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EDITORIAL

Dear Readers

I am immensely happy to learn that the Journal of Extension Education, Bhubaneswar entered the twenty third year of publication. We are extremely grateful to the esteem authors, readers, and other stakeholders for the unconditional support and faith on us. In this issue we have tried to include the extension research topics from a variety of subject matters. It is now important to extend the thinking horizon of extension research beyond the adoption, communication and impact studies. The upcoming and burning issues like climate smart agriculture, virtual extension, cyber extension, sustainable livelihood and extension plus are the topics on which the authors are requested to send the papers. We are regularly trying to update the journal with all innovative inputs and I am sure the journal will fulfill the aspirations of all the professionals in future.

Dr. R. K. Raj

Chief Editor

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Rural Consumers and their Behaviour towards Different FMCG Products

Dr. C. Satapathy

Director Amity Humanity Foundation, Bhubaneswar

ABSTRACT

*The study on rural consumers and their behaviour towards different FMCG products has multiple effects. The study provides enough information for marketers and companies to know the choice of the consumers and how their product will be positioned in the market. Further such studies aid to sales man and retailers to market their FMCG products. The purchase act by a **consumer** is governed by various factors such as economic, social and psychological.*

Key words : Consumer behaviour

Marketing at present is the core aspects of all establishments. At individual level marketing of self is also important. Those who fail in marketing probably fail to compete others in every walk of life. In real situation, marketing is the important component in our living. Earlier urban or city areas were main center for marketing for all products. But now trend is different. Many companies and marketers are now finding greater potentiality for their products in rural areas. The **Rural Marketing** refers to the activities undertaken by the marketers to encourage the people, living in **rural** areas to convert their purchasing power into an effective demand for the goods and services and making these available in the **rural** areas, with the intention to improve their standard of living.

The purchase act by a **consumer** is governed by various factors such as economic, social and psychological. The rural consumer and their behaviour refers to the acts of individuals directly involved in obtaining and using goods and services and includes the decision process that provide a purchase. The scientists and scholars in the field of management have undertaken a series of studies to reveal the potentiality for their products in rural areas.

The study on rural consumers and their behaviour towards different FMCG products has multiple effects. The study provides enough information for marketers and companies to know the choice of the consumers and how their product will be positioned in the market. Further such studies aid to sales man and retailers to market their FMCG products.

FMCG goods like biscuits, bathing soap, toothy paste and mosquito repellents are in everyday use of the consumers. These are fast moving in market, high in demand may be of low margin based and low involvement of the consumers in deciding the brands. The non-durable items are opened to consumers at each and every corners of the society. The FMCG products are many and diversified in use and nature. These are, process foods, beverages, dry goods, prepared meals, cosmetics, toiletries, candy and

many more. We need these items from morning till we go to beds. The urban market being saturated; the companies are now looking to rural areas for their business. It is so because rural India has changed in terms education, income, aspiration and knowledge. The wide coverage of mass media like TV, radio, news papers, magazines have contributed significantly through advertisement to reach the unreached.

To provide ready information to the market world, the present study, "Rural Consumers and their behaviour towards different FMCG product" was conducted in rural areas of Odisha with following objectives.

Objectives of the study: The study was designed to find out the behaviour of rural consumers towards FMCG in general and the following objectives in particulars.

1. To ascertain the brand preference of rural consumers towards FMCG products like biscuit, bathing soap, tooth paste and mosquito repellents.
2. To determine features FMCG products for which the rural consumers are attracted to purchase particular brands out of many in the area under investigations
3. To examine effects if any of the selected socio-economic indicators on purchase behaviour of sample respondents while taking decision to purchase particular brands..
4. To measure satisfaction of the rural consumers on use of FMCG products under consideration of the investigation.

Materials and methods:

(i). Location of the study: The study was carried out in rural areas of Puri and Cuttack districts with minimum distance of 30Km from the district Head quarters in order to find out rural base as per need of the study.

(ii) Selection of Sample: The sample were selected at random combined with the convince sampling method

putting a rider of consuming the products under question usually without any specific time interval. The sample respondents were both males and females being characterised by as users being ascertained from village shops to where the villagers normally come to purchase FMGC products.

(iii) Size of the sample: The users of FMCG products under question were the sample for the study without discrimination of gender. The total sample consisted of 80 males and 70 females totalling 150 in number.

(iv) Method of data collection. The information as required were collected personally through a pretested interview schedule as and when the respondents were available. The

response of the sample respondents were recorded after being convinced of their clear cut opinion. The responses so collected were decoded to tabular form for statistical treatment of data.

(v). FMCG products and Brand: The study included only four FMCG products like biscuits, bathing soap, tooth paste and mosquito repellents. The selection of FMCG product was based on two criteria like, (a) quantum of sale as understood from local shops and (b) regular use by the sample

(vi) Brand Selection: After personal discussion with stockiest and retailers the following brands of FMCG products were selected for the study.

Table 1: FMCG Product and Brands

Biscuit		Bathing soap		Tooth paste		Mosquito repellent	
Sl.No	Brand	Sl.No	Brand	Sl.No	Brand	Sl. No	Brand
1	Britania	1	Hamam	1	Colgate	1	Good knight
2	Parle G	2	Cinthol	2	Close up	2	All out
3	Nimkin	3.	Lux	3	Neem	3	Mortein
4	Krackjeck	4	Life boy	4	Promise	4	Power on
		5	Margo	5	Peepsodent	5	Jumbo coil
		6	Mysore sandal	6	Vicco	6	Tortise
		7	Liri	7	Patanjali		
		8	Medimix	8	8 Ancher		

Result and discussion

Brand preference towards FMCG products

1. Biscuit : The most common dry food in our country is biscuit. The biscuits are made of almond, ginger, cinnamon, jam, chocolate. The average ingredients **composition of biscuits** was 44% flour, 23% sugar, 3% milk, 11% fat and 4% egg. The average chemical **composition of biscuits** was 5.58% protein 28.05% o fat, 0.47% ash, 1.46 fiber % and 57.27% carbohydrates. Biscuits are consumed at any time anywhere for which it is most commonly recognised dry food.

Indian biscuit industries.. The production capacity of wafer biscuits is 60 MT and the cost is Rs.56, 78,400 with a motive power of 25 K.W. Maharashtra, West Bengal, Andhra Pradesh, Karnataka, and Uttar Pradesh. Indian subcontinent is known to be the second largest manufacturer of biscuits, the first being USA.

Parle-G, the glucose biscuit brand from the country's largest biscuit maker **Parle** Products, has consolidated its position as the world's largest selling biscuit brand, says a new report by market researcher Nielsen. (March 3, 2011)

The preference of sample for different brands of biscuit was studied as presented in table below.

Table2 : Preference for brands of biscuits

Sl. No	Brand	Preference score and rank			
		Male (n=80)	Female (n=70)	Pooled Mean score	Rank
1	Britania	1.97	1.92	1.94	I
2	Parle G	1.76	2.02	1.80	IV
3	Nimkin	1.60	2.05	1.82	III
4	Krackjeck	1.83	1.82	1.83	II

The preference of sample was studied in terms of 1st, 2nd and 3rd choice in order with assigned scores of 3, 2 and 1 respectively. The score value under male and female sample has been presented. The analysis reveals that male consumers prefer Britannia followed by Krackjeck, Parle G and Nimkin in order. The female sample expressed highest choice for Nimkin followed by Parle G Britannia and Krackjeck in order. The pooled data reveals that Britannia is the first choice followed by Krackjeck, Nimkin and Parle G in order.

2. Bathing soap: Now market is floating with variety of bathing soaps in shape, size and colour As it is a daily used product the consumers are countless.

The total revenues of the global bath soap market reached values worth US\$ 18.6 Billion in 2017. This represented a CAGR of around 5% during 2010-2017. Several factors such as growing population, rising levels of hygiene among consumers, value addition, and increasing demand from emerging markets are currently fostering the growth of the global bath soap market.

The Soap Industry in India is comprised of about 700 companies, which generate combined annual revenue of approximately \$17 billion US dollars. Soaps are distributed to all of India's major metropolitan cities, and an estimated 50 percent of the soaps that are produced in the country are sold in rural markets. The size of **India's soap market** is expected to grow at a moderate rate over the next few years.

Handmade soaps are gaining immense popularity these days as a chemical free alternative to conventional soaps. Handmade soaps are made of natural ingredients and essential oils like olive oil, avocado oil, cocoa butter, grape seed oil and other organic ingredients. These soap bars retain the glycerine created during the soap making process, resulting in naturally moisturizing soap. Handmade soaps are very mild in nature and gently cleanse the skin leaving the skin smooth with no residue of dirt.

The study included eight commonly used soaps in Odisha. The preference of the sample in order of 1st, 2nd and 3rd was computed with assigning score of 3, 2 and 1 respectively. The findings on preference score for different eight kinds of soaps are presented herewith.

Table 3 : Preference for different brands of Soaps.

Sl. No	Brand	Preference score and rank			
		Male (n=80)	Female (n=70)	Pooled Mean score	Rank
1	Hamam	1.71	1.92	1.81	II
2	Cinthol	1.75	1.90	1.82	I
3	Lux	1.41	1.92	1.66	V
4	Life boy	1.42	1.68	1.55	VI
5	Margo	1.77	1.82	1.79	III
6	Mysore sandal	1.98	1.58	1.78	IV
7	Liril	1.35	1.25	1.30	VII
8	Medimix	1.10	1.05	1.05	VIII

Analysis reveals that bathing soap Cinthol has topped the list followed by Hamam, Margo, Mysore sandal lux and life boy, The bathing soap medimix is least preferred in the villages under study. The male sample prefers Mysore sandal soap followed by Margo and Cinthol while female sample prefer Lux, followed by equally Hamam and Cinthol.

On rank order taking all respondents together Cinthol tops the list followed by Hamam and Margo. The bath soap

Medimix and Liri have least preferences.

3. Tooth paste: Tooth paste is daily use items irrespective of towns and rural areas. This statistic represents the production volume of toothpaste in India from fiscal year 2015 to fiscal year 2018. The toothpaste production amounted to almost 217 thousand metric tons in the country during fiscal year 2017, down from about 251 thousand metric tons in fiscal year 2016.

Table 4. Preference for brands of tooth pastes

Sl. No	Brand	Preference score and rank			
		Male(n=80)	Female (n=70)	Pooled Mean score	Rank
1	Colgate	1.93	2.04	1.98	II
2	Close up	1.97	2,28	2.12	I
3	Neem	1.41	1,80	1.60	V
4	Promise	1.67	1,88	1.77	IV
5	Peopsodent	1.73	1.90	1.81	III
6	Vicco	1.47	1.47	1.47	VI
7	Patanjali	1,47	1,40	1.43	VII
8	Ancher	1,25	1,22	1.23	Viii

Results reveal that on whole the preference rank goes high with Close up followed by Colgate, Peopsodent and Promise. The least preference is observed in case of Ancher and Patanjali. The relative ranking position was found to be V and VI with respect to Neem and Vicco respectively. The female sample expressed more preference for tooth pastes like Colgate, Closeup, Neem, Promise and Peopsodent than their counterparts. The preference of male sample was more in case of Ancher and Patanjali compared to female samples.

4. Mosquito Repellent : In rural sector of Odisha, the mosquito bite is a serious problem. During rainy season it is more severe than other seasons. On some parts of the state the mosquito problem remains throughout the year.

This **statistic** shows the projected global **mosquito repellent** market value in 2016 and 2022. It is projected that in 2022, the **mosquito repellent** market value worldwide will be approximately five billion U.S. dollars. (Forecasted based on an estimated compound annual growth rate of 7.5 percent from 2017-2022).

Mosquito repellents can be an effective method for personal protection against mosquito bites that are a

nuisance and carry the risk of transmission of mosquito-borne pathogens like *plasmodia*, dengue virus, chikungunya virus, and Zika virus. A multitude of commercially available products are currently on the market, some of them highly effective while others have low or no efficacy. Many home remedies of unknown efficacy are also widely used.

From mosquito coils to cockroach sprays to electric swatters, India's **insect repellent** market clocks Rs 4,400 crore in retail sales a year, according to a report by Euro monitor. Coils are the top selling repellents with a 50% market share, though sprays are also gaining in popularity. **Godrej Consumer Products**, with brands such as Good Knight and Hit, controls nearly half the market and is gradually eating into shares of rivals such as SC Johnson, **Reckitt Benckiser** and Jyothy Labs. The country's home insecticide market is forecast to reach Rs 5,200 crore by 2020. (reports ET.)

Our efforts were to find out the preference of consumers for different brands of repellent based on cost as well as effectiveness.

Table 5 : Preference for Mosquito Repellent Brands

Sl. No	Brand	Preference score and rank			
		Male (n=80)	Female (n=70)	Pooled Mean score	Rank
1	Good Knight	2.25	2.28	2.26	I
2	All out	2.10	2.31	2.20	II
3	Mortein	1.85	2.04	1.94	III
4	Power on	1.35	1.41	1.38	VI
5	Jumbo coil	1.52	1.37	1.44	V
6	Tortoise	1.55	1.52	1.53	IV

The sample expressed highest preference in case of Good Knight followed by All Out, Mortein and Tortoise. The least preference was observed in case of Power on and Jumbo. The expression was based on cost and effectiveness in controlling mosquitoes.

Features of attraction:

Further the study investigated into the features of attraction of the FMCG under considerations

1. Biscuit

Table 6 . Attracting feature of Biscuit (N=150)

Features	Average score	Rank
1.Reduces hunger	1.73	V
2.Very healthy	1.69	IV
3.Very tasty	2.16	I
4 Provides refreshment	1.79	III
5 Gives energy	2.05	II

The attraction of consumers for biscuit is based on considerations like very tasty, it gives energy, provides refreshment and very healthy followed by reduction of

hunger. Consumption of biscuit does not follow any specific time or place. People consume it as they like.

2. Bathing soap

Table 7 :Attracting feature of bathing soaps (N=150)

Features	Average score	Rank
1. Smoothness of skin	1.44	III
2.Gives fragrance	1.65	II
3.Kills germs	1.34	IV
4.Stops bad odour	2.06	I
5. Prevents skin diseases	1.28	V

Bathing soap is on common use and more in case of women. The use of bathing soap is based on reasons like

factors like, it stops bad odour, gives fragrance, makes skin smooth and kills germs followed by prevention of skin diseases

3. Tooth paste

Table 8 :Attracting feature of tooth paste(N=150)

Features	Average score	Rank
1.Wheitens teeth	2.11	I
2.Increases beauty of teeth	1.41	VI
3.Taste foamingness	1.72	IV
4.Kill germs	2.15	II
5.Removes food particles	2.03	III
6.Prevents toothache	1.65	V

The use of toothpaste is reasoned by the factors that it whitens the teeth, kills germs, removes food particles,

gives taste of foamingness, prevents toothache and increases beauty of teeth in order.

4, Mosquito Repellents

Table 9 : Reaction about Mosquito repellents (N=150)

Features	Average Score	Rank
1.Safe guards from mosquitoes	1.53	V
2.Good fragrance	1.68	IV
3.Is a slow poison	2.46	I
4.Affects health	2.09	II
5. Kills other insects.	1.94	III

The sample consumers feel that mosquito repellents are slow poison, affects health, kills other insects, gives good fragrance and guards health from mosquitoes.

Socio-Economic status and categories of Consumers:

Purchasing behaviour and socio-economic status of the consumers are closely associated. On the basis of

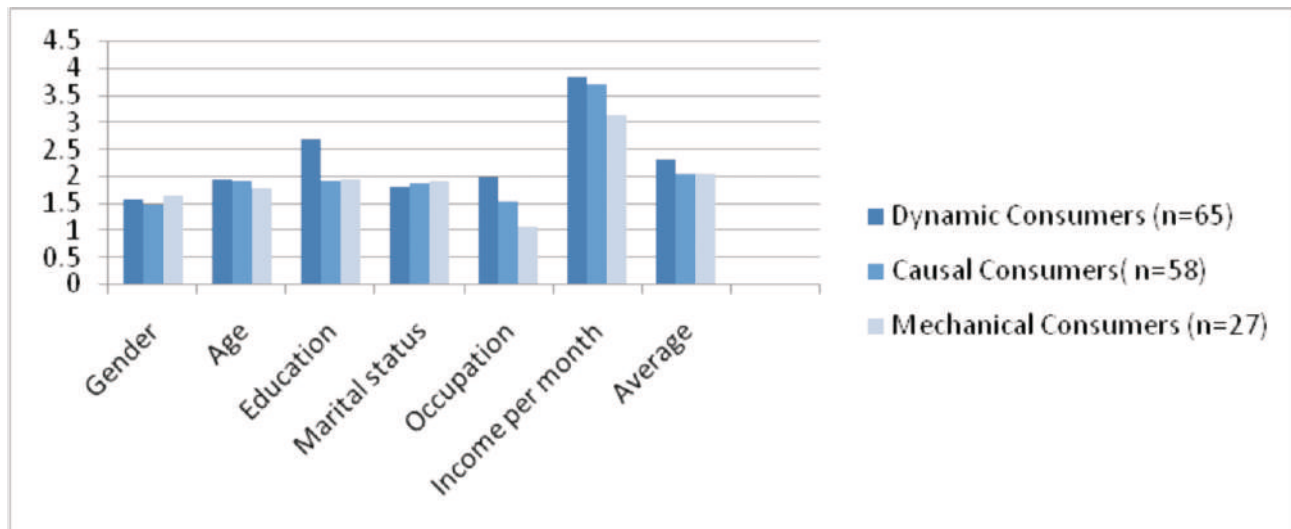
purchasing behaviour the consumers are classified as Dynamic who frequently looks after new brands and products, Casual who purchase on casual basis without giving much importance to brand and Mechanical who do marketing on mechanical way just to meet the situation. On the basis of classification like, Dynamic, Casual and Mechanical the consumers were examined with reference to their socio-economic status.

Table 10: Socio-Economic status and categories of Consumers

Sl.No.	Socio-Economic indicators	Dynamic Consumers (n=65)	Causal Consumers (n=58)	Mechanical Consumers (n=27)
1	Gender	1.56	1.45	1.62
2	Age	1.96	1.91	1.77
3	Education	2.70	1.91	1.96
4	Marital status	1.81	1.86	1.92
5	Occupation	1.98	1.53	1.06
6	Income per month	3.86	3.72	3.14
	Average	2.31	2.06	2.06

On socio-economic parameters dynamic consumers scored more over casual and mechanical. Both casual and mechanical consumers are at par. In case of age education occupation and monthly income the dynamic consumers

are ahead of others. The analysis reveals that dynamic consumers are significantly different than others in socio-economic status. Therefore marketing strategies need be formulated accordingly.



Conclusions

The study “Rural Consumers and their behaviour towards different FMCG product” conducted with sample

of 150 respondents consisting of 80 male and 70 female consumers of FMCG products like biscuit, toothpaste, bathing soap and mosquito repellent lead to arrive at the following conclusions.

Recommendation

1. The study included four brands of biscuits, eight brands of bathing soaps , eight brands of tooth pare and six brands of mosquito repellents to ascertain preference of the consumers.
2. Out of four brands of biscuits, Britannia, Krackjeck Nimkin and Parl G. Were found in order of preference.
3. Out of eight brands of bathing soaps Cinthol was found to be first choice followed by Hamam, Margo, Mysore Sandal and Lux. The soaps like Vicco, Medimix have yet to be popular among the consumers.
4. Among the different brands of tooth pastes, Close up is found to be at top followed by Colgate, Peepsodent Promise and Neem. The other soaps like Vicco, Patanjali and Ancher have yet to earn market names.
5. There are about six brands of mosquito repellents in market but Good Knight, All Out, and Moetein are commonly preferred.
6. The FMCGs under study reveals that biscuit is backed by the considerations, that it provides good taste and energy, bathing soap stops bad odour and provides fragrance, toothpaste whitens the teeth and kills germs while mosquitoes are slow poison and affects health.
7. Dynamic consumers are socio-economically better than casual as well as mechanical consumers.

Socio economic and political profile of Rural Women Entrepreneurs- an analytical study

B. Mishra, A. Mishra and S. Das

Department of Extension Education, OUAT

ABSTRACT

This paper deals with analysis that has been done with women entrepreneurial behavior; socio economic condition, association between the profile of rural women entrepreneur with the entrepreneurial behavior and constraints faced by women. Women entrepreneurs are contributing a lot towards rural economic development and growth but their potential is not yet exploited. Right efforts from multi direction are required in the development of women entrepreneurs. The following suggestions can be taken into account for effective development of rural women entrepreneurs

Key words : Women entrepreneurship, Analytical study.

Most of the businesses are owned by male worldwide. However in comparison to male led social enterprises, female-led social enterprises tend to focus on improving the lives of women and on education and literacy. They are more likely than male-led social enterprises to address the needs of children and persons with disabilities and they work on empowering women and solving women specific issues. Women Entrepreneurs can not only contribute to the GDP, but can also play a key role in addressing social challenges and changing the norms in society. Though the number of women entrepreneurs in India remains relatively low, there has been a change in women entrepreneurship of women due to growth in education, urbanization, industrialization and awareness of democratic values. The Indian government had also proposed, adopted and promoted the SHGs to uplift rural women and their families and community as a whole. In this context a study entitled “Socio economic and political profile of Rural Women Entrepreneurs- an analytical study” was under taken in Cuttack district of Odisha with following objectives.

- To enlist the entrepreneurial activities undertaken by rural women entrepreneurs in the study area

- To study the socio-personal and economic profile and political orientation of respondents

Materials and methods

The study was conducted in Cuttack district of Odisha selected purposively due to ease of the investigation. Salepur block, two gram Panchayats namely Chanipur and Sauri and four villages namely Balabhadrapur, Sarada, Karamuan, Balia were also selected purposively based on the location and communication facility to conduct the research work. One hundred respondents were selected through disproportionate random sampling technique from selected villages.

Socio-personal and economic profile and political orientation of respondents

The study was conducted in Cuttack District of Odisha with. The respondents were selected based upon the entrepreneurial activities undertaken by rural women in the study area. The list of entrepreneurial activities given below.

Table 1 List of entrepreneurial activities undertaken by women entrepreneurs

Sl. No.	Activities	Frequency
1	Badi pampad making	16
2	Paper plate making	20
3	Vegetable cultivation	22
4	Marble work	14
5	Agarbati making	28

Table 2 Socio-personal Profile of women entrepreneurs**(N = 100)**

Sl. No.	Characteristics	Category	Respondents	
			Frequency (F)	Percentage (%)
1.	Age	Below 20 years	3	3
		21 – 30	25	25
		31 – 40	39	39
		41 – 50	31	31
		Above 50 years	2	2
2.	Education	Illiterate	0	0
		Just read and write	5	5
		Primary school	14	14
		Middle school	20	20
		High school	30	30
		Intermediate	15	15
		Graduation and above	16	16
3.	Marital status	Married	78	78
		Unmarried	17	17
		Divorced	2	2
		Widow	3	3
4.	Types of family	Nuclear	54	54
		Joint	46	46
5.	Family size	Up to 3	1	1
		4-6	52	52
		Above 6	47	47
6.	Family income per annum	Up to Rs 20000	0	0
		Rs 21,000 – Rs 40,000	0	0
		Rs 41,000 – Rs 60,000	48	48
		Above Rs 60,000	52	52
7.	Occupational background of family members	Father	22	22
		Mother	0	0
		Husband	73	73
		Self	5	5
8.	Source of family income	Main source of income(Farming)	60	60
		Subsidiary source of income	83	83

- The study revealed that 39% of respondent women entrepreneurs belong to the age group of 31 – 40 followed by 31% , 25%, 3%, 2% of them within that of 41-50, 21-30, below 20 and above 50 respectively
- It was observed that majority of women entrepreneurs are high- school pass out (30%) followed by middle - school pass-out having a figure of 20%. Very less i.e. 5% were only just literate. None of them was illiterate.
- Majority of the respondents (78%) were married. Rest of the samples constitute unmarried, widow and divorcee category.
- The family under survey constitutes both nuclear and joint family. 54% of the samples had nuclear family and 46% belong to joint family.
- Women entrepreneurs having family member in between four to six, above 6 and upto 3 are of 52%, 47% and 1% respectively
- Annual income of majority (52%) of respondents was above Rs 60,000 and rest of them belongs to Rs 41,000 - Rs 60,000. Majority (73%) of families of the samples, the earning member was her husband, Father (22%) and self(5%).
- Majority of entrepreneurs (83%) had subsidiary sources of income i.e. poultry, diary, fishing, tailoring, and trolley pulling etc

Table 3 Distribution of respondents according to type of house**(N = 100)**

Sl. No.	Types of house	Frequency and percentage
1	Pucca	58
2	Kutchra	42

There are two types of house such as kutchra and pucca where people live. Pucca house made up of cement, stones etc. whereas kutchra house made up of mud, straw, bamboo

etc. table 3 revealed that majority (58%) of rural women entrepreneurs were staying in pucca house followed by only 42 % women in kutchra house.

Table 4 Distribution of respondents according to changes in the family household facilities after being involved in entrepreneurship**(N = 100)**

Sl. No.	Facilities	Before	After
		Frequency and percentage	Frequency and percentage
1.	Electricity	59	100
2.	Water supply installed	2	10
3.	Hand pump	30	75

This Table 4 reflects that change has occurred in the families of the entrepreneurs after the entrepreneurship development. after entrepreneurship, about 100% of the women entrepreneurs have electricity in their household.

followed by hand pump (75%) and water supply installed (10%). This indicated that after involvement in entrepreneurial activity the use of available facilities by the women entrepreneurs had improved their standard of living notably.

