aquaculture, nutrition, and health. This



Figure 5. Fish pond constructed at Prithivi Higher Secondary School.



Figure 6. Students' participation during training programme.



Figure 7. A training workshop was organized for fisher women group.

study only occurred over a period of a few months, so there was little time to change behaviour observation of students and their parents, there was a significant increase in knowledge of the students about aquaculture with a medium grade of <40% on the pre-test and 61-80% on post-test during two survey (pre and post training). At first, initial information about the nutritive value and production system of fish was very poor. By the end of the training, the knowledge of students on fish farming and nutritive value of fish was significantly increased with a medium grade of <40% on the pre-test

and 61-80% on post-test during two survey (pre and post training) (Figure 7).

The establishment and operation of these pond was a very exciting event for the school communities. Often, a few adults showed up for events such as stocking and harvesting as well as visit during our training exercises. After establishment of school pond project in community area, where fish ponds projects were so popular that neighbouring farmers constructed several similar ponds in the same community within a few months of our school ponds establishment. Training events helped students,

teachers and community women with benefits of fish to human nutritional needs. Over a period of few months, there was a significant increase in knowledge of the students about aquaculture on the post test. At first initial information about the nutritive value and production system about fish was negligible. By the end of the training, the knowledge of students on fish production and nutritive value of the fish was significantly higher.

CONCLUSION AND RECOMMENDATION

The development of school ponds increased awareness of the value of nutrition and fish consumption in rural households by teaching school children and participating teachers about aquaculture. It will help schools as the teaching material for students especially for those schools which have included agriculture as a part of its curriculum. This research also helped in capacity building of teachers who could spread the knowledge on the importance of fish in nutrition to parents during teacher-parent interactions. For a healthy body, all we need is a balanced combination of proteins, carbohydrates, fats, vitamins, and minerals. A balanced diet need not be special, imported, or expensive. It can be prepared from locally available resources with little effort. It is good to have proper nutrients in balance form, which can be indeed beneficial. The problem of nutritional insufficiency cannot be tackled if considered in absolute form. Nutritional needs differ according to population. Hence, it should be tailored according to the need of the population through awareness creation.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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