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Effect of pre-sowing heat treatment on germination, vigour, oil and fatty acid composition of Indian mustard

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Abstract

An experiment was conducted on six high yielding varieties of Indian mustard for evaluation after giving the pre-sowing heat treatment under semi arid conditions at Directorate of Rapeseed-Mustard Research, Bharatpur during 2009-10. The seeds of these varieties were exposed to 50°C for 4 hours and 8 hours. Among the six varieties, BPR-543-2 and Urvashi showed higher rate of germination (93 and 90% respectively) and low seedling mortality (10.26 and 7.01% respectively) after the heat treatment. The vigour index, plumule and radicle length at 3rd, 4th and 5th day was also higher for Urvashi and BPR-543-2. The oil and glucosinolate content reduced due to high temperature treatment. The fatty acid composition was also altered as saturated: unsaturated fatty acid ratio increased. Major unsaturated fatty acids like oleic acid, linoleic acid, linolenic and eicosenoic acid content reduced, while erucic acid increased due to the high temperature treatment, although the reduction in unsaturated fatty acid was less for Urvashi and BPR-543-2.

Key words: heat treatment, vigour index, germination, fatty acid composition

Introduction

The increasing demand of edible oils in India will continue due to the demographic pressure and improving living standards. Rapeseed-mustard can help to meet out this demand because of its high oil content, better adaptability to various agro-climatic regions and high acceptability in the Indian kitchens. In the present scenario of the global climate change, more pressure will be on the rabi crops as they experience high temperature at the time of sowing and emergence. India is the fourth largest oilseed economy in the world. Among the seven edible oilseed cultivated in India, rapeseed-mustard contributes 28.6% in the total oilseeds production and ranks second after groundnut sharing 27.8% in the India's oilseed economy. Rapeseed-mustard, a temperate crop, is grown extensively in countries with tropical and subtropical climate like India where not only the post grain filling period but also the sowing stage faces high temperature stress. The mustard growing areas in India are experiencing the vast diversity in the agro climatic conditions. Improvement in high temperature tolerance is considered vital for yield improvement in mustard based cropping systems in different regions. Further high temperature tolerance will be necessary if the frequency of hot weather increases in the future because of global climate change (Schneider, 1989). The identification of reliable physiological traits for selection of high temperature tolerant genotypes by

utilizing the existing variability among cultivars is therefore, important. Hence, the study was conducted to evaluate the performance of Indian mustard varieties under pre-sowing heat treatment

Materials and methods

Seed material

The experiment was conducted on parental seeds of six different Indian mustard varieties viz. Rohini, Varuna, Urvashi, BPR-543-2, BPR-540-6 and BPR-541-4. 1000 seeds of all 6 varieties were kept in glass Petri dishes.

Seed treatment

These varieties were given heat treatment 50°C temperature for 4 hours and 8 hours with one control; hence there were total 18 treatment combinations which were replicated thrice. Three sets of each variety-one control (untreated) and two heat treated (hardening) were exposed to high temperature of 50°C of B.O.D incubator for 4 hours and 8 hours.

Germination test

Radicle protrusion through the seed coat as considered germination. Ten seeds of each variety were kept in Petri dishes lined with wet filter paper. After that, these were allowed to germinate at 25°C temperature in a B.O.D. incubator. The moisture in sufficient quantity was maintained by equal quantity of distilled water in each Petri dish. Seed germination was observed daily up to the 5th day according to the methods of the Association of Official Seed Analysis (1990). Seeds with emergence of 2mm length were

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counted for germination (Heydeckar 1972, Lang 1965). The germination % was calculated as follows:-

$$\text{Germination \%} = \frac{\text{No. of seed germinated}}{\text{total no. of seeds}} \times 100$$

Seedling mortality

The germinated seeds were observed and the seedling mortality was counted. The seedling mortality % was calculated as follows:-

$$\text{Mortality \%} = \frac{\text{No. of mortal seed}}{\text{total no. of seeds}} \times 100$$

Seedling emergence

Control and treated seeds were sown in plastic trays containing moist sand replicated thrice, and were placed in a B.O.D. incubator at 25°C. Day and night lengths were kept at 15 and 9 hours, respectively with relative humidity of 70%. Seedling emergence was recorded as plumule length, radicle length and hypocotyl length on 3rd, 4th and 5th day.

Vigour index

Vigour index was calculated for 72, 96, 120 hours old seedling. Vigour index was calculated for each 10 seed as per details given by Abdul-baki and Anderson (1973).

$$\text{V.I.} = \text{Germination \%} \times \text{Length of hypocotyl} + \text{radicle length}$$

Oil content (%)

The whole seed sample for oil content determination of treated and untreated seed was estimated using NIR spectrophotometer (Niewiadomski, 1990).

Glucosinolate content (micrograms per g defatted meal)

The total glucosinolate content was estimated by Palladium complex method given by Kumar *et al.* (2004)

Fatty acid composition

Identification and quantification of fatty acid in oil was done using gas liquid chromatography (GLC).

Results and discussion

Germination study of 6 mustard varieties was done at 25°C for untreated and heat treated seeds for 4 hours and 8 hours. The germination reduced with heat treatment but the difference was non-significant for varieties treated for 4 hours. However, a significant reduction in germination was noticed when seeds were exposed to high temperature for 8 hours. Under normal

condition, Varuna and Urvashi resulted in higher germination. The germination of Urvashi and BPR-543-2 reduced least after heat treatment followed by BPR-541-4 and BPR-540-6. However, Rohini and Varuna showed maximum reduction in germination.

Seed viability denotes the degree to which a seed is alive, metabolically active and possesses enzymes necessary for catalyzing metabolic reactions needed for germination and seedling growth (Basara *et al.*, 2002). High temperature treatment induces certain distinct morphological and biochemical changes in rapeseed-mustard seeds by modulating activities of enzymes and the related metabolites during germination (Biddington and Robenson, 1993 and Anto and Jayaram, 2010). Ability to germinate after heat treatment is related to the temperature sensitivity of the embryo and there is a considerable genotypic variation for this character. Therefore, the tolerant varieties Urvashi and BPR-543-2 had higher rate of germination even after high temperature treatment.

Seedling mortality

Seedling mortality of the mustard varieties were studied up to 5th day. Thermal treatment had a great influence on germination characteristics. The seedling mortality increased with increase in duration of heat treatment. Seedling mortality was observed at high temperature due to which either there was no germination or the seedling mortality was observed before 5 days. At 4 hours of pre-sowing heat treatment, the difference was non-significant, however, the seedling mortality increased sharply at 8 hours of heat treatment (Table 1). Minimum seedling mortality under normal condition was recorded in Varuna and BPR-541-4 and maximum was recorded for Rohini. At 4 and 8 hours of pre-heat treatment, the minimum seedling mortality was recorded in Urvashi and BPR-543-2.

In seed germination of most plants, heat treatment plays an important role (Thomson and Grime 1993). Seedling mortality of seed increases with high temperature treatment which just did not allow germination. During germination and seedling establishment, the stored starch of the cotyledons is degraded into soluble sugar which is rapidly mobilized to the growing axis. High temperature

Table1: Influence of pre-sowing high temperature treatment on germination of different cultivars of mustard.

S.No. Variety/ Pre-heat treatment	Germination (%)			Seedling mortality (%)		
	Control	4 hours	8 hours	Control	4 hours	8 hours
1 Rohini	90.00	90.00	76.67	13.61	16.34	18.12
2 Varuna	93.33	86.67	83.33	8.71	12.15	11.43
3 Urvashi	93.33	90.00	90.00	10.61	9.04	10.01
4 BPR-543-2	90.00	93.33	86.67	11.53	10.10	10.26
5 BPR-540-6	86.67	83.33	76.67	12.56	12.15	13.44
6 BPR-541-4	83.33	83.33	80.00	9.56	10.00	13.41
CD (0.05%)	10.76	2.13				

Table 2. Influence of pre-sowing high temperature treatment on vigour index of different cultivars of mustard.

S. No.	Variety	Control			4 hours			8 hours		
		3 rd day	4 th day	5 th day	3 rd day	4 th day	5 th day	3 rd day	4 th day	5 th day
1	Rohini	270.6	322.7	476.8	247.0	308.8	436.4	230.3	321.0	381.1
2	Varuna	302.9	379.6	563.9	250.7	301.4	432.7	247.4	302.5	394.3
3	Urvashi	301.2	406.9	650.0	287.2	396.4	614.1	259.5	370.2	447.4
4	BPR-543-2	365.6	418.8	711.2	314.2	384.8	622.5	366.9	344.7	429.9
5	BPR-540-6	240.9	323.5	531.3	273.1	320.8	426.6	247.2	272.2	374.0
6	BPR-541-4	257.0	325.8	526.3	286.5	306.4	526.8	276.8	274.9	455.3
	CD (0.05%)	89.0	84.0	176.5	89.0	84.0	176.5	78.2	81.9	115.9

stress reduces the enzymatic activity and the supply of reduced sugar to the developing seedling reduces resulting in seedling mortality.