Table 5 Distribution of respondents according to changes occurred in the assets available in the household**(N = 100)**

Sl. No.	Household Assets	Before	After
		Frequency and percentage	Frequency and percentage
1.	Land	99	100
2.	House	100	100
3.	TV	11	82
4.	Telephone	4	94
5.	Refrigerator	0	16
6.	Two wheeler	0	51
7.	Gas Chula	8	28
8.	Computer	0	0
9.	Radio	44	33
10.	Water filter	0	2

The table above shows that all the respondents did possess their own house both before and after involvement in entrepreneurial activity. However, after involvement in profit making initiative most of the respondents had improved their use of household assets like telephone (94%), TV (82%) and gas Chula (28%) in comparison to

before entrepreneurship. Very few of them (2%) had water filter in their house. None of the respondents had computer in both before and after. However, most of the respondents preferred audio visual aid like TV instead of radio. Therefore, the demand of radio was decreasing day by day.

Table 6 Available household drudgery reducing equipments**(N = 100)**

Sl. No.	Equipments	Before	After
		Frequency and percentage	Frequency and percentage
1	LPG with gas Chula	8	28
2	Pressure cooker	6	28
3	Water heater	1	5
4	Smokeless Chula	1	2
5	Washing machine	2	7
6	Mixture grinder	12	39

From the table 4.1.6 it was observed that out of total sample, only 40 % women entrepreneurs have knowledge about drudgery reducing equipment. This table shows that before adopting entrepreneurship, only 12% respondents had mixture grinder in their household but after involvement 39% had mixture grinder. Before

involvement, 8% had knowledge about LPG followed by pressure cooker (6%), water heater (1%) and smokeless Chula (1%) and washing machine (2%). However, after involvement, only 28 % of respondents had knowledge about LPG with gas Chula and pressure cooker followed by washing machine (7%), water heater (5%) and smokeless Chula (2%).

Table 7 Distribution of respondents according to household food consumption pattern**(N = 100)**

Sl. No.	Food items	Regular	Occasional	Never	Mean score	Rank
		Frequency	Frequency	Frequency		
1	Cereals and millets	100	0	0	3	I
2	Pulses and legumes	30	54	16	1.62	VII
3	Milk and milk products	40	56	4	2.36	III
4	Fish, poultry, meat and meat products	4	91	5	1.99	V
5	Nuts and oil seeds	5	80	15	1.90	VI
6	Fruits and vegetables	79	18	3	2.76	II
7	Fats and oils	50	35	15	2.35	IV

It was observed from the table 7 that majority (100%) of the respondents regularly consume food items i.e. cereals and millets and very less (4%) number of respondents, consume fish, poultry, meat and meat products regularly.

Majority of respondents preferred to consume cereal and millets regularly and ranked I followed by fruits and

vegetables (II), milk and milk products (III), fats and oils (IV), fish, poultry, meat and meat products(V), nuts and oil seeds(VI) and pulses and legumes (VI).

Due to locally availability of cereal and millets, fruits and vegetables etc. with affordable price, the respondents consumed it regularly. Milk is also available in their home so they preferred more to consume milk rather than selling.

Table 8 Political orientation of rural women entrepreneurs**(N = 100)**

Sl. No.	Statement	Yes	No
		Frequency and %	Frequency and %
1	Are you an elected member of any political party?	5	95
2	If you are elected to the panchayat, are you able to function independently?	30	70
3	Are you getting any type of help from political leader?	20	80
4	Are you having good relation with political leader?	20	80
5	Do you expect a political leader should work for women entrepreneur?	10	90

It is observed from table 8 that only 30% of respondents had opined that if they get selected to the Panchayat, then they can able to do work independently followed by 20% prefer getting help from political leader, 20% have good relation with political leader and only 10% expect a political leader should work for women entrepreneurship. Majority of respondents had no knowledge and idea about political party and the work performed by them. Due to low level of education, they had lack of confidence to do work in a political party.

Conclusion

Women entrepreneurs are contributing a lot towards rural economic development and growth but their potential is not yet exploited. Right efforts from multi direction are required in the development of women entrepreneurs. The following suggestions can be taken into account for effective development of rural women entrepreneurs:-

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Go-NGO Collaboration: A New Avenue of Extension Reforms in India

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ABSTRACT

In situation like India it is very difficult on the part of the government organizations to reach the desired targets, working in isolation. The biggest example is the public extension system in India. While the working model of extension system in India is a real wonder due to the wide network of agricultural extension, the efficacy of the model is not so appreciable. Though it is well known for its knowledge and information dissemination, still it is being impaired by political influences. Several corrective measures have been undertaken in the recent days to improve the organizational performance of this system. One of these reforms includes the collaboration of the Public sector with the Non-Governmental organizations. Through this intervention the extension services in India can be triggered toward creating more demand-driven, broad-based, and holistic approach.

Key words : Reforms, Information, Government, NGOs, extension services

1. Background:

Agricultural extension in India is very dynamic. Though the public sector extension remained neglected for many years, now it is taking its shape towards renewed interest and policy attention. Both its purpose and management structure is transforming to work closely with extension providers from the private and voluntary sectors. This transformation can appreciably impact on improving extension's contribution towards agricultural development by strengthening its capability of providing services at the bottom level and by expanding its mandates to a significant scale. Development of agricultural sector is very vital for India's economic growth and poverty reduction. Indian agricultural extension services being a major player in eradicating the challenges of agriculture can contribute to growth and development of this sector considerably. However, to get the desired result, the constraints faced by it need to be wiped out as soon as possible.

2. Introduction:

Effective and meaningful collaboration between Government and NGOs has become imperative for both partners in accelerating the development activities (World Bank, 1990). As days are becoming complex and Governments are facing problems, NGOs are emerged as a strong party in development discourse and playing significant role. NGOs have emerged as third sector development organizations. The relationship between the GO and the NGOs is a talking point in India. Several Non Governmental organizations were set up these organization become a significant actor in the development perspective

of India. The NGOs have been playing an effective role in working with poor in addressing poverty alleviation and awareness building (Aminuzzaman, 1993). To address the situational demand, various NGOs have emerged. Some of the NGOs are very successful in their efforts and have been recognized internationally. NGOs play a significant role in the socio-economic development of India. A World Bank policy paper stresses that, there is a need to explore how the capacities of some of the successful NGOs can be expanded in order to supplement GO efforts in accelerating the pace of development in India. So in the present socio economic context of India GO-NGO collaboration is very much essential.

3. Concept of GO-NGO collaboration:

In order to conceptualize 'collaboration', we delineate different terms being used to express the relationship between the government and NGOs. Green and Matthias (1997) have argued that relationships between organizations form a continuum of increased structure, decreased autonomy and intensified communication. The continuum starts with competition, progresses through cooperation to coordination and then on to collaboration, finally ending in control.

'Competition' is perhaps the easiest to conceptualize. Organizations compete with each other and there is almost no functional linkage and communication between them. 'Cooperation' can be seen as a one-off relationship where organizations cooperate around certain issues or at certain times; although the organizations communicate with each other, they maintain almost complete autonomy (Green and Matthias 1997).

Competition**Coordination****Control****Cooperation****Collaboration****Source: Green and Matthias 1997**

'Coordination' represents an on-going and structured relationship between independent organizations for mutual benefit (Green and Matthias 1997). 'Collaboration' is often described as 'joint activity' or 'working together', where two or more organizations work closely together and share resources and responsibility for common goals and purpose

(Omondi et al. 1993). Finally, 'control' is a relationship where one organization gains control over others (Begum 2000).

4. GO-NGO relationship:

Young has drawn the following model to elaborate GO-NGO relation in four countries, based on his theory.

Country/Mode	Supplementary	Complementary	Adversarial
United States	Private philanthropy in early republic and late 19th century; growth of charitable provision in response to shrinking welfare programmes in the 1980s and 1990s	Government engagement of non-profits to deliver expanded public services in 1960s and 1970s; privatization of public services through contracting with non-profit in the 1980s and 1990s	Government restrictions on foundations in the 1960s; protest movement to change policy in the 1960s; government effort to restrict non-profit profit advocacy in
United Kingdom	Voluntary provision of services not covered postwar welfare state, e.g. lifeboats, counseling voluntary services provision in response to government cutbacks in 1980s	Contracts and partnership between government and voluntary organization in response to privatization and cutbacks in welfare services in the 1980s and 1990s	Lobby groups advocating for the rights of needy people left unserved by the post war welfare state
Israel	Non-profit service provision prior to state formation; nonprofit social services to non-mainstream religious and Arab groups independent foundation after the 1970s	Non-profit health services under tight state supervision; engagement of Jewish agencies as fund raising and diplomatic agent of the state	Protest and advocacy groups associated with youth, ethnic and other issues, beginning in the 1970s
Japan	Establishment of grant-making foundation in the early 20 th century; growth of unincorporated association in the post WWII period, voluntary sector response to the Kobe earthquake	Takeover of non-profit by the military government in 1930s and 1940s establishment/close supervision of "auxiliary" non-profit by government ministries in the 1980s and 1990s	Emergence of peace and human rights groups in the 1950s and 1960s

Source: Dennis R. Young, "Alternative Models of Government-Nonprofit Sector Relations: Theoretical and International Perspectives.

5. GO-NGO Relation: Conflict

Some important government policies towards NGO activities include:

1. Government would encourage NGO activities if these were not against national security;
2. NGOs could not do anything which would hurt people;' religious sentiments and which would make negative effect on local culture;
3. NGOs would work within public rules and regulations; and
4. NGOs would supplement and complement government's national development projects.

6. Government-NGO Collaboration: Common argument:

With respect to national development, the Government and NGOs share common goals e.g. poverty alleviation, human resources development, women's development, protecting the environment and sustainable resource management and building a democratic civil society and others. The institutional approach to address the issues, however, differs due to variations in perceptions as well as responsibilities, expertise, experience, resource base and administrative/management structure. In particular, Government- NGO collaboration in providing relief, literacy, and health care and family planning services, has a long history of success in the country. The development of sustainable collaboration and partnership requires the acceptance of some fundamental propositions by both the Government and NGOs.

7. Examples of potentially replicable NGO-GO interaction

The examples that demonstrate the types of GO-NGO configurations those perform better in the three major areas: (1) providing technical advice and feedback (2) training (3) working with groups.

7.1 NGO-GO relationship for Providing Technical Advice and Feedback

This chapter argues that the extreme institutional position in which all extension services are provided by the public sector is likely to be inefficient. At the other extreme, only in very specific circumstances can government hand over large parts of the extension function entirely to NGOs. This has been done in Chile, where government has

contracted private technology companies to cater to the larger commercial farmers, and NGOs for small subsistence-oriented farmers.

7.2 NGO-GO Configurations in Training

Some of the farmer training conducted by GOs is linked more strongly with GOs' programmes and targets than with farmers' needs. Much training is given in a classroom environment, without the practical content necessary to engage farmers' interests. NGOs have sought to work with GOs to address these shortcomings in several contexts: In Gujarat, India, the Aga Khan Rural Support Project (AKRSP) identified village training needs through discussions with farmer groups (Shah & Mane, 1993)

7.3 NGO-GO Configurations in Group Formation

Substantial scope exists for GOs to benefit from NGOs' group-organizing skills. In India, for instance, recent modifications to the training and visit extension system now require village-level extension workers to interact with groups of approximately twenty farmers instead of with individual "contact farmers." However, extension workers are not trained in group formation skills, and groups that they form are unlikely - if they survive at all - to become interested in anything other than the testing of immediately available technology. The examples cited above illustrate how NGOs can effectively organize groups around integrated pest management, soil and water management, and the management of common property resources and capital assets.

Conclusion:

GO and NGOs can supplement to each other in performing various works for development of the society efficiently. It can help in the group-organizing and human resource development among the rural people which is the main target of the extension system in India. However, formal forum is required for this collaboration to maintain efficiency of interaction, including training, the joint planning of research and extension agenda, and the securing of joint management agreements for soil and water, fodder, and grazing resources. The task for the coming decade will be to improve these in ways which are non-threatening both to the organizations involved and to the informal interaction they already undertake and to develop the efficiency of each other's activities on which formal interaction depends. Finally, this miraculous collaboration will one day proved to be a blessing for the society as many myths can be unfurled into reality, and become a boom for the whole of the mankind.

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Climate vulnerability mapping of dairy farming in Karnataka and adaptation strategies

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ABSTRACT

An effort was made to analyse the impact of climate change on livestock farming, in Chitradurga and Kolar districts of Karnataka state, through a combination of quantitative and qualitative methods, with the objective to assess and map the vulnerability of dairy farming to climate variability and formulate adaptation strategies that would enhance adaptive capacity to climate variability.

Key words : Climate, vulnerability

Introduction

Vulnerability to climate change varies across regions, sectors, and social groups. Understanding the regional and local dimensions of vulnerability is essential to develop appropriate and targeted adaptation efforts. It is crucial to recognize that climate change has differential effects on men and women population. These constraints must be addressed to increase livestock productivity, improve food and nutrition security, reduce poverty, and build the resilience of rural populations.

Materials and methods

The project identified vulnerable areas and social groups, and assessed nature of vulnerability using geo spatial data, with special emphasis on women headed families. Data was gathered at two levels. A macro-scale analysis at district level to map vulnerability profile for identified districts in Karnataka; and at micro level, attempts were done to map the vulnerability of dairy farming at village level. Case studies were carried out to focus on socio-economic implications of climate vulnerability for different dairy production systems in different regions. Vulnerability index was developed and tested by combining data on factors such as social vulnerability, infrastructure development, biophysical conditions, climate, agriculture, livestock and, transportation at appropriate scale (village/district) etc. Using this index vulnerability profile of districts was mapped. For mapping MapInfo tool was used. A few case studies were carried out in regions identified as exposed, to study impacts of climate change on lives of women headed families at village level and strategies used by them in coping with these changes. Research tools such as survey, semi-structured in-depth interviews, focus group

discussions etc., were used to generate information from various stakeholders. Secondary data sources were contacted for collecting data on geo-spatial and climatic parameters for the study.

Results and Discussions

Vulnerability to climatic variability in Karnataka

Most of the households reported that they suffered crop loss and loss of animals due to extreme climatic conditions. The major loss was due to field crops and vegetables, which are much sensitive to climatic conditions. Cross bred cattle was most vulnerable as compared to sheep and goat. Animal Feeding and management were the worst affected in case of climate vagaries. In extreme climate affected situations, livestock was the first option to en-cash, followed by cash crops and trees. Shelter, food and basic sustenance were the most essential needs in case of climate vagaries, both for human and animal. 95% of respondents reported that meeting out the water requirement of animals was challenge during drought periods. There is very little compensation received for the loss of livestock, due to natural disasters, as is the case of crops. 98% were not able to repay the agricultural loans during climate disasters. 79% of the total respondents changed their livelihood pattern, as coping strategy to climate changes (species of crops and livestock, management practices, housing of animals etc).

The vulnerability indices were constructed for different districts of Karnataka mapped onto the district level maps of Karnataka and they were mapped onto the district level maps using GIS software. Raichur was found the most vulnerable and Shimoga was found the least vulnerable for climate variability.

Table 1-Climate Vulnerability of districts in Karnataka

District	Climate vulnerability index	District	Climate vulnerability index
Raichur	82.04	Mandya	73.91
Yadgir	81.90	Mysuru	72.41
Bagalkot	79.43	Belagavi	73.70
Vijayapura	79.81	Chitradurga	74.83
Ballari	76.62	Kolar	74.06
Kalaburagi	75.91	Bidar	74.90
Koppal	77.00	Udupi	54.96
Chikkaballapur	75.17	Kodagu	52.03
Chamarajanagar	76.08	Shivamogga	52.01
Dharwad	69.00	Uttara Kannada	53.91
Gadag	67.84	Bengaluru Urban	59.69
Haveri	65.32	Dakshina Kannada	55.04
Tumakuru	68.47	Bengaluru Rural	63.00
Chikkamagaluru	61.06	Hassan	69.05
Davanagere	64.92		

It was found that groups with single livestock species (Cattle) were highly vulnerable to climate vagaries. Integrated farming system with a few cattle, sheep/goat and livestock was found to be the least vulnerable system. Significant difference was found among integrated farming system and livestock farming system. Most of the households reported that they suffered crop loss and loss of animals due to extreme climatic conditions. The major loss was due to field crops, which are much sensitive to climatic conditions. Vegetable crops also faced the similar issues. The most vulnerable livestock species was found to be cross bred cattle as compared to sheep and goat, which can withstand extreme weather conditions.

Adaptation strategies practiced by livestock farmers to cope with climate variability

Animal Feeding and management were the worst affected in case of climate vagaries. In extreme climate affected situations, livestock was the first option to encash, followed by cash crops and trees. Shelter, food and basic sustenance were the most essential needs in case of climate vagaries, both for human and animal. 95% of respondents reported that meeting out the water requirement of animals was challenge during drought periods. There is very little compensation received for the loss of livestock, due to natural disasters, as is the case of crops. 98% were not able to repay the agricultural loans during climate disasters. 79% of the total respondents changed their livelihood pattern, as coping strategy to climate changes (species of

crops and livestock, management practices, housing of animals etc).

Case studies

Five case studies were conducted in the study area, to find out the micro level adaptation strategies for coping the impact of climate variability. In general, six measures were zeroed in as coping behaviour by the households to hedge against the shocks. They were: (i) interest free loans from friends and relatives, (ii) relief from government (iii) selling of land iv) additional loans v) selling household assets and (vi) selling livestock.

The findings are summarized in the following points:

- Households belonging to BPL, households which own the land and those receiving medical or any other kind of aid are least likely to opt for selling of livestock.
- Most of women headed households opted for sale of household assets, whereas male headed households were not opting it as coping strategies.
- Female headed households were not opting for additional loans to cop up with losses due to climate vagaries. Similar is the case with that receiving government relief for natural disasters.
- Respondents belonged to OBC and above middle class were not receiving government relief for natural disasters, and had to resort to other coping strategies.

- Money received from friends and relatives were used mainly to cover up short fall in supply of food and other necessary items.

Conclusion

The areas which were vulnerable in the earlier time continued to be more vulnerable. But the study focused changes during the past 5 years only, as collecting information through recall method is difficult for beyond 5 years period. Climate extremes and most of them carved out their own adaptation strategies, especially in case of livestock rearing, affected majority of households. There is still lack of initiatives in the climate adaptation policies from the government agencies and most of the households

believe that there has to be intervention from the government, especially in natural disasters, with respect to crops and livestock. Insurance sector also can play a vital role in this regard. The trend in crop-livestock production shows that milk production is less susceptible to draft conditions, compared to crop production. Farmers have developed their own adaptation strategies to vagaries of nature by shifting from field crops to cash crops, adoption of scientific management practices for crops and livestock. It was observed that milk production can be sustained even under stress if population is optimised along with proper management of available feed-fodder resources. This is more important for feed-fodder deficit states like Karnataka.

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State Structuring : New Challenge & Opportunities for Agriculture Extension Service in Nepal

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ABSTRACT

Limited resources create a number of challenges for its transition to a new federal country like Nepal. Institutional transition offers unique opportunities to address existing weakness in the current policy process and institutional structure including within the agriculture sector. The problem of agriculture extension service delivery however is not just the issue of decentralization, whether the extension system is centralized or not, it is still largely based on public sector system. This paper analyses the discourses of local government promoted at the constitutional domains in contemporary Nepal and examines the existing legal provisions. The structure of the local governance and the relative autonomy at local level is one of the major agenda in the context of popular discourses of state restructuring. In this context this paper highlights the discourses of local governance in Nepal by reviewing three types of documents: Local Governance Act (LGA) 2017; Agriculture Development Strategy (ADS, 2015-2035) and learning's to decentralized agriculture extension service delivery in last two decades of Nepal. It also demonstrates the strengths and weaknesses of concept of decentralization of services against the ideals of strong and autonomous local governance system and its implication in agriculture service delivery. Finally, the paper discusses the way forward for crafting the architecture of local governance in relation to the agriculture service delivery. The specific questions addressed in this paper include: What is the overall context of state structuring in relation to changing previous administrative structure of Nepal? How does these structure and related provision of public agriculture goods and services will provide to the people to grassroots level administrative structure? What will be the best structure in agriculture sector aligned with national goal and strategy?

Key words : Extension service

Introduction

State restructuring in general refers to the reorganization of the existing state structure of any country to achieve certain objectives. The purpose of state restructuring is multi-faceted. In most instances, restructuring is pursued to create a more logical organization in which the state can perform its mandate and fulfill its responsibilities more efficiently and effectively (Young, nd). Peoples' successful movement in Nepal has recently dismantled two and half century old Shah regime and Nepal has transformed from a kingdom to federal republic (Pyakuryal & Upreti 2016). Consequently, the debate on restructuring of the state and societal transformation has become a common agenda at academic and political levels. Agrarian transformation would occur, subsistence agriculture will turn into a modern, commercial and industrial agriculture and agricultural development will accelerate industrial development in the country. Farmers will be influential in policy formulation and decision making leading to agrarian transformation through alteration in the existing federal agrarian relation (Pyakuryal & Upreti 2016). Moreover, Nepal's small area and limited resources pose a number of challenges for its transition to a federal country. At the same time, this institutional transition offers a unique opportunity to address existing weaknesses in the current policy process

and institutional structure, including the agricultural sector (IFRI, 2016)

Governance is a prerequisite for managing the service delivery functions that can only be ensured through high accountability and transparency on the part of the government and the local bodies while effective participation on the people. The Nepalese government has created different public service delivery mechanisms to make an effective service provision to the public, however, the targets are found to be difficult to achieve (Paudel 2011). Although significant efforts have been made by the agriculture service delivery system, there still exist several problems and issues that require due attention for more efficient and effective service delivery (Jaishi et. al. 2013).

Nepal is a late starter in providing public services to the general people, as it formally began in the 1950s after the fall of the autocratic Rana regime (Paudel, 2011). Most of the ministries had their branch offices at the regional and district level, which have very crucial roles in service delivery down to the Village Development Committee (VDC) level. The Nepalese government had been providing various public services such as postal, agriculture, health, education, infrastructure development etc. to the grassroots level through the respective line agencies. The performance of public service system had

been mixed as some service sector performed well, while a number of other sectors needed new strategies and efforts to produce positive results. There are still significant challenges in providing extension and advisory services (EAS) in these areas. The challenges range from insufficient funds for supporting public extension, poor resourcing, disorganized structures resulting in poor infrastructure for attracting businesses, limited involvement of rural farmers and populations in extension processes to the lack of appropriate strategies for effective research and extension methods. Limited coverage of extension services across rural regions and challenges in adapting technology packages to community-specific contexts have also been highlighted as critical issues in the delivery of EAS (GFRAS, 2016).

With the increasing participation of private sector and civil society organizations, Extension and Advisory Service (EAS) delivery has become pluralistic in many countries, brought new capacities and additional funding, it has also brought new challenges, mainly related to coordination, knowledge management, policy alignment and sustainable financing (GFRAS, 2016). The need for agricultural and rural information and advisory services is

likely to intensify the foreseeable future and is also likely to witness a reversal of recent trends towards bureaucratization within hierarchical extension services and reduction in their levels of public funding (Gwyn & Garforth, 2005).

Materials and methods

The methodology used in this study is exploratory-analytical. The secondary informations were obtained from various published and unpublished sources. This paper addresses how governance of the agricultural sector more generally- can be restructured to meet the constitutional provisions while simultaneously delivering on its agricultural objectives. The paper elaborates on the implications of the new constitutional provisions for agriculture, subsequently, the status of decentralization and agricultural policy in Nepal. Conceptually, the comparison cases provide useful insights related to the five principles as suggested by Kyle and Resnick 2016: authority, autonomy, accountability, incentives, and coordination. In many instances, the challenge will be identifying ways to minimize tradeoffs among these principles without forfeiting the potential advantages of a more decentralized system under federalism (Table 1).

Table 1: Key definition and concept of federalism and characteristics

Characteristics	Implication
Authority	Clear delineation of responsibilities across tiers within a legal framework
Autonomy	Adequate control over fiscal and human resources to fulfill responsibilities
Accountability	Flows of information and mechanisms for rewards/sanctions, both vertically (between citizens and governments and between tiers of government) and horizontally (across ministries and actors engaged in complimentary activities)
Coordination	Institutional mechanisms and other options for ensuring horizontal and vertical coordination
Incentives	Human resource and expenditure policies that encourage good performance and efficient service delivery

(Adapted from: Kyle and Resnick, 2016)

Federalism and Nepal: New experiences

After a lengthy period of consultation, in September 2015 Nepal's elected parliamentary body, the Constituent Assembly, passed a new constitution, known as the 2072 Constitution of Nepal. Among other notable provisions, a key objective of the Constitution is to transform Nepal into a “federal democratic republican country” in the next two years. This reform represents a new chapter in Nepal's history, which has been relatively fragile and volatile since the 1990s.

Federalism refers to a division of powers among multiple entities, typically between a central and regional (provincial/state) government (Kyle and Danielle, 2016). According to Riker (1975) “federalism is a political organization in which the activities of government are divided between regional governments and a central government in such a way that each kind of government has

some activities on which it makes final decisions.” Nepal has followed the “holding together” pathway to federalism. This decision has implications for the structure of responsibilities and finances across different levels of government. The creation of 753 local levels in Nepal marks a major restructuring of local bodies. This has been done in line with federal structure. As per the new arrangement, Nepal has 460 rural municipalities, 276 municipalities, 11 sub-metropolitan cities and 6 metropolitan cities. These local levels are divided into altogether 6743 wards (www.gov.np). The government's priority should now be effective management of local governance system.

