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Research Article

Indigenous Technical Knowledge on Ethnic Dishes of Snail in Goalpara District of India

Ms. Hira Prabha Rabha[1], Ms. Minakshi Mazumdar[2], Dr. Uttam Kumar Baruah*[3]
[1]Dudhnoil College, Dudhnoi-783124, Goalpara, Assam
[2]Jawahar Navadaya Vidyalaya, Dudhnoi-783124, Goalpara, Assam
[3]KrishiVigyan Kendra Goalpara, National Research Centre on Pig, Indian Council of Agricultural Research, Dudhnoi-783124, Assam

***Corresponding author**
Uttam Kumar Baruah
Email: ukbaruah@rediffmail.com

Abstract: Fresh water snails have been a traditional food for the tribal people of Goalpara district, India. It is believed that snail meat cures eighteen ailments which are not yet validated. An investigation was conducted in eight Rural Development Blocks of Goalpara district of India for exploring the traditional methods of preparing ethnic snail dishes and their ethno-medical uses. A total of 120respondents were interviewed using a structured and validated questionnaire. Eighteen independent variables and eleven critical dependent variables were selected for designing the questionnaire. Statistical techniques and tools used were frequency and percentage analysis, and simple correlation. The results revealed that there are eleven methods for preparation of traditional snail dishes. These dishes are traditionally used for healing of eighteen ailments. The study suggested the need of validation of these traditional practices for commercialization of the traditional cuisine of the district.
Keywords: Snail dishes, ethno-medical, lathyrus, roselle, alkali.(*kola khar*)

INTRODUCTION

Goalpara district (25^0 5′N to $60^0$10′N Latitude and $90^0$00′to $91^0$15′E Longitude) is inhabited by different population *viz*. Scheduled Tribes (36.10%) which includes *Rabha*, *Boro*, *Garo* and *Hajong*; Scheduled Castes (6.55%) and general caste (43.45%) [1]. Snail dishes have been delicacies in Goalpara district for the indigenous people excepting the immigrant Mushlims. Snail is also believed to have medicinal properties and has been used for treatment of various ailments. The people normally collect snails from natural source. Beels (oxbow lakes) are the main source of fish and aquatic organisms in the state [2]. A study was conducted in Goalpara district to explore the indigenous technology knowledge (ITK) related to preparation of ethnic dishes of snails and their uses of common ailments. The study, depending on uses of snail and their importance, aims to draw inference for inclusion of snail farming after validation of its traditional aquaculture.

MATERIALS AND METHODS

The study was conducted in eight rural development blocks of Goalpara district of India. Both primary and secondary data were used in this study. Secondary data were collected from the published literature such as project reports, official documents etc. Primary data were collected through structured and validated questionnaire to elicit information from the respondents. The sampling procedure consisted of purposive selection of 120 respondents for investigating the Indigenous Technology Knowledge related to traditional freshwater snail dishes. Eleven critical questions related to collection of freshwater snails and preparation of traditional snail dishes were developed and included in the questionnaire as variable dependents. The questions included were(i) do you eat snail?(Q_1), (ii) how many snail species you can identify?(Q_2), (iii) how many species of snail are available in your locality which is edible?(Q_3),(iv) how many snail dishes do you know?(Q_4), (v)what are the ailments treated by snail?(Q_5), (vi)is there any declination in snail population in your locality? (Q_6),(vii) is there any deterioration of snail habitats around your locality?(Q_7),(viii)do you think that use of agro-chemicals affect the snail?(Q_8),(ix) is snail population declining due to wild catch?(Q_9),(x) do you think that conservation of snail is necessary?(Q_{10}) and (xi) is snail aquaculture necessary?(Q_{11}). Weights of the questions were decided by the judge's rating. Responses were measured as -most often (MO), often (O), seldom (S) and never (N) with assigned scores of 3, 2, 1 and 0, respectively. Final adoption scores were attained by multiplying the weights of a practice with the corresponding extent of adoption scores. A total of nine socio-economic variables were selected to study the

profile of the farmers. These were - (i) age (X_1), (ii)education (X_2), (iii)marital status(X_3), (iv) family type (X_4), (v)main occupation (X_5), (vi) operational holding(X_6), (vii) annual income (X_7), (viii) economic motivation (X_8), (ix) knowledge on integrated rice snail farming(X_9), (x) possession of means of transportation of snail(X_{10}), (xi)localiteness & cosmopoliteness (X_{11}), (xii) economic motivation(X_{12}) , (xiii) decision making ability(X_{13}), (xiv) scientific orientation (X_{14}) , (xv) interest(X_{15}) , (xvi)information seeking behaviour (X_{16}), (xvii) knowledge of snail culture(X_{17}),(xviii) attitude towards snail business (X_{18}) (Table-1).

Various descriptive and inferential statistical methods were employed to analyse the data following Panse and Sukhatme [3]. The main statistical techniques and tools used were – (i) Frequency and percentage analysis, (ii) simple correlation.

RESULTS AND DISCUSSION

The results of the independent variables are described below. Majority (76%) of the respondents belonged to middle age category (29to 58 years) followed by old (above 58 years) 22% and young (below 29 years) 2%. While 92% of the respondents belonged to high category of educational status that is above high school stand ard, only 8% belonged to medium education level that is between primary and high school stand ard. No respondent was illiterate. Most of the respondents (96%) were married and only small portion (4%) was unmarried. While 68% of the respondents were member of joint family, 32% respondents were from nuclear family. Main occupation for 78% of the respondents was rice cultivation. Rest of the respondents had government job (12%) and business (10%). Operational holding was low (up to 2 ha) for 54%, medium (2.0 to 3.33 ha) for 38% and high (> 3.33%) for 4% respondents. Data on annual income revealed that 56% of the respondents had middle level of annual income (INR 1,50,000.00 - 2,50,000.00) followed by high category (more than INR 2,50,000.00) for 24% and low and (less than INR 1,50,000.00) for20%. Economic motivation of the respondents showed that 68% were in medium level and 32% were in low level category.