Root: shoot ratio

The radicle and plumule length of different mustard varieties were studied for 3rd, 4th and 5th day. The root: shoot ratio was worked out on the 5th day and is given in the Fig.1. The root: shoot ratio increased progressively with the heat treatment duration. Under normal condition, the ratio was high for Varuna and BPR-543-2, while after 4 hours heat treatment, the ratio was highest for Urvashi indicating the more root proliferation than shoot. When the treatment for 8 hours was given, highest root: shoot ratio was recorded in BPR-543-2 followed by Urvashi. The effects of temperature treatments on mustard seeds in the early imbibitional phase changes with respect to changes in seedling growth in terms of root and plumule lengths is due to differential water uptake, respiration and hydrolytic enzymes activity, viz. α -amylase, adenosine triphosphatase (ATPase) and phytase. The increase in the ratio is primarily due to pre-enlargement of the embryo and a quick radicle emergence (Grey and Steckle, 1977). The differential rate of imbibition for different varieties at high temperature results in altered root: shoot ratio. The faster root development of high temperature tolerant varieties is due to higher solute content on the growing seedling (Equaza *et al.*, 1997). A direct relationship exists between the carbohydrate accumulation and high temperature shock resulting in high root growth.

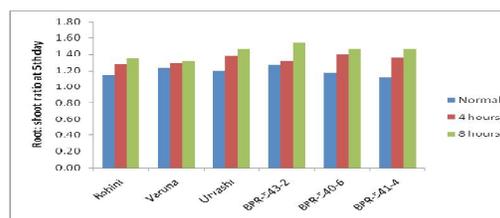


Fig.1. Influence of pre-sowing high temperature treatment on root: shoot ratio of different cultivars of mustard.

Vigour index

Vigour determines the potential for rapid uniform emergence and development of normal seedlings. Low vigour will result in poor establishment under adverse seedbed conditions such as high temperatures and crusting. Seed vigour is best estimated by measuring actual seedling growth. Germination studies up to five or seven days is also a measure of seed lot vigour. In the present study, the vigour index was estimated for 3rd, 4th and 5th day. The vigour index increased with days after germination due to increasing hypocotyl length, although the vigour reduced after giving 4 and 8 heat treatments. The vigour index for untreated BPR-543-2 seeds was highest followed by Urvashi. At 4 hours heat treatment, maximum vigour was recorded for Urvashi, while BPR-543-2 was at par with Urvashi. Like wise when the seeds were treated for 8 hours, vigour index of Urvashi and BPR-543-2 was at par with each other, being lowest for Rohini.

Table 3. Influence of pre-sowing high temperature treatment on vigour index of different cultivars of mustard.

S.No.	Variety/ Pre-heat treatment	Oil (%)			Glucosinolate content (micro moles/ g meal)		
		Control	4 hours	8 hours	Control	4 hours	8 hours
1	Rohini	40.54	39.60	39.54	158.44	117.12	114.50
2	Varuna	40.52	38.34	40.38	143.31	85.99	86.14
3	Urvashi	40.19	39.34	38.48	101.21	76.73	65.47
4	BPR-543-2	41.92	41.40	36.35	116.37	121.22	114.01
5	BPR-540-6	39.93	39.14	40.66	157.86	126.49	107.97
6	BPR-541-4	41.34	39.41	40.26	105.24	91.47	100.25
	CD (0.05%)		2.17			23.14	

Respiration and mitochondrial phosphorylation reduces in seeds exposed to very high temperature and the ATP level becomes inadequate for germination. The specific activities of several important enzymes are lower, and the rate of protein synthesis is severely reduced compared with seeds imbibing at normal temperature depending upon their known specific temperature sensitivity. The damage could also be caused due to electrolytic leakage from the cells. High temperature treatment also induces tighter packing of molecules and increases their structural disorder leading to loss of seed vigour and/or viability. The final water content of dry seeds before germination is important in determining their survival over long periods of storage (Ellis and Robert, 1989).

Oil and glucosinolate content

Rapeseed-mustard seeds contain about 39 to 48% oil, which is mainly influenced by moisture and temperature during reproductive stages (Si *et al.*, 2003). Cooler and moist spring has been concluded to be conducive for higher oil accumulation. The oil content reduced in all the mustard varieties after heat treatment. Under normal conditions, the highest oil content was recorded in BPR-543-2, although all other varieties were at par with it. After high temperature treatment, the maximum reduction in oil content was observed in BPR-543-2. The differential response of various Indian mustard varieties in oil content due to altered heat treatment indicated that Varuna, BPR-540-1 and BPR-541-4 retained significantly higher oil content in the seeds after heat shock. The oil content of the seed is a polygenic and complex trait that is responsive to environmental effects that occur during plant development and seed storage. The oil content was increased by low temperature during the growing period (Saastamoinen *et al.*, 1990 and Miranda *et al.*, 1998).

Glucosinolate (TGLS) content of Indian mustard varieties range from 12 to 90 g/kg DM (Chauhan *et al.*, 1999). Glucosinolates themselves are non-toxic, whereas their degraded products thiocyanate, isothiocyanates, nitriles, etc. are toxic to the animals. These end products suppress thyroidal uptake of iodine (Barrett *et al.*, 1997) and induce metabolic disorders such as liver and thyroid hypertrophy. Upon hydrolysis by the endogenous enzyme myrosinase, a large number of compounds can be formed of which some are potentially anticarcinogenic, while others are largely inactive. The glucosinolate content of various mustard varieties reduced upon exposure to the high temperature shock before sowing. Under control condition, the glucosinolate content was highest for Rohini followed by BPR-540-6. The content reduced significantly at 4 hours heat treatment, while further reduction was relatively less after 8 hours of high temperature treatment. Heating for 30 minutes reduces the levels of

glucosinolates by 58 to 77% due to the effects of myrosinase activity increases the conversion of glucosinolates to corresponding isothiocyanates during heating (Conaway *et al.*, 2001). Environment is important in determining the glucosinolate content. Soil type, temperature, daylight and water are all determining factors and seasonal effects that determine the glucosinolate content. High temperature up to 50°C may cause denaturation that is why *Brassica* reduces glucosinolate content partly due to the effect of heat. After storage for 7 days, the total glucosinolate content was decreases up to 11–27%. For individual glucosinolate, the losses of glucoiberin, glucoraphanin and glucoalyssin were higher than of sinigrin, gluconapin and progoitrin (Elyen *et al.*, 2009).

Fatty acid composition

Oils are made up of fatty acid and glycerols. Fatty acids are of two types depending up on number of double bonds; saturated and unsaturated fatty acids. Unsaturated fatty acids (UFA) are again of two types; mono-unsaturated fatty acid (MUFA) and poly-unsaturated fatty acid (PUFA). Among the major fatty acids of rapeseed-mustard, palmitic and stearic acids are saturated fatty acids; oleic is MUFA, while linoleic and linolenic are PUFA. A higher UFA: SFA ratio is desirable for good quality of oil. The fatty acid of 6 varieties under normal and heat treated condition was evaluated and the results are given in Fig. 2, 3 and 4. Highest palmitic and stearic acid were recorded in BPR-541-4 and lowest in Urvashi. Varieties like BPR-543-2 and Urvashi were at par with BPR-541-4. Highest oleic acid recorded in Urvashi and lowest oleic acid recorded in BPR-543-2. Highest linoleic+ eicosenoic acid and erucic acid was recorded in Urvashi. The palmitic+ stearic acid content remained unchanged due to high temperature stress. A significant reduction in the oleic acid content was observed due to high temperature treatment. However, the linoleic, linolenic+ eicosenoic acid content reduced with the high temperature treatment. Erucic acid content increased due to 8 hours high temperature treatment. The reduction in unsaturated fatty acids in Urvashi and BPR-543-2 was significantly less than Rohini and Varuna.

Destabilization of cellular membranes is the primary result of heat treatment. The fatty acid composition of triacylglycerols may change the composition of the intracellular fatty acid pool; i.e., the acids that are synthesized, desaturated and/or elongated under prevailing ambient conditions. Changes in fatty acid composition are among several means of altering lipids in response to high temperature. Minor changes in phospholipid fatty acids can, in fact, confer major changes in the stability of cellular membranes (Bennett and Richard, 1997) thus altering the composition.

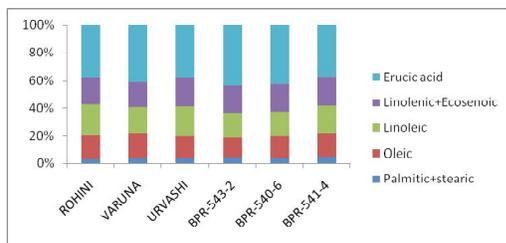


Fig.2. Fatty acid composition of Indian mustard varieties under normal condition.

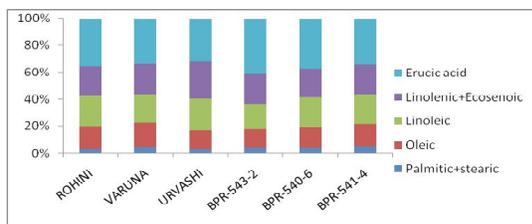


Fig.3. Influence of pre-sowing high temperature treatment for 4 hours on fatty acid composition of different cultivars of mustard.

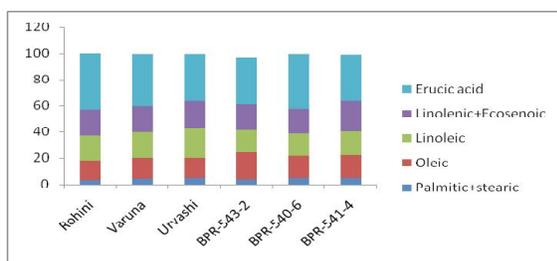


Fig.4. Influence of pre-sowing high temperature treatment for 8 hours on fatty acid composition of different cultivars of mustard.