Reform agriculture extension delivery system: Opportunities and challenges

Investments in agriculture and complementary rural infrastructure and institutional mechanisms are needed to

promote sustainable agricultural growth (Zavale et. al. 2011). According to the World Bank (2007), sustainable agricultural growth requires a holistic strategy consisting of policy reforms, institutional innovations and well-targeted investments aimed at boosting agricultural productivity and stimulating competitiveness. Major reforms in extension delivery have included decentralization and privatization of rural agricultural service delivery systems. The major trend has been the transfer of specific decision-making functions to the district and county administrations (Swanson and Rajalathi, 2010). Increasingly, the role played by local governments is an important move towards successful implementation of EAS delivery methods. With their comparative advantage in accessing farmers' needs, local organizations are in a better position to understand and suggest tailored extension activities to suit local conditions and needs. The involvement of local governments in agricultural extension activities has also brought opportunities for promoting publicly-funded but privately delivered EAS systems. This has paved the way for possible outsourcing of EAS delivery to NGOs, farmer-based organizations (FBOs) and private firms by enhancing the effectiveness of agricultural extension activities through the creation of a competitive environment.

However, the new Constitution does not start with a blank slate. The agricultural sector in Nepal has several preexisting features to be accounted when considering how to implement the federal structure. Most notably, rural livelihoods are quite distinct across the country's three broad agro-ecological zones, known as the Terai, the mid-hills, and the mountains. The harsh topography leaves approximately 20% of land in the country to be cultivable. Nonetheless, agriculture represents the livelihood of approximately two-thirds of the population, and constitutes about one-third of the country's GDP and more than half of its exports (USAID 2013).

Further, the Government of Nepal has committed to agricultural development goals, which it will now pursue within a federal structure. The country's current agricultural framework is guided by the Agricultural Development Strategy (ADS), which is intended to provide direction within the sector for the next two decades. The ADS is a 20-year vision that ultimately aims to achieve "a self-reliant, sustainable, competitive, and inclusive agricultural sector that drives economic growth and contributes to improved livelihoods and food and nutrition security leading to food sovereignty" (MoAD 2013). There are also a number of cross-ministerial policies and strategies intended to achieve food security more broadly, including the Multi-Sector Nutritional Plan, the Food Security Action Plan, and the Zero Hunger Challenge Initiative 2025. These goals will carry over to the new administrative structure (IFRI, 2016)

Agriculture Extension system in the past: Lesson for future

Nepal's extension system is highly pluralistic. In the public sector, extension is provided under the Department

of Agriculture in MoAD and in the Department of Livestock Services in the Ministry of Livestock Development (MoLD). However, extension education is provided by the Council for Technical Education and Vocational Training (CTEVT), Agriculture and Forest University and Tribhuvan University (TU). In addition, the private sector plays an active role in offering improved seed, pesticides, and artificial insemination for livestock, among other services (Suvedi and McNamara, 2012). Likewise, there are a number of NGOs, especially in the remote areas that provide extension services to farmers. With the LSGA, agricultural extension services were devolved to the district level. These services were organized in a network within the five development regions, 75 districts, and agricultural and livestock service centers at the Ilaka level, which encompasses multiple VDCs. Junior technicians worked at the Ilaka level and reported to the DADO or DLSO. In order to access extension services, an individual must be a member of a farmers' group registered to a DADO. There are approximately 22,000 farmers' groups and more than 1,500 dairy cooperatives existing in Nepal (Suvedi & McNamara, 2012).

Notably, the Agriculture Development Strategy (2013) has stressed that extending coverage and improving equity of agricultural extension services will be a priority (MoAD, 2013). For a country that remains relatively dependent on public-sector extension services, Nepal has comparatively few public extension agents, as indicated by the high number of agricultural workers served by one extension officer (1:3,837). Lack of adequate staff severely strains their ability to fulfill basic job functions.

Local governance act (LGA): Provision of agriculture extension in local level

Regarding local governance, several Acts and Regulations have been formulated and implemented in Nepal over the past six decades. The focus of these attempts was to provide a legal basis for the decentralization of power from central authority to district, municipality and village levels. They were however not designed to fully adhere to central idea of local governance that is meant to encourage and establish people's access, ownership, and participation in governing system. Local Self-governance Act (LSGA) 1999 was the last legal instrument crafted for designing local governance in last 18 years (1999-2017). It aimed to enhance autonomy and greater roles to the local government bodies. Unfortunately, three years after the LSGA was passed, the entire elected leadership of local bodies was dissolved as their tenure expired. The LSGA is regarded as a landmark for the devolution of power and authority to the local governing bodies and has marked important departure from earlier legal provisions. As consequences GoN instructed VDCs and DDCs to allocate at least 15% of the total block grant to the agricultural development. The LSGA had stipulated that all local bodies have their own elected political leadership. However, by 2000, civil conflict had affected about half of the 75

(predominantly rural) districts. Insurgents often targeted VDC offices, forcing elected officials to flee their villages (Brand, 2014). Consequently, in 2002, the government decided that it was not possible to hold new local elections and instead allowed the terms of those officials who were elected in 1998 to expire. Therefore, for the last 15 years, local governments had been authorized by civil servants appointed by GoN (Kyle and Resnick, 2016). Having said this, the LSGA had some inadequacies and ambiguities on sharing power and authority between different governing units. Recently, in September 2017, Local Governance Act (LGA, 2017) has been legitimated by the government to execute new federal structure of Nepal. Agriculture development and extension related duties and responsibilities have been explicitly mentioned in the part (3) under roles duties and authority of local body under clause (11). Further planning and implementation has been mentioned in part (6) clause (24). Representatives of local bodies from recent local election 2017 will implement these provisions.

Constitutional changes and its implication in agriculture

The dividends of state restructuring take time to be realized and state restructuring should be given sufficient time to deliver. Despite some limitations, Nepal's considerable experience with local governance and decentralization will facilitate its adaptation to the new federal structure. During the past decade, Nepal has institutionalized the Fourteen Point Planning Process, which has given citizens the capacity to participate in public forums on local development, and to plan projects and monitor their outcomes. More than a decade's experience with planning local agricultural development projects has taught citizens how to articulate their demands concerning the priorities of local agricultural development (Kyle and Resnick 2016). Thus, Nepal's strong history of participatory planning will make the transition into a federal system—with more demand-based agricultural services—easier than if these institutional frameworks and processes had not existed

Table 2: Major constitutional changes and its implication in agriculture extension service delivery

Characteristics	Prior to 2015	New constitution 2015	Implication
Units of government	National, Development regions (5), districts (75), VDCs (3,915), and municipalities (58)	National government, federal provinces (7), districts (77), local bodies 753	Human resource and financial capacity at the local body level may be insufficient
Administration of local bodies	Appointments by MoFALD of officials to administer local bodies	Elections at the national, provincial, and local (VDC and municipality) levels where as district boundaries will be retained for parliamentary constituencies	Potential disconnect between national agricultural priorities and those of locally elected governments
Responsibility for agricultural functions	Agricultural policy development at national level and implementation at sub-national level and agricultural extension de-concentrated to DDCs through DADOs and DLOs	Agricultural policy development and implementation at both national and sub-national levels and agricultural extension devolved to sub-national government	Different tiers of government have authority over different elements of agriculture, requiring high levels of horizontal and vertical coordination
Staffing	Civil service staff at the national, provincial, and district levels recruited through the National Public Service Commission	Civil service staff at the provincial and local levels recruited through a Provincial Public Service Commission; federal civil servants continue to be recruited by the National Public Service Commission	Extension staff are responsible to local government but hired through the Provincial Public Service Commission,

Adapted from Kyle and Resnick, 2016

The Constitution restructures Nepal as a federal country with three layers of federalism. The erstwhile unitary structure of the country has been replaced by seven federal provinces with delineation of stipulated legislative powers for the central, provincial, and local bodies (Table 3). There is an elaborate federal scheme in the Constitution. It provides for separate list of powers of the federal layers. Table 2 describes the primary responsibilities in governing the agricultural sector and the government tier given primary authority for the particular responsibility. As can

be seen from the table, many of the responsibilities are officially allocated across multiple tiers of government, leaving it unclear according to the Constitution where certain powers should lie. There is particular ambiguity over agricultural research, food safety, environmental protection and conservation, and agricultural education. Typically, when there are concurrent functions, the principle of subsidiary prevails, which means that the lowest government tier that is capable of performing the function should be given the mandate to do so.

Table 3: Schedule of powers across tiers of government within the agricultural sector

Responsibilities	Government tier
Regulatory Services: Food Safety	Federal, Provinces
Plant quarantine and livestock quarantine	Federal
Seed safety	Unspecified
Research and development	Federal & province
Agricultural education	Unspecified
Agriculture and livestock extension service	Local
Environment, protection & conservation: Soil health, forest, water use	Federal, Province, local
Land Use, Land Tenure, Land Reform	Federal, Province, local
Irrigation	Federal, Province, Local
Rural Infrastructure	Federal, Province, Local

Source:, Kyle and Resnick, 2016; The constitution of Nepal 2015

Setting up local level structure: New avenue to devolve of agriculture service

With the government formally transforming local bodies into local units under the newly-adopted federal system, people in far-flung villages across the country will now get various services from the local units themselves. While setting up new structured as provisioned in government policy (ADS 2013) by integrating livestock and other closely related agencies in each local level by dissolving existing district level organizations, we may require several additional office buildings and other facilities. Similarly, additional manpower will also be required. Adequate resources, in terms of knowledge, skills, experience, funding, and facilities are required for agriculture research and development. Such a structure needs training center equipped with necessary facilities and some piece of land of its own.

Community Agricultural Extension Service Center (CAESC) in each unit of local bodies as proposed by the Agriculture Development Strategy (ADS) will be the best structure that can deliver the extension services (ADS, 2013). The center will be fully owned and managed by the

communities and funded by the combination of resources from the local government, cooperatives, private sector, and the provincial government. Each CAESC will be registered according to the law. Membership will be open to all farmers, agro-enterprises, and agricultural extension service providers in the community and their organizations. The center will own and manage its own assets, hire its own staff, conduct meetings, formulate business plans, open a bank account, disburse funds, audit accounts and review activities periodically. Governance rules will establish the composition of the board and the way board members are elected by the members of the society. The center will be entirely managed by the community according to governance rules that are clearly established at the outset. Membership fees will be decided by the general assembly. The overall purpose of the centers will be to facilitate extension services at the village level and to meet the demands and needs of technical services at the grassroots. The center will hire their own extension service as per demand who will receive training and technical and backstopping from the local agriculture development office (LADOs). The center might sign MoUs or contracts with projects, NGOs, or private service providers as well.

The ADS has recommended promotion of a pro-poor decentralized extension system approach while facilitating the movement towards commercialization and propose a different approach and institutional framework. As per the proposed the contribution of the GON to the CAESC consists of a seed funding that is intended to leverage local resources. For each amount of fund provided by the GON as seed funding to the establishment of the CAESC, the local community (local bodies, Community support organization, cooperatives, private sector) will provide a multiple of fund. The CAESC will be entirely managed by

the community according to governance rules that are clearly established at the outset. The center will hire its own staff to provide extension services. The staff will be trained by the government staff at training centers of the DOA/DLS. The outcome will be a network of extension service centers that have the chance of reaching all local bodies in the country, are totally managed by the communities and therefore more likely to be responsive to the diverse needs of the farming population, and be responsible for raising funds and therefore more sustainable.

Table: characteristics of Community Agriculture Extension Service Center (CAESC)

Targeting	By type of farmers (subsistence, semi-commercial and commercial), commodity, by market (domestic or international market), and by agro-ecological region.
Devolution	To the lowest administrative level with option to decide whether such level is the district, the VDC or the municipality - based on resources and capabilities.
Partnership	Major involvement of private and cooperative sector (including business community, cooperatives, NGOs, CBOs, individual resource persons, universities and training institutions etc) into various forms of public-private partnership modalities (PPP).
Networking	Establishment and capacity building of a network of village extension workers.
CAESC	Establishment of Community Agricultural Extension Centers (CAESC) in each VDC that are funded and managed by VDC or local communities or cooperatives and are linked to existing DOA/DLS service centers/sub-centers for technical support and backstopping.
voucher system	Promotion of a voucher system on a pilot basis that would empower farmers to buy the best available extension and advisory services that meet their demand.
Market center	Target agricultural market centers to provide information and extension services.
Multiple extension	Adopt multiple extension methods including farmer field schools and farmer marketing schools.
Linkage	Facilitate linkages of farmer groups and organizations with other value chain actors and financial institutions, including commercial banks.
ICT	Use of innovative forms of Information and Communication Technology (ICT)
GESI sensitive	Train JTA to be more GESI sensitive
Women JTA	Increase the representation of women in JTAs.
Nutrition	Introduce nutrition into extension programs, particularly targeted to women

The approach requires considerable capacity building of service providers (NGOs, cooperatives, village extension workers, and private sector) to enhance their capacity of responding to the demands and needs of users. It will also require specific programs to target poor farmers, socially excluded, and the most marginal groups (women farmers, dalits, the uneducated, those living in remote areas). This pro-poor decentralized approach to agricultural extension challenges both the wide scale privatization which implies removal of state subsidy and the domination by the state of the delivery of services. The approach is focused on identifying appropriate public and

private roles and partnerships between them. On one hand, the approach introduces private-type performance and management practices into the public sector including charges for services and performance assessment by clients and an element of payment by results (ADS, 2013). Furthermore, this approach envisages a greater role for the local government as it is more directly in contact with people's needs and opportunities than is the central government. This assumes that local government is more able and accountable to respond to poor people's needs and opportunities.

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Information Technology for Transfer of Technology

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ABSTRACT

Rural communities and small scale agricultural producers are widely affected by global economic, environmental and political forces. This is true to a greater extent beyond the common myth that communities of small scale agricultural producers are isolated and living in closed, self sufficient societies. Interest rates, global commodity situations, changing trade pattern, transportation development, communication development and tariff structure, all impact upon the small farm operation.

Key words : *Transfer of technology*

Introduction

Indian farming community is in crisis and facing a multitude of problems for increasing the efficiency of farm production. One of the reasons is that expert / scientific advice is not reaching farming community in a timely manner. Due to several reasons the current extension system in India is unable to deliver the advice to the farming community in an efficient manner. Without having access to credible advice, the farmers are following unscientific farming practices, thus facing severe crisis due to reduced farm output or failure. Moreover, it is difficult to get high price for such low quality products in both domestic and international markets. So we have to use all the resources at our disposal to resolve these problems. Access to information and improved communication is a crucial requirement for sustainable agricultural development. Modern communication technologies when applied to conditions in rural areas can help improve communication, increase participation, and disseminate information and share knowledge and skills. However it is observed that the rural population still has difficulty in accessing crucial information in order to make timely decisions. It is essential that information availability is demand driven rather than supply driven. The challenge is not only to improve the accessibility of communication technology to the rural population but also to improve its relevance to local development. The ongoing IT revolution has opened huge opportunities for providing access to information as well as to interactive distance learning in rural India. Computer aided knowledge dissemination mechanism help to reach the un-reached and foster new voices and new leaders. Any effort in this direction will be highly effective way to empower the rural population with the most needed commodity that is *Information*.

Efforts made in the transfer of technology

In independent India rural development was taken on priority basis for systematic development. Community Development Scheme initiated in 1952 and National Extension Service (NES) initiated in 1953 encompassed the whole country into the realm of activities in agriculture, animal husbandry and rural welfare. A field level force of village level workers (VLWs) was put into service under subject matter specialists (SMSs) for transfer of technology in their respective areas. The Intensive Agricultural District Programme (IADP), Intensive Agricultural Area Programme (IAAP), Intensive Cattle Development Programme (ICDP) and Integrated Rural Development Programme (IRDP) were introduced to increase the production and productivity. In order to give added attention to research based transfer of technology, National Demonstration Programmes were launched in 1965 and Lab to Land Programmes (LLPs) were introduced by Indian Council of Agricultural Research (ICAR) in 1979. The Training and Visit (T&V) system, introduced in 1977 on pilot basis, later extended to all over the country by 1985, was the first major programme which focussed on extension only. The trend thus, till 1980s, had been to focus on Agriculture and more specifically to important crops of the concerned area. During the past two decades, the work of the extension services has often become more diversified into areas other than agriculture like animal husbandry, horticulture, fisheries etc. This requires the Extension Worker at the cutting edge level to be master of so many trades, which is well nigh impossible. The use of Information Technology can help the extension workers to be more effective in meeting farmer's information needs.

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Limitations of traditional extension methods

Before one can appreciate the question of what really makes cyber extension necessary it may be helpful to take look at some of the limitations of traditional extension techniques and processes such as

1. Production and printing extension message brochures and training a whole chain of extension personnel is expensive.
2. It takes many actors to understand the message and deliver it to next layer. This process takes a lot of time and effort on part of extension machinery of the state.
3. In Traditional Extension the quality of messages gets eroded as it passes through different layers.
4. The flow of the information from research to extension tends to be top-down, rather than a two-way, interactive process and little use of up-to-date communications technology lead to poor communication.
5. Neglect of extension in livestock development since priority was given to crop production. The focus of animal husbandry is mainly on animal health than o production aspect.

Thus it's found that the capacity of traditional extension system is very limited, and the challenge in terms of reaching all the villages and all the farmers is becoming more and more difficult to meet.

Potential advantages of Information Technology (IT) in rural development

1. Saves money, time and effort
2. Cuts actors at various levels in the diffusion process
3. Information rich and interactive
- 4 .Instant international reach
5. Continuous availability

Uses and Applications of IT

1. Personal Computer

Computer is one of the powerful tools which can aid in processing information and communicating it. It can store and display all kinds of information. It offers farmers many new opportunities to obtain technical and economic information quickly and use it effectively for decision making. Linked to a central information bank, farmers or extension agents can continuously receive available information or interactively request information. It can be used in planning, implementation and evaluation of community development programmes, facilitate easy handling and storage of written text and publishing special magazines for a small group at a cheaper cost and greater speed. A computer system can be used to generate

- Personal letters to cater to specific needs of the farmers viz., solution for a specific problem, etc.

- Circular letters by using mail merger facility to announce recent technological developments, to inform the dates, venue of training, meetings etc.
- Prepare report of studies / programmes conducted for the use of the decision makers and the benefit of the end users / participants in the programme.
- Data history of the animals of a farm as a whole to estimate, understand and inform the current performance trend to compare the past and the present data and assess the progress achieved and predict the future based on these data.
- Details of a maintenance records in animal management, production details and represent graphically the results for easy visual understanding.

2. CD ROM technology

The latest technology available for wide distribution of information in the Compact Disk Read Only Memory (CD ROM) which helps in information storage and retrieval. Advantages include storage potential, low cost, durability and easy to use.

3. Desktop publishing

It can be used for printing and publishing books, literatures etc. this may be combined with telecommunication to make production and distribution of publication inexpensive. Also revision can also be easily done.

4. Expert system

It is an intelligence computer programme that uses knowledge to solve problems that are difficult enough to require human expertise for their solution. The advice is given to farmers with alternatives chosen from a wide range of possible options by processing data from a large number of variables according to certain decision rules. Expert systems can be developed for disease diagnosis, farm planning, feeding systems etc.

5. Geographic Information System (GIS)

GIS is a systematically designed, spatially indexed approach for organizing information about places and regions in order to facilitate analysis of relationships between different social, economic and environmental variables. It is rapidly becoming and affordable technology with substantial, immediate and long term benefit for developing countries. The main applications of GIS include land use analysis, thematic mapping, site selection, socio economic studies, demographic analysis, analysis of biodiversity, disease and health studies, watershed planning, etc.

6. Networking

We are familiar with networking of railways, post and telegraphs, etc. they are all interconnected service

locations. A network is a means by which computers share and exchange information and resources across short distances (LAN – Local Area Network) or globally (WAN – Wide Area Network). LAN is a group of desktop computers located relatively close to one another and connected through cabling systems to enable them to share access to computing resources. A LAN typically consists of PCs on the same floor of the building or situated in different floors of the same building. It may even consist of computer spread across various buildings. When computers are spread across large geographical areas like intracity, intercity, etc. and still connected to one another to share information, it is called WAN. Networking will enhance the quality of communication by sharing of information among all extension wings and between different veterinary departments would ensure that the farmer will be provided with all latest information.

7. Internet

The internet is a worldwide collection of computer networks. It provides access to communication services and information resources to millions of users around the globe. The machines of one network can communicate with machines of other networks and send data files and other information back and forth. The internet covers the globe and is not owned by any individual, company or country. Through internet you could get information about people, products, organization, research data, electronic version of printed material, etc. For an organization or an institution, setting up a home page is a good way to let the world know what its products and services are. The crucial function that relate to provision of information are

- Publishing - including full text articles, reports, illustrated articles, abstracts, computer programmes, demonstrations, etc.
- Extension - in which some of the delays of other media can be reduced and disseminate information faster.
- Teaching - possibilities including both distance learning and assistance for students.

Internet provides for the compilation of information. Forms, email can be used for the conduct of survey. They are discussion groups and list servers where one can post a question and get it answered by hundreds of people of people who participate in these discussions. Some of the fundamental capabilities of the Internet are

- International communication is a fundamental facet of web
- Information can be maintained centrally on the network server and still be displayed, accessed and disseminated on an individual is possible.
- Two way of multi channel communication is possible.
- Seamless access to shared data, project coordination, coordinated information management resulting in enhanced opportunities for innovative services.

To become successful in the today's competitive world one has to manage the future which is achieved by managing information. Internet is a vast source of information. It is the window to the information superhighway. Access to the internet will bring the whole world under ones fingertip. Internet itself is a huge library with plethora of backup and publication is all subjects under the nose. Scores of information of the day-to-day affairs across the horizon would help the extension agents to go global and his ability to act local would make him the most sought after personal. The World Wide Web can help the extension world wide in the following ways:

- i. Providing interaction among research scientists, extension workers , farmers and other rural people through e-mail;
- ii. Providing up-to-date news and information services, such as market prices and weather conditions;
- iii. A question and answer service where experts respond to queries on specialized subjects;
- iv. Creation and maintenance of Statistical Databases on critical agricultural and rural development parameters that can be queried on demand;
- v. Providing the details of Poverty Alleviation Schemes on the Internet;
- vi. Providing status of various Government Programmes and details about their implementation mechanism on demand basis;
- vii. Hosting web sites by major institutions participating in agricultural extension, putting latest packages of practices (with more situation specific packages), for various agro-eco regions. These institutions, particularly the Project Directorates may also place the diagnostic and pre-emptive farm practices for the major crops particularly the commercial crops, well in advance of the concerned crop season. This can help the extension workers to access latest information on IPM (Integrated Pest Management), INM (Integrated Nutrients Management) and other such practices for high value important commercial crops. The institutions will also be able to get direct customer feedback for their packages.
- viii. Launching online rural development and extension journals, newsletters etc. (with or without print version);
- ix. Providing Internet access at district and block level agriculture and rural development offices. This service may also be open for rural communities on fixed days. This connectivity can also be used to download online publications on useful topics from anywhere in the world;
- x. Opening of cyber cafes to enable educated rural people and extension workers at village level to have direct access to world wide web for having market information etc.;

- xi. Providing maps that display different features, such as population density, crops planted, etc.;
- xii. Providing video clips to demonstrate complex procedures; and audio files for re-broadcast on local radio stations (FAO, 1999);
- xiii. Providing mechanism of user / beneficiary feed back for the Public Sector Schemes.

8. e-Mail (electronic mail)

e-Mail or the electronic mail is one of the services provided by the Internet. Computer users can interact using electronic mail network. Being cheaper than voicemail, it overcomes the time zone difference that hinders that hinders the real time communication. E-mail also offers to stay in touch with special groups. A mailing list is a special and easy way to share information with many people on a specific topic or for a specific purpose. Once subscribed, you will receive regular information via E-mail on a subject with minimum cost and effort. Sharing knowledge with other subscribers and getting help in case of a problem are all possible. E-mail facilitates, by their speed, immediate availability of information and thereby empowers the extension would then be multifold. The E-mail by itself would be a record for information shared.

9. Multimedia

It is a multi faceted instructional strategy that brings together text, graphics, animation, video, still images audio and video. The computer integrates all these media into a single platform and provides interactivity to the system. It allows the users to navigate through the package on any path he wishes. Understanding the vast capabilities of multimedia several software packages have been developed which are used as a teaching tool by the instructor. It enable the learners to actually hear and see what is actually happening in a given problem situation. It is more simplified than making slides, transparencies and

the teacher can create an entire lesson and present a running commentary.

Role of extension staff

Person-to-person communication has traditionally been the most important form of information transfer. Print media as well as radio and television were of a supplementary nature because they frequently lacked target group or location specificity and information was not up-to-date. Revolutionary changes in communication technology have dramatically increased the speed and quality of information transfer and changed the role of extension workers in industrialized countries. Electronic communications systems may in part replace personal visits, and one of the major tasks of any agent will be to link her or his clients with other suppliers of information.

Conclusion

Today, the working conditions of extension personnel have deteriorated; expectations with regard to their role are increasing. They are no longer to be simply transmitters of technical knowledge. They are to practice participatory methods, recognize and respect gender issues, identify indigenous needs and problem solutions, and serve as a link to the world outside the village, to name but a few of the present topics. The emerging role is closer to that of a "socio-economic community worker" than a technical expert, but their training is insufficient for either. For that matter computer wisdom is again an indispensable qualification for them to pump up the information to the needy in time at seasons and in emergencies. This would also lessen their burden on transport facilities, staying in their office and networking their advices and ideologies will bring a lot of change in the rural scenario. Insitu storage and retrieval of information could reduce a lot of stress and burden of the extension worker in their field visits. This would pave a way for them to inculcate a sense of zeal to answer the queries of the farmer at any time.