None of the respondents had high level of decision-making ability. While majority (80%) respondents had medium level of decision-making ability,20% had low level of decision-making ability. Majority 20% respondents were found in high category, 50% were in medium category and 30% were low category of scientific orientation. In case of information seeking behavior, analysis of data reveals that the majority of the respondents 80% had medium level followed by 20% had low level. None of the respondent exhibited high level of information seeking behaviour. Total 80% of the respondents had high level and 20% had medium level of interest towards snail dishes. Frequency distribution of respondents according to their knowledge on snail culture technology reveals that 20% of respondents exhibited medium level of knowledge followed by 80% in the low level. The attitude towards snail business reveals that 90% of respondents had favourable attitude followed by more favourable10%.All the four tribes have their own techniques of preparing snail dishes. There are no recommended stand and /specifications for preparation of ethnic snail dishes. Snails are normally processed before cooking (http://www.snail-world.com/snails-as-food/). [7]. People normally use common sense techniques for preparation of such ethnic dishes. The present study attempted to categorise the ethnic snail dishes. The investigation revealed eleven categorise of snail dishes (table-2). Those are described below:

1. Snail with black gram and alkali:

Amongst the pulses, black gram is most preferred which is prepared with *kola khar*, analkali of 2.0N(traditionally prepared from banana ash extract).Snail is prepared with black gram and alkali. Ninety percent(90%) of the respondents opined that majority of the people are fond of this preparation.

Process: Snails (*Viviparous viviparous*) collected from natural sources are kept soaked in water for about 48 hours to make them empty stomach. Then they are cleaned off the algae on shell by putting into boiled water for 5-10 minutes. The dead snails are again rinsedin warm water. Opercula of the snails are removed with a sharp knife. Black gram soaked in freshwater for at least three hours, are boiled in *kolakhar* (2.0 N). The processed snails are added into the boiling black gram and cooked for20 minutes. Other ingredients such as ginger paste, green chillies and common salt to taste are added during cooking. About 100g black gram is prepared with 250 g (50 - 60 nos.) of snails for serving five persons. The dishes are served in warm condition.

2. Snail with *pithaguri, kola khar* and gingerleaves:

In general, the tribal people of Goalpara commonly use *pithaguri* (rice powder) as one of the main ingredients for various kinds of traditional dishes. Cleaned rice is soaked in water and then grinded to prepare rice powder. The tribal people use rice powder along with ginger *Zingiber oficinalis*) leaves for preparation of snail dishes. Sixty eight percent (68%) of the respondents elicited that majority of the people commonly prepare snails with rice powder and ginger leaves paste.

Process: Snails(*Viviparous viviparous*)collected from natural sources are cleaned as described above and boiled for about 20 minutes. *Pithaguri* and grinded ginger leaves are boiled with *kola khar* (2.0N) and boiled snails are put into the boiling mixture of *pithaguri* and ginger leaves paste. Salt and green chilli, are added to the preparation. In general, 50g *pithaguri* with about 250 g(50 - 60 numbers) of snails is prepared to serve five persons. Preparation is served in warm condition.

Snail and ginger leaves curry:

Some people, especially, the poor section of the society prepare snail meat with paste of ginger leaves without *pithaguri*. This however is an ordinary dish.

Snail with pumpkin:

Pumpkin (*Cucurbita* spp.) is used as one of the most preferred food item in the district. The tribal people prepare snail with pumpkin. Thirty six percent (36%) of the respondents expressed that this is an ethnic delicacy prepared in festive occasion.

Process: Cleaned snails with shell without opercula are added into prepared pumpkin and cooked for 20 minutes. Salt, turmeric, green chilli, and other spices are added to the preparation. For serving 5 persons, 500g pumpkin and 250g snail (50 - 60 numbers) are prepared.

Snail with papaya and *kola khar*:

Papaya (*Carica papaya*) is a common fruit generally used as vegetable by the tribal people of Goalpara. Papaya is prepared in alkali. Cleaned snails are added into papaya gravy. Sometimes rice powder is also added. Forty percent (50%) of the respondents informed that this dish is prepared occasionally to serve prestigious guests.

Process: Papayais boiled in alkali. Some people use oil for cooking papaya. Use of oil varies from family to family. However, majority of the families don't use oil. Snails along with shell is mixed with papaya and cooked for some time by adding other ingredients according to their taste. About 500 g papaya and 250 g snails (50 - 60 nos.) are used for serving 5 persons.

Snail with ash gourd and *kola khar*:

Ash gourd (*Moschata* spp.) along with snail and *kola khar*is prepared by the tribal people of Goalpara as ethnic dish. Cleaned snails are added into prepared ash gourd. Thirty percent (30%) of the respondents elicited that this is a common ethnic dish amongst them.

Process: Ash gourd is cooked with alkali. Cleaned snails along with shell are put in to cooked ash gourd and cooked again for 20 minutes. Salt, chilli and ginger are added to taste. About 500 g ash gourd and 250 g snails (50 - 60 nos.) are used for serving 5 persons.

Snail fried with onion:

Snail meat fried with onion (*Allium cepa*)is a delicacy in the tribal society of Goalpara. Ten percent (10%) of the respondents elicited that this is a common ethnic dish amongst them.

Process:

Snails are boiled and meat is removed from the shell then fried with onion. Deep fry of snail meat is prepared with sliced onion and other spices such as chilli, black pepper, coriand er powder, cumin powder, garlic paste, ginger paste and salt. About 250 g raw snails(50-60 numbers) and 250 g of onion used for serving 5 persons.