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Marketing of Sugarcane in Bijnor District of U.P.

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Abstract

This study was conducted in Budhanpur block of district Bijnor Uttar Pradesh. Following purposive random sampling technique. 100 sample farmers were selected and interviewed for collection of data. Three marketing channels i.e. (i) producer to purchase center (ii) producer to sugar mill gate (iii) producer to cane crusher were identified. Among three, channel Ist was found most effective through which 65 per cent of total product was marketed. Highest producer's share in consumer's rupee i.e. 94.44 per cent was also recorded from this channel. Financial, technical and input supply support as well as fixation of remunerative prices prior to planting of the crop and prompt payment of sugarcane was suggested to improve the production and marketing of sugarcane.

Key words: Interviewed, consumer's, remunerative, fixation, payment, marketing

Introduction

Being cash crop sugarcane is of great importance for the farmer due to its income and employment generating nature. It is an important crop of agriculture sector which share 7 per cent of the total value of the agricultural output and occupies only 2.5 per cent of the country's gross cropped area. In India sugarcane industry accounted for one per cent of GDP during 2005. In the world, largest area was covered by sugarcane in India and also stood first rank in production during 2006-07. Sugarcane industry employs 0.5 million workers and also provides substantial indirect employment through various ancillary activities; as such sugarcane industry occupies an important place among agricultural based industry after cotton textile. Marketing of sugarcane is equally important like production to encourage the farmer for further strengthening of sugarcane cultivation. Variation in area and production of sugarcane is noticed due to various reasons among which marketing aspects are mainly responsible.

Uttar Pradesh has the highest number of sugar factories (115 in number) as compared to other state and also occupies first rank in India, both in acreage (2.05 million ha) and production (125 million tonnes) during 2006-07. Uttar Pradesh with 30 per cent of sugar production top the nine state of the nation, Meerut, Ruhelkhand and Gorakhpur are the three main sugarcane growing division of Uttar Pradesh, which accounts for 66 per cent of the total area and 71 per cent of the total production. Moradabad division of Western U.P. having 0.385 million hectares area under sugarcane produce 22.84 million tones during 2002-03 and district Bijnor of this division has an area of 0.2143

million hectares under sugarcane with a production of 13.55 million tones during 2004-05.

Though the acreage under sugarcane and its production in Bijnor district was not higher but it does not reduce the important of the crop. Since no scientific study was conducted for on economic analysis of marketing of sugarcane in Bijnor district of Western U.P., a micro level study on marketing of sugarcane in Bijnor district of Western U.P. was conducted with the objectives:

- (i) To study the different marketing channels prevailing in Bijnor district.
- (ii) To find out the marketing costs and producer's share in consumer's price.
- (iii) To suggest the future policies for improvement of marketing of sugarcane.

Methodology

(i) Sampling Design:-

Purposive random sampling technique was used to select the sample respondents. Bijnor district of Uttar Pradesh and Budhanpur block of district Bijnor were selected purposely. A list of all the sugarcane growing villages of the selected block was prepared and arranged in descending order on the basis of magnitude of area under sugarcane and 5 villages were selected randomly from this list.

A list of all the sugarcane cultivators of each selected villages was prepared along with their size of holding and was arranged in ascending order. From this list 100 sample farmers (i.e. 40 marginal <1ha, 32 small 1-2 ha, 18 medium 2-3 ha and 10 large 3 ha and above) were selected following the proportionate random sampling technique.

(ii) Method and Period of Enquiry

The primary data were collected by survey method through personal interview on well structured and pre tested schedule for the agricultural year 2007-08.

(iii) Analysis of Data

Tabular analysis was used. Percentage and averages were calculated to interpretate the result.

Marketable surplus and Marketing channels

Marketable surplus is the quantity of the produce which can be made available to the non- form population. Marketable surplus was calculated by using following formula-

$$\text{Marketable surplus (MS)} = \text{Total production (P)} - \text{Total requirement (C)}$$

Price Spread

Price spread is the difference between price paid by consumers and price received by Producers. This difference occurs due to marketing costs and marketing margins charged by different functionaries for different marketing functions. Amount of price spread varies to different channels.

Result and Discussion

Marketing channels

Three marketing channels were identified during the investigation. Disposable of marketable surplus through these channels are presented in Table 1.

Table 1: Channels Identified in the Marketing of Sugarcane and Quantity Moved Through These Channels.

S. Channels No.	Percentage of total quantity sold	
	Planted	Ratoon
1. Producer – Purchase center	71.72	58.83
2. Producer – Sugar Mill Gate	29.93	28.43
3. Producer – Cane crusher	0.35	12.74
Total	100	100

It is evident from the table that in all three channels two were more effective because 99 per cent of planted crop and 87 per cent of ratoon crop sale

flowed through these channels.

It is evident from the table that maximum quantity of planted and ratoon crop flowed through channel-Ist (Producer – Purchase center) i.e. 71.72 and 58.83 per cent respectively. Supply of sugarcane of both the crops (i.e. planted and ratoon) through channel-II was almost equal i.e. 28 per cent, sale of planted sugarcane crop through channel- IIIrd was negligible where as 12.74 per cent of total sale of ratoon crop flowed through channel- IIIrd (Producer – Cane crusher). It was because of early maturity of ratoon crop, and sample farmers were willing to take next crop of Rabi season after ratoon. Thus they prefer to sale their produce at an early date to Cane crusher even at low price rate.

Channel wise disposal of sugarcane

Extent of disposal of sugarcane through different channel is presented in Table 2. It is depicted from the table that the contribution of different size group of sample farm in total marketed surplus were 18.33, 28.01, 26.50 and 27.16 per cent corresponding to marginal, small, medium and large farms respectively. As for as preference of different marketing channels by various categories of farms is concerned, the channel-Ist was most preferred by the sample farmers because more than fifty per cent of the total marketed surplus was disposed through this channel . The share of marketing channel- IInd and IIIrd in total were 28.00 and 7.00 per cent respectively.

Price spread & Producer's share in Consumer's rupee

Price spread and Producer's share in Consumer's price in different channels are presented in the Table 3. It is revealed from the table -3 that all the marketing costs were borne by producer and overall average of this cost came to Rs. 9.04 per quintal. The highest marketing costs incurred in channel- II i.e. Rs. 13.62 pre quintal, that was because of maximum transportation charges paid by producer. Lowest marketing cost incurred in channel- I because sample farmer sold out their produce at nearest purchase center paying minimum transportation charges

Table 2: Extent of disposal of sugarcane on different size group of farms- (Planted and Ratoon)

S. No.	Size Group of Farms	Marketed Surplus	Channel I	Channel II	Channel III
1.	Marginal (Below 1 ha.)	7391(18.33)	6065(23.08)	(0.00)	1326(49.51)
2.	Small (1-2 ha.)	11296(28.01)	8264(31.44)	2230(19.62)	802(29.95)
3.	Medium (2-3 ha.)	10686(26.50)	6783(25.81)	3353(29.50)	550(20.54)
4.	Large 3 ha. and above	10953(27.16)	5170(19.67)	5783(50.88)	-
5.	Total	40326(100)	26282(100)	11366(100)	2678(100)

(Figure in parenthesis indicate percentage)

Table 3: Price spread of sugarcane through different channels in district Bijnor (U.P.) (Rs./q.)

S. No.	Particulars	Channel I	Channel II	Channel III	Overall average
1.	Producer's Sale Price/ purchase center, Mill gate, cane crusher purchase price	104.00	110.00	80.00	98.00
2.	Expenses incurred by producers	reparation of sugarcane and its loading was done by the hired labourers on the costs of tops and leaves.			
a.	Preparation charge and loading- unloading charges				
b.	Transportation charges	4.78	12.62	6.73	8.04
c.	Losses	1.00	1.00	1.00	1.00
d.	Total expenses incurred by producer	5.78	13.62	7.73	9.04
3.	Net price received by the producer	98.22	96.38	72.27	88.96

(Figure in parenthesis indicate percentage)

Producer's share in Consumer's price was highest i.e. 94.44 per cent in channel first followed by channel third 90.34 and channel second 87.62 per cent respectively. The overall average of Producer's share in Consumer's price was found to 90.78 per cent.

Suggestion for improvement in marketing of sugarcane

A reasonable number of jaggery processors and farmers were interacted regarding problems and suggestion related to of marketing of sugarcane. Defective marketing process was found mainly responsible for curtail in area under sugarcane crop. Major marketing defects were noticed as fluctuation in price of sugarcane and its product, lingering in payment by sugar mills. Exploitation of sugarcane growers by the mill staff and unfair practices involved in supply of sugarcane.

It was suggested that for establishment of area and production of sugarcane, the remunerative price should be announced prior to commencement of the planting. Prompt payment should be done by sugar mill, and farmers should be assured for purchase of their produce. Unhealthy competition among the sugar factories should be checked by allotment of specified number of villages consisting of well demarcated cane growing regions.

Sound input supply system including irrigation facilities should be assured. Financial support and

sound knowledge and skill were required, need of cooperative marketing and processing were also advocated. Actual weighing, fair slip distribution, and easy transport facilities were reported most important requirement for improvement in production and marketing of sugarcane.