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Adoption of improved technologies in lower Shivalik range of Uttarakhand for enhancing Farmer's Income

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ABSTRACT

Adoption of a new technology is not instant act but a mental process through an individual passes from hearing about it to its ultimate adoption. In order to promote adoption improved technology, a conceptual model has been developed which comprises of three components namely, input, process and output. Any new technology generated through research acts as 'Input' to activate the 'Process' consisting of policy options, organizational characteristics and extension education efforts to produce the desired 'Output', that is, the feeling of satisfaction among the farmers. Majority of smallholder farmers relies on traditional technologies in lower Shivalik range of Uttarakhand and this has lowered the level of productivity. These farmers generally obtain very low crop yields because the local varieties used by farmers have low potential yield, unavailability of quality planting materials, little or no fertilizers are used, lack of knowledge about technical know-how. Keeping these point in view, three blocks from Haridwar district of Uttarakhand has been selected randomly. It was explored that introduction of IARI improved varieties (in paddy Pusa 1121, PS-5, in wheat HD-2967, HD-3086) has enhanced yield per ha area than the local ones. IARI improved wheat varieties (HD-2967, HD-3086) were introduced which rise the average profit Rs.40000/- per ha of land, improved paddy varieties Pusa 1121, P5 and Pusa -1612 recorded estimated increased profit of Rs. 10,800/- per ha than the local variety (Sarbaty). Thus results showed a significant positive impact on productivity. This suggests that adoption of improved varieties significantly generate an improvement in farming and so far household living standard. Hence, efforts should be intensified to ensure farmers have access to adequate quality improved seeds at the right time. All programs, strategies and policies that could lead to increase in improved adoption should be intensified in order to achieve the much desired enhance production and generate an improvement in rural farming households' welfare in lower Shivalik range of Uttarakhand.

Key words : Improved Varieties, enhancing farmer's income

Introduction:

Agriculture sector has been recognized as a key fundamental for spurring growth, overcoming poverty, and enhancing food security (Diagne *et al.*, 2009). One of the overarching goals of Indian agriculture development programs and policies is increasing agricultural productivity for accelerated economic growth. Particularly, majority of the population (70%) depend on agriculture for survival. Thus, agricultural sector has been recognized as a key fundamental for spurring growth, overcoming poverty, and enhancing food security. Productivity increase in agriculture can reduce poverty by increasing farmers' income, reducing food prices and thereby enhancing increments in consumption (Diagne *et al.*, 2009). Consistent with this argument, the Department for International Development (2003) estimated that a 1% increase in agricultural productivity reduces the percentage of poor people living on less than 1 dollar a day by between 0.6 and 2%, and no any other economic activity generates the same benefit for the poor. It is also of considerable significance that when agricultural production increases through the use of improved varieties of crops in a given area, farmers and their communities derive added socio-economic benefit. Such activities can increase the value of

locally produced crops, generate local employment, stimulate local cash flow, and through processing, marketing, and related activities can bring about improvement in socio-economic status and the quality of life.

Significance of the study:

As rising populations and income increase pressure on land and other resources around the world, agricultural productivity plays an important role in improving food supplies and food security. Improper use of inorganic fertilizers, non-availability of adequate seed and planting materials as well as the selection of crops and cropping pattern which is not appropriate to the land is also resulting in degradation of soil and water resources substantially. Uttarakhand is primarily an agricultural state although its share in the country's total area and production is negligible. The contribution of agriculture to the state's domestic product is about 22.4 per cent and 75-85 per cent people of the state are dependent on agriculture for their livelihood (Roy *et al.*, 2016). The state possesses diverse agro-climatic endowments, the plains and hills present differing scenarios for agriculture while commercial agriculture is practiced in the plains.

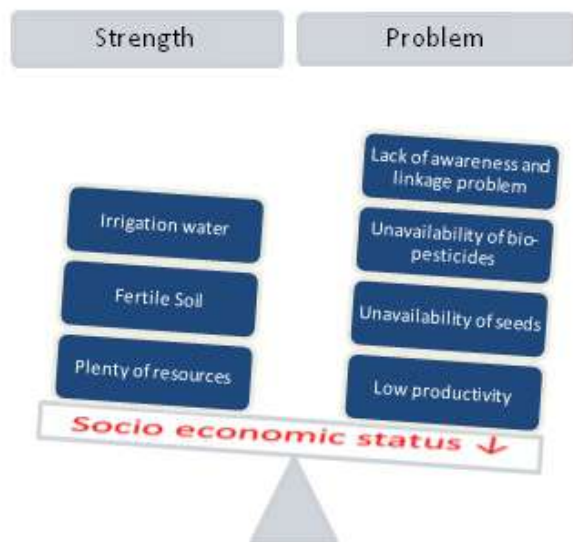


Fig1: Situational analysis

Instead of adequate natural resources for successful crop growing like fertile soil, 87 per cent irrigation water, the productivity was found not to reach at competitive level for various crops as compared to other parts of the lower Shivalik Hills (i.e., Jammu region of J&K and Malwa region of Punjab) because of unavailability of improved planting materials (seed), poor access to modern

technologies, poor productivity level leading to abysmally low marketable surplus in plains (Roy et al, 2016).

As a source of livelihood, agriculture remains the largest sector of Indian Economy. While its output share fell from 28.3% in 1993-94 to 14.4% in 2011- 12, employment share declined from 64.8% to 48.9% over the same period (NITI Aayog, GOI, 2015). Given the low share of this workforce on average, it earns much lower income poorer than its counterpart in industry and services. So, this paper attempts to explore the possibilities to upgrade the existing subsistence level of agriculture to competitive agriculture with the prevailing natural resources in Uttarakhand State and probing a suitable strategy for enhancing farm income of the region.

Immediate intervention in study area:

Focusing on the above problems improved HYV has been demonstrated at the farmers' fields to assess the benefit in economic terms which help them to adoption and multiplication of improved technologies for future use.

In Rabi 2015, improved HYV of wheat like HD-2967 and HD-3086 has been introduced and was compared with the existing wheat varieties (PBW-226, PBW-292). Similarly, In Kharif 2016, improved paddy varieties (P-1121 and PS-5) was compared with local variety (Sarbat) in economic terms. Simultaneously Summer vegetable Bottle gourd (Pusa Naveen) has been introduced and compared with local ones. Mustard variety (PM-30) was compared with local variety and yield gap has been recorded.

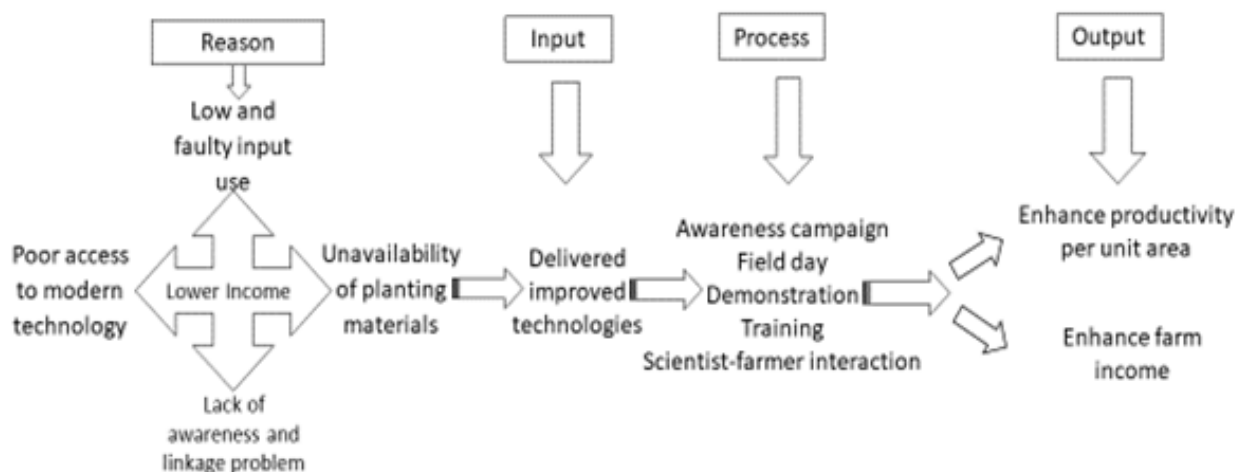
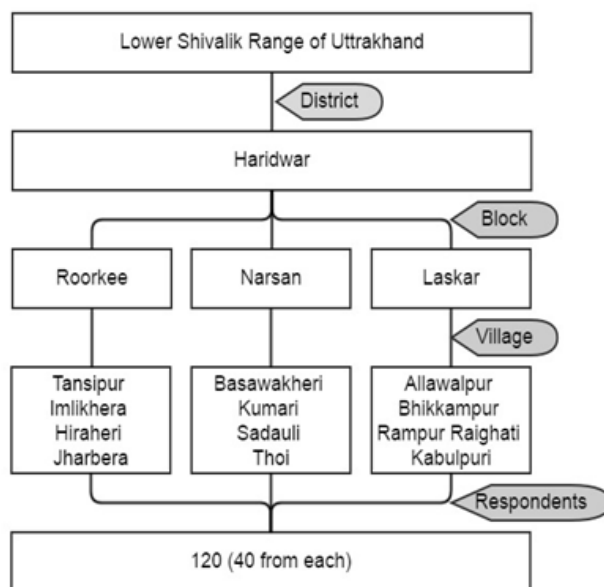


Fig2: Conceptual model for adoption of new technologies

Locale of study and sampling procedure:

The study was conducted Roorkee, Laksar and Narsan blocks of Haridwar district of Uttarakhand. A total of

sample 120 farmers was taken randomly from the four villages of each block. Details of sampling plan has been given below:

**Data analysis and statistical tools:**

The data was obtained from structured interview schedule as well as focus group discussion. The raw data was subjected to analysis with the descriptive statistical tools (frequency, percentage).

Results and discussion:

Table 1 clearly revealed that introduction IARI improved paddy varieties Pusa 1121, P5 and Pusa -1612

recorded average yield 50.13 qt/ha compared to local check (Sharbati) 45.60 qt/ha with 9.93 percent increased yield and estimated increased profit of Rs. 10,800/- per ha. Similarly, wheat varieties (HD-2967) and (HD-3086) recorded yield of 52 q/ha and 45 q/ha, respectively with an increase yield of 14 and 2 percent than the local check (PBW-226, PBW- 292) with an estimated profit of Rs. 40,000/- per hectare.

Table1: Comparative yield performance of IARI improved varieties with the local ones

Crop	Improved Variety	Yield (ha)	Local Variety	Yield (ha)	Proportionate change in yield (in %)	Profit (Rs)
Paddy	Pusa-1121	48.6	Sarabati	45.6	6.57	10,800
	Pusa-1612	52.3			14.69	
	Pusa-2511	49.5			8.55	
Wheat	HD 2967	52.09	PBW 292	45.72	13.93	40,000
	HD 3086	45.05	PBW 226	44.14	2.06	
Mustard	Pusa Mustard 30	37.5	Desi	30.0	25.0	10,067.5
Bottle gourd	Pusa Naveen	108.5	Desi	62.0	74.19	48,789

In Rabi 2016, mustard variety (Pusa Mustard 30) was preferred by the farmers with net profit of Rs.17121.25, Rs. 3887.50 and Rs 9193.75 in Roorkee, Laksar and Narsan block, respectively. IARI bottle gourd variety (Pusa Naveen) was introduced which is not only high yielding but also high calorie vegetable, providing 14 calories per 100 gm. Additionally, it is also a moderate source of Vitamin-C (100 g of raw fruit provides 10 mg or about 17% of RDA); a moderate source of thiamin, niacin (Vitamin B-3), pantothenic acid (Vitamin B-5), pyridoxine (Vitamin B-6) and minerals viz., calcium, iron, zinc, potassium, manganese and magnesium (Roy et al, 2017). Moreover, introduction of Pusa Naveen showed economic benefit more than Rs. 48,000/- per hectare of land indicating higher net return compared to local varieties being grown by the farmers of the region.

It was explored during the interview with targeted group of respondents that multi-dimensional constraints like non-availability of quality seed of recommended varieties, non-availability of reliable and recommended bio-pesticides, bio-fertilizers and bio-control agents, insufficiency of rural infrastructure, marketing of agricultural produce and infestation of wild animals have significant influence on the present state of agriculture. All these lead to poor socio-economic status of the farming people. It was observed that important aspects of agriculture in lower Shivalik region of Haridwar that need immediate attention to bring economic advantages to farm families was to enhance the output per hectare, which is a common measure of agricultural productivity. It was inferred that low and faulty input uses, poor access to modern technology and no real technological breakthrough was the reason thereof (Roy et al, 2017)

Conclusion and way forward:

The analysis on the revenue of the respondents' shows that introduction of IARI improved varieties generated more profit than the local varieties available on that location. This result shows that the B:C ratio of IARI improved varieties are double as compared to local varieties which shows a positive impact in increasing productivity and farm income of the farming community.

Hence, in the long run productivity enhancement requires research toward discovery of robust seed varieties and other inputs, appropriate crops, input usage for a given soil type and effective extension practices which need to follow up to taking advantage of these potential would require institutional support and investment in technological innovations so as to accelerate agricultural growth and bring remunerative prices to farmers.

Henceforth, it is necessary to motivate the farmers and building their capacity through organizing campaigns and method demonstration on location specific technological intervention. Extension professionals should develop innovative ways of mobilizing communities by carry out effective monitoring and intervention of their programmes for measuring social change and formulate the strategies to lead the farmers towards secured livelihoods.

At the same time, it is imperative to mobilize and to educate the farming community about the existing policy and facilities as extended by the Govt. So, formulation strategies in order to development and strengthening of farmers' organizations through various extension strategies such as demonstration, field days, exposure visits and integrate with other organizations working at villages to achieve higher and sustainable agricultural productivity is necessary. Besides, arrangement to linking these activities with marketing facilities in the particular area assume much more priority.

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Factors affecting attitude of stakeholders towards Genetically Modified Crops in Malwa Region of Punjab

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ABSTRACT

This paper investigates the stakeholder's attitude towards the genetically modified crops and foods. Sixty farmers were selected from each of the two highly producing districts of Punjab in terms of genetically modified crops and ten extension personnel were selected from each of the two districts. Finally ten research scientists from Punjab agricultural university. Thus a total of one hundred and fifty respondents were selected for the study. The data were collected with the help of self-structured interview schedule. Findings of the study revealed that almost half of the farmers were having unfavourable attitude which was measured by self-constructed attitude scale while majority of extension personnel and research scientists had favourable attitude towards GM crops. Correlation analysis revealed that factors like GM crops experience, mass media exposure, extension contacts, risk orientation and innovativeness of farmers significantly influences attitude of farmers towards GM crops. The multiple regression analysis determined the contribution of these factors more concretely with how much amount. Therefore, modern techniques in agriculture need to be well targeted in accordance to the socio-psychological and socio-personal characteristics of stakeholders.

Key words : Attitude, GM crops and foods, correlation, multiple regression analysis

Introduction

Agriculture which has always been saviour of human civilization is facing enormous challenges in twenty first century. In order to feed growing population more food and fibres need to be produced with stagnating labour force to contribute for the overall development in developing countries. The introduction of genetically modified (GM) crops has been an exemplary progress to world agriculture over the last couple of decades. It has been found that technology has the prospective to not just enhance global food yields but also can lead to sustainable development. Making utilization of present day biotechnology, including GM, is one approach to diminish weight on farming resources, by enhancing food quality; expanding the efficiency of the crops and helping crops adjust to ecological burdens such as drought and disease pest incidence. Genetically modified organisms (GMOs) can be defined as organisms in which the genetic material (DNA) has been altered in a way that doesn't occur naturally by mating or natural recombination. The technology is regularly called as "modern biotechnology" or "gene technology", sometimes also "recombinant DNA technology" or "genetic engineering". It enables desired genes to be transferred from one creature on to the next, also between non-related species (Anonymous 2015a). Globally, since being introduced commercially in 1996, GM crops have contributed to food security, sustainability and the abatement of climate change. A record 185.1 million hectares of biotech or GM crops were grown globally by 2016, at an increase in growth rate of threepercent from 2015 (ISAAA 2016). With around 18

million farmers involved in its cultivation across the 28 countries of the world, biotech crops have set a precedent that the biotech area has grown impressively every single year for the past 20 years and achieved remarkable 100-fold increase since its commercialization in 1996. Thus, biotech crops are considered as the fastest adopted crop technology in the history of modern agriculture (Anonymous 2014). In terms of genetically modified crops cultivation area, India has global ranking of 5th with 10.8 million hectares of genetically modified crops area behind USA (72.9Mha), Brazil (49.1Mha), Argentina (23.8Mha) and Canada (11.6Mha). It is interesting to find that, among the 18 biotech mega countries, 14 are from developing countries of Asia, Africa and Latin America. There is decrease in 0.8 million hectares in India which is mainly attributed to severe whitefly infestations. (ISAAA 2016). The State of Punjab which is the bread basket of India, have around 75 per cent (Anonymous 2015b) of population dependent on agriculture. Presently, Punjab agriculture is very progressive in terms of inputs and technologies usage. GM crops (Bt. cotton) were introduced in Punjab in 2002 as part of GM revolution in India. In the year 2016, around 2.43 lakh hectares of Bt. cotton was grown in Punjab which is less than 2015 cotton area (3.05 lakh ha). The decrease in Bt. cotton area was mainly due to severe white fly infestation of 2015. The severe whitefly infestation raised concerns about growing dependency upon Bt. cotton in Punjab. The GMO Bt. cotton which was engineered to produce Bt. cotton, are now perceived to be vulnerable to attack by non-target insects and has increased the application of pesticides. The expanding development of

GM crops has raised extensive worries regarding food security, ecological impacts, financial issues and health hazards. It has been found by researchers that attitude is a foremost factor which is responsible for acceptance of any new technology. Among the few studies conducted to judge the attitudes of farmers, consumers and stakeholders, most of the respondents show positive attitude towards the technology. Respondents show reservations towards food crops more than cash crops where number of other factors like biosafety regulations, familiarity, moral aspects or type of gene transfers played a crucial role (Aerni et al 2005; Anonymous 2009; Hall 2008; Han et al 2015;). The findings from some studies brought out cautious approach of stakeholders towards genetically modified crops (Aminet al 2013; Elum and Sekar 2015). The object for the present study has been referred to genetically modified crops and foods. The success or failure of any idea or technology to a larger extent depends upon the favourable attitude of various stakeholders towards it. Considering this, effort has been put forward for assessing the attitude of stakeholders towards genetically modified crops which can be utilized by other researchers beyond the study area.

Materials and Methods

Attitude in this study referred to the degree of favourable and unfavourable feeling of different stakeholders towards GM crops and foods. The study was conducted in the Malwa region of Punjab purposively because genetically modified crop in the form of Bt. cotton was introduced in this region of Punjab. In Malwa region, two districts with highest acreage under transgenic crops viz. Bathinda and Fazilka were selected. Then from each of the selected districts, 3 blocks were selected randomly. A sample of 120 farmers drawn randomly, with 10 farmers

from each of the 12 selected villages selected through simple random sampling technique. This study also comprised of extension personnel and research scientists. Ten extension personnel from state department of agriculture and KVK/FASS were selected from each of the two districts. Similarly, ten research scientists from Punjab Agricultural University, Ludhiana were also considered as part of the study. Thus, 120 farmers, 20 extension personnel and 10 research scientists who aggregated total of 150 respondents were included in the study. In order to measure attitude, an attitude scale was prepared in accordance with Likert's summated rating scale technique. Attitude scale included statements which measure the degree of positive and negative attitude towards genetically modified crops. The scale was standardised by reliability and validity determination. The data were collected through self-structured interview schedule. The statistical analysis of data was done through spearman's correlation method and multiple regression analysis.

Results and Discussion

In examining attitude of stakeholders, three components were focussed upon viz. attitude of farmers, attitude of extension personnel and attitude of research scientists.

1. Attitude of farmers towards genetically modified crops

The overall results show that almost half (45.83%) of the farmers had unfavourable attitude towards genetically modified crops followed by less than one-third (31.66%) of farmers with favourable attitude. About 22 per cent of farmers had neutral attitude.

Table 1 Distribution of farmers according to their overall attitude towards GM crops (n=120)

S.N.	Category	Frequency	Percentage
1.	Unfavourable (32 -47)	55	45.83
2.	Neutral (48 -49)	27	22.50
3.	Favourable (50 -65)	38	31.66

The critical examination of table 2 indicates that almost all the farmers viz. 99.16 per cent with mean attitude score of 4.99 strongly agreed that regulations for genetically modified foods need to be framed by government. A very large number of farmers (97.50%) with mean attitude score of 1.14 expressed strong agreement on the fact that farmer's dependency on seed of multinational company for genetically modified crops reduces their autonomy. Data in table 2 also indicate that 82.50 per cent of farmers with mean score of 4.82 strongly agreed that it is essential for companies to label foods/products derived from GM technology. In accordance to the statement of GM technology being producer neutral, 82.5 per cent of farmers had strong agreement. The studies related to distribution of

Bt. cotton have been studied in Argentina (Qaim and de Janvry 2003), China (Pray and Huang 2003), Mexico (Traxler *et al* 2003). These available evidences showed that GM technology is scale neutral and has greater degree of acceptance. A large majority (81.66%) of farmers with mean score of 4.64 had strong agreement that GM crops will decrease pesticide/herbicide residue from the environment. Just less than half of the farmers (47.5%) strongly agreed that less man days in terms of labour requirement are required for GM crops.

The data in table 2 also indicate that around 45.83 per cent of farmers were undecided about GM crops having unknown effects upon human health. Interestingly a huge majority of farmers' viz. 91.66 per cent with mean score of

4.85 strongly disagreed that GM technology makers are playing with God. More than half of the farmers strongly disagreed about GM crops ensuring reduction in losses caused by weed growth. Exactly half of the farmers strongly disagreed that modified genes can spread to the wild relatives of crop plants. Around 43.33 per cent of

farmers disagreed that GM crops are forced by developed countries upon developing countries. About 40.83 per cent of farmers strongly disagreed that there is increase agrochemicals due to GM crops. As much as 35.00 per cent of farmers strongly disagreed that genetically modification helps in creating food with more nutritional values.

Table 2 Distribution of farmers according to attitude towards genetically modified crops and foods:

S.N.	Statement	SA	A	UD	DA	SD	MS
1.	There is increase in use of agrochemicals due to GM crops	11 (9.16)	24 (20)	15 (12.5)	21 (17.5)	49 (40.83)	3.60
2.	Genetic modification helps in creating food with more nutritional values.	27 (22.5)	7 (5.83)	23 (19.16)	21 (17.5)	42 (35)	2.63
3.	It needs less man days in terms of labour requirement	57 (47.5)	15 (12.5)	39 (32.5)	3 (2.5)	6 (5)	3.95
4.	It ensures reduction in losses caused by weed growth.	0 (0)	7 (5.83)	23 (19.16)	20 (16.66)	70 (58.33)	1.72
5.	It promotes super weed.	42 (35)	21 (17.5)	48 (40)	4 (3.33)	5 (4.16)	2.24
6.	GM crops have unknown effects upon human health.	27 (22.5)	6 (5)	55 (45.83)	6 (5)	26 (21.66)	2.98
7.	GM crops will decrease pesticide/herbicide residue in the environment.	98 (81.66)	4 (3.33)	16 (13.33)	1 (0.83)	1 (0.83)	4.64
8.	Modified genes can spread to the wild relatives of crop plants	0 (0)	3 (2.5)	34 (28.33)	23 (19.16)	60 (50)	4.16
9.	It is essential for companies to label the foods/products derived from GM technology.	99 (82.5)	21 (17.5)	0 (0)	0 (0)	0 (0)	4.82
10.	Regulations for GM foods need to be framed by the govt.	119 (99.16)	1 (0.83)	0 (0)	0 (0)	0 (0)	4.99
11.	GM technology makers are playing with God.	2 (1.66)	1 (0.83)	0 (0)	7 (5.83)	110 (91.66)	4.85
12.	Farmer's dependency on seed of multinational company for GM crops reduces their autonomy.	117 (97.5)	1 (0.83)	1 (0.83)	0 (0)	1 (0.83)	1.14

Figures in parentheses indicates the per cent

II. Attitude of extension personnel towards genetically modified crops

Overall attitude of extension personnel is quite positive

with 60 per cent of extension personnel having favourable attitude and about twenty per cent of extension personnel with both unfavourable and neutral attitude.

Table 3 Overall Distribution of extension personnel according to their attitude towards GM crops.

S.N.	Category	Frequency	Percentage
1.	Unfavourable (43-48)	4	20
2.	Neutral (49)	4	20
3.	Favourable (50-55)	12	60

A close look of data in table 4 indicate that with mean attitude score of 4.9, almost all the extension personnel viz. 90 per cent had strongly agreed that regulations of GM foods need to be framed by the government while another 10 per cent of respondents agreed to this. With mean score of 4.45, as much as 60 per cent of extension personnel provide strong agreement on the statement that GM crops will reduce pesticide and herbicide residue from the environment and another 30 per cent agreed to this. All the extension personnel either agreed or strongly agreed that farmer's dependency on seeds of multinational companies reduces their autonomy. With mean attitude score of 4.0, fifty five per cent of extension personnel agreed to the fact that it is essential to label foods of GM technology while 30 per cent of extension personnel strongly agreed to it. With mean score of 3.65, more than half (55 %) of the extension personnel agreed that genetically modification can produce food with more nutritional values while 15.00 per cent of them strongly agreed to it. Again 45 per cent of extension

personnel with mean score of 3.6 agreed that GM crops need less man days in terms of labour requirement. Sixty per cent of extension personnel agreed with mean score of 3.25 that GM technology is producer neutral technology.