Snail meat and potato curry:

Curry of snail meat with potato (*Solanum tuberosum*) is yet another delicacy. Very less families having access to modern cuisine use this dish. Only two percent(2%) of the respondents have experience of preparation of this dish.

Process: Snails are boiled in water after removing the shell and then fried with potato, sliced onion, other spices such as chilli, black pepper, coriand er powder, cumin powder, garlic paste, ginger paste and salt, then adding water make it curry. About 250 g raw snails (50-60 numbers) and 250 g of onion are used for serving 5 persons.

Snail with gram dal:

Another delicacy in the tribal society of Goalpara is snail curry prepared with gram (*Cicerariecenum*) dal. Four percent (4%) of the respondents elicited that this is an ethnic dish used by the rich section of the society.

Process: Snails are boiled in water and meat is removed from the shell. Then fried with onion and gram dal and boiled in water to prepare curry. Spices like turmeric, chilli, cumin powder, coriand er powder etc. are used. Salt is added to taste. About 200 g dal and 250 g raw snails (50-60 numbers) are used for serving 5 persons.

Snail with roselle:

Roselle (*Habiscus sabdariffa*)is one of the most favourite item for the tribal people of the district. They in general use roselle leaves for preparation of curry. When snails are available they prepare snail meat with roselle leaves. Ten percent (10%) respondents expressed that they prefer this dish to any other snail dishes.

Process: Snailswith shells are boiled then roasted to bring out the meat. Snail meat is fried in oil along with roselle leaves and then cooked to make gravy. Green chilli is the only spice used in this dish. Salt is added to taste. About 250 g snails (50 - 60 nos.) and 50 g roselle leaves prepared to serve 5 persons.

Snail with lathyrus:

Snail with (*Lathyrus sativus*) is another ethnic dish of the tribal society of the district. Lathyrus (*khesharidal*)is generally used by the people during pre-monsoon season. Generally it is used for preparation of curry. Two percent (2%) respondents expressed that they prefer this dish to any other snail dishes.

Process: Snails are boiled by giving salt and then cooked with *khesharidal* and *kola khar*. Spices like salt, turmeric, chilli, cumin powder, coriand er powder *etc*. are used. About 250 g snails (50 - 60 nos.) and 100 g lathyrus is prepared to serve 5 persons.

Ethno-medical uses of freshwater snails in the districtare –

1. Snail meat is used for treatment of whooping cough.
2. Fluid produced by snails is used for treatment of hypertension.
3. The snail meat is also recommended for treatment of ulcer
4. Snail meat is use for treatment of asthma.
5. Snail meat helps reducing the iron deficiency.
6. Snail is rich in mineral such as calcium, phosphorus, iron, and copper;whichhelpinmitigating mineral deficiency.
7. Snail meat is also used for the treatment of arteriosclerosis.
8. It cures anaemia, high blood pressure and other fat related ailments.
9. Snail meat is used for treatment ofhaemorrhoids and constipation.
10. Snail meat is used in treatment of poor eye-sights.
11. Snail meat is used to also prevent heat problems.
12. Consumption of snail meat help in treatment of kidney related diseases.
13. Snail meat is used as suppressant in stroke treatment.
14. For good voice maintenance musicians also consume snail meat.
15. Snail meat restores virility and vitality.
16. In traditional medicine, snail meat is used in the preparation of contortions for various cases like reduction of labour pain and blood loss in a pregnant woman during delivery.
17. Snail meat is also used to cure small pox.
18. Snail meat has been strongly recommended as a curative meal for patients with diabetes.