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A study of potato commodity system in the Tarai of Kumaon region of Uttarakhand

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Abstract

In the tarai area of Kumaon region of Uttarakhand, the growers have a big agribusiness commodity system of potato. The problems of the potato producers centre on the input supply and potato marketing. The inputs distribution channels are to be streamlined. Though market in the region is regulated by government, still the producers are being exploited by the traders. The region has a large potato production but farmers suffer from wide price fluctuation. Strengthening of input supply system through efficient functioning of mobile teams, forceful implementation of Mandi Act, Setting up of processing units in the area and declaration of major potato growing areas in the state as potato production zone were the major policy implications that emerged from the findings of the study.

Key words: agribusiness ,marketing, government, exploited, efficient, production

Introduction

Potato is an important crop in the state of Uttarakhand. To strengthen the strategy for commercialization and diversification of agriculture, the state of Uttarakhand plans to promote increasing area under horticulture and other ancillary activities. However, they need to be supported by excellent marketing strategies. The state of post-harvest management and marketing infrastructure is far from developed particularly in the hilly regions and this needs to be strengthened. There is a great need to modernize the whole system of the potato commodity including the supply of the inputs, financing and marketing of potato

Traditional farm management studies and/or marketing studies on potato usually concentrated on a particular aspect of the problem investigated. Such an approach fails to take into account the many related aspects of the commodity since all the aspects from farm supplies to production, assembling, storing and distribution and coordinating institutional arrangements are integrated. Hence, by considering one or few aspects of the commodity, realistic policy decisions to modernize its system, can not be taken. It is in this perspective; the study on commodity system of potatoes has assured great significance. The present study has therefore, been undertaken to study the existing potato commodity system.

Materials and Methods

The study was conducted in the tarai area of Kumaon region of Uttarakhand. Udham Singh Nagar district was purposively chosen due to highest

production of potato among all districts in the tarai region. The sample design of the study covered two blocks of Kashipur and Bazpur having maximum percentage of area under the crop. From the selected blocks a sample of six villages was drawn randomly. From the sampled villages a sample of 90 farmers, 15 farmers from each village, was drawn. Equal number of farmers were selected from each village because the number of potato growers was more or less equal in each village. Relevant market information was collected from market intermediaries; 30 Wholesaler cum Commission Agents and 30 retailers randomly selected from the regulated market of Haldwani. Some relevant secondary informations were also obtained from the offices of Directorate of Horticulture and Food Processing, District statistical Office, Development Blocks' Office, Mandi Samittee and Cooperative and Rural Banks.

To fulfill the objectives of the study the agribusiness commodity system approach was used. For the purpose, the whole agribusiness potato system was partitioned into four important sub-systems: (i) input supply (ii) financing (iii) production and (iv) marketing. To analyze the existing agribusiness potato system simple statistical tools like arithmetic mean, percentages, frequency distribution etc. were used.

Results and Discussion

For potato crop in the study area, fertilizers and pesticides appeared as the important cash inputs. Farmers acquired fertilizers from cooperative societies and pesticides from mobile teams of block and private traders. Under the existing system, the average

acquisition cost of different fertilizers from cooperative societies exceeded over the official retail prices from Rs.8.00 to Rs.10.00 per quintal on account of transportation and labour. Regarding pesticides supplies, 100 per cent farmers used pesticides and out of them 11 per cent purchased it from mobile team, 61.11 per cent purchased it from private trader while 27.77 purchased from both the sources. The acquisition cost of pesticides from private traders was higher than the mobile team. The prices offered by the mobile team were 3.57 per cent to 9.09 per cent lesser than that offered by private trader except for Dithane M-45 for which the prices charged by both the sources were same. The services rendered by mobile team were very poor as reported by all the farmers. The mobile team did not visit the villages in order to supply inputs. Moreover, quantity of the inputs supplied by the mobile team fell short of the requirement of the farmers. Farmers also faced the problem of non-availability of certain pesticides with mobile team. Due to these problems, inspite of having greater acquiring cost, farmers have to depend on private traders in order to meet their demand of required pesticides. Of the total potato producers studied, 33.33 per cent of the farmers used home grown seed 16.66 per cent acquired seeds from the mobile team of the block offices while 50 per cent acquired seeds from private agencies. The cost of acquiring seed from private trader was quite high (Rs.40 per quintal) as against the value of home grown seed. That's why farmers used home grown seed. Among the farmers using home grown seed, 63.33 per cent of farmers reported about the poor quality of their seed. All those farmers who purchased seed from mobile team reported that mobile team could not meet their full requirement of seed. Of all the farmers who purchased seed from private trader, 14.54 per cent complained of underweighment (75 kg bag instead of 80 kg), and 54.54 per cent faced problem of unsorted/upgraded seed. Farmers reported the high prices of seed as a major problem.

On an average, under existing system, total cropped area per farm was 56.46 acres. Rice, the most important crop, occupied as much as 30.46 per cent of the total cropped area followed by wheat (21.87 per cent) and potato (15.27 per cent), among the major crops. Analysis showed that there was no relation between the cost and source of pesticide on yield of potato crop. The use of pesticides was more because the humid climate in tarai regions is more conducive to the infestation by insects/pests and diseases. The total variable cost per farm (cash expenses) incurred by the producers to produce potatoes amounted to Rs. 217213.05. The total marketed surplus flows through Wholesaler cum Commission Agents in the market in different months during harvest period. The marketing

Table 1: Existing cropping pattern on sample farms in district Udham Singh Nagar during 2008-09

Particulars	Area (in acres)	
	Total Area	Percentage of area
Rice	17.20	30.46
Sugarcane	6.25	11.07
Maize	2.77	4.91
Moong	1.86	3.29
Wheat	12.35	21.87
Pea	3.11	5.51
Mustard	2.20	3.90
Gram	2.10	3.72
Potato	8.62	15.27
Total	56.46	100.00

Note: Figures in parentheses show the percentage to total area under respective crop

costs borne by a typical producer accounted for quite a high share of the total cost of production. The share of marketing cost was about 40.50 per cent of the total cash cost per farm incurred on potato production. Thus per quintal cost of production of potato in the study area was Rs.248.30. Of the total potato produced per farm 89.48 per cent was the marketed surplus while 6.76 per cent was kept for family consumption and 3.76 per cent for seed purpose. Out of the total marketed surplus, about 15.44 per cent and 11.09 per cent was sold out in the months of January and May respectively. Maximum produce was disposed off in the month of March (34.48 per cent). On an average a producer borrowed about Rs. 84315.89 from cooperative societies mainly to meet consumption requirement and other contingencies in the months of kharif and rabi. Due to many other crops cultivation. Consequently farmers have no income from crop activities during these months. Also, opportunities of off-farm employment also dampen. Under such situation farmers borrow from the cooperative societies and repay the loan from the sales of crop in the months of rabi and kharif i.e. after ten months at an interest rate of 7 per cent per year.

Table 2 : Price spread in channel I

Particular	Rs. per Quintal
Farmers's share	475.40 (38.38 per cent)
WCA's margin	220.28(17.79 per cent)
Retailer's margin	330.36 (26.67 per cent)
Total Marketing charges	212.51(17.00 per cent)
Consumer's price	1238.55 (100.00 per cent)

Results of the study further showed that though Haldwani market is a regulated market, farmers are

still exploited by the private traders. The private traders take 6-8 per cent commission of the total value of produce from the farmers which are against the by-laws of mandi. They also made unnecessary deductions on part of palledari and dana. Per quintal net receipts of the farmer in the existing market situation ranged from Rs.473.94 per quintal in January to Rs.356.68 in March. Major distribution channels were I) producer-Wholesaler cum Commission Agent-retailer-consumer II) producer-Wholesaler cum Commission Agent of local market- Wholesaler cum Commission Agent of distant market-retailer-consumer and III) producer-Wholesaler cum Commission Agent-institutions/hotels-consumer. Of the total potato arrival in the market, 73.29 per cent was sold through channel II and channel III while remaining 26.71 per cent was sold through channel I. The total price spread of the channel I can be broken up as 38.38 per cent as producer's share, 17.00 per cent as marketing charges, 17.79 as margin of wholesaler and 26.67 per cent as margin of retailer. The price spread was calculated only for channel I in the present study because it was not possible to follow the produce to different distant markets. Also the quantity of the produce flowing through channel II and channel III was not known separately.

POLICY RECOMMENDATIONS

The important policy implications emerged from the results of the study are:

1. The input supply system should be strengthened in order to ensure the supply of quality inputs in required quantity at right time to the potato growers. In this context, the functioning of mobile team should be improved in terms of coverage and also services of NGO's may be encouraged.
2. Malpractices such as unauthorized deductions on account of dana, palledari and commission from the grower in the produce market need to be checked through forceful implementation of Mandi act.
3. Price support policy should be declared by the Government for the crop in order to safeguard potato growers from price fluctuations
4. Market information sources to the potato growers and transportation services etc in the area should be improved.
5. Organized credit institutions should come forward to advance consumption loan to safeguard the potato

growers from the pinch of high interest they are paying to the wholesaler cum commission agents.

6. The processing units should be set up in the area to promote the value addition process and generate local employment.
7. Potato is among the major commercial crops in the area. As, hill potato from Uttarakhand is the major source of off-season supply of potato in the plains, the major potato growing areas in the state should be declared as potato production zone.
8. Finally, there seems a good case to form potato growers' cooperatives / self help groups, to take care of different dimensions of problems faced by potato growers in the study area.

The above listed policies will strengthen the whole potato commodity system and thus will help in making the economical gain to the farmer.