With mean attitude score of 3.65, about half of the extension personnel disagreed that there is increase in use of agrochemicals due to GM crops while twenty per cent strongly disagreed to it. Forty per cent of extension personnel disagreed that GM crops ensure reduction in losses caused by weed growth. Seventy per cent of extension personnel disagreed that GM crops promote super weeds. With mean score of 3.9, fortyfive per cent of extension personnel have disagreement that GM technology makers are playing with God. About 40 per cent of extension personnel were undecided about GM crops having unknown effects upon health while 35 per cent of extension personnel were undecided that modified genes could spread to the wild relatives of crop plants.

Table 4 Distribution of extension personnel according to attitude towards genetically modified crops and foods:

S.N.	Statement	SA	A	UD	DA	SD	MS
1.	There is increase in use of agrochemicals due to GM crops	1 (5)	2 (10)	3 (15)	10 (50)	4 (20)	3.7
2.	Genetic modification helps in creating food with more nutritional values.	3 (15)	11 (55)	3 (15)	2 (10)	1 (5)	3.65
3.	It needs less man days in terms of labour requirement	3 (15)	9 (45)	5 (25)	3 (15)	0 (0)	3.6
4.	It ensures reduction in losses caused by weed growth.	2 (10)	3 (15)	5 (25)	8 (40)	2 (10)	2.75
5.	It promotes super weed.	0 (0)	3 (15)	2 (10)	14 (70)	1 (5)	3.65
6.	GM crops have unknown effects upon human health.	1 (5)	7 (35)	8 (40)	3 (15)	1 (5)	2.8
7.	GM crops will decrease pesticide/herbicide residue in the environment.	12 (60)	6 (30)	1 (5)	1 (5)	0 (0)	4.45
8.	Modified genes can spread to the wild relatives of crop plants	1 (5)	5 (25)	7 (35)	4 (25)	3 (15)	3.15
9.	It is essential for companies to label the foods/products derived from GM technology.	6 (30)	11 (55)	0 (0)	3 (15)	0 (0)	4

10.	Regulations for GM foods need to be framed by the govt.	18 (90)	2 (10)	0 (0)	0 (0)	0 (0)	4.9
11.	GM technology makers are playing with God.	0 (0)	1 (5)	5 (25)	9 (45)	5 (25)	3.9
12.	Farmer's dependency on seed of multinational company for GM crops reduces their autonomy.	10 (50)	10 (50)	0 (10)	0 (30)	0 (10)	4.5

Figures in parentheses indicates the per cent

III. Attitude of research scientists towards genetically modified crops

Research scientists are the one who develop technology and are constantly involved in critical appraisal of it.

Results regarding attitude of research scientists towards genetically modified crops show that sixty per cent of research scientist had favourable attitude while 40 per cent of them show negative attitude.

Table 5: Distribution of research scientists according to their overall attitude towards GM crop

S.N.	Category	Frequency	Percentage
1.	Unfavourable (36-49)	4	40
2.	Neutral (50-51)	0	0
3.	Favourable (52-65)	6	60

As much as 60 per cent of the research scientists strongly agreed that GM crops need less man days in terms of labour requirement while 30 per cent of them agreed to it. With mean score of 4.4, 60 per cent of research scientists strongly agreed that regulation of GM need to be framed by government, while 20 per cent agreed to it. With mean score of 4.3, 70 per cent of research scientists agreed that genetically modification helps in creating food with more nutritional values while 30 per cent of them strongly agreed to it.

Sixty per cent of research scientists with mean score of 4.4, agreed that GM crops will decrease pesticide/herbicide residue from the environment while 40 per cent of research scientists strongly agreed to it. 40 per cent of research scientists strongly agreed that it is essential for companies to label the GM crops to distinguish properly while 20 per cent agreed to it.

On the issue of GM crops being producer size neutral technology, 60 per cent of research scientists disagreed to it with mean score of 2.8. With mean score of 3.3, 40 per cent of research scientists agreed that GM products are being forced upon developing nations by developed countries, while 30 per cent of them disagreed to this. Exactly half of the research scientists strongly disagreed that GM technology makers are playing with God while 30 per cent of them disagreed to it. With mean score of 4.3, 60 per cent of researchers strongly disagreed that there is increase in agrochemicals due to GM crops while 20.00 per cent disagreed to it. On the matter of GM crops promoting super weeds, 40.00 per cent of researchers disagreed while 30 per cent of them were undecided about it. On the issue of GM crops having unknown effects upon health forty per cent of research scientists disagreed to it while 30.00 per cent strongly disagreed to it.

Table 6 Distribution of research scientists according to attitude towards genetically modified crops and foods:

S.N.	Statement	SA	A	UD	DA	SD	MS
1.	There is increase in use of agrochemicals due to GM crops	0 (0)	1 (10)	1 (10)	2 (20)	6 (60)	4.3
2.	Genetic modification helps in creating food with more nutritional values.	3 (30)	7 (70)	0 (0)	0 (0)	0 (0)	4.3

3.	It needs less man days in terms of labour requirement	6 (60)	3 (30)	0 (0)	1 (10)	0 (0)	4.4
4.	It ensures reduction in losses caused by weed growth.	4 (40)	1 (10)	2 (20)	2 (1)	1 (10)	3.5
5.	It promotes super weed.	0 (0)	2 (20)	3 (30)	4 (40)	1 (10)	3.4
6.	GM crops have unknown effects upon human health.	0 (0)	1 (10)	2 (20)	4 (40)	3 (30)	3.9
7.	GM crops will decrease pesticide/herbicide residue in the environment.	4 (40)	6 (60)	0 (0)	0 (0)	0 (0)	4.4
8.	Modified genes can spread to the wild relatives of crop plants	0 (0)	4 (40)	1 (10)	2 (20)	3 (30)	3.4
9.	It is essential for companies to label the foods/products derived from GM technology.	4 (40)	2 (20)	3 (30)	0 (0)	1 (10)	3.8
10.	Regulations for GM foods need to be framed by the govt.	6 (60)	2 (20)	2 (20)	0 (0)	0 (0)	4.4
11.	GM technology makers are playing with God.	1 (10)	0 (0)	1 (10)	3 (30)	5 (50)	4.1
12.	Farmer's dependency on seed of multinational company for GM crops reduces their autonomy.	3 (30)	2 (20)	1 (10)	3 (30)	1 (10)	3.3
13.	GM products are being forced on developing nations by developed countries.	0 (0)	4 (40)	1 (10)	3 (30)	2 (20)	3.3
14.	GM technology is producer size neutral technology favouring all type of farmers.	2 (20)	0 (0)	2 (20)	6 (60)	0 (0)	2.8
	Average						3.80

Figures in parentheses indicates the per cent

Relationship of profile characteristic of farmers with their attitude towards genetically modified crops:

To get a definite idea about the relationship between socio-personal and socio-psychological variables of farmers with their attitude towards various aspect of genetically modified crops, Karl Pearson's correlation coefficients were calculated.

A critical perusal of table 5 clearly revealed that out of 10 independent variables; GM experience, mass media exposure, extension contacts, risk orientation and innovativeness were found to be

statistically much significant with attitude of the farmers towards genetically modified crops. Genetically modified crop (Bt. Cotton) experience and risk orientation of farmer was found to be highly correlated and significant with attitude of farmers. It implies with every increase in GM experience or risk orientation, farmers form a higher degree of favourable or unfavourable attitude towards GM crop. This was also true alternatively also. Mass media exposure, extension contacts and innovativeness were also positively correlated with attitude of farmers and shows linear relation or vice-versa.

Table 7 Correlation of socio-personal characteristics of farmers with attitude

S.N.	Independent Variables	Value r
1.	Age	-0.181
2.	Farm experience	-0.179
3.	GM experience	0.217***
4.	Education	0.133
5.	Mass media exposure	0.311**
6.	Extension contacts	0.254**
7.	Progressiveness	0.313
8.	Risk orientation	0.562***
9.	Innovativeness	0.041**
10.	Economic motivation	0.319

***- significant at 0.001 percent level

** - significant at 0.01 percent level

*- significant at 0.05 percent level

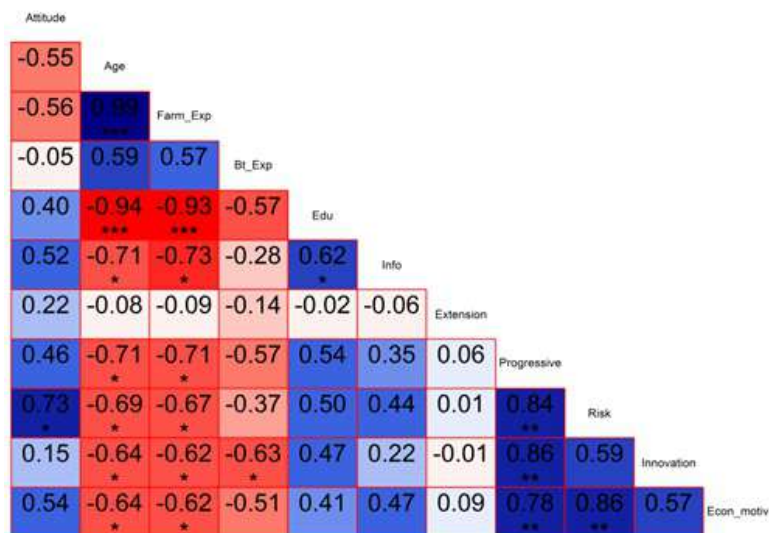


Fig.2 Correlogram showing degree of correlation among the variables towards attitude

Determinants of factors affecting the attitude of farmers towards genetically modified crops by multiple regression analysis

To get a definitive idea about the various factors affecting the farmer's attitude, multiple regression analysis was carried out. Data presented in table 5 revealed that GM crops experience, mass media exposure, extension contacts, risk orientation, innovativeness are the six independent variables which were statistically significant. Only innovativeness show negative regression coefficients

which means that with every increase in one unit of GM area there is decrease in 0.2754 units and 0.2555 unit of attitude. Similarly in case of positive regression coefficients, with every one unit increase in GM experience, mass media exposure, extension contacts, risk orientation and innovativeness there is decrease in 0.389, 0.846, 0.553 and 0.985 units respectively. Risk orientation, innovativeness, extension contacts, mass media exposure, innovativeness and GM experience are major factors contributing towards the attitude of farmers.

Table 8 Multiple regression analysis for the factors affecting the attitude of farmers towards genetically modified crops

S.N.	Independent Variables	Dependent Variables	B	S.E.	t-statistics
	Intercept	Attitude	17.899	8.203	2.1819**
1.	Age		-0.0793	0.0933	-0.8500
2.	Farm experience		-0.0198	0.0863	-0.2293
3.	GM experience		0.3899	0.1565	2.4906**
4.	Education		-0.2949	0.4759	-0.6196
5.	Mass-media exposure		0.8460	0.3728	2.2691**
6.	Extension contacts		0.5538	0.2344	2.3622**
7.	Progressiveness		0.1657	0.3337	0.4967
8.	Risk orientation		0.9850	0.1982	4.9692**
9.	Innovativeness		-0.2555	0.1248	-2.0467**
10.	Economic Motivation		-0.2039	0.2556	-0.7977

**** Significant at 0.01 level, B: Regression co-efficient, S.E: Standard error**

Conclusion

India, which is having second largest population in the world have to address concerns related to food security, climate change and rising disease-pest incidence. In order to tackle these challenges, genetically modified crops provides a great solution. There are various traits of GM crops lined up for commercialization. This study, which examines the attitude of all the stakeholders involved in genetically modified crops towards the GM technology. It was conducted in Malwa region of Punjab, which is the predominant GM crop growing region of India. Study was carried out by self-structured interview schedule. The results show that the cultivators who are producing genetically modified crops in the form of Bt. cotton are although very much satisfied with it, but show bit of

apprehensions and lack of proper knowledge towards GM food crops. These GM food crops in order to be properly marketable need to be properly accepted by consumers. Interestingly many of them are ready to cultivate these crops, if they are thoroughly tested and granted by research institutes for commercialization. The attitude of extension personnel and research scientists is quite favourable towards GM technology. Efforts need to be put forward for proper training of farmers about GM technology and proper bio safety tests and field trials need to be carried out by govt. agencies as private companies suffer from trust deficit. Based on these findings it is clear that policies regarding GM crops must be based on open and honest debate involving all stakeholders and decision must be based on credible scientific information.

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Exploring the ICT tool users' attitude towards its appropriate utilization in agricultural development of West Bengal

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ABSTRACT

The economy of the developing country like India purely depends on agriculture. Agricultural development is the main stay of rural economy and this agricultural development emphasizes the need of information to be transformed into knowledge and wisdom. Now-a-days information communication technology plays a vital role in the every sector of India like education, agriculture, health etc. The country like India is increasingly integrating ICT into its national development plan and adopting strategies for its wide spread promotion in all the spheres of economic activities by ensuring the benefits of ICT to all the different socioeconomic strata and the grassroots of rural India for transforming a nation into a knowledge vibrant e-learning society. So, the attitude of farmers is also transforming from the traditional to modern technologies. They have shown interest towards Information Communication and Technologies (ICTs). The study was conducted in five villages of Cooch Behar-I and Cooch Behar-II block of Cooch Behar district of West Bengal. Purposive as well as multistage and random sampling procedures were followed in selecting the respondents. In the present study, farmers' attitude towards ICT tools was considered as dependent variable and the other related social, personal, psychological and communication attributes were considered as the independent variables. The data were collected with the help of the structured interview schedule through personal interview method. The major statistical measures used were coefficient of correlation and multiple regressions. From the coefficient of correlation, it has been found that the variables like family education status, possession of assets, management orientation and Utilization pattern of communication sources are positively and significantly associated with the dependent variable, attitude towards ICT tools. In multiple regression analysis, the variable like family education status and family annual expenditure are significantly and positively contributing towards characterizing the attitude towards ICT tools and the entire explicability is 29.60%.

Key words : Attitude of farmers, Information Communication Technology, Family education status, Technological development, Sustainability

Introduction

In the realm of post globalisation, the agriculture development through productivity enhancement and entrepreneurship building is much more information and knowledge vibrant in the country like India. The rural areas in India cannot be compared with the urban areas where the needs and service requirements are at a very different level with poor existing infrastructure in rural areas. The delivery of services for essential requirement becomes in itself formidable task in its 6, 40,000 villages spread out in every type of agro climatic zones. In this context, the information communication technology (ICT) through some computer and mobile enabled, analogue and digital tools is the key enabler and vital component of new knowledge based economy and information revolution. In the present era, agriculture is moving towards more market oriented than production oriented. Due to various programmes and projects by the government and non-government organizations the production has been increased from 52 million ton to 260 million ton. This is also achieved by the transfer of information and technology

through different electronics media like radio, television, computer and mobiles. ICT plays a great role in the development of agriculture by providing information to the farmers. The attitudes of farmers are changing towards accepting modern technologies due to ICT. So their attitude is good towards ICT tools. There was no scale available to measure farmers' attitude towards ICTs based extension services. The present study was contemplated to develop and standardize the same. Attitude scale developed by them could be used to measure farmers' attitude beyond the study area with suitable modifications (Kumar and Ratnakar, 2011). A study on attitude and level of knowledge of farmers in the villages of Bangladesh and reported that farmers of the study areas have a moderately favorable attitude and the most important finding is that there are no farmers in the study areas who less or slightly favorable attitude towards ICT based farming (Kabir, 2015). **Dhaka and Chayal (2010) found that** the application of ICT in agriculture had emerged an important pillar of agriculture extension focusing on the enhancement of agricultural and rural development through improved information and communication processes. Kumar Ganesh (2008) in his

study found that majority (66.67%) of the extension service providers had favourable attitude towards ICT based extension followed by more favourable (18.33%) and less favourable (15.00%) attitude towards ICT based extension.

Materials and Methods

The study was conducted in five villages of Cooch Behar-I and Cooch Behar-II block of Cooch Behar district of West Bengal. Purposive as well as multistage sampling and random sampling procedures were followed in selecting the respondents. An exhaustive list of ICT tool users for agricultural extension services was prepared with the help of the local people, local administrators etc. From the exhaustive list twenty (20) number of ICT tool users were randomly selected as respondents from each selected villages. Accordingly, the total number of respondents was hundred (100). Attitude is an organized predisposition to think, feel and perceive and behave towards a cognitive

object. Thurstone (1946) defined attitude as the degree of positive and negative effect associated with some psychological object. By a psychological object, Thurstone means any symbol, phrase, slogan, person, and institution, idea towards which people can differ with respect to positive or negative effect. Attitude in this study was operationalized as the degree of positive or negative feeling of farmers towards ICTs. This is operationalized and measured with the help of slightly modified scale developed by **P. Ganesh Kumar and R. Ratnakar (2011)**. The scale consists of 21 statements of which 16 statements were positive and 5 statements are negative. The responses were taken with the help five point continuum scale to represent the degrees of strongly agree, agree, undecided, disagree, strongly disagree with the assigned scores 5, 4, 3, 2, 1, 0. The reverse scoring is followed in case of negative sentence. The score for each individual was obtained by summing the score for each statement.

Results and Discussion

Table: 1: Distribution of respondents according to their attitude on Information Communication Technology (ICT) tools (Y)

Category	Score	Frequency	Percentage	Statistics
Low	55-64.66	34	34	Range=55-84 Mean=69.02 SD=7.64 CV=11.07%
Medium	64.67-74.33	38	38	
High	74.34-84	28	28	

Table 1 represents the distribution of the farmers according to their attitude on ICT tools. The results show that majority of the respondents are under medium level of attitude on ICT tools 64.67-74.33(38%) followed by low level of attitude on ICT tools 55-64.66(34%) and high level of access on ICT tools 74.34-84(28%) respectively. The

mean score of total distribution is 69.02 and standard deviation is 7.64. The coefficient of variation value within the distribution is 11.07% which signifies very high consistency level of the distribution for the variable 'attitude on ICT tools'. It indicates that most of the farmers have medium level of attitude towards ICT tools.

Table.2: Correlation Coefficient of Attitude towards ICT tools (Y) of respondents with 20 independent variables

Variables	Coefficient of correlation (r)
Age(X_1)	-0.111
Caste(X_2)	0.113
Experience in farming (X_3)	-0.18

Educational Qualification(X_4)	-0.008
Family Education Status (X_5)	0.221*
Family Annual Income (X_6)	0.058
Family Annual Expenditure(X_7)	0.131
Land Holding (X_8)	-0.099
Possession of assets (X_9)	0.207*
Livestock possession(X_{10})	0.069
House Type (X_{11})	0.015
Social Participation(X_{12})	0.166
Self Confidence (X_{13})	0.089
Risk Preference (X_{14})	0.11
Scientific Orientation (X_{15})	0.113
Economic Motivation (X_{16})	0.175
Management Orientation(X_{17})	0.210*
Decision making ability(X_{18})	0
Achievement Motivation (X_{19})	0.057
Utilization pattern of communication sources(X_{20})	0.253*

** Significant at 1% level

*Significant at 5% level

Table 2 reflects the Pearson's coefficient of correlation among the dependent variable, access to ICT tools of the farmers with the twenty causal variables. The result shows that the variables family education status (X_5), possession of assets (X_9), Management Orientation(X_{17}) and Utilization pattern of communication sources(X_{20}) are positively and significantly associated with the dependent variable, attitude towards ICT tools.

Family education status and attitude towards ICT tools

Family education status is the back bone of cognitive enlargement. Persons acquire their knowledge from the formal education system and that makes an individual more confident and self-reliant in any decision making process. Educated persons seek information from the different cosmopolite sources which makes them to change through their gathered information and builds up their confidence towards accessing on ICT tools. The educated family have higher decision making ability due to the formal education and their attitude towards ICT is very positive while uneducated family have unfavourable attitude towards ICT due to their lack of knowledge. Educated family have more attitudes towards ICT than the less educated family. That may be the plausible reason why the variable family education status is significant and positively correlated with attitude towards ICT tools.

Possession of assets and Attitude towards ICT tools

Farmers having more asset possession are socially richer, innovative and advanced farmer. They mainly use new implements in farming as their possession of asset is more. They are searching for more information for their economic improvement in agriculture. The farmers having greater possession of asset have high favourable attitude towards ICT tools than the farmers having less possession of assets. That is why the variable possession of assets is significantly and positively correlated with attitude on ICT tools.

Management Orientation and Attitude towards ICT tools

The management of any agricultural enterprise needs careful consideration in case of planning, organizing, production and marketing of products. Management orientation may be treated as one of the psychological variables which develops a motive within the psyche to stimulate the positive thinking on a particular issue. In the present study, the farmers are very much sincere, diligent and careful towards the agriculture. They are mainly information seeker and more advanced in adopting the modern technologies in farming. For development of their farming and to obtain the market information timely and get suitable price for their product they give more emphasis

towards using ICT tools. That is why the variable 'management orientation' is significantly and positively correlated with attitude towards ICT tools.

Utilization pattern of communication sources and attitude towards ICT tools

Information is considered as a vital resource, alongside land, labour, capital and skills. Information serves as the cornerstone of successful socio-economic development because it plays a key role in decision making. Every person needs information for his/her decision making. Information is the driving and sustaining force behind any development strategy. The successful use of information as

a resource for development of agriculture depends to a large extent, on accessibility and adequacy of information mode as well as the attitude of farmers towards information and information sources. Sources and channels of agricultural information play an important role in the dissemination of information from the source of its invention to its ultimate users that are clientele system. In the present study, farmers are more innovative and advanced in taking information from different communication sources. This may be the possible cause for which the variable utilization pattern of communication sources is significantly and positively correlated with attitude towards ICT tools.

Table.3: Multiple regression analysis of Attitude on ICT tools (Y) of respondents with 20 predictor variables

Variables	Standardized regression coefficient (β)	Unstandardised regression coefficient (B)	S.E of 'B'	t-value
Age(X_1)	0.129	0.102	0.153	0.666
Caste(X_2)	0.060	0.721	1.210	0.595
Experience in farming (X_3)	-0.218	-0.223	0.201	-1.108
Educational Qualification(X_4)	-0.092	-0.850	1.020	-0.833
Family Education Status(X_5)	0.188	0.543	0.301	1.801*
Family Annual Income (X_6)	-0.530	-8.368	4.254	-1.967
Family Annual Expenditure(X_7)	0.611	11.556	5.213	2.216*
Land Holding (X_8)	-0.187	-0.745	0.570	-1.306
Possession of assets(X_9)	0.086	0.057	0.083	0.683
Livestock possession(X_{10})	0.077	0.109	0.151	0.718
House Type (X_{11})	0.034	0.398	1.294	0.307
Social Participation(X_{12})	0.141	2.634	2.075	1.269
Self Confidence (X_{13})	0.014	0.042	0.308	0.135
Risk Preference (X_{14})	0.019	0.097	0.524	0.185
Scientific Orientation (X_{15})	0.029	0.107	0.397	0.271
Economic Motivation (X_{16})	0.110	0.522	0.542	0.964
Management Orientation(X_{17})	0.110	0.204	0.196	1.043
Decision making ability(X_{18})	-0.010	-0.064	0.648	-0.098
Achievement Motivation (X_{19})	0.145	0.599	0.429	1.396
Utilization pattern of communication sources(X_{20})	0.192	0.347	0.202	1.713

**Significant 1% level

* Significant at 5% level

$R^2 = 0.296$

Table 3 reflects the multiple regression analysis of the predicted variable i.e. attitude towards ICT tools of the farmers with twenty predictor variables. From the table it is observable that two variables family education status and family annual expenditure are positively and significantly contributing in case of characterizing the attitude of the farmers towards ICT tools.

Family education status and Attitude towards ICT tools

Family education status represents the literacy level of the members of the family. Higher is the family education status more will be the educational exposure of each and every members of the family. People with higher level of education also possess high information seeking behavior which makes them more exposed towards mass media. In

reality, it is evident that family support is one of the critical factors that hinder farmer to adopt new technologies, mostly in rural areas. But the family having educated members always encourages and supports the farmers in doing farm activities. In the present study area it seems that family members equipped with high level of education develop a favorable attitude towards the use of ICT tools. That is why the variable family education status is positively and significantly contributing towards characterizing attitude on ICT tools. The variable family education status is directly contributing 18.80% in case of characterizing attitude towards ICT tools. One unit change of the variable family education status is delineating the 0.543 unit change in the predicted variable, attitude on ICT tools.

Family annual expenditure and Attitude towards ICT tools

Family annual expenditure means the expenses of a family in different activities in one year. In the present study area most of the families have low level of family expenditure. It indicates that they are not aware of how to use their money in a better way, so that they can get benefit in every aspects like agriculture, health etc. The farmers believe that by expending their money on ICT tools, it would give them a better result in their investment. They are interested to use ICT tools to get better information about how to spend their income for improvement in their living condition. That is why the variable 'family annual expenditure is significant and positively contributing towards characterizing the predicted variable 'attitude towards ICT tools'. The variable family annual expenditure is directly contributing 61.10% in case of characterizing attitude towards ICT tools. One unit change of the variable family annual expenditure is delineating the 11.556 unit change in the predicted variable, attitude on ICT tools.

The R^2 value being 0.296, it is to infer that the twenty predictor variables put together have explained 29.60% variation embedded with the predicted variable attitude towards ICT tools used by the respondents. Still 70.40% variable embedded with predicted one remains unexplained.