There are 29 species of freshwater snails are available in Goalpara district of India and out of those 8 species are edible [4]. All these species inhabits in different habitats. Analysis of simple correlations amongst the independent variables was done and results are presented in Table3. Positively significant correlations were observed between age (X_1) and decision making ability (X_{13}) (r=(+) 0.593,)(r=(+) 0.340, p<0.01), age (X_1) and interest (X_{15}) (r=(+) 0.593, p<0.01); education (X_2)and material status (X_3) (r=(+) 0.541, p<0.01),education (X_2)and main occupation (X_5)(r=(+) 0.340, p<0.01),education (X_2)and operational holding (X_6)(r=(+) 0.314, p<0.01), education (X_2)and annual income (X_7) (r=(+) 0.527, p<0.01), education (X_2)and material possession (X_8) (r=(+) 0.626, p<0.01),education (X_2)and knowledge on integrated rice-snail farming(X_9) (r=(+) 0.626, p<0.01), education (X_2)and possession of means of transportation of snail (X_{10}) (r=(+) 0.510, p<0.01), education (X_2)and localiteness and cosmopolitenesss(X_{11}) (r=(+) 0.447, p<0.01), education (X_2)and economic motivation(X_{12}) (r=(+) 0.527, p<0.01), decision making ability (X_{13}) (r=(+) 0.266, p<0.01),education (X_2)and scientific orientation (X_{14}) (r=(+) 0.955, p<0.01),education (X_2)and interest(X_{15}) (r=(+) 0.266, p<0.01), education (X_2)and information seeking behavior (X_{16}) (r=(+) 0.626, p<0.01);material status (X_3)and main occupation (X_5) (r=(+) 0.469, p<0.01), material status (X_3)and operational holding(X_6) (r=(+) 0.395, p<0.01), material status (X_3)and annual income (X_7) (r=(+) 0.461, p<0.01), material status (X_3)and material possession (X_8) (r=(+) 0.590, p<0.01),material status (X_3)and knowledge on integrated rice-snail farming (X_9) (r=(+) 0.590, p<0.01), material status (X_3)and possession of means of transportation of snail (X_{10}) (r=(+) 0.482.p<0.01), material status (X_3)and economic motivation(X_{12}) (r=(+) 0.461, p<0.01),material status (X_3)and scientific orientation (X_{14}) (r=(+) 0.422, p<0.01),material status (X_3)and information seeking behavior(X_{16}) (r=(+) 0.590, p<0.01); family type(X_4)and annual income (X_7) (r=(+) 0.294, p<0.01),family type(X_4)and material possession (X_8) (r=(+) 0.341, p<0.01),family type(X_4)and knowledge on integrated rice-snail farming(X_9) (r=(+) 0.341, p<0.01),family type(X_4)and possession of means of transportation of snail (X_{10}) (r=(+) 0.248, p<0.05), family type(X_4)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.387, p<0.01), family type(X_4)and economic motivation(X_{12}) (r=(+) 0.294, p< 0.01) , family type(X_4)and scientific orientation (X_{14}) (r=(+) 0.195, p<0.05),family type(X_4)and information seeking behavior (X_{16}) (r=(+)0.341, p<0.01); main occupation (X_5)and operational holding (X_6)(r=(+) 0.889, p<0.01),) main occupation (X_5)and annual income (X_7) (r=(+) 0.356, p<0.01), main occupation (X_5)and material possession (X_8) ((r=(+) 0.382, p<0.01), main occupation (X_5)and knowledge on integrated rice-snail farming(X_9) (r=(+) 0.382, p<0.01), main occupation (X_5)and possession of means of transportation of snail (X_{10}) (r=(+) 0.260, p<0.01), main occupation (X_5)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.230, p<0.05), main occupation (X_5)and economic motivation(X_{12}) (r=(+) 0.356, p< 0.01),); main occupation (X_5)and scientific orientation (X_{14}) (r=(+) 0.248, p<0.01),); main occupation (X_5)and information seeking behavior (X_{16}) (r=(+) 0.382, p<0.01); operational holding (X_6)and annual income (X_7) (r=(+) 0.291, p<0.01), operational holding (X_6)and material possession(X_8) (r=(+) 0.324, p<0.01),operational holding (X_6)and knowledge on integrated rice-snail farming(X_9) (r=(+) 0.324, p<0.01),operational holding (X_6)and possession of means of transportation $X(_{10})$ (r=(+) 0.204, p< 0.05), operational holding (X_6)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.195, p<0.05), operational holding (X_6)and economic motivation(X_{12}) (r= (+) 0.291, p<0.01), operational holding (X_6)and scientific orientation(X_{14}) (r=(+) 0.232, p<0.05), operational holding (X_6)and information seeking behavior (X_{16}) (r=(+) 0.324, p<0.01); annual income (X_7)and material possession (X_8) (r=(+) 0.811, p<0.01), annual income (X_7)and knowledge on integrated rice-snail farming(X_9) (r=(+) 0.811, p< 0.01), annual income (X_7)and possession of means of transportation of snail (X_{10}) (r=(+) 0.653, p<0.01), annual income (X_7)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.673, p<0.01), annual income (X_7)and economic motivation(X_{12}) (r=(+) 1.000, p<0.01), annual income (X_7)and scientific orientation

(X_{14}) (r=(+) 0.510, p<0.01),annual income (X_7)and information seeking behavior (X_{16}) (r=(+) 0.811, p<0.01), annual income (X_7)and knowledge of snail culture (X_{17}) (r=(+) 0.315, p< 0.01);material possession(X_8)and knowledge on integrated rice-snail farming (X_9) (r=(+) 1.000, p<0.01),material possession (X_8)and possession of means of transportation of snail (X_{10}) (r=(+) 0.812, p<0.01),material possession (X_8)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.799, p< 0.01), material possession (X_8)and economic motivation(X_{12}) (r=(+) 0.811, p<0.01), material possession (X_8)and scientific orientation (X_{14}) (r=(+) 0.594, p<0.01) ,material possession (X_8)and information seeking behavior (X_{16}) (r=(+) 1.000, p<0.01), material possession (X_8)and knowledge of snail culture (X_{17}) (r=(+) 0.214, p<0.05); knowledge on integrated rice-snail farming(X_9)and possession of means of transportation of snail (X_{10}) (r=(+) 0.812, p<0.01), knowledge on integrated rice-snail farming(X_9)and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.799, p<0.01), knowledge on integrated rice-snail farming(X_9)and economic motivation(X_{12}) (r=(+) 0.811, p<0.01),knowledge on integrated rice-snail farming(X_9)and scientific orientation (X_{14}) (r= (5+) 0.594, p<0.01),knowledge on integrated rice-snail farming(X_9)and information seeking behavior (X_{16}) (r=(+) 1.000, p<0.01),knowledge on integrated rice-snail farming(X_9)and knowledge of snail culture (X_{17}) (r=(+) 0.214, p<0.05); possession of means of transportation of snail (X_{10})and localiteness and cosmopoliteness(X_{11}) (r=(+) 0.644, p<0.01), (X_{12}) (r=(+) 0.653, p<0.01), possession of means of transportation of snail (X_{10})and scientific orientation (X_{14}) (r=(+) 0.498, p< 0.01), possession of means of transportation of snail (X_{10})and information seeking behavior (X_{16}) (r=(+) 0.812, p<0.01),possession of means of transportation of snail (X_{10})and knowledge of snail culture(X_{17}) (r=(+) 0.208, p<0.05);localiteness and cosmopoliteness(X_{11})and economic motivation(X_{12}) (r=(+) 0.673, p<0.01),);localiteness and cosmopoliteness(X_{11})and decision making ability (X_{13}) (r=(+) 0.252, p<0.01),);localiteness and cosmopoliteness(X_{11})and scientific orientation (X_{14}) (r=(+) 0.461, p<0.01),);localiteness and cosmopoliteness(X_{11})and interest (X_{15}) (r=(+) 0.252, p<0.01),);localiteness and cosmopoliteness (X_{11})and information seeking behavior (X_{16}) (r=(+) 0.799, p<0.01),);localiteness and cosmopoliteness(X_{11})and knowledge of snail culture(X_{17}) (r=(+) 0.216, p<0.01);economic motivation (X_{12}) and scientific orientation (X_{14}) (r=(+) 0.510, p<0.01),economic motivation (X_{12}) and information seeking behavior (X_{16}) (r=(+) 0.811, p<0.01), economic motivation (X_{12}) and knowledge of snail culture(X_{17}) (r=(+) 0.315, p<0.01); decision making ability (X_{13})and scientific orientation(X_{14}) (r=(+) 0.243, p<0.01) , decision making ability (X_{13}) and interest (X_{15}) (r=(+) 1.000, p<0.01); scientific orientation (X_{14}) and interest (X_{15}) (r=(+) 0.243, p< 0.01),scientific orientation (X_{14})and information seeking behavior (X_{16}) (r=(+) 0.594, p<0.01); information seeking behavior(X_{16})and knowledge of snail culture(X_{17}) (r=(+) 0.214, p< 0.05);knowledge of snail culture(X_{17}) and attitude towards snail business(X_{18}) (r=(+) 0.269, p< 0.01).