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Effect of integrated plant nutrient management on productivity trends, Economics and soil fertility in soybean (*Glycine Max*)

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Abstract

A field experiment was conducted at farmers fields under Ph.D experiment during Kharif 2002 and 2003, to study the effect of integrated plant nutrient management on productivity trends, economics and soil fertility of soybean in mixed red and black soil of Rewa district of Madhya Pradesh. Six treatments viz. traditional farmers practice (30% RDF), 100% RDF + S + Zn, 75% RDF + FYM @ 2.5t ha⁻¹ + Bio-fertilizers, 50% RDF + FYM @ 2.5t/ha + Bio-fertilizers, 100% RDF + FYM @ 2.5t ha⁻¹ + Bio-fertilizers and FYM @ 2.5t ha⁻¹ + Bio-fertilizers were replicated at 5 farmers fields having similar fertility status in randomized block design. The mean of two years data indicated that the highest soybean yield 20.60q/ha, energy yield 302.79MJ ha⁻¹, protein yield 7.71 q ha⁻¹ and oil yield 3.94 q ha⁻¹ were obtained with the application of 100% RDF + S + Zn as compared to other treatments. Similar trends were also observed in uptake of N, P, K and S (159.72, 10.31, 100.67 and 9.43 kg ha⁻¹ respectively). It was significantly at par with the treatment where 100% RDF + FYM @ 2.5t ha⁻¹ + Bio-fertilizers applied. The same treatment also gave maximum gross return (Rs. 20,600/-), net return (Rs.10, 140/-) and best benefit cost ratio (1: 1.96). After the two year (two crop cycle) application of 100% RDF along with sulphur & zinc or combination with FYM + biofertilizer resulted in the improvement of soil organic carbon content, available soil N, P, K and S compared to 30% RDF treatment. Impact of farm yard manure and bio-fertilizers without chemical fertilizer had meager effect.

Key words: Soybean, Integrated plant nutrient management, Productivity, Economics, Soil fertility

Introduction

Application of plant nutrients has a significant and vital effect on yield and quality attributes of soybean. Integrated plant nutrient management is essential to maintain soil fertility and plant nutrient supply to an optimum level to sustain desired crop productivity by optimizing the benefits from all sources of plant nutrients in an integrated manner. In Kaymore plateau and satpuda hills region either continuous sole application or imbalanced use of costly chemical fertilizers in soybean has led to decrease in nutrient uptake efficiency. This has ultimately resulted in either stagnation or decrease in yield. We have ignored the potential of organic manures composts and agricultural wastes and their synergistic effect with chemical fertilizers for increasing productivity, sustainability of agriculture and improving soil health and environmental security. An all out effort is needed to map up all the locally available organic resources and recycle the nutrients from them efficiently. Most conservative estimate shows that hardly 270/300 million tonnes of organic manures of different kinds contributing around 4-6 million tones of NPK are available in the country (singh, 1999). Soybean requires a high amount of

essential plant nutrients for its optimum growth and seed production and the soil may supply only a part of them. Hence, the required quantities of nutrients have to be supplied externally by means of organic manures and chemical fertilizers to maintain the soil fertility as well as high yields. Adopting IPNS using organic and inorganic sources jointly, the yield of soybean can be not only increased but sustained at higher level (santhy et al. 1998). In view of this the present study was undertaken.

Material and Methods

A field experiment was conducted at farmer's field in Rewa district during the Kharif season of 2002 and 2003 in mixed red and black soil having pH 7.51, EC 0.23 dSm⁻¹, OC 0.44% and available N,P,K and S 265.36, 10.86, 378 and 7.0 kg ha⁻¹ corresponding to medium, medium, medium and low status in soil respectively. The treatments were T₁ – 30% RDF, T₂ 100% RDF + S + Zn, T₃ – 75% RDF + FYM @ 2.5 t ha⁻¹ + Rhizobium + PSB, T₄ – 50% RDF + FYM @ 2.5 t ha⁻¹ + Rhizobium + PSB, T₅ – 100% RDF + FYM @ 2.5 t ha⁻¹ + Rhizobium + PSB, T₆ – FYM @ 2.5 t ha⁻¹ + Rhizobium + PSB. Recommended dose of

fertilizers ie 20:60:30:48:5 kg N, P₂O₅, K₂O, S and Zn ha⁻¹ was applied. FYM contained 0.55% N, 0.29% P and 0.65% K. It was applied in calculated amount and mixed in the soil before sowing of soybean. N P and K were given in the form of urea, single superphosphate and muriate of potas, sulphur was given by SSP (12% S) and zinc through zinc sulphate (Heptahydrate). The experiment was laid down in randomized block design and treatments were replicated five times using soybean var. JS- 335 as a test crop. The crop was allowed to grow up to maturity. After harvesting of the crop grain yield data was recorded. Representative plant and soil samples were drawn from each plot for chemical analysis. The plant samples were processed after drying in oven at 60°C and were digested in dia-acid mixture of nitric and perchloric acid (5:2). The digested material was analyzed for NPK and S Content and uptake was calculated. Plant samples (straw & seed) were analyzed for nitrogen content by using the method described by A.O.A.C. (Anonyms, 1965) and N uptake was calculated from this data. Based on nitrogen content in seed protein content was calculated. Energy yield was calculated by the procedure described by mittal and dhawan (1988). Soil samples were also processed and analyzed for pH (1:2.5) and EC as described by piper (1960). Organic carbon was determined by Black (1965) method. Available N in soil was determined by the procedure described by subiah and and Asija (1956) and potassium was extracted using neutral ammonium acetate and determination was made flame photometrically as described by Jackson (1967). Available phosphorus was extracted using Olsen's extractant and determination was made by colorimetrically (Olsen's et al, 1953). Available sulphur was determined by using turbidimetric method described by chesin and yien (1951).

Data presented in table-1 showed that addition of sulphur and zinc along with RDF marginally increased grain and energy yields (20.60 qha⁻¹ & MJha⁻¹) of soybean as compared to application of 100% RDF along with FYM and bio-fertilizers i.e 19.97 q ha⁻¹ & 293 MJha⁻¹. The increase was significantly higher in comparison to traditional farmers practice (30% RDF) followed in the region. This indicated that by the adoption of balanced and integrated nutrient management system farmers can enhance soybean production by 1.5 times. The significantly higher grain yield (18.48 qha⁻¹) energy yield 272 MJ ha⁻¹ and protein yield 679.50 kg ha⁻¹ were recorded in T₃ (75% RDF + FYM @ 2.5 t ha⁻¹ + Bio fertilizers) as compared to the lowest grain (13.37 qha⁻¹), energy (196.53 MJha⁻¹), and protein (477.71 kg ha⁻¹) yields noted in T₆ – (FYM @ 2.5 t ha⁻¹ + biofertilizers). 100% RDF + FYM + Bio fertilizers (T₅) gave significantly higher values than T₃ (75% RDF + FYM + Bio fertilizers) but, they were comparable to 100% RDF + S + Zn (T₂). Similar results have been reported by Kumar et al. (1996), Tiwari et al (1997) and Deshmukh et al (2005).

Maximum N P K and S uptake i.e. 159.72, 10.31, 100.67 and 9.43 kg ha⁻¹ respectively were registered in the treatment where 100% RDF was applied in combination with S and Zn.

Minimum N P K & S uptakes i.e. 95.26, 4.98, 49.16 and 4.84 kg ha⁻¹ respectively were noted in T₆ where FYM @ 2.5 t ha⁻¹ along with Rhizobium and PSB was given. The treatment T₂ (100% RDF + S + Zn) was comparable with treatment T₅ (100% RDF + FYM + Rhizobium + PSB) where uptake of NPK and S was 156, 10.49, 97.76 and 8.18 kg ha⁻¹ respectively. This may be due to beneficial effect of FYM in conjunction with bio fertilizers in improving of soil properties. Similar beneficial role of FYM has also been suggested by Vyas et al (2003).

Beneficial effect of RDF in conjunction with sulphur and zinc on N,P,K,S uptake could be due to

Results and Discussion

Table 1: Effect of integrated nutrient management on seed yield, protein yield, oil yield and nutrient uptake of soybean.

Treatments	Yield (qha ⁻¹)	Protein Yield (qha ⁻¹)	Oil Yield (qha ⁻¹)	Energy yield (MJ ha ⁻¹)	Total Nutrient uptake(kgha ⁻¹)			
					N	P	K	S
T1	13.69	487.77	219.58	201.0	99.01	5.01	51.85	4.71
T2	20.60	771.26	394.69	302.79	159.72	10.31	100.67	9.43
T3	18.48	679.50	321.73	272.00	140.50	8.46	84.21	7.31
T4	16.64	606.39	280.88	244.75	122.91	7.15	71.46	6.62
T5	19.97	757.66	360.05	293.55	156.93	10.49	97.76	8.18
T6	13.37	477.71	213.25	196.53	95.26	4.98	49.16	4.84
CD (0.05)	0.46	-	-	-	4.48	0.38	3.01	0.32

Table 2 : Effect of integrated nutrient management on economics of soybean and physico-chemical properties of soil.