Conclusion

In the perspective of making knowledge vibrant agricultural society in India, the fathomable need of information to be transformed into knowledge and wisdom was perceived by a group of social scientist. The generation of information and dissemination of information in the form of technology can only way to transform the agriculture depended society more vibrant and pave the way to make the farmer mere producer to agricultural entrepreneur. The attitudinal change of the farmer is the primary concern in this perspective to create a knowledge vibrant agricultural society. The predisposition of behaviour towards positive utilization of ICT tools can usher a new era of information depended technological intervention in agriculture. The present study has also rightly reflected the attitude of the farmers in case of utilizing the ICT tools and their relations with the socio-personal and economic and psychological attributes. The education status and economic affluence of the family enhance the positive attitude of the farmer in case of utilising the ICT tools in a better way. The managerial efficacy and the appropriate use of communication sources are also two important indicators for developing positive attitude towards ICT tools use in an effective manner. Never the less the economic indicator like annual expenditure is also playing a pivotal role in this perspective. So, it is to infer that for future policy implication related to development of positive attitude of farmers towards appropriate use of ICT tools should technically and critically consider the perspectives like higher economic status, high level of managerial efficacy, high level of education and high level of efficiency for appropriate utilization of information sources. The knowledge dependent agricultural development may occur with the help of positive attitude development towards appropriate utilization of ICT tools among the farmers through their economic development, managerial skill development, educational development and efficiency development in case of utilization of communication sources.

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Identification of the constraints faced by the farmers in adoption of recommended production technology of brinjal

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ABSTRACT

Tapi district was selected for the study. Total 120 brinjal growers, with minimum 3 years of experience in brinjal cultivation were selected randomly from twelve villages of selected four Talukas. Findings of this study revealed that major constraints faced by brinjal growers in adoption of recommended production technology of brinjal were high cost of inputs, fluctuations in market rate, unavailability of healthy seedlings, non-availability of labours, high cost of transportation, lack of timely technical guidance, high rate of labours and non-availability of timely credits. The prices of inputs should be minimized, timely technical guidance, good and healthy seedlings be provided, rate of agricultural produce should be regulated and proper marketing facilities should be established were the important suggestions given by brinjal growers for overcoming the constraints faced by them.

Key words : Adoption, brinjal

Introduction

Botanical name of brinjal is *Solanum melongea* L. and it belongs to Solanaceae family. It is originated in India. According to USDA, production of eggplant is highly concentrated. China is the top producer having 55 per cent of production from world and India is second producer having about 28 per cent production about 8 lakhs MT. The scope to increase the productivity of brinjal to its potential would substantiate the need for promotion of brinjal cultivation technology in the farmer's field. One way by which extension scientist can contribute to this task is to find out better ways and means of promoting brinjal cultivation technology among the group of clientele. Since change in knowledge and attitude preceded adoption of an innovation. Brinjal has high nutritive and medicinal values. It contains about 92.3 gms moisture, 0.3 gms fat, 1.3 gms fiber, 24 kcal energy, protein 1.4 gms, minerals 0.3 gms, carbohydrates 4 gms, vitamin C 12 mgs etc per 100 gm. Brinjal also valued for its medicinal properties and has got de-cholesterolizing property primarily due to presence of poly-unsaturated fatty acid present in fresh and seed of fruit. In native medicines, role of brinjal in treatment of liver diseases, cough due to allergy etc. It can block the formation of free radicals, help in control of cholesterol level and good source of folic acid and potassium.

Brinjal has been considered as one of the important vegetable crop of Gujarat. The brinjal growers can increase production of brinjal through the adoption of new varieties and with improved technologies. A first hand knowledge regarding existing status of adoption of improved

technology helpful to the extension workers for concentrating their efforts to create favorable condition for better adoption of the innovations of brinjal cultivation. It is expected that findings of this study may prove beneficial to know the personal, social and economical characteristics of the brinjal growers as well as the adoption of improved technology of brinjal by them. Like wise findings available from this study will be useful to immense importance for planners, extension workers, administrators, teachers and students of extension education who are directly or indirectly engaged with the development of improved technology of brinjal cultivation. For the students and academicians it will serve as a guideline who wants to work on the same direction.

Materials and methods

The present study was conducted in Tapi district of Gujarat state. An ex-post-facto research design was used. Tapi district has seven talukas namely Vyara, Songad, Valod, Kukurmunda, Uccal, Dolvan and Nigar. Multistage random sampling was used for selection of respondent brinjal growers. At first stage, out of seven, four taluka (namely Vyara, Valod, Dolvan and Songad) are selected on the basis of highest area under brinjal growers respectively. At second stage three villages per talukas was selected on the basis of discussion with the VEW and proportionate area under these villages. At last stage, ten growers per village was randomly selected. In all samples will be composed of 120 brinjal growers. Simple static tools viz, average and percentage was used to accomplish the objective.

Table 1: Constraints faced by brinjal growers in adoption of recommended production technology of brinjal crop
(n = 120)

SR. No.	Constraints	Number	Per cent	Rank
1.	Unavailability of healthy seedlings	102	85.00	III
2.	High cost of inputs	112	93.33	I
3.	High cost of transportation	93	77.50	V
4.	Non-availability of labours.	98	81.66	IV
5.	High rates of labours.	86	71.66	VII
6.	Non-availability of credit in time	73	60.83	VIII
7.	Lack of timely technical guidance	90	75.00	VI
8.	Irregular supply of irrigation	47	39.16	X
9.	Irregular supply of electricity	43	35.83	XI
10.	Lack of market facility	67	55.83	IX
11.	Lack of stress of product	38	31.66	XII
12.	Fluctuations in market rate	108	90.00	II

The major constraints faced by brinjal growers are high cost of inputs (93.33 per cent), fluctuations in market rates (90.00 per cent), unavailability of healthy seedlings (85.00 per cent), non-availability of labours (81.66 per cent), high cost of transportation (77.50 per cent), lack of technical

guidance (75.00 per cent), high rates of labours (71.66 per cent), non-availability of timely credits (60.83 per cent), lack of market facilities (55.83 per cent), irregular supply of irrigation (39.16 per cent), irregular supply of electricity (35.83 per cent) and lack of stress of product (31.66 per cent)

Table 2: Suggestions given by brinjal growers to overcome constraints faced by them

Sr. No.	Suggestions	Number	Per cent	Rank
1.	Price of seed should be minimized.	112	93.33	I
2.	Good and healthy seedlings should be provided.	97	80.83	III
3.	Regular and timely visit of the farm should be necessary by horticulture officer.	27	22.50	X
4.	Rate of produce should be regulated.	83	69.17	IV
5.	Proper marketing facility should be established.	76	63.33	V
6.	Training on new technologies should be imparted to the farmers.	54	45.00	VIII
7.	Timely technical guidance should be provided to the farmers.	104	86.67	II
9.	Guidance should be provided to raise nursery.	58	48.33	VII
10.	Sufficient electric power should be available for long time.	36	30.00	IX
11.	Sufficient knowledge should be provided regarding recommended dose of fertilizer, insecticide / pesticides etc.	64	53.33	VI

It can be concluded from the Table 19 that the brinjal growers suggested that prices of inputs should be minimized (93.33 per cent), provide timely technical guidance (86.67 per cent), good and healthy seedlings should be provided (80.83 per cent), rate of agricultural produce should be regulated (69.17 per cent), knowledge

regarding recommended dose of fertilizer, insecticide / pesticide should be provided (53.33 per cent), guidance on raising nursery should be provided (48.33 per cent), training on new technology should be imparted (45.00 per cent) and regular visit of horticultural officer should be necessary (22.50 per cent)

Conclusion:

From the above discussion it could be concluded that Findings of this study revealed that major constraints faced by brinjal growers in adoption of recommended production technology of brinjal were high cost of inputs, fluctuations in market rate, unavailability of healthy seedlings, non-availability of labours, high cost of transportation, lack of

timely technical guidance, high rate of labours and non-availability of timely credits. The prices of inputs should be minimized, provide timely technical guidance, good and healthy seedlings should be provided, and proper marketing facilities should be established were important suggestions given by brinjal growers for overcoming constraints faced by them

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Model Villages as a Pathway towards Inclusive Development

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ABSTRACT

The United Nations have set 17 Sustainable Development Goals in 2015 meant to be achieved by all countries worldwide. There are mentions of inclusive growth and development throughout the agenda. But as per the Inclusive Development Index of 2017, India ranks 60 among 79 developing countries of the world. Needless to say, India should start working at war footing to achieve its target of inclusive development by mainstreaming the rural areas of the country. Indian villages shelter more than two third of population and supports the country for food and nutritional security through its agricultural activities. Hence, the dream of growth of India into a global economic Super Power amidst negligence to the majority of rural population will not be an inclusive developmental approach. So it is high time that developmental agencies put intensive efforts in developing Model Villages which will be self sufficient miniature sustainable and equitable inclusive units. In these Model Villages, special concern should be to revive the agricultural, infrastructural, economic, social and ecological conditions of the village. Sustainable and scientific agricultural and allied farming activities, modern infrastructure, economic prosperity and equitability, social harmony and women and youth empowerment and ecological balance should be the desirable characteristics of Model Villages. Already many development agencies have adopted villages in order to develop them into Model Villages. Need of the hour is to evaluate these efforts and also develop more of such kind. Presence of extension professional along with development agents in such efforts can help in rapport building, situation analysis, prioritisation of needs, demand driven technology development and their adoption in the village with ease because extension professionals can be the best facilitators in any rural scenario. Extension professionals can also play key roles in analysing the impact of such Model Village Development efforts. Model Villages hence can serve as milestones in the pathway of achieving inclusive development in India.

Key words : Model village

Introduction

Villages in India are the repositories of culture, tradition, natural resources and above all the economic backbone of the country ensuring food and nutritional security to its vast population through its agricultural and livestock activities. At a time when India dreams of emerging as a powerful global economy setting up an international landmark, it warrants inclusive economic growth comprising of all sectors, regions and sections of population to realise this dream by everyone. Villages are our roots and shelters 68.84 per cent of Indian population. Hence growth of India amidst negligence to the majority is not a rightful development agenda. India has 640867 villages. About 65 per cent is dependent on agriculture for their livelihood (Census of India, 2011). Development programmes and technological advancements have brought about transformations in rural India in infrastructure, education, health, sanitation and employment. Although Indian economy has grown steadily over the last two decades in all spheres of development in rural areas, its growth has been found to be uneven when comparing different social and economic groups, geographic regions, and rural and urban areas. When the global development agenda is Inclusive Development, since the adoption of Millennium Development Goals and recently the Sustainable Development Goals in 2015 by the United Nations, it becomes all the most important to shift

our attention from hard core income and economic growth towards more sustainable and equitable development which is impossible by ignoring rural India.

The Concept of Development

Development is an emergent property of the economic and social system. The traditional concept of development meant only economic growth of the nation and its citizens. Development is instead a system-wide manifestation of the way that people, firms, technologies and institutions interact with each other within the economic, social and political system. Specifically, development is the capacity of those systems to provide self-organising complexity. Self-organising complexity in an adaptive system is never designed or deliberately built: it comes about from a process of adaptation and evolution. It follows that if we want to accelerate and shape development, we should focus especially on how the environment can be made most conducive for self-organising complexity to evolve. Development is a characteristic of the system; sustained improvements in individual well-being are a yardstick by which it is judged (Barder, 2012).

The Concept of Inclusive Development

The concept of inclusive development combines the two basic principles of inclusion and development. Inclusion is a process and a goal. Inclusion is about society changing to accommodate difference and to combat

discrimination. It sees society as the problem, not the person. To achieve inclusion, a twin track approach is needed. First is to remove the barriers that exclude, that is, to foster mainstreaming and the second is to focus on the group of persons who are excluded, to build their capacity and support them to lobby for their inclusion. Inclusion involves everyone in society at all levels, collaboration and networking are core strategies to achieve inclusion (IDDC, 2009).

The Theoretical Framework of Inclusive Development

Gupta and Vegelin (2016) have documented a theoretical framework of inclusive development and how they are significantly embodied into the 17 Sustainable Development Goals adopted by the United Nations in 2017. Inclusive development builds on the following intellectual roots: social roots which lead to the articulation of social inclusiveness; ecological roots which lead to the articulation of ecological inclusiveness; and political geography roots which argue that power politics need to be addressed to protect social and ecological goals which lead to the articulation of relational inclusiveness. Hence inclusive development includes these three types of inclusiveness which are discussed in details below:

- **Social inclusiveness**

Social inclusiveness aims at empowering the poorest through investing in human capital and enhancing the opportunities for participation. It is non-discriminatory and is age, gender, caste, sect and creed sensitive in terms of income, assets and the opportunities for employment (Huang and Quibria, 2013). It aims to reduce the exposure to risks such as natural disasters and civil conflict that exacerbate vulnerability (Rauniyar and Kanbur, 2010). In doing so, inclusive development policies focus attention on the places (e.g. rural, peri-urban), sectors (e.g. small-scale farming, fishing and community forestry), and arenas (home-based activities, street vendors) of high vulnerability to enhance well-being, including material (i.e. living conditions through access to infrastructure and amenities such as drinking water and sanitation services, education and transport services), social-relational (i.e. in terms of human relations), and cognitive well-being (i.e. taking people's knowledge, experiences and aspirations into account) (Gough and McGregor, 2007; Fritz et al. 2009; Narayan et al., 2009; Borel-Saladin and Turok, 2013; Arthurson, 2002; Mansuri and Rao, 2004).

- **Ecological Inclusiveness**

Ecological inclusiveness at the local level focuses on protecting local access to and ownership of resources as

well as protecting local ecosystems. At the national level, it requires that resources are well managed and the sustainability of ecosystem services are ensured. At the trans-boundary and global level, it implies not causing harm to other countries and using common but differentiated responsibilities for dealing with global problems (Gupta and Vegelin, 2016).

- **Relational Inclusiveness**

Relational inclusiveness recognizes that poverty and ecological degradation are often the result of actions taken by others (Harriss-White, 2006; Mosse, 2010) because of increasing inequality in society (Piketty, 2014; Stiglitz, 2015) and the substance and process of politics (Okafor, 2008). A scalar perspective requires understanding and addressing the multilevel drivers of inequality, exclusion and vulnerability (Laven, 2010; Ros-Tonen, et al. 2015).

- **Inclusive Development Index by World Economic Forum**

A new economic measure introduced at the World Economic Forum suggests inequality is not a natural byproduct of globalization but, a choice, countries make through investments and priorities. The Inclusive Development Index shifts the evidence of a nation's economic health from gross domestic product to living standards. GDP, a commonly used economic measure, is good (though increasingly less good) at tracking overall wealth creation but fails to capture how that wealth is distributed. The inclusion index measures economic development and social well-being by combining per capita income and employment data with poverty rate and income distribution patterns, as well as intergenerational equity and sustainability such as net savings and carbon intensity. By that measure, Norway comes out on top of the list in 2017. In the five years between 2008 and 2013 Norway grew its standard of living by more than 10 percent with market incentives and welfare policies, despite economic growth of less than one percent (Price, 2017).

- **Pillars of Inclusive Development Index**

The Inclusive Growth and Development Report of World Economic Forum, 2017, present a policy framework encompassing 7 principal domains (pillars) and 15 sub-domains (sub-pillars). The countries worldwide are evaluated and given scores against these pillars and sub pillars by using 140 statistical indicators. The seven domains and 15 sub domains are as follows:

Table 1: Domains and Sub-domains of Inclusive Development Index

Domains (Pillars)	Sub-domains (Sub pillars)
Education and Skills	Access Quality Equity
Basic Services and Infrastructure	Basic and Digital Infrastructure Health-Related Services and Infrastructure
Corruption and Rents	Business and Political Ethics Concentration of Rents
Financial Intermediation of Real Economy Investment	Financial System Inclusion Intermediation of Business Investment
Asset Building & Entrepreneurship	Small Business Ownership Home and Financial Asset Ownership
Employment and Labour Compensation	Productive Employment Wage and Non-Wage Compensation
Fiscal Transfers	Tax Code Social Protection

Source: World Economic Forum, 2017

Position of India in Inclusive Development Index 2017

India, with a score of only 3.38, ranks 60th among the 79 developing economies on the IDI in 2017, despite the fact that its growth in GDP per capita is among the top 10 and labour productivity growth has been strong. Poverty has also been falling, albeit from a high level. On the other hand, its debt-to-GDP ratio is high, raising some questions about the sustainability of government spending. With regard to Framework indicators, educational enrolment rates are relatively low across all levels, and quality varies greatly, leading to notable differences in performance among students from different socioeconomic backgrounds. While unemployment is not as high as in some other countries, the labour force participation rate is low, the informal economy is large, and many workers are in vulnerable employment situations with little room for social mobility. A more progressive tax system would help raise capital for expenditure on infrastructure, healthcare, basic services, and education. India scores well in terms of access to finance for business development and real economy investment. However, new business creation continues to be held back by corruption, underdeveloped infrastructure, and the large administrative burden involved in starting and running companies (World Economic Forum, 2017).

Rural India, Agriculture and Inclusive Development in India: what is the link?

India is a land of rich cultural heritage and origin of one of the most ancient human civilizations in the world. The varied food habits, languages, lifestyle pattern all of which have been influenced by the climatic conditions of the area. India is divided into twenty agro ecological zones by National Bureau of Soil Survey & Land Use Planning (NBSS & LUP), fifteen agro climatic zones by the Planning Commission of India and 127 agro climatic zones by National Agricultural Research Project of the Indian Council of Agricultural Research (www.vikaspedia.in). India takes pride in her “Unity in Diversity” over a vast stretch of geographical area of 328.74 million hectares and among a population of 1.27 billion of which 68.84 per cent population live in villages (Census of India, 2011). India is a land of villages which provide 49 per cent of work force in agriculture. But it generates just a seventh of the GDP implying earning of farmer less than a fourth of what others do on an average (Gupta 2015). Clearly the Indian farmers who mainly reside in rural areas are in a pitiful situation, struggling with innumerable odds like lack of knowledge, capital, credit facilities, rising competition due to globalisation and natural vagaries are a few among the many. As most rural people still rely on agriculture as the

mainstay for livelihood so in a way any reference to villages has direct effect on Indian farming sector. So when we talk about inclusive development and India's pathetic position in global rankings, the poor condition of rural India is to a great extent instrumental behind this rank. This will be more evident from the following:

- 75% of the poor in India live in rural areas, most of them are daily wagers and landless labourers
- 65% of small villages do not have access to all weather roads in their vicinity

- Only 30% of households have access to piped water
- Twenty crore Indians have yet to see electricity in their homes
- 68.3% villages have a Primary Health Centre (Ponnusamy et. al., 2015).

The wide gap between urban and rural situation in India is evident from the following indicators:

Table 2: Rural Urban Disparity

Parameters	Urban	Rural
Population distribution (%)	31.16	68.84
Growth Rate of Population (2001-11) in per cent	31.8	12.2
Sex ratio (females/1000 males)	926	947
Sex ratio (0-6yrs)	902	919
Male literacy rate (%)	89.67	78.57
Female literacy rate (%)	79.92	58.75

Source: Census of India, 2011

The rural poor and the neglected are the marginalized and weaker sections of the society and as the definition of inclusive development goes, mainstreaming this large section of rural population can only bring inclusive development in India. And for improving their condition, agriculture, the mainstay livelihood of rural India can be leveraged.

Model Villages: the answer to Inclusive Development

Mahatma Gandhi long back dreamt of “Gram Swaraj” where each village is basically self reliant, making provision for all necessities of life- food, clothing, clean water, sanitation, housing, education and so on, including good governance and all socially useful amenities required by a community. Equality and social justice prevail in the village promoting human, spiritual, ethical and social values. The community adopts eco friendly and sustainable agricultural practices ensuring the security for future generations. Villagers live with unity and discipline without any discrimination of caste, religion, political, class etc. Community dreams together about its future and works together for its achievement under able leadership. People just do not fight for their rights but put in sincere and committed efforts towards their obligations as a resident of the village. The community adopts modern technology to bring efficiency in production and enhancing economic opportunities.

Model Village Efforts in India

Government and other related societies and institutions are trying their best to realise the dream of Mahatma once again. The Government of India has already initiated efforts in this direction through the “Saansad Adarsh Gram

Yojana” (SAGY) launched on 11th October, 2014 in which every Member of Parliament adopts a village and strives to develop it into a model - 'Model means an ideal village'. The efforts made to start developing some villages as Models for Development, will surely be followed by other villages as well. The Saansad Adarsh Gram Yojana, unlike other Schemes, does not look at the beneficiaries as receivers and the Government as the doer. The Yojana aims to empower the villagers to make choices and provide them with opportunities to exercise those choices. Also the Indian Council of Agricultural Research (ICAR) has launched the programme of “Mera Gaon Mera Gaurav” to promote the direct interface of scientists with the farmers to hasten the lab to land process. With majority of Indian population living in villages, it is now high time to focus the attention towards developing villages into Models meant to be replicated. Already certain villages either on their own or through the help of development agencies have started developing themselves in certain aspects. For example the Ankapur Model Village in Nizamabad district of Telangana with a cropping intensity of 250-300 per cent (Muthuraman et. al, 2006); Ralegaon Siddhi Model Village in Ahmednagar district of Maharashtra with the transformation from a highly degraded village ecosystem in a semi arid region of extreme poverty to one of the richest in the country by the watershed development efforts of social reformer, Shri Anna Hazare, the then Sarpanch (www.panchayat.gov.in); the Hiware Bazar Model Village in Maharashtra, known for water conservation in 40000 contour trenches around hills (Menon, 2012) and also the Smart Villages of Andhra Pradesh – a programme inaugurated by Hon'ble Chief Minister of Andhra Pradesh Chandrababu Naidu in January 2015 according to which

anybody can adopt one village and develop it in partnership with Government (Nichenametla, 2015).

Need for a Holistic Approach towards Development of Model Villages: way forward towards Inclusive Development

The successful model village initiatives mentioned above are a few of the many efforts undertaken country

wide and also many have failed. In order to achieve our target of inclusive development, villages should be developed on all paradigms with special care being taken to include the small and marginal farmers, people below poverty line, weaker and backward sections of society, rural and farm women and youth. The development of model villages should focus on the five major components which can be considered as the Five Pillars. They are:

Table 3: Domains and Sub-domains of Model Village

Domains of Model Village	Sub-domains of Model Village
	Roads Hygiene and Sanitation Drinking Water
Infrastructural Domain	Electricity Type of Houses Community Centre and its usage Educational Facilities Health facilities Communication Facilities Average annual income of each household Proportion of APL and BPL population
Economic Domain	Extent of utilization of services of financial institutions Self sufficiency of village in food requirements
Farming Domain	Availability of irrigation water Prevalence of cooperative farming Extent of usage of agricultural implements Adoption of scientific farming practices Housing of animals Practice of Artificial Insemination Adoption of scientific livestock farming practices Cultivation and storage of fodder Presence of other enterprises Extent of veterinary facilities Milk cooperative society and services Agricultural marketing facilities Presence of food processing industries Frequency of visits by agricultural personnel
Social Domain	Literacy rate of the village Absence of consumption of alcohol and tobacco Status of women in the village Trust and solidarity among villagers

A village which has qualifies to all the above mentioned domains and sub-domains can aptly be called a progressive village and can serve as a Model for other neighbouring villages. And in this way, more and more villages will compete for achieving excellence, progress and prosperity.

Actors in Development of Model villages

To transform a village into a progressive one or a Model Village, any individual, Government department, private agency, voluntary organisation, educational institution, research organisation, Krishi Vigyan Kendras or corporate company; any one can become instrumental in introducing interventions which can transform the village into an ideal village. Already many such development agencies have adopted villages in order to develop them into Model Villages.

Evaluation of Model Villages

The agencies adopt villages in order to develop them as Model Villages in a certain perspective but can these villages be assessed against a continuum of an ideal Model Village which has all the modern facilities in an eco friendly backdrop along with a good balance of scientifically recommended agricultural and allied activities and also a strong sense of solidarity among the residents? There is a need to develop a method of assessing the performance of these villages adopted under various development programs and schemes so that not only their evaluation will provide a feedback to the adopting agency but also provide a guidance to future policymakers of different development programs.

Role of Extension Professionals

As a discipline extension has always been in direct contact with the rural and farming community, striving to develop rural households through enhanced farm production and hence income. Because of the paradigm shift, extension is no longer now concerned with only Transfer of Technology (ToT) from lab to land but is also associating with other disciplines like economics, education, sociology, psychology, health, gender, nutrition etc. Over the past few decades the role of extension has changed substantially, shifting away from a production oriented, technology transfer model to a greater emphasis

on broader development objectives such as improving rural livelihoods through a demand-led, participatory and market-oriented approach. In other words, extension is capable of handling the diversity of multidisciplinary approaches. Also extension system enjoys (a) an established infrastructure (b) reach (c) community trust, and (d) and cultural awareness, including (e) an understanding of how to mitigate the constraints faced by farmers. Hence extension professionals can very well be leveraged by development agencies to facilitate their respective development interventions in their adopted villages so that the villagers very easily can welcome these development agencies and adopt their interventions. Presence of extension professional along with development agents can help in rapport building, situation analysis, prioritisation of needs, demand driven technology development and their adoption with ease because extension professionals can be the best facilitators in any rural scenario. Moreover, among the variety of extension researches, impact studies have always been a favourite area of research. Impact study of a Model Village will help not only in evaluation of the socio economic impact of the developmental intervention but also provide guidelines to policy makers for designing future developmental programs for that particular agro ecological region. Impact studies can identify the facilitating and inhibiting factors behind the growth of a Model Village. Above all, the role which development agencies play in developing a Model Village, if studied through impact analysis, can prove as a mirror for the agencies in finding their strengths and flaws and improve their services in future.

Conclusion

Model Villages can serve as miniature self sufficient, sustainable and equitable units. One village can inspire other villages and if in this way, the developmental efforts cover whole of rural India, then India can set example of inclusive development in global charts. Not only food and nutritional security through scientific farming but also sustainable ecological balance, enhanced income and equitable distribution, modern infrastructure and along with social harmony and brotherhood can serve as a milestone in the pathway of achieving inclusive development.