Negatively significant correlations wereobserved between age(X_1)and education (X_2) (r=(-) 0.218, p<0.05),age (X_1) and material status (X_3) (r=(-) 0.600, p<0.01), age (X_1) and main occupation (X_5)(r=(-) 0.436, p<0.01),age (X_1) and operational holding (X_6)(r=(-) 0.370, p<0.01), age (X_1) and annual income (X_7) (r=(-) 0.260, p<0.01), age (X_1) and material possession(X_8) (r=(-) 0.340, p< 0.01), age (X_1) and knowledge on integrated rice-snail farming(X_9) (r=(-) 0.340, p< 0.01), age (X_1) and possession of means of transportation of snail (X_{10}) (r=(-) 0.256, p<0.01),age (X_1) and economic motivation (X_{12}) (r=(-) 0.260, p< 0.01), age (X_1) and information seeking behavior (X_{16}) (r=(-) 0.340, p<0.01);education (X_2)and attitude towards snail business (X_{18}) (r=(-) 0.182, p<0.05);annual income(X_7) and attitude towards snail business(X_{18}) (r=(-) 0.185, p<0.05);material possession(X_8) with attitude towards snail business (X_{18}) (r=(-) 0.218, p<0.05);knowledge on integrated rice-snail farming(X_9)and attitude towards snail business(X_{18}) (r=(-) 0.218, p<0.05);localiteness and cosmopoliteness(X_{11})and attitude towards snail business(X_{18}) (r=(-) 0.290, p<0.01);economic motivation(X_{12}) and attitude towards snail business(X_{18}) (r=(-) 0.185, p<0.05);information seeking behavior (X_{16})and attitude towards snail business(X_{18}) (r=(-) 0.218, p<0.05).

Analysis of simple correlations between the dependent and independent variables was done and results are presented in Table 4. It revealed positively significant correlation between age(X_1) and do you eat snail?(Q_1) (r=0.722, p<0.01), education(X_2) and do you eat snail?(Q_1) (r=0.238, p<0.01),education(X_2) and how many snail species you can identify? (Q_2) (r=0.778, p<0.01),education(X_2) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.753, p<0.01),education(X_2) and how many snail dishes do you know?(Q_4) (r=0.753, p<0.01),education(X_2) and what are the ailments treated by snail?(Q_5) (r=0.842, p<0.01),education(X_2) and (vi)is there any declination in snail population in your locality? (Q_6) (r=0.809, p<0.01),education(X_2) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.494,p<0.01),education(X_2) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.441, p<0.01),education(X_2) and is snail population declining due to wild catch?(Q_9) (r=0.395, p<0.01),education(X_2) and do you think that conservation of snail is necessary?(Q_{10})) (r=0.301, p<0.01);material status (X_3) and how many snail species you can identify?(Q_2) (r=0.509, p<0.01),material status (X_3) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.459, p<0.01),material status (X_3) and how many snail dishes do you know?(Q_4) (r=0.420, p<0.01), material status(X_3) and what are the ailments treated by snail?(Q_5) (r=0.372, p<0.01), material status(X_3) and is there any declination in snail population in your locality? (Q_6) (r=0.327, p<0.01),material status