Treatments	Gross Return (Rs.)	Net return (Rs.)	B : C ratio	pH	EC	OC%	Soil available nutrients (kg ha ⁻¹)			
							N	P	K	S
T1	13690	3932	1:1.40	7.52	0.23	0.45	245	9.50	361	6.68
T2	20600	10140	1:1.96	7.52	0.24	0.48	298	12.50	392	7.95
T3	18480	7443	1:1.67	7.52	0.24	0.48	290	12.06	387	7.18
T4	16650	5815	1:1.53	7.51	0.24	0.47	277	11.47	377	7.02
T5	19970	8730	1:1.77	7.51	0.24	0.51	312	13.68	398	7.23
T6	13370	2940	1:1.28	7.51	0.24	0.45	244	9.66	359	6.84
CD (0.05)	-	-	-	NS	NS	NS	6.59	0.45	6.32	1.15

the effect of balanced fertilization in improving better nutrition to plants. Balance dose of fertilizers also improving physical, chemical and biological environment of soil conducive to better plant growth. Similar beneficial role of balance fertilization has also been suggested by Ramesh et al (2010).

Application of RDF along with S & Zn or combination with FYM + Biofertilizer resulted in the significantly higher soil available N,P,K and S as compared to traditional farmers practice (30% RDF). This indicated that if integrated nutrient management system is adopted then higher level of nutrient uptake by plant as well as its availability in soil can be maintained even after harvest of the crop (Table-2)

Furthermore, this might be due to organic manure and bio fertilizer which might have helped in maintaining the availability and supply of plant nutrients in soil to meet the plant requirement at the critical growth stages. Similar findings have also been reported by Dosani et. al. (1999)

Optimum gross return (Rs. 20,600 /ha), net return (Rs. 10,140 ha⁻¹) and Benefit cost ratio (1:1:96) were obtained in treatment T₂ where 100% RDF was applied with S and zinc. Lowest gross return (Rs. 13370 ha⁻¹), net return (Rs. 2940 ha⁻¹) and benefit cost ratio (1:1:28) were found in the treatment T₆.

Thus it appears that higher level of yields can be achieved by using balance dose of fertilizers with organic manures, sulphur and zinc. Integrated use of plant nutrients with organic manures, bio fertilizers also helped in maintaining the sustainable productivity of soil. Thus application of balance dose of fertilizers along with secondary and micronutrient or integrated plant nutrient supply system will tremendously improve financial gain by the farmers and will help in improving their standard of living.

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Socio-economic profile of the sugarcane growers

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Abstract

The present study was conducted in Bijnore & Meerut districts of Western Uttar Pradesh during the year 2007 – 08. To know the socio-economic profile of the sugarcane growers, that maximum 53.03 percent marginal farmers belonged to backward caste, majority 65.16 percent marginal farmers belong to 26 to 50 years of age group, 21.68 percent respondents were having education upto high school. Their main occupation was agriculture, 29.58 respondents were belonging to small size of land holdings. 61.25 percent respondents were living jointly family system. 52.50 percent respondents were participated sugarcane co-operative societies. Most of the big farmers were well equipped with all necessary equipments. Maximum respondent were having their own source of irrigation.

Key words: Sugarcane, growers, characteristics, respondents, irrigation

Introduction

Sugarcane is an important cash crop of India as well as of the World which is reflected with its cultivation in about 77 Countries World over, India is the largest producer of sugarcane after Brazil. The production of sugarcane 273.39 million tones during the year 2009-10 with an area of 4.4 million hectare and leading state of India is Uttar Pradesh.

Uttar Pradesh which has the largest area under sugarcane, had an increase of about 18% last one decade. These are the facts which indicate that given the price attraction, the growers in the south where yield levels are also high, would go a long way to take up this crop, compared to sub-tropical belt, in spite of higher prices, there has been not much increase in the area. Keeping in view our aim to study the socio-economic profile of the sugarcane growers.

Research Methodology

For this study two districts namely Bijnore & Meerut were selected purposively. From each district two blocks were selected randomly. The total four blocks were considered for the study and two villages were purposively selected from each block, than thirty respondents from each village were selected purposively. Thus the total sample size was of 240 respondents for the investigation. The data were analyzed, tabulated and find out the percentage.

Results and discussion

The data was presented in table 1, indicate that

maximum 53.03% marginal farmers belonged to backward caste, followed by 24.24 and 22.73% belonging to higher caste and schedule caste respectively. In case of small farmers maximum i.e. 56.34% belong to backward caste and 33.80% belongs to high caste and 9.86 percent belong to schedule caste.

In case of medium farmer maximum 56.45% belong to backward caste followed by 33.87% and 9.68% belonging to high caste and schedule caste respectively. In case of big farmer 43.90 and 17.08% belonging to backward caste high caste and schedule caste respectively. Thus, it is clear from the above table that most of the respondents belonged to backward caste. It means backward people were using sugarcane as a cash crop, which will be helpful for upliftment of the socio-economic of sugarcane growers.

The data presented in table 2, reveals that majority 65.15% marginal farmers belonging to 26 to 50 years of age group remaining 22.73 and 12.12% marginal farmers belonging to above 50 years age and upto 25 years age group. In case small farmers maximum 60.56 percent respondents belonging to 26 to 50 years of age group remaining 29.57, 9.86 per cent respondents belonging to above 50 years group and up to 25 years age group, respectively 53.23 per cent medium respondents belonged to 26 to 50 years age group and 35.48 and 11.29% medium farms belonged to above 50 years and up to 25 years age group respectively. In case of big farmers maximum 51.22% belonged to 26 to 50 years age group remaining 41.46 and 7.32% big farmers belonged to above 50 years and up to 25 years

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Table 1: Caste background of the respondents

S.No.	Caste categories	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	Large farmers (n=41)	Total
1.	Backward caste	35(53.03%)	40(56.34%)	35(56.45%)	18(43.90%)	128(53.34%)
2.	Schedule caste	15(22.73%)	7(9.86%)	6(9.68%)	7(17.08%)	35(14.58%)
3.	High caste	16(24.24%)	24(33.80%)	21(33.87%)	16(39.08%)	77(32.08%)

Table 2: Age categories of the respondents

S.No.	Age categories	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	Large farmers (n=41)	Total
1.	Upto25 years	8(12.12%)	7(9.86%)	7(11.29%)	3(7.32%)	25(10.4%)
2.	26 to 50 years	43(65.15%)	43(60.56%)	33(53.23%)	21(51.22%)	140(58.3%)
3.	Above 50 years	15(22.73%)	21(29.57%)	22(35.48%)	17(41.46%)	75(31.3%)

Table 3: Level of education of the respondents

S.No.	Level of education	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	Large farmers (n=41)	Total
1.	Illiterate	10(15.16%)	3(4.23%)	5(8.07%)	2(4.88%)	20(8.33%)
2.	Can read only	5(7.58%)	9(12.68%)	3(4.84%)	1(2.44%)	18(7.50%)
3.	Up to primary	8(12.12%)	21(29.58%)	11(17.74%)	8(19.51%)	48(20.0%)
4.	Up to junior high school	20(30.30%)	15(21.13%)	10(16.13%)	7(17.07%)	52(21.68%)
5.	Up to high school	13(19.70%)	6(8.45%)	11(17.74%)	5(12.20%)	35(14.58%)
6.	Intermediate	10(15.16%)	17(23.94%)	22(35.48%)	18(43.90%)	67(27.92%)

age group respectively.

Thus, is clear from the above table that most of the respondents belong to 26 to 50 years of age group that is 65.15% marginal, 60.56% small, 53.23% medium and 51.22% big farmers. It can be said that young farmers are very keen to grow sugarcane.

The data presented in table 3, reveals that majority 30.30% marginal farmers were having education up to junior high school, followed by 19.70%, 15.16%, 12.12% and 7.58% marginal farmer were having up to high school, intermediate and can read only. Only 15.16% marginal farmers were found illiterate. In case of small farmers 29.58% were up to primary level of education followed by 23.94%, 21.13%, 8.45% and 12.68% small farmers having education intermediate, can read only, up to junior high and 4.23% small farmers were found illiterate respectively. In case of medium farmers 35.48% were educated intermediate and above level of education, followed by 17.74%, 17.74%, 16.13% and 4.84% medium farmers having up to high school, up to primary, up to junior high school, can read only and 8.07% medium farmers were found illiterate. In case of big farmers 43.90% were having intermediate and above of education, followed by 19.51, 17.07, 12.02 and 2.44% big farmers having up to primary, up to junior high school, up to high school, can read only

and 4.88% big farmers were illiterate.

Thus, it is clear from the above table that maximum respondent were having higher level of education being to intermediate & above. They were aware about new technologies and can adopt advance technologies. Their education status also responsible for the above fact.

The data presented in table 4, reveals that majority of the big farmers 78.05%, medium 75.81%, small 56.34% and marginal farmers 50% were adopting main occupation agriculture 22.73% marginal, 18.31% small, 12.90% medium and 12.20% big farmers were adopting agriculture+service.

Small 19.72%, marginal 18.19%, medium 8.07 and 7.32% big farmers were adoption agriculture + business and 9.09% marginal, 5.64% small, 4.44% big and 3.23% medium farmers were doing agriculture + business + service.

Thus, it is clear from above table that the majority of farmers were involved in agriculture (63.33%) only 17.08% were adopting agriculture + service, 14.17% agriculture + business and 5.42% farmers were adopting agriculture + business + service.