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Assessment of Professional Ethics among Village Level Extension Personnel

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ABSTRACT

Ethics are the guidelines principles of right or wrong. Professional Ethics tells the way and individual respond to issues and situations through the duties, rights, responsibilities, and obligations. Professional ethics are essential for village level extension personnel as they are change agent and catalyst for socio-economic development and agricultural development. Value education and code of conduct is essential for professional as perceived by the Village Level workers (VAWs). personal ethical practices should be strengthen and unethical practices like gossiping, taking advantages of others need to be manage ethically. The honesty, respect, responsibility, helping others are the significant ethical practices as felt by VAWs.

Key words : Professional Ethics, Ethical, Unethical, VAWs

Introduction

Human values are fundamental to human existence irrespective of social, cultural, regional and national difference. Human values cultivate an environment of trust, honesty, responsibility, caring, respect, cooperation, quality, transparency and excellence. Good character, morality and ethics are the self motivators and catalyst for the personal productivity as well as organizational efficiency. Ethics are the principles of behavior, standards of right and wrong, guidelines of what humans ought to do, usually in terms of rights, obligations, benefits to society. Ethics is the word that refers to morals, values, and beliefs of the individuals, family or the society. The study on ethics helps to know the people's beliefs, values, and morals, learn the good and bad of them, and practice them to maximize their well-being and happiness. It involves the inquiry on the existing situations, form judgments and resolve the issues. In addition, ethics tells us how to live, to respond to issues, through the duties, rights, responsibilities, and obligations. (Nagarajan, 2006). Ethics are a system of moral principles and a branch of philosophy which defines what is good for individuals and society. Ethics covers the following dilemmas: how to live a good life, our rights and responsibilities, the language of right and wrong, moral

decisions - what is good and bad? (BBC, 2014). According to Auguste Comte's dictum, "Live for others" refers that individuals have a moral obligation to help, serve or benefit others, if necessary at the sacrifice of self-interest. A professional is a member of a profession or any person who earns their living from a specified professional activity. Professional ethics consist of those fundamental values on which the profession has been built. Moral principles and ethical guidelines provide a basis for the achievement of organisational goals and are worthy of further consideration in the context of public service development. Codes of professional ethics are often established by professional organizations to help guide members in performing their job functions according to sound and consistent ethical principles. The duty ethics theory, proposed by Immanuel Kant (1724-1804) states, that actions are consequences of performance of one's duties such as, 'being honest', 'not cause suffering of others', 'being fair to others including the meek and weak', 'being grateful', 'keeping promises' etc. The stress is on the universal principle of respect for autonomy i.e., respect and rationality of persons. UNDP has adopted six values that define the overall expectations for organizational behaviour:

Sl no.	Ethical values for organizational behaviour
1	Integrity
2	Transparency
3	Mutual respect
4	Professionalism
5	Accountability
6	Results orientation/ Principled Performance

Source- (UNDP CODE OF ETHICS - 2017 version.pdf)

According to United Nations and OECD the 'International Code of Conduct for Public Officials' has following general principles:

1. A public office, as defined by national law, is a position of trust, implying a duty to act in the public interest. Therefore, the ultimate loyalty of public officials shall be to the public interests of their country as expressed through the democratic institutions of government.
2. Public officials shall ensure that they perform their duties and functions efficiently, effectively and with integrity, in accordance with laws or administrative policies. They shall at all times seek to ensure that public resources for which they are responsible are administered in the most effective and efficient manner.
3. Public officials shall be attentive, fair and impartial in the performance of their functions and, in particular, in their relations with the public. They shall at no time afford any undue preferential treatment to any group or individual or improperly discriminate against any group or individual, or otherwise abuse the power and authority vested in them.

The government of India also prescribed some Values of Public Service in public service bill 2006. The Public Service and the Public Servants shall be guided and informed by the following values in the discharge of their functions:

- (a) act objectively, impartially, honestly, equitably, diligently and in a fair and just manner;
- (b) act with integrity and in a courteous and transparent manner;
- (c) establish high standards, and ensure quality service, effective working and prompt decision making;
- (d) be accountable for the decisions and the decision making process in the discharge of functions;

In India, there is a long history of immoral practices in the governance system. Ethical practices enhance the productivity in general and organizational development. It is necessary to study the different ethical practices in work place which hinder the efficiency of institution. There are some good ethical practices which boost our work efficacy and efficiency. Value education and code of ethics in professional organization and institution is very vital.

Agricultural extension is pillar of the most of the countries. The village level extension personnel play significant role in agricultural as well as national development process. The local level change agent has immense role in socio-economic development by linking the downtrodden farmers and the higher level researchers, scientist, officers and others. The job pressure may affect their professionalism behaviour and their moral values. There ethical behaviors vital for social and community development. Village level extension personnel are backbone of extension development in every country. They not only provide service of agricultural extension but also other secondary information which very much needed for national development like socio-economic profile of farmers ,agricultural as well as population census etc. hence this study on “Assessment of professional ethics among village level extension personnel “has significant importance in current scenario.so the ethical practices of village level extension personnel as they perceived and to understand the work ethical behaviour at work palce which may help ful for work efficiency is need to be analysed.

Objectives of the study

Taking into consideration all the above mentioned aspects related to the ethical practices and unethical practices at their personal level and at workplace, the present study is undertaken with the following objectives

1. To study the different personal ethical as well as unethical practices
2. To analyse the perception towards professional ethics at work place
3. To evaluate the importance of value education and code of conduct for professional

Materials and methods

The study was conducted in five selected districts viz: Ganjam ,Bhadrak ,Jajpur ,Keonjhar ,Koraput of odisha state in India. The population under study was selected village level extension personnel i.e village agriculture workers (VAWs). A total of 82 usable responses were received that indicates a response rate of 82 percent. Finally 82 village level workers from 17 blocks were selected for data analysis. The table 1 shows the information regarding sample size and respondents.

Table 1: sampling frame and number of respondents

Sl. No.	District	Block	No. of Respondents
1	Ganjam	Aska	9
2		Sheragada	8
3		Dharkote	2
4		Hinjilikuata	7

5		Bhanjanagar	4
6	Bhadarak	Bhadrak	5
7		Bhandaripokhari	3
8		Chandabali	2
9		Dhamanagar	3
10		Tihidi	7
11		bonth	2
12	Jajpur	Barachana	9
13		Bari	3
14	Keonjhar	Ghatagaon	7
15		Hatadihi	2
16	Koraput	Kptpada	7
17		Boriguma	2
		total (n)=	82

Research Instruments

The questionnaire was constructed by considering various literatures on professional ethics .A questionnaire was drafted taking into account ethical principles, code of ethics human values and of UNDP. The questionnaire regarding importance of value education and code of conduct in one section and another two section contained the statements to measure the perception of village level extension personnel towards personal ethical practices and unethical practices while other section concentrated on the statements regarding the attitude of the village level extension personnel towards ethics at workplace. To assess the personal as well as work place ethical practices five point likert scale (from strongly agree to strongly disagree = 5 to 1)with the middle of the scale identified by the response alternative "neither agree nor disagree" was used. The questionnaire was based on the views of Anupama G and P. Lavanya Kumari(2014).

Data Analysis

The data from the questionnaires were coded and

captured in Excel, and subsequently processed using cross-tabulation. Data was analyzed and tabulated to draw the inferences. Descriptive statistics such as frequency, percentage, means and ranks were calculated and analyzed.

Results and Discussion

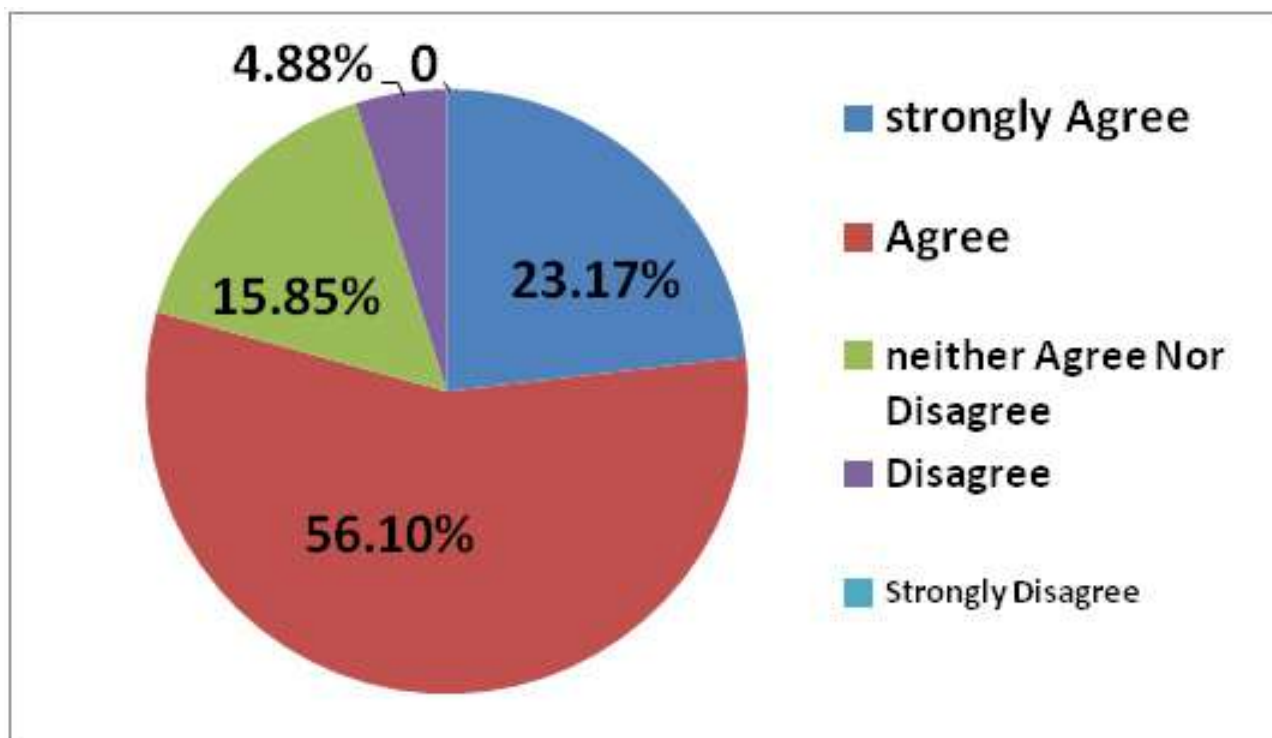
The present study reveals the various aspects of professional ethics of the village level extension personnel.

Need of value education and code of conduct for professional

Value education and code of conduct is essential for professional as they felt that. Most of the village level extension personnel think that value education and code of conduct is necessary as majority (56.1%)have strongly agree and 23.17 % have agree about need of value education while only 5 percent respondents disagree with the need of value education and code of conduct as shown in the table 2 and figure 2. As Lakshmi, 2009, Iyer R B (2013),Aneja N,2014 also described the need of value education for professional.

Table 2 :Value Education and Code of Conduct is necessary for professional

value education and code of conduct is necessary for professional	Frequency (n=)	Percentage (%)
Strongly agree (SA)	19	23.17
Agree (A)	46	56.1
neither agree nor disagree (NAND)	13	15.85
Disagree(D)	4	4.88
Strongly disagree (SD)	0	0
Total,N=	82	100

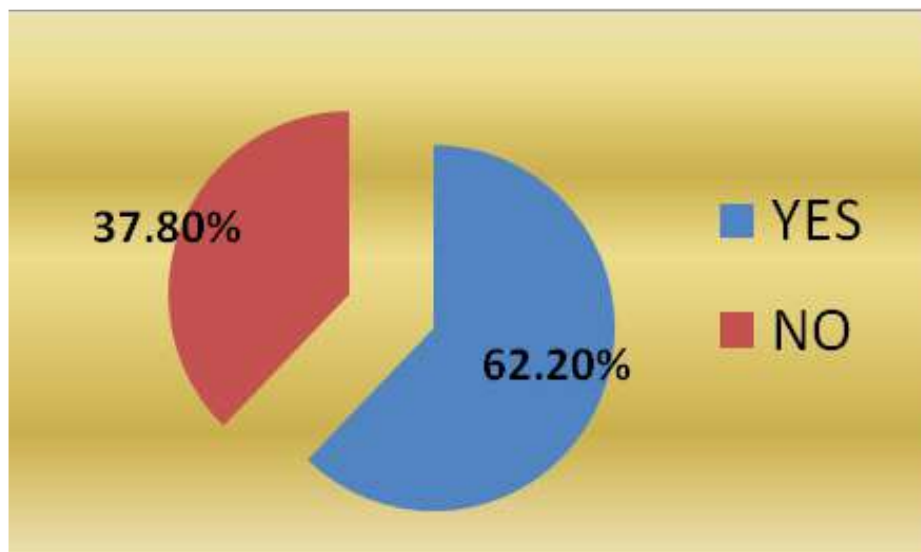


Data regarding any course or workshop or training on ethics or moral philosophy they have undertaken to increase their personal and professional ethics knowledge

and values has been presented in the Table 3 and figure 3. It was interesting to know that 62 percent respondents have completed the training/workshop/course on value based education.

Table 3: course/workshop/training in ethics or moral philosophy undertaken

Course / Workshop /Training on ethics	N=82 ,Frequency (n=)	Percentage (%)
YES	51	62.2
NO	31	37.8
total	82	100



Personal Ethical Practices

In response to the consideration of personal ethical practices, the majority of VAWs (83%) combine agreed that Ethical conduct is necessary for their personal development while only very few (4.9%) were disagreed. majority (56.1%) of VAWs agree and one third (29.3%) of them were strongly think that honesty is the best policy in day to day life and none of them disagree with this practice. About 67 percent of the VAWs are felt that do not harm to others and about 57.3 percent of them think listening other empathetically and actively enhanced personal ethical

behavior while nearly one third of them were neutral to these practices. About three- fourth (75.6 %) think that corruption is evil for the society while 6.1 percent were strongly disagree with them. about 36.6 percent of them Neither Agree Nor Disagree that they have been try to practice what advice to others but one third of them were agreed while 22 percent does not practice what they advice to others. Half of them agree that they admit if they don't know. Majority (60%) of VAWs were admitted their mistake while very few (11%) does not admit their mistake always as shown in the table 4.1. this findings are similar with the Anapurna G and Kumari PL (2014).

Table 4.1: Perceptions towards Personal Ethical Practices by VAWs

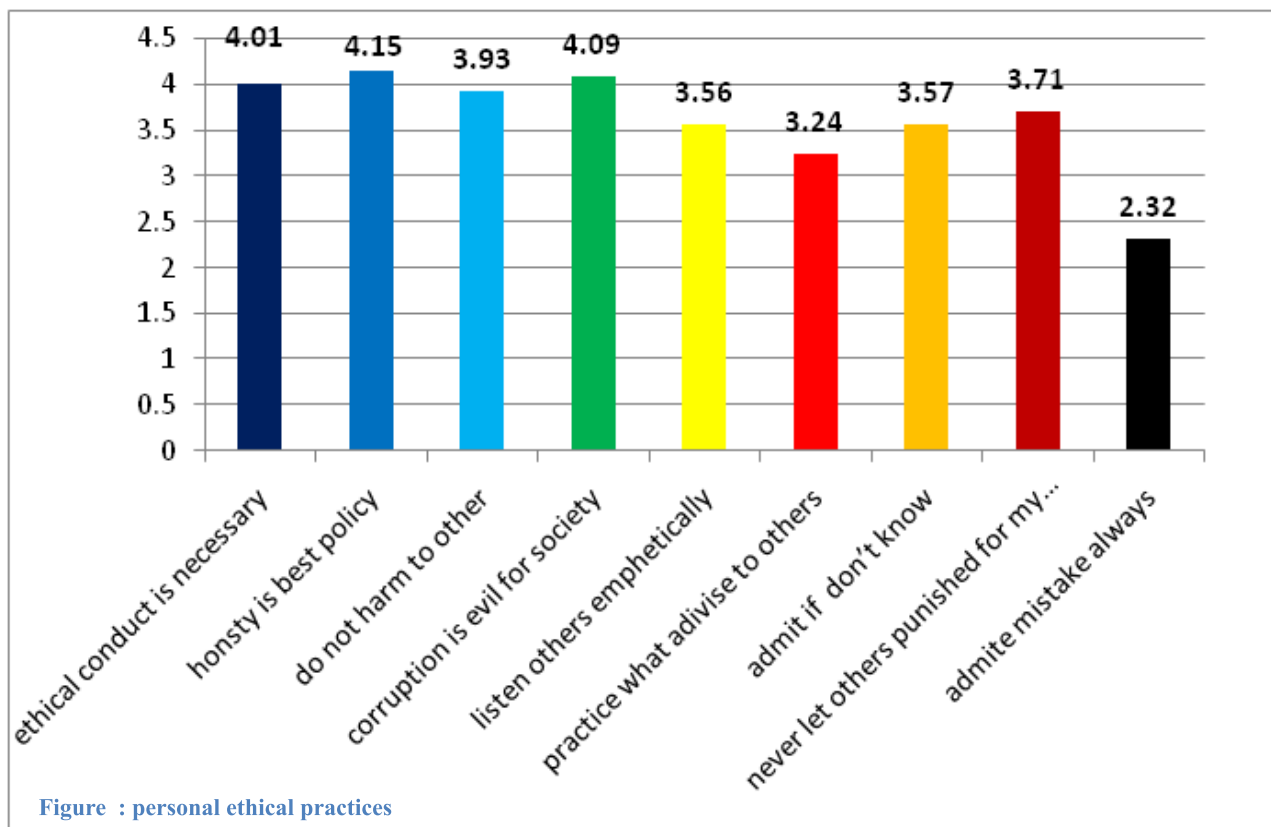
Personal Ethical Practices N=82	Strongly Agree (%)	Agree (%)	Neither Agree Nor Disagree (%)	Disagree (%)	Strongly Disagree (%)
Ethical conduct is necessary	23.2	59.8	12.2	4.9	0
Honesty is the best policy	29.3	56.1	14.6	0	0
Do not harm to others	30.5	36.6	28	4.9	0
Corruption is evil for the society	45.1	30.5	18.3	0	6.1
Listen others empathetically	18.3	39	28	9.8	4.9
Try to practice what advise others	9.8	31.7	36.6	17.1	4.9
Admit if I don't know	14.6	41.5	34.1	6.1	3.7
Never let others be punished for my mistakes	28	32.9	23.2	13.4	2.4
Admit mistakes always	19.5	30.5	36.6	11	2.4

The most important ethical practice considered by them personally were honesty is the best policy and corruption is the evil for society followed by ethical conduct is necessary

and do not harm to others policy. it was observed that admit mistake always and try to practice what they advise to others were less important ethical practice as depict in table 4.2 and figure 4

Table 4.2 Personal Ethical Practices

Personal ethical practices	TOTAL SCORE	MEAN SCORE	RANK
Ethical conduct is necessary	329	4.01	III
Honesty is the best policy	340	4.15	I
Do not harm to others	322	3.93	IV
Corruption is evil for the society	335	4.09	II
Listen others empathetically	292	3.56	VII
Try to practice what advise others	266	3.24	VIII
admit if I don't know	293	3.57	VI
Never let others be punished for my mistakes	304	3.71	V
Admit mistakes always	190	2.32	IX



Personal unethical practices

Table 4.1 depicts the perception about personal unethical practices. It is evident from the table that majority of VAWs (63.4%) Neither Agree Nor Disagree that they are not like gossiping but almost 24 percent agree that they like gossiping about others. It was observed that only 8 percent people felt jealous on others while 33 percent of them never felt jealous at others. About 40 percent agreed that they

Insist things to happen in their way. Most of the VAWs disagree and neutral on views that Angry on people when they express their ideas and felt punished without any cause sometimes. About 60 percent respondents neither agree nor disagree that they have taken advantages of others while only 14.6 percent disagree on them. It was found that one third of the respondents condemn the rebellion behavior in the society.

Table 5.1 : Perception about personal unethical practices

Personal unethical practices	PERCENTAGE , N=82				
	SA %	A %	NAND %	D %	SD %
Take advantage of others	9.8	15.9	59.8	14.6	0.0
Feel jealous of others	0.0	8.5	58.5	19.5	13.4
like to gossip at others	3.7	20.7	63.4	8.5	3.7
Insist things to happen in my way	3.7	35.4	51.2	9.8	0.0
felt punished without any cause sometimes	3.7	25.6	52.4	13.4	4.9
Rebel against people in the society even they were right	0.0	29.3	43.9	12.2	14.6
Angry on people when they express their ideas	0.0	12.2	52.4	14.6	20.7

From the table 5.2 and figure 5, it was indicate that most important unethical behavior were Insist things to

happen in my way and Take advantage of others followed by they like to gossip at others and feeling jealous of others.

Table 5.2 : personal unethical practices

Personal ethical practices	TOTAL SCORE	MEAN SCORE	RANK
Take advantage of others	263	3.21	II
Feel jealous of others	215	2.62	VI
like to gossip at others	256	3.12	III
Insist things to happen in my way	273	3.33	I
felt punished without any cause sometimes	254	3.10	IV
Rebel against people in the society even they were right	236	2.88	V
Angry on people when they express their ideas	210	2.56	VII

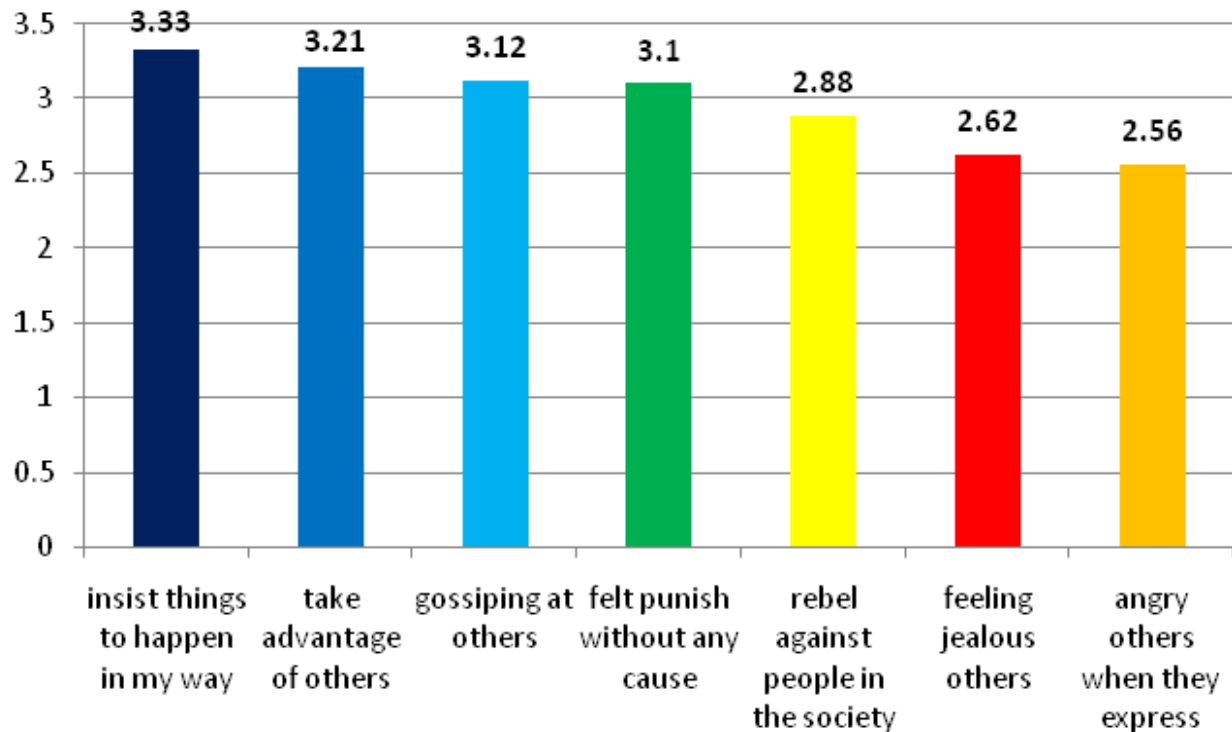


Figure : personal unethical practices

Ethical practices at work place

From table 6.1, it was observed that three fourth (75.6%) of VAWs were think that Ethics are important at workplace and try to help their colleagues at work place while only very few percent were disagreed. about 28 percent and 47.6 percent VAWs were strongly agree and agree the that unselfish service to farmers is the important ethical practice. majority of the respondents felt respect to

others at work place enhance ethical climate. about half of the VAWs agreed that punctuality i.e. submit their works and report at time is vital. about 47 percent respondents were agree while 20 percent were strongly agree to appreciate others for good works. it was interesting to know that one third of them reluctant to take responsibility on ethical problem may be due to lack confidence or lack value education. This finding was in line with the Carolina Cuellar, David L. Giles, (2012) and Anapurna G and

Table 6.1: Ethical practices at work place

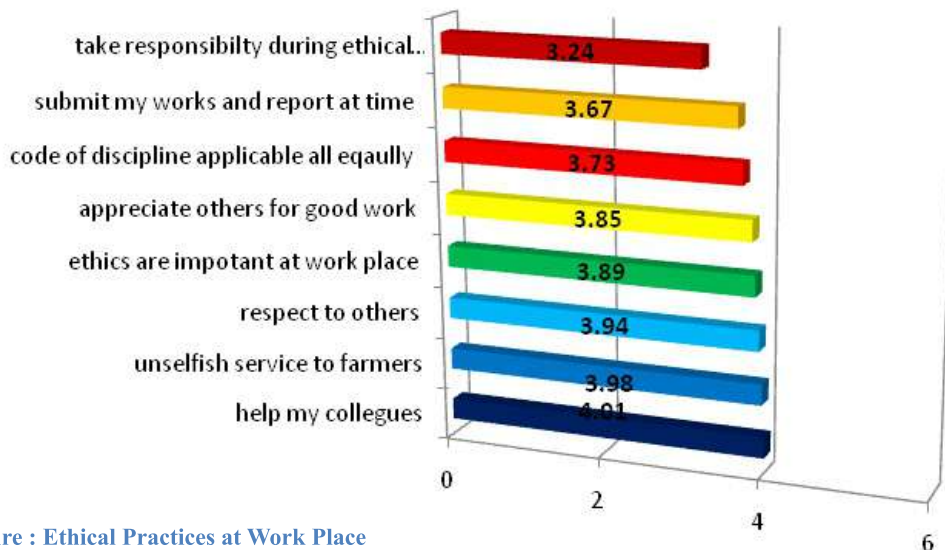
Personal unethical practices	SA %	A %	NAND %	D %	SD %
Ethics are important at workplace	18.3	57.3	19.5	4.9	0.0
try to help my colleagues	29.3	46.3	20.7	3.7	
provide unselfish service to farmers	28.0	47.6	18.3	6.1	0.0
Respect to others at work place	28.0	41.5	26.8	3.7	0.0
submit my works and report at time	23.2	25.6	46.3	4.	0.0
Take responsibility during ethical problem	20.7	17.1	31.7	26.8	3.7
Code of discipline applicable to all equally	25.6	40.2	22.0	6.1	6.1
Appreciate others for good work	20.7	47.6	28.0	3.7	0.0

Table 6.2 disclose that helping other at workplace was best ethical practices while provide unselfish service to farmers was the next best practices as perceived by them. Respect to

others at work place and Ethics are important at workplace were ranked third and fourth respectively as shown in figure 6.