(X_3) and do you think that conservation of snail is necessary?(Q_{10}) (r=0.340, p<0.01),(X_3) and (Q_{11}) (r=0.227, p<0.05);(X_4) and (vi)is there any declination in snail population in your locality? (Q_6) (r=0.205, p<0.05); main occupation (X_5) and how many snail species you can identify?(Q_2) (r=0.235, p<0.01), main occupation (X_5) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.181, p<0.05), main occupation (X_5) and what are the ailments treated by snail?(Q_5) (r=0.219, p<0.05), main occupation (X_5) and is there any declination in snail population in your locality? (Q_6) (r=0.192, p<0.05); operational holding (X_6) and How many snail species you can identify?(Q_2) (r=0.198, p<0.05),operational holding (X_6) and what are the ailments treated by snail?(Q_5) (r=0.184, p<0.05), operational holding (X_6) and is there any declination in snail population in your locality? (Q_6) (r=0.197, p<0.05); annual income (X_7) and how many snail species you can identify?(Q_2) (r=0.370, p<0.01), annual income (X_7) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.310198, p<0.01),annual income (X_7) and how many snail dishes do you know?(Q_4) (r=0.316, p<0.01), annual income (X_7) and what are the ailments treated by snail?(Q_5) (r=0.467, p<0.01),(X_7) and is there any declination in snail population in your locality? (Q_6) (r=0.432, p<0.01), annual income (X_7) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.236, p<0.01), annual income (X_7) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.229, p<0.05), annual income (X_7) and is snail population declining due to wild catch?(Q_9) (r=0.241, p<0.01),annual income (X_7) and do you think that conservation of snail is necessary?(Q_{10}) (r=0.272, p<0.01);(X_8) and how many snail species you can identify?(Q_2) (r=0.427316, p<0.01), material possession (X_8) and How many species of snail are available in your locality which is edible?(Q_3) (r=0.384, p<0.01), material possession (X_8) and how many snail dishes do you know?(Q_4) (r=0.368, p<0.01),material possession (X_8) and what are the ailments treated by snail?(Q_5) (r=0.529, p<0.01),material possession (X_8) and is there any declination in snail population in your locality? (Q_6) (r=0.472, p<0.01), material possession (X_8) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.267, p<0.01), material possession (X_8) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.232, p<0.05),material possession (X_8) and is snail population declining due to wild catch?(Q_9) (r=0.197, p<0.05), material possession (X_8) and do you think that conservation of snail is necessary?(Q_{10}) (r=0.242, p<0.01);knowledge on integrated rice-snail farming(X_9) and how many snail species you can identify?(Q_2) (r=0.427, p<0.01),knowledge on integrated rice-snail farming (X_9) and how many species of snail are available in your locality which is edible?(Q_3) (r=0. 384, p<0.01),knowledge on integrated rice-snail farming (X_9) and how many snail dishes do you know?(Q_4) (r=0.368, p<0.01),knowledge on integrated rice-snail farming (X_9) and what are the ailments treated by snail?(Q_5) (r=0.529, p<0.01),knowledge on integrated rice-snail farming (X_9) and is there any declination in snail population in your locality? (Q_6) (r=0.472, p<0.01),knowledge on integrated rice-snail farming (X_9) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.267, p<0.01),knowledge on integrated rice-snail farming(X_9) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.232, p<0.05),(X_9) knowledge on integrated rice-snail farming and Is snail population declining due to wild catch?(Q_9) (r=0.197, p<0.05),knowledge on integrated rice-snail farming (X_9) and do you think that conservation of snail is necessary?(Q_{10}) (r=0.242, p<0.01), possession of means of transportation of snail(X_{10}) and how many snail species you can identify?(Q_2) (r=0.338, p<0.01),possession of means of transportation of snail(X_{10}) and how many species of snail are available in your locality which is edible?d(Q_3) (r=0.309, p<0.01),(X_{10}) and how many snail dishes do you know?(Q_4) (r=0.296,p<0.01),possession of means of transportation of snail(X_{10})and what are the ailments treated by snail?(Q_5) (r=0.420, p<0.01),possession of means of transportation of snail(X_{10}) and is there any declination in snail population in your locality? (Q_6) (r=0.225, p<0.05),possession of means of transportation of snail(X_{10}) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.225, p<0.05); localiteness and cosmopolitenesss(X_{11}) and (Q_1) (r=0.277, p<0.01),(X_{11})localiteness and cosmopolitenesssand what are the ailments treated by snail?(Q_5) (r=0.360, p<0.01),localiteness and cosmopolitenesss(X_{11}) and is there any declination in snail population in your locality? (Q_6) (r=0.350, p<0.01); economic motivation (X_{12}) and how many snail species you can identify?(Q_2) (r=0.370, p<0.01), economic motivation (X_{12}) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.310, p<0.01), economic motivation (X_{12}) and how many snail dishes do you know?(Q_4) (r=0.316, p<0.01), economic motivation (X_{12}) and what are the ailments treated by snail?(Q_5) (r=0.467, p<0.01),),economic motivation (X_{12}) and is there any declination in snail population in your locality? (Q_6) (r=0.432, p< 0.01), economic motivation (X_{12}) and is there any deterioration of snail habitats around your locality?(Q_7) (r = 0.236, p < 0.01),economic motivation (X_{12}) and do you think that use of agro-chemicals affect the snails?(Q_8)(r=0.229, p<0.05),economic motivation (X_{12}) and is snail population declining due to wild catch?(Q_9) (r=0.241, p<0.01); decision making ability (X_{13}) and do you eat snail?(Q_1) (r=0.521, p<0.01), decision making ability (X_{13}) and what are the ailments treated by snail?(Q_5) (r=0.238, p<0.01),decision making ability, (X_{13}) and is there any declination in snail population in your locality? (Q_6) (r=0.232, p<0.05); scientific orientation (X_{14}) and do you eat snail?(Q_1) (r=0.339, p<0.01), scientific orientation (X_{14}) and (Q_1) (r=0.339, p<0.01), scientific orientation (X_{14}) and how many snail species you can identify?(Q_2) (r=0.718, p<0.01),(X_{14})scientific orientation and how many species of snail are available in your locality which is edible?(Q_3) (r=0.709,p<0.01), scientific orientation (X_{14}) and how