The data obvious in table 5, revealed that 29.58% respondents were having 1 to 2 hectare of land, followed by 25.84% respondents were having 2 to

Table 4:Occupation of the respondents

S.No.	Occupation	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	large farmers (n=41)	Total
1.	Agriculture	33(50%)	40(56.34%)	47(75.81)	32(78.05%)	152(63.33)
2.	Agricultur+service	15(22.73%)	13(18.31%)	8(12.90%)	5(12.20%)	41(17.08%)
3.	Agricultur+business	12(18.19%)	14(19.72%)	5(8.07%)	3(7.32%)	34(14.17%)
4.	Agricultur+business+service	6(9.09%)	4(5.64%)	2(3.23%)	1(4.44%)	13(5.42%)

4 hectare of land, 27.50% respondents were having up to 1 hectare of land and the remaining 17.08% respondents were having up to 1 hectare of land. It is clear that the majority of the respondent belonged to small farmers category followed by marginal, medium, big farmers respectively.

Table 5: Distribution of respondent as per size of land holding.

Particular	Number	% Age
Marginal farmers(Up to 1 ha)	66	27.50
Small farmers(1to 2 ha)	71	29.58
Medium farmers(2 to 4 ha)	62	25.84
Big farmers(Above 4 ha)	41	17.08

It is evident from the table 6, indicated that maximum 53.03% marginal farmers were belonging to nuclear family system and 46.97% were belonging to joint family system. Similarly 73.17% big family, 70.97% medium and 59.16% small farmers belonging to joint family and 40.84% small, 29.03% medium and 26.83% big farmers belong to single family system. Thus it is clear from the above table that most of the respondents were belonging to joint family system.

It is revealed from table 7, that 56.06% marginal farmers were having membership of co-operative society and 18.18%, 13.64% and 12.12% marginal farmers were having membership of offices (KVK/KGK, sugar society and other agricultural department,

Table 6:Distribution of respondents on the basis of family system

S.No.	Family	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	large farmers (n=41)	Total
1.	Nuclear family	35(53.03%)	29(40.84%)	18(29.03%)	11(26.83%)	93(38.75%)
2.	Joint family	31(46.97%)	42(59.16%)	44(70.97%)	30(73.17%)	147(61.25%)

Table 7:Social participation of the respondents

S.No.	Particulars	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	Large farmers (n=41)	Total
1.	Panchayat	9(13.64%)	14(19.72%)	6(9.68%)	8(19.51%)	37(15.42%)
2.	Co-operative cane Society	37(56.06%)	36(50.70%)	29(46.77%)	24(58.54%)	26(52.50%)
3.	Cane Development agency	8(12.12%)	6(8.45%)	10(16.13%)	3(16.13%)	27(11.25%)
4.	Offices (KVK/KGK and others)	12(18.18%)	15(21.13%)	17(27.42%)	6(14.63)	50(30.82%)

panchayat and cane development agencies. In case of small farmers maximum 50.70% were having membership of co-operative cane society followed by 21.13%, 19.72% and 8.45% were having membership of offices, panchayat and cane development agency. In case of medium farmers maximum 46.77% were having membership of co-operative society followed by 27.42%, 16.13% and 9.68% were having membership of offices of K.V.K./ K.G.K./ other departments, cane development agencies and panchayat. In case of big farmers maximum 58.54% were having membership of co-operative society, followed by 19.51%, 16.13% and 14.63% were having membership of panchayat, cane development agencies, KVK/KGK and other offices.

Thus, it is clear from the above table that the most of the respondent were having either membership of co-operative cane society or offices of K.V.K./ K.G.K./ other departments, panchayat and cane development agencies.

The data presented in table 8 reveals that the highest majority of 48.49 marginal farmers possessed bullock/buffalos cart, followed by 37.88%, 27.27, 10.61 and 4.55% farmers who possessed Chaff cutter, pumping set, tractor and cultivator respectively. In case of small farmers highest majority 92.96% possessed chaff cutter, followed by 76.10%, 71.83%, 33.80%, 23.94%, 12.68%, 7.04% and 5.63% small farmers possessed pumping set, bullock/buffalo cart. Tractor,

Table 8: Farm assets of the respondents

S.No.	Family	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	large farmers (n=41)	Total
1.	Bullock/buffalo	32(48.49%)	51(71.83%)	58(93.55%)	35(85.37%)	176(73.33%)
2.	Cart	-	-	-	-	-
3.	Chaff cutter	25(37.88%)	66(92.96%)	60(96.75%)	39(95.12%)	190(79.17%)
4.	Pumping Set	18(27.27%)	54(76.10%)	51(82.26%)	40(97.56%)	163(67.92%)
5.	Tube Well	-	2(2.82%)	28(45.16%)	22(53.66%)	52(21.67%)
6.	Cultivator	3(4.55%)	17(23.94%)	55(88.71%)	32(78.05%)	115(47.92%)
7.	Seed drill	-	5(7.04%)	23(37.10%)	31(75.61%)	60(25.00%)
8.	Tractor	7(10.61%)	24(33.80%)	51(82.26%)	41(100%)	123(51.25%)
9.	Thresher	-	4(5.63%)	49(79.03%)	12(29.27%)	84(35.00%)
10.	Crasher	-	9(12.68%)	6(9.68%)	30(73.17%)	18(7.50%)
11.	Sprayer	-	-	25(40.32%)	50(12.17%)	94(26.67%)
12.	Sugarcane planter	-	-	4(6.45%)	-	59(3.75%)

Table 9: Distribution of the respondents on the basis of irrigation sources

S.No.	Family	Marginal farmers (n=66)	Small farmers (n=71)	Medium farmers (n=62)	large farmers (n=41)	Total
1.	Private tubewell/pumping set	34(51.52%)	40(56.34%)	42(67.74%)	34(82.93%)	150(62.50%)
2.	Canal	12(18.18%)	14(19.72%)	9(14.52%)	2(4.88%)	37(15.42%)
3.	Govt. tube well	20(13.30%)	17(23.94%)	9(14.52%)	5(12.20%)	53(22.08%)

cultivator sprayers, seed drills, thresher.

In case of medium farmers the majority of 96.75% were having chaff cutter, followed by 93.55%, 88.17%, 82.26%, 79.03%, 45.13%, 40.32%, 37.10%, 6.45% and 9.68%, possessed bullock/buffalo cart, cultivator pumping set, tractor thresher, tube well, sprayer seed grill, sugarcane planter and crusher, respectively, in case of big farmers cent percent big farmers possessed tractor, followed by 95.12%, 97.56%, 85.37%, 78.05%, 75.61%, 73.17%, 53.66%, 51.75%, 29.27%, 12.19%, big farmers possessed pumping set, chaff cutter, bullock/ buffalo cart, cultivator, seed drill, crusher, thresher, sprayer, and tube well. Thus, it is clear from the above discussion on, that most of the big farmers are well equipped with all the necessary equipments, farm animals and farm implements as compared to small and marginal farmers.

The data presented in table-9, reveals that maximum 51.52% marginal farmers were using pumping set / private tube well as a source of irrigation, followed by 18.18% were using canal and 13.30% government tube well respectively. In case of small farmers maximum 56.34% were using private tube well/ pumping set, followed by 23.94% Government tube well and 19.72% canals as a source of irrigation. In case of medium farmers 67.74% were using private tube well/pumping set, followed by 14.52% canal and the remaining 14.52% were using government tube well as a source of irrigation. In case of big farms 82.93% were using private tube well/

pumping set, followed by 12.20% government tube well and the remaining 4.88% canal were using as a source of irrigation.

Thus, it is clear from the above table that most of the respondents were using own pump set / private tube well for timely irrigation as compared to other sources of irrigation.

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Effect of preservatives on physico-chemical changes and shelf life of chhana

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Abstract

Chhana samples prepared from milk of Sahiwal cows were treated with five different preservatives at two levels. viz. calcium propionate (0.32 and 0.16%) potassium sorbate (0.20 and 0.10%), sodium benzoate (0.10 and 0.05%), oxytetracycline (7.0 and 3.5 ppm), potassium metabisulphite (250 and 125 ppm) and stored at 25°C. Changes in sensory, physico-chemical and microbiological quality of product were assessed at one day interval. Protein, fat and total solids content of chhana underwent slight changes during storage. Changes in the microbial quality as revealed by SPC, coliform, lipolytic and proteolytic counts and yeast and mold counts during various storage periods were very limited in preservative treated samples as compared to control samples. Higher concentrations of preservatives were found more effective than lower concentration. Further, potassium sorbate and sodium benzoate exerted greater control on microbial inhibition including yeast and mold, which were major spoilage organisms. Based on sensory scores, the control samples were unacceptable on fourth day, while treated samples were highly acceptable on fourth day and remained acceptable upto 6 to 7 days with higher concentration and 5-6 days at lower concentration of preservatives.

Key words: Physico-chemical, coliform, lipolytic, proteolytic, microbial

Introduction

Chhana is a high moisture product with soft body and smooth texture. It contains almost entire milk casein, part of denatured whey proteins, almost all fat, colloidal salts and soluble milk solids in proportion to the moisture content retained. However, chhana is an extremely perishable dairy product, as its shelf life is limited and is influenced to a great extent by storage temperature and packaging material. The average shelf life of chhana from both cow and buffalo milk at 22°C and 37°C is about 3 days and 1-2 days, respectively (De *et al.*, 1971; De 1980). As the demand for chhana is growing rapidly, specially in big towns and cities for conversion into sweets (Aneja *et al.*, 1982), there is an urgent need to extend the shelf life of chhana for ease of long-distance transportation and convenience disposal. The present study was undertaken to assess the role of select preservatives on the sensory, chemical and microbiological quality of chhana with a view to enhance its shelf life at ambient temperature.