Table 6.2: Ethical practices at work place

Ethical practices at work place	total score	mean score	RANK
Ethics are important at workplace	319	3.89	IV
Try to help my colleagues	329	4.01	I
Provide unselfish service to farmers	326	3.98	II
Respect to others at work place	323	3.94	III
submit my works and report at time	301	3.67	VII
Take responsibility during ethical problem	266	3.24	VIII
Code of discipline applicable to all equally	306	3.73	VI
Appreciate others for good work	316	3.85	V

**Figure : Ethical Practices at Work Place**

Conclusions and Recommendations

Agricultural development and rural development are keys to national socio-economic development. Public extension system in most of the countries plays vital role for enhanced production, productivity and inclusive growth in our country. Hence strengthen extension system and extension professional at local level could built our strong foundation on research extension and teaching linkages it essential to create an ethical climate at local level functionaries. Most of the village level extension personnel are aware about the ethical dilemma and think that value education is essential. A strong ethical behaviour of individual may enhance the other components of behavior that is knowledge, skill s, attitude and leads to sustainable development. Following recommendation

- Value education course should be compulsory as recommended by ICAR 5th dean committee.
- Training and workshop should be organized at various levels.
- Good ethical practices should be nurtured properly and unethical practices like gossiping, taking advantages, unpunctuality should condemned by effective ethical management strategy.
- Awareness on code of conduct and moral philosophy by mass media and others effective procedure like games, completion, drama etc.

Conducting self motivation and self awareness exercises at organizational level to educate and sensitizes about the core human values.

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Socio economic status of Tribal Farmers practicing Livestock and Poultry Farming

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ABSTRACT

A study was conducted in Kalvarayan hills of Villupuram district of Tamil Nadu to ascertain the socio economic status of tribal farmers and to understand the livestock and farming practices followed by them. The results revealed that majority were middle aged marginal male farmers engaged in mixed occupation with low experience in livestock farming. The livestock and poultry farming practices followed depicted that nearly half of them were using mud floor and thatched roof for housing livestock, all of them using artificial insemination for breeding their cattle, following green and dry fodder feeding. In management of young ones all of them practice umbilical cord disinfection and deworming with mostly marketing their produce through private vendors.

Key words : tribal farmers, livestock

Introduction

India is the home to large number of tribal people, who are still lagging behind the modern lifestyle of the world. As per 2011 census, Tribals constitute 8.61% of the total population of the country, numbering and cover about 15% of the country's area. These tribal people also known as the *adivasis* are the poorest in the country and are still dependent on hunting, agriculture and fishing for their livelihood. Some of the major tribal groups in India include Gonds, Santhals, Khasis, Angamis, Bhils, Bhutias and Great Andamanese. All these tribal people have their own culture, tradition, language and lifestyle. Out of a total of 645 district tribes in India, as recognized by the Constitution of the Indian Republic, Tamil Nadu accounts for 1.05 per cent. The Tamil Nadu Tribal communities are at present engaged in economic pursuits ranging from hunting to settled agriculture and urban or industrial callings. Even though, agriculture dominates the tribal economic scene in Tamil Nadu, their miseries are compounded by a low level of infrastructural and social services and the existence of a greater inequality among the tribes. It was advocated that, the rural non-farm sector has become a major source of livelihood for the poor households. It has become a primary source of income and employment especially for many of tribal households.

However livestock and poultry farming contribute to their livelihood to a greater extent. In this situation the objectives set forth for the study was to ascertain the socioeconomic profile of selected tribal farmers of Kalvarayan hills and to understand the existing Livestock and Poultry Farming practices followed by tribal farmers of Kalvarayan hills.

Materials and methods

Vellimalai block of Kalvarayan hills, Villupuram district was purposively selected for the study. Based on the total livestock population as per the 19th All India Livestock census (shown in table 1), Vellimalai panchayat within Vellimalai block was selected due to the high number of livestock population. Within Vellimalai panchayat, three tribal locations namely, *Kottaputhur, Kendikal and Vazhapadi* villages were purposively selected based on the ingenuity of tribal settlement and accessibility. Ten tribal farmers from each of the above three selected tribal villages thus forming a total sample of 30 were randomly selected for this study. A well prepared and pretested Interview Schedule was used to collect necessary information pertaining to the objectives proposed for the study. The data collected were subjected to analysis using frequency, percentage and equal class interval methods.

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Table 1. Livestock population of Vellimalai block

S.No	Village Panchayat	Cattle	Buffalo	Sheep	Goat	Pig	Dog	Poultry
1.	Vellimalai	1987	51	37	1954	254	495	2585
2.	Kariyalur	1241	41	55	913	80	141	1510
3.	Maniyarpalayam	1191	46	68	940	59	71	943
4.	Kundiyanatham	1103	0	0	1017	133	84	1734
	Total	5522	138	160	4824	526	791	6772

Source: 19th Livestock Census, Govt of India

Socioeconomic profile of tribal farmers

An attempt was made to understand the socio-economic characteristics of tribal farmers. This will help to understand the standard of living achieved by tribal farmers. The results pertaining to different socio economic attributes are presented in the table 2. It was noted that most of the farmers were married middle aged men with all

of them belonging to Hindu religion and Scheduled Tribe community (*Malayali*) with 80 per cent of them living in nuclear family. Nearly 15 per cent of them had up to primary level of education and the occupation is found to mixed with crop, animal husbandry farming together with non farm income from being employed as *coolie* labour for breaking coconuts in Erode district and trimming trees in Mysore district, Karnataka.

Table 2. Socioeconomic profile of tribal farmers (N=30)

S.No	Characteristics	Categories	Frequency	Percentage
1.	Gender	Male	27	90.0
		Female	3	10.0
2.	Age	Young (up to 35)	12	40.0
		Middle (36-45)	14	46.7
		Old (more than 45)	4	13.3
3.	Community	ST (Malayali)	30	100.0
4.	Religion	Hindu	30	100.0
5.	Marital status	Married	30	100.0
6.	Family type	Nuclear	18	60.0
		Joint	12	40.0
7.	Educational status	Illiterate	9	30.0
		Primary	13	43.3
		SSLC	1	3.3
		HSC	4	13.3
		Graduate	3	10.0
8.	Occupation	Crop husbandry	0	0
		Crop+Animal husbandry	0	0
		C+A.H+Non farm income	30	100.0

9.	Land Holding	Landless	5	16.7
		Marginal (up to 2.5 acres)	24	80.0
		Small (2.6-5 acres)	0	0
		Large (more than 5 acres)	1	3.3
10.	Experience in Livestock farming	Low	16	53.3
		Medium	8	26.6
		High	6	20.0
11.	Family labour	No involved 2	7	23.3
		No involved 3	14	46.7
		No involved 4	9	30.0
12.	Livestock possession	Low	10	33.3
		Medium	15	50.0

Nearly 80 per cent of them are marginal farmers possessing land of at least 2 – 2.5 acres. Experience in livestock farming was low for more than 50 per cent of respondents, however almost half of the respondents possessed livestock up to medium level. Based on the annual income of the respondents more than 50 per cent of them were under low income category of around Rs 12000 per annum. This is because returns from agricultural land are very poor due to rain fed zone and lack of irrigation facilities. The social participation of majority of respondents is very poor with around 70 per cent falling under low participation category. In Extension agency contact and Mass media exposure nearly 50 per cent of the respondents are coming under High group category. This shows the increased awareness and interest of the people on new electronic devices. The findings on socio economic characteristics are similar to the conclusions drawn in study of tribal farmers of Tinsukia district of Assam by Deka *et al.*

Livestock and Poultry Farming practices

The livestock and poultry farming practices differ in hilly zones when compared with that of the plains. Hence, the basic farm management practices like housing,

breeding, feeding, calf management and other practices followed by the tribal farmers are presented in the following table 3. In housing of livestock more than 50 per cent of the respondents used slated floor animal shed with light roofing materials followed by mud floor and thatched roof houses. The reasons attributed were most of them reared Jersey cross bred cows, for which they were recommended proper animal sheds/houses. In breeding of livestock almost all of them are practicing only artificial insemination for their cattle, however with more than 80 per cent of them lacked knowledge on one calf per year breeding programme. In the aspect of feeding, all of them were well aware of concentrate and mineral mixture feeding in addition to green and dry fodder feeding, due to the support of private milk co-operative societies like *Hatsun* in *Kottaputhur*. In calf rearing almost all the respondents were well aware of colostrum feeding and umbilical cord disinfection. They found to take extra care particularly for female calfs. In other vital management practices, all of the respondents followed regular deworming, vaccination procedures followed by ear tagging for insurance purposes. In farm waste utilization owing to poor knowledge the farmers were practicing only farm yard manure by using cow dung.

Table 3. Livestock and Poultry Farming practices (N=30)

S.No.	Farming practices	Practicing			
		Yes		No	
		Freq	Per	Freq	Per
Housing					
1	Pakka with RC floor and roof	6	20.0	24	80.0
2	Slated floor and Lite roof	16	53.3	14	46.7
3	Mud floor and Thatched roof	14	46.7	16	53.3
4	Conventional pen (Patti)	11	36.7	19	63.3
5	Shelter under trees	14	46.7	16	53.3

Breeding					
1	Artificial Insemination for cattle	30	100.0	0	0
2	Natural service for other livestock/poultry	6	20.0	24	80.0
3	Breeding male availability	4	13.3	26	86.7
4	Knowledge on breeding (a calf per year)	5	16.7	25	83.3
5	Treating breeding problems	4	13.3	26	86.7
Feeding					
1	Green fodder feeding	30	100.0	0	0
2	Dry fodder feeding	30	100.0	0	0
3	Concentrate feeding	27	90.0	3	10.0
4	Unconventional / alternate feeding	3	10.0	27	90.0
5	Mineral mixture feeding	12	40.0	18	60.0
6	Natural grazing	12	40.0	18	60.0
7	Azolla feeding	3	10.0	27	90.0
Calf/Lamb/Kid rearing					
1	Umbilical cord disinfection	30	100.0	0	0
2	Colostrum feeding	30	100.0	0	0
3	Weaning at recommended age	26	86.7	4	13.3
Management practices					
1	Deworming	30	100.0	0	0
2	Deticking/delousing	6	20.0	24	80.0
3	Vaccination	30	100.0	0	0
4	Castration of males	5	16.7	25	83.3
5	Tagging/Tattooing	28	93.3	2	6.7
Farm waste utilisation					
1	Vermi compost production	0	0	30	100.0
2	Bio gas production	0	0	30	100.0
3	Organic farm yard manure	30	100.0	0	0
Marketing practices					
1	Shandi place	3	10.0	27	90.0
2	Govt Regulated Market Committee	0	0	30	100.0
3	Farmers union/federation/club/association	19	63.3	11	36.7
4	Private vendors	19	63.3	11	36.7

In marketing practices, as there are no cooperatives or regulated market of government, the farmers depend on private companies like Hatsun or other local milk vendors. This is similar to the findings like majority (65%) were selling milk through middle man followed by 24% directly selling to the tea shops in northern hills zone of Chhattisgarh state. Even though the priceless free milch cows distribution scheme has been implemented, the cooperative milk society has not been initiated.

Conclusion

The socio economic characteristics of tribal farmers showed that most of them are marginal farmers with low annual income mostly falling under the low to medium category in livestock farming experience, livestock and material possession, social participation, extension agency contact and mass media contact. This clearly shows that status of development of tribal farmers has to be addressed both at policy and implementation level. Though the government is promoting livestock and poultry farming by implementing new schemes, suitable strategies must be advocated to upscale the income generation from farming activities in a long run.

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Sustainability Index for Scientific Wheat Cultivation Practices

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ABSTRACT

India has undergone various changes in agriculture sector since independence. It has moved from begging bowl situation in 1960's to self sufficiency in food grain production in 1980s. Thanks to green revolution which has brought drastic change in agriculture sector. With green revolution there was introduction of use of synthetic chemical fertilizers, use of high yielding varieties, etc. But, the over-use of chemicals to intensify crop production led to health problems in people and animals as well as environmental pollution. Hence, these days, much emphasis is being laid on sustainable development in agriculture by adoption of scientific crop cultivation practices to meet the needs of the present without compromising the ability of future generations to meet their needs.

In India, wheat is next in importance only to rice and has acreage around 30 million hectares with a production of about 100 million tonnes during 2016-17 (Directorate of Economics and Statistics). Sustainability of scientific wheat cultivation practices should be assessed and necessary modification may be carried out, if required, to ensure sustainability. The study focuses on development of sustainability index. This index can be used to assess the sustainability of scientific wheat cultivation practices (SWCP). Suitable corrective measures may be taken for the practices which have less level of sustainability.

Key words : Sustainability, wheat crop

Introduction

Indian agriculture has undergone a sea change since the advent of green revolution era. The major thrust of the green revolution was to maximize food grain production through high yielding varieties (HYV), higher doses of chemical fertilizers, irrigation and plant protection measures. As a result, India achieved the accomplished position of self-sufficiency in foodgrain production, which increased our food-production by more than four times during the last fifty years (from 51 million tonnes in 1950s to 241 million tonnes in 2010-11).

These developments are fine examples of technological and economic sustainability of agriculture. It enhanced the income, improved the life-style and comforts of the beneficiaries. Even in political arena, this form of development has been recognized as sustainable. All in all, it became the *mantra* of rural development and development of agriculture throughout the country.

However, there was not only this glittering side, some gloomy side was also apparent in this development. The green revolution remained restricted to the well endowed irrigated areas of the country. The impact on environmental aspect on account of high input regime was ignored and not taken into consideration. The consumption of chemical fertilizers, pesticides, etc. has increased manifold. The over-use of chemicals to intensify crop production led to health problems in people and animals as well as environmental pollution.

The sustainability has become buzz word under any kind of development. In agriculture sector, the sustainability is being discussed even more strongly, as the survival and welfare of mankind is being increasingly attached with the sustainability of resources. Sustainability has been evolved from the original meaning 'ability to continue'. Brundtland commission's concept of sustainability referred to development that meets the needs of the present without compromising the ability of future generations to meet their needs.

FAO (1989) defines 'sustainable agriculture' as "the management and conservation of the resource base and the orientation of technological and institutional changes in such a manner as to ensure attainment and continued satisfaction of human needs for present and future generations". It follows that sustainable agricultural development is that path of agricultural development, which is environmentally non-degrading, technologically appropriate, economically viable and socially acceptable.

Sustainable agriculture is a balanced management system of renewable resources including soil, wildlife, forest, crop, fish, livestock, plant generic resources and eco-system without degradation and to provide food, livelihood for current and future generations, while maintaining or improving productivity and eco-system services of these resources (Reddy and Reddi, 1992).

Adoption of improved and sustainable agricultural technologies holds the key to ensuring both sustainability

as well as increased productivity in agricultural production in different regions of the country. Agricultural produces should also meet the quality standard of export to reap the benefits of globalization under WTO.

Keeping in view, the importance of scientific practices and fragile ecology, the measurement of the level of sustainability is being calculated using sustainability index. Kerlinger (1983) defined “an index as number that is composite of two or more other numbers”. An investigator makes a series of observations and derives some single number from the measures of the observations to summarize the observations, to express them succinctly. By this definition, all sums and averages are indices. They include in a single measure more than one measure. The specific objective is to develop sustainability index for assessing level of sustainability of scientific wheat cultivation practices.

Materials and methods

Steps involved for developing sustainability index (S.I.) are as follows:

- (a) Selection of dimensions
- (b) Selection of indicators under each dimension

(a) Selection of dimensions:

It requires selection of various dimensions of sustainability and indicators for assessing the sustainability of scientific wheat cultivation practices (SWCP). Dr. M.S. Swaminathan has suggested fourteen dimensions for assessing sustainability of agricultural technology.

Keeping in view the context of present study, coupled with available literature and experts' advices fourteen dimensions given by Dr. M.S. Swaminathan were modified into ten dimensions. Judges' opinions were sought to assess relative importance level of selected dimensions. Most of the judges were extension scientists and few of them were belonging to other related discipline. The opinion of the judge regarding each dimension was given as more important, important and less important for which the scores assigned were three, two and one respectively.

From the scores obtained on the basis of the opinions, the total score, mean score and nearest whole number for all dimensions were calculated. Mean scores of dimension reflects its relative importance, such as, economic viability as most important dimension, followed by technological appropriability, resource-use efficiency, environmental soundness and so on. Based on mean scores and nearest whole number, number of indicators under particular dimension were selected. The results of the judge's opinion are presented in Table 1.

(b) Selection of indicators under each dimension:

Judges opinions were taken for selection of indicators. Proforma was sent to forty judges for their opinion against each statement for its appropriateness to particular dimension of sustainability. The opinions were given as

more appropriate, appropriate, less appropriate and not appropriate for which the scores assigned were three, two, one and zero respectively.

On the basis of obtained mean score the statements were ranked under each selected dimension. Statements which got rank I, II and III were selected for technological appropriability. Two statements shared the 2nd rank for economic viability, therefore, the statement which ranked 1st was selected along with these two statements for this dimension. For remaining dimensions, two statements, which got first and second ranks in respective tables were selected. These selected statements under respective dimensions were considered indicators for assessing sustainability of SWCP. Therefore, three indicators for each technological appropriability and economic viability were selected and two indicators were selected in each remaining dimensions of sustainability. The ten dimensions along with the selected indicators are mentioned below:

1) Technological appropriability:

- a) SWCP is need based.
- b) SWCP is suited with the infrastructure (land, labour, capital, road, electricity, etc.) available to the farmers.
- c) The result of SWCP is easily observed

2) Economic viability:

- a) Low cost inputs are required for SWCP.
- b) SWCP helps in augmenting profit of the farmers.
- c) Market is available in the vicinity of farmer to purchase inputs and or sell the produce of SWCP.

3) Environmental soundness:

- a) SWCP is helpful in conservation of resources like soil, water, biodiversity, etc.
- b) SWCP doesn't possess harmful residual effect.

4) Socio-cultural compatibility:

- a) SWCP is suited to need and aspiration of different sectors (rich-poor, men-women, general, OBC, SC, etc.) of the society.
- b) SWCP fits with the existing culture of the society.

5) Stability:

- a) There is no downward effect on result of SWCP over the long run.
- b) There is no high risk involved in implementing the SWCP.

6) Resource-use-efficiency:

- a) SWCP effectively utilizes available input / resources.
- b) Quality produce / output is obtained with adoption of SWCP.

7) Productivity:

- a) SWCP is yielding as per the expectation and its potential on farm.

- b) SWCP helps to enhance production and / or productivity level of farm.

8) Local adaptability:

- a) SWCP is adaptable to physical and climatic factors at the farm such as soil, ground water, rainfall, etc.
b) Coping strategy exist for unfavourable conditions (e.g., flood, drought, epidemic, etc.) during implementation of SWCP.

9) Equity:

- a) Common resources used are within the access of all the farmers.
b) Technical assistance of SWCP is available for all farmers.

10) Government policy:

- a) Existence of government incentive / support for implementation of SWCP.
b) Government facilitating supply of essential inputs and /or purchasing produce at reasonable price.

RESULT AND DISCUSSION

Table 1 shows that out of 40 judges, 29 were of the opinion that technological appropriability is more appropriate, 9 were of the opinion that this dimension is important and rest two judges were of the opinion that it is less important. Three, two and one scores were assigned to more important, important and less important, respectively. Thus, total score for technological appropriability was 107. It was divided by 40 (number of judges), which gave mean score. Three (3) was considered nearest whole number of 2.67.

Table 1 Relative importance of dimensions of sustainability of scientific wheat cultivation practices.

Sr. No.	Dimensions	More Important (3)	Important (2)	Less Important (1)	Total Score	Mean Score	Whole No.
1.	Technological appropriability	29	9	2	107	2.67	3
2.	Economic viability	30	8	2	108	2.70	3
3.	Environmental soundness	16	14	10	86	2.15	2
4.	Socio-cultural compatibility	8	26	6	82	2.05	2
5.	Stability	11	21	8	83	2.07	2
6.	Resource-use-efficiency	18	11	11	87	2.17	2
7.	Productivity	21	7	12	88	2.2	2
8.	Local adaptability	12	17	11	81	2.02	2
9.	Equity	5	16	19	66	1.65	2
10.	Government policy	6	16	18	68	1.7	2

The present study is based on assessing sustainability index for scientific wheat cultivation practices e.g., use of HYV seed, application of FYM, application of synthetic nitrogenous fertilizers and irrigation. The Schedule (Table 2) was developed by using all above-mentioned dimensions and indicators. Nearly 50 percent of the indicators in each dimension were framed negatively worded. This was done to get correct and actual perception of respondents regarding sustainability of SWCP. Respondents should not feel that only positive answers are to be given for all questions. Responses were taken from both farmers as well as expert respondents on three-point continuum, i.e., agree, undecided and not agree. Score two

(2) for agree, one (1) for undecided and zero (0) for not agree were given. Scoring was reversed in case of negatively worded indicators. Total obtained score for each selected practice was calculated. It was divided by number of respondents, which gave mean sustainability score. Dimension-wise mean sustainability scores were also calculated. For a total of ten dimensions of sustainability, maximum possible mean score were 44, out of which, for two dimensions, viz., technological appropriability and economic viability, the maximum possible mean score was 6; whereas, for rest of them it was 4. In this way, mean sustainability score for the four scientific wheat cultivation practices is obtained.

Table 2: Degree of Sustainability of Scientific Wheat Cultivation

Dimensions and indicators of sustainability		Responses given by respondents for scientific wheat cultivation practices			
		Use of HYV seed	Application of FYM	Application of synthetic nitrogenous fertilizers	Irrigation
1.	Technological Appropriability				
a.	*SWCP is not need based				
b.	SWCP is suited with the infrastructure available to the farmers.				
c.	*The result of S WCP is not easily observed				
2.	Economic Viability				
a.	Low cost inputs are required for SWCP				
b.	SWCP helps in augmenting profit of the farmers				
c.	*Market is not available in the vicinity of farmer to purchase inputs and/or sell the produce of SWCP				
3.	Environmental Soundness				
a.	SWCP is helpful in conservation of resources like soil, water, biodiversity etc.				
b.	*SWCP posses harmful residual effect				
4.	Socio-cultural Compatibility				
a.	*SWCP is not suited to need and aspiration of different sectors of the society				
b.	SWCP fits with the existing culture of the society				
5.	Stability				
a.	There is no downward effect on result of SWCP over the long run				
b.	*There is high risk involved in implementing the SWCP				

6.	Resource-use-efficiency				
a.	SWCP effectively utilizes available inputs/resources.				
b.	*Quality produce/output is not obtained with adoption of SWCP				
7.	Productivity				
a.	*SWCP is not yielding as per the expectation and its potential on farm				
b.	SWCP helped to enhance production and/or productivity level of farm				
8.	Local adaptability				
a.	*SWCP is not adaptable to physical and climatic factors at the farm such as soil, ground water, rainfall, air, temperature etc.				
b.	Coping strategies exist for unfavorable conditions (e.g. flood, drought, epidemic etc.) during implementation of SWCP				
9.	Equity				
a.	Common resources used are within the access of all the farmers				
b.	*Technical assistance of S WCP is not available for all farmers.				
10.	Government Policy				
a.	Existence of govt. Incentive/support for implementation of SWCP				
b.	*Govt. is not facilitating supply of essential inputs and/or purchasing produce at reasonable price.				

Conclusion

The sustainability index developed is used to assess the level of sustainability of SWCP as mentioned above. If mean sustainability score of any particular practice is greater than 50% of maximum possible score it is considered as higher level of sustainability. If it is less than

50%, it is considered lower level of sustainability. If any SWCP is less sustainable, suitable corrective measures must be taken to improve it. Similarly, the Sustainability index (S.I.) for agricultural technology, dairy farming, rainfed farming, etc can be judged and suitable measure may be taken for achieving higher sustainability for achieving goal of sustainable agriculture.

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