many snail dishes do you know?(Q_4) (r=0.718, p<0.01)),scientific orientation(X_{14}) and what are the ailments treated by snail?(Q_5) (r=0.829, p<0.01),scientific orientation(X_{14}) and is there any declination in snail population in your locality? (Q_6) (r=0.817, p<0.01), scientific orientation (X_{14}) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.482, p<0.01)scientific orientation, (X_{14}) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.452, p<0.01), scientific orientation (X_{14}) and is snail population declining due to wild catch?(Q_9) (r=0.394, p<0.01), scientific orientation (X_{14}) and (Q_{10}) (r=0.269, p<0.01); interest (X_{15})and do you eat snail?(Q_1)(r=0.521,p<0.01),interest (X_{15}) and what are the ailments treated by snail?(Q_5) (r=0.238, p<0.01),interest(X_{15}) and is there any declination in snail population in your locality?(Q_6) (r=0.232, p<0.05); information seeking behavior (X_{16}) and how many snail species you can identify?(Q_2) (r=0.427, p<0.01),information seeking Behavior (X16) and how many species of snail are available in your locality which is edible?(Q_3) (r=0.384,p<0.01), information seeking behavior.(X_{16}) and how many snail dishes do you know?(Q_4) (r=0.368, p<0.01), information seeking behavior.(X_{16}) and what are the ailments treated by snail?(Q_5) (r=0.529,p<0.01), information seeking behavior.(X_{16}) and is there any declination in snail population in your locality? (Q_6) (r=0.472, p<0.01),information seeking Behavior (X16) and is there any deterioration of snail habitats around your locality?(Q_7) (r=0.267, p<0.01), information seeking behavior(X_{16}) and do you think that use of agro-chemicals affect the snails?(Q_8) (r=0.232, p<0.05), information seeking behavior(X_{16}) and is snail population declining due to wild catch?(Q_9) (r=0.197, p<0.05), information seeking behavior(X_{16}) and do you think that conservation of snail is necessary?(Q_{10}) (r=0.242, p<0.01).

Negatively significant correlations were observed between age(X_1)and how many snail species you can identify?(Q_2) (r=(-) 0.280, p<0.01),age(X_1) and how many species of snail are available in your locality which is edible?(Q_3) (r=(-) 0.256, p<0.01),age(X_1) and how many snail dishes do you know?Q_4) (r=(-) 0.229, p<0.05),age(X_1) and (Q_{10}) (r=(-) 0.292, p<0.01); material status (X_3) and do you eat snail?(Q_1) (r=(-) 0.335, p<0.01); main occupation (X_5) and do you eat snail?(Q_1) (r=(-) 0.252, p<0.01); operational holding (X_6) and do you eat snail?(Q_1) (r=(-) 0.255, p<0.01).

Table-1: Independent variables for the study on ITK related to snail

Sl. No.	Variables	Empirical measures	Methods
1	Age (X_1)	Chronological and rounded off to nearest year	Pareek and Trivedi [5]
2	Education (X_2)	Socio-economic status scale-Rural	Pareek and Trivedi [5]
3	Marital status (X_3)	Structured schedule	
4	Family type (X_4)	Structured schedule	
5	Main occupation (X_5)	Socio-economic status scale-Rural	Pareek and Trivedi [5]
6	Operational holding (X_6)	Structured schedule	
7	Annual income (X_7)	Structured schedule	
8	Economic motivation (X_8)	Structured schedule	
9	Knowledge on integrated rice-snail farming (X_9)	Structured schedule	
10	Possession of mean of transportation (X_{10})	Structured schedule	
11	Localiteness and cosmopoliteness(X_{11})	Structured schedule	
12	Economic motivation scale (X_{12})		Singha [6]
13	Decision making ability(X_{13})	Structured schedule	
14	Scientific orientation (X_{14})	Socio-economic status scale-Rural	
15	Interest (X_{15})	Structured schedule	
16	Information seeking behaviour(X_{16})	Structured schedule	
17	Knowledge of snail culture (X_{17})	Socio-economic status scale-Rural	
18	Attitude towards snail business(X_{18})	Structured schedule	

Table-2: Frequency and percentage distribution of respondents in different response categories (N=120).

Sl. No.	Preparation method of Snail	MO	O	S	N
		(3)	(2)	(1)	(0)
1	Snail with blackgram and alkali	108 (90.00)	10 (8.00)	2 (2.00)	0 (0.00)
2	Snail with *pithaguri*, *kola khar* and gingerleaves	82 (68.00)	19 (16.00)	14 (12.00)	5 (4.00)
3	Snail and ginger leaves curry	1 (0.07)	2 (2.00)	10 (8.00)	107 (90.00)
4	Snail with pumpkin	43 (36.00)	30 (25.00)	47 (39.00)	0 (0.00)
5	Snail with papaya and *kola khar*	60 (50.00)	31 (26.00)	17 (14.00)	12 (10.00)
6	Snail with ash gourd and *kola khar*	36 (30.00)	19 (16.00)	17 (14.00)	48 (40.00)
7	Snail fried with onion	12 (10.00)	24 (20.00)	36 (30.00)	48 (40.00)
8	Snail meat and potato curry	2 (2.00)	0 (0.00)	10 (8.00)	108 (90.00)
9	Snail with gram dal	48 (40.00)	7 (6.00)	5 (4.00)	60 (50.00)
10	Snail with roselle	5 (4.00)	24 (20.00)	37 (31.00)	54 (45.00)
11	Snail with lathyrus	2 (2.00)	4 (3.00)	6 (5.00)	108 (90.00)

(Data in parentheses are percentage of frequencies.)

Table 3: Correlations amongst the independent variables

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
X1	1	-.218*	-.600**	-.094	-.436**	-.370**	-.260**	-.340**	-.340**	-.256**	.106	-.260**	.593**	-.088	.593**	-.340**	.082	.064
X2	-.218*	1	.541**	.167	.340**	.314**	.527**	.626**	.626**	.510**	.417**	.527**	.266**	.955**	.266**	.626**	-.050	-.182*
X3	-.600**	.541**	1	.138	.469**	.395**	.461**	.590**	.590**	.482**	.146	.461**	-.162	.422**	-.162	.590**	-.062	.025
X4	-.094	.167	.138	1	.137	.126	.294**	.341**	.341**	.248**	.387**	.294**	.011	.195*	.011	.341**	.083	-.160
X5	-.436**	.340**	.469**	.137	1	.889**	.356**	.382**	.382**	.260**	.230*	.356**	.012	.248**	.012	.382**	-.136	-.046
X6	-.370**	.314**	.395**	.126	.889**	1	.291**	.324**	.324**	.204*	.195*	.291**	.090	.232*	.090	.324**	-.132	.017
X7	-.260**	.527**	.461**	.294**	.356**	.291**	1	.811**	.811**	.653**	.673**	1.000**	.090	.510**	.090	.811**	.315**	-.185*
X8	-.340**	.626**	.590**	.341**	.382**	.324**	.811**	1	1.000**	.812**	.799**	.811**	.040	.594**	.040	1.000**	.214*	-.218*
X9	-.340**	.626**	.590**	.341**	.382**	.324**	.811**	1.000**	1	.812**	.799**	.811**	.040	.594**	.040	1.000**	.214*	-.218*
X10	-.256**	.510**	.482**	.248**	.260**	.204*	.653**	.812**	.812**	1	.644**	.653**	.004	.498**	.004	.812**	.208*	-.141
X11	.106	.417**	.146	.387**	.230*	.195*	.673**	.799**	.799**	.644**	1	.673**	.252**	.461**	.252**	.799**	.216*	-.290**
X12	-.260**	.527**	.461**	.294**	.356**	.291**	1.000**	.811**	.811**	.653**	.673**	1	.090	.510**	.090	.811**	.315**	-.185*
X13	.593**	.266**	-.162	.011	.012	.090	.090	.040	.040	.004	.252**	.090	1	.243**	1.000**	.040	.039	-.067
X14	-.088	.955**	.422**	.195*	.248**	.232*	.510**	.594**	.594**	.498**	.461**	.510**	.243**	1	.243**	.594**	-.006	-.117
X15	.593**	.266**	-.162	.011	.012	.090	.090	.040	.040	.004	.252**	.090	1.000**	.243**	1	.040	.039	-.067
X16	-.340**	.626**	.590**	.341**	.382**	.324**	.811**	1.000**	1.000**	.812**	.799**	.811**	.040	.594**	.040	1	.214*	-.218*
X17	.082	-.050	-.062	.083	-.136	-.132	.315**	.214*	.214*	.208*	.216*	.315**	.039	-.006	.039	.214*	1	.269**
X18	.064	-.182*	.025	-.160	-.046	.017	-.185*	-.218*	-.218*	-.141	-.290**	-.185*	-.067	-.117	-.067	-.218*	.269**	1

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Table 4: Correlations amongst the independent- dependent variables

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
Q1	.722**	.238**	-.335**	-.133	-.252**	-.255**	-.042	.002	.002	.022	.277**	-.042	.521**	.339**	.521**	.002	.116	-.045
Q2	-.280**	.778**	.509**	.115	.235**	.198*	.370**	.427**	.427**	.338**	.179	.370**	.055	.718**	.055	.427**	-.138	-.138
Q3	-.256**	.753**	.459**	.080	.181*	.137	.310**	.384**	.384**	.309**	.172	.310**	.042	.709**	.042	.384**	-.172	-.147
Q4	-.229*	.753**	.420**	.076	.174	.146	.316**	.368**	.368**	.296**	.165	.316**	.062	.718**	.062	.368**	-.147	-.141
Q5	-.132	.842**	.372**	.089	.219*	.184*	.467**	.529**	.529**	.420**	.360**	.467**	.238**	.829**	.238**	.529**	-.079	-.159
Q6	-.096	.809**	.327**	.205*	.192*	.197*	.432**	.472**	.472**	.357**	.350**	.432**	.232*	.817**	.232*	.472**	-.048	-.082
Q7	-.143	.494**	.152	.081	.149	.159	.236**	.267**	.267**	.225*	.166	.236**	.095	.482**	.095	.267**	-.120	-.094
Q8	-.122	.441**	.090	.069	.113	.124	.229*	.232*	.232*	.153	.151	.229*	.078	.452**	.078	.232*	-.051	-.105
Q9	-.165	.395**	.116	.051	.127	.139	.241**	.197*	.197*	.105	.084	.241**	.029	.394**	.029	.197*	.038	-.111
Q10	-.292**	.301**	.340**	.071	.116	.085	.272**	.242**	.242**	.158	.024	.272**	-.048	.269**	-.048	.242**	.051	-.068
Q11	-.119	.150	.227*	-.047	-.019	-.023	.071	.061	.061	.132	-.097	.071	-.030	.142	-.030	.061	-.040	-.068

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

The study suggests validation of this indigenous technology knowledge and its transformation shall benefit food production and income as well as farm integration. Blending ITK with recent technology shall help achieving the goal of sustainable agriculture and food security.

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REFERENCES

1. Annon; Statistical Hand book of Assam.Govt. of Assam. India. 2012.
2. Baruah UK., Bhagowati AK., Talukdar RK, Saharia PK; Beel Fisheries of Assam: Community-based Co-management Imperative. Naga. The ICLARM, 2000;23:37-41.
3. Panse VG, Sukhatme PV; Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi. India, 1985;359.
4. Borkakati Rudra N, Gogoi Robin, Borah Birinchi K; Snail: From Present Perspective to the history of Assam. Assian Argi-history, 2009;13(3):227-234.
5. Pareek U, Trivedi G; Manual of Socio-Economic Status Scale (Rural).Mansayan, Delhi, India, 1964; 32.
6. Singha AK; A study on the determinants of entrepreneurial behaviour in the adoption of selected farm practices by the farmers of Cachar district of Assam. M. Sc. (Agric. Ext.) Thesis: Assam Agricultural University, Jorhat, Assam, India, 1991.
7. http://www.snail-world.com/snails-as-food/