Materials and Methods

Preparation of Chhana

Chhana was made in the laboratory from fresh, whole milk of Sahiwal cows, maintained at the University dairy according to the method suggested by Kundu and De (1972) with minor modification. Lactic acid (2%) was used as coagulant. The coagulum gathered in muslin cloth was slightly pressed during

hanging to hasten the drainage of whey.

Treatment with Preservatives

The chhana was divided into several lots and treated with the following preservatives in concentration noted against each.

Preservatives	Concentrations	
	C1	C2
1. Calcium Propionate (P1)	0.32	0.16
2. Potassium Sorbate (P2)	0.20	0.10
3. Sodium Benzoate (P3)	0.10	0.05
4. Oxytetracycline (P4)	7 ppm	3.5 ppm
5. Potassium Metabisulphite (P5)	250 ppm	125 ppm

The chhana samples were dipped in distilled water containing the requisite preservatives. Control samples were dipped in distilled water and all the samples were stored at 25°C. Changes in sensory, physico-chemical and microbiological quality of the product were monitored at one day interval.

Observations recorded

Changes in sensory (a 9-point hedonic scale), chemical (total solids, fat and protein contents by BIS, 1961; BIS, 1964), and microbiological (standard plate count, coliform, lipolytic, proteolytic and yeast and mold counts by BIS, 1962) qualities were ascertained. The yield of product was also recorded.

Results and Discussion

The milk of Sahiwal cows used for chhana making in the present study contained 4.40±0.20(4.10-4.70)% fat, 3.38±0.31(3.21-3.69)% protein and 14.18±0.45(13.83-14.42)% total solids. The recovery

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of chhana ranged from 14.80 to 15.50 with an average of 15.18 ± 0.36 per cent.

All the samples of fresh chhana had a normal yellow colour, pleasant sweetish taste, soft and uniform compact body. The samples were highly relished and scored 8.5 on a 9-point hedonic scale.

Changes in Chemical Quality of Chhana During Storage

The chhana samples were treated with five different preservatives (P1 to P5) at two different concentrations (C1 and C2). These were assessed for changes in chemical quality, viz. changes in percentages of protein, fat and total solids on one day interval upto 3 days. The details of data are presented in Table 1 and Table 2.

Results revealed that the protein, fat and total solids contents of chhana underwent slight changes during storage on first, second and third day. Changes observed both at full (C1) and half (C2) concentrations of all the preservatives (P1 to P5) were almost comparable. Furthermore, appreciable differences were not observed between full and half concentrations of the preservatives used.

Changes in Microbiological Quality

Results on changes in total viable count (SPC), coliform, lipolytic, proteolytic and yeast and mold count in various chhana samples, as influenced by treatment with various preservatives (P1 to P5), at two concentrations (C1 and C2) are presented in Tables 3

and 4.

It is revealed from Tables 3 that the fresh samples had slightly higher SPC count (8.31 cfu/g) than the treated samples (lowest 7.80 cfu/g in oxytetracycline treated). Coliform and yeast and molds were not detectable while the lipolytic and proteolytic organisms were observed in higher numbers (4.71 and 5.46) than in treated samples (lowest 4.18 and 5.19 in oxytetracycline treated). Such counts (SPC, lipolytic and proteolytic) were slightly higher in samples treated with half of the concentrations (C2) of the preservatives (Table 4). The SPC, lipolytic and proteolytic counts increased with increase in storage periods. On fourth day (D3), some coliform (5.40 cfu/g) and yeast and mold (6.62 cfu/g) organisms were also visible in control samples, while the treated samples did not elicit the presence of coliform organisms but some yeast and molds (2.94-3.05) were noted but in much lesser number than in control samples. It was observed that the full concentration of preservative (A2C1) was more effective than the half concentration (A2C2). Yeast and molds were visible in control samples on second day, which continued to increase with increase in storage period, whereas in treated samples coliform organisms were not observed but yeast and molds became apparent but in much lesser numbers as compared to the control on fourth day (D3). Potassium sorbate (P2) and sodium benzoate (P3) were found more effective in inhibiting yeast and molds, which

Table 1: Changes in protein, fat and total solids content (%) at 25°C

Treatments	Days of storage											
	D0			D1			D2			D3		
	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS
A2C0	17.43	24.66	47.83	17.17	24.16	47.54	16.59	23.49	47.23	15.60	22.66	47.08
A2C1P1	17.64	24.99	47.83	17.18	24.33	47.44	16.68	23.33	47.13	16.08	22.65	46.83
A2C1P2	17.23	22.99	47.83	17.01	22.65	47.50	16.72	22.31	47.16	16.45	22.33	46.90
A2C1P3	17.63	24.66	47.85	17.24	24.00	47.46	16.82	23.66	47.16	16.30	23.00	46.84
A2CP4	17.47	24.99	47.87	17.20	24.33	47.51	16.69	23.66	47.16	16.23	22.66	46.88
A2C1P5	17.68	24.66	47.83	17.09	24.33	47.43	16.55	23.66	47.12	16.11	22.33	46.77

CO – Control, A2 – Dipped in distilled water with preservative, C1 – Concentration (Full), P1 to P5 – Preservatives, DO to D3 – Days after manufacture

Table 2: Changes in protein, fat and total solids content (%) at 25°C

Treatments	Days of storage											
	D0			D1			D2			D3		
	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS
A2C0	17.43	24.66	47.83	17.17	24.16	47.54	16.59	23.49	47.23	15.60	22.66	47.08
A2C2P1	17.69	24.66	47.85	17.16	24.33	47.44	16.64	23.00	47.16	16.09	22.66	46.85
A2C2P2	17.22	22.99	47.90	17.08	22.66	47.52	16.86	22.33	47.19	16.41	22.33	46.90
A2C2P3	17.59	24.66	47.87	17.16	24.00	47.47	16.69	23.33	47.17	16.13	22.66	46.87
A2C2P4	17.41	24.99	47.93	17.18	24.33	47.52	16.66	23.66	47.20	16.25	22.99	46.88
A2C2P5	17.59	24.99	47.86	17.03	23.99	47.46	16.52	23.33	47.14	16.07	22.66	46.79

CO – Control, A2 – Dipped in distilled water with preservative, C1 – Concentration (Full), P1 to P5 – Preservatives, DO to D3 – Days after manufacture

Table 3: Changes in bacteriological quality of chhana at 25°C (cfu/g)

Treat-ments	Days of storage																			
	Do					D1					D2					D3				
	SPC	Coli-form	Lipo-lytic	Proteol ytic	Yeast & mold	SPC	Coliform form	Lipo lytic	Proteol ytic	Yeast & mold	SPC	Coli-form	Lipo lytic	Proteol ytic	Yeast & mold	SPC	Coli form	Lipo lytic	Proteol ytic	Yeast & mold
A2C0	8.31	0.00	4.71	5.46	0.00	8.81	0.00	5.36	5.72	3.32	9.21	0.00	5.73	6.11	4.55	9.54	5.40	6.03	6.51	6.62
A2C1P1	8.19	0.00	4.59	5.48	0.00	8.11	0.00	4.37	5.31	0.00	8.31	0.00	4.81	5.50	0.00	8.56	0.00	5.05	5.66	3.07
A2C2P2	8.13	0.00	4.49	5.36	0.00	8.03	0.00	4.19	5.24	0.00	8.26	0.00	4.69	5.46	0.00	8.53	0.00	4.94	5.56	2.98
A2C3P3	8.10	0.00	4.37	5.29	0.00	8.01	0.00	4.19	5.22	0.00	8.20	0.00	4.66	5.39	0.00	8.45	0.00	4.78	5.48	2.94
A2C4P4	7.80	0.00	4.18	5.19	0.00	7.64	0.00	3.74	5.00	0.00	7.88	0.00	4.37	5.26	0.00	8.06	0.00	4.78	5.48	3.05
A2C5P5	8.12	0.00	4.37	5.43	0.00	8.01	0.00	4.14	5.32	0.00	8.29	0.00	4.57	5.52	0.00	8.50	0.00	4.86	5.59	3.02

CO – Control, A2 – Dipped in distilled water with preservative, C1 – Concentration (Full), P1 to P5 – Preservatives, DO to D3 – Days after manufacture

Table 4: Changes in bacteriological quality of chhana at 25°C (cfu/g)

Treat-ments	Days of storage																			
	Do					D1					D2					D3				
	SPC	Coli-form	Lipo-lytic	Proteol ytic	Yeast & mold	SPC	Coliform form	Lipo lytic	Proteol ytic	Yeast & mold	SPC	Coli-form	Lipo lytic	Proteol ytic	Yeast & mold	SPC	Coli form	Lipo lytic	Proteol ytic	Yeast & mold
A2C0	8.31	0.00	4.71	5.46	0.00	8.81	0.00	5.36	5.72	3.15	9.21	0.00	5.73	6.11	4.45	9.54	5.40	6.03	6.51	6.62
A2C2P1	8.26	0.00	4.60	5.52	0.00	8.19	0.00	4.45	5.43	0.00	8.46	0.00	4.86	5.70	0.00	8.70	0.00	5.22	5.82	3.21
A2C2P2	8.24	0.00	4.66	5.40	0.00	8.17	0.00	4.37	5.28	0.00	8.42	0.00	4.83	5.49	0.00	8.65	0.00	5.13	5.62	3.00
A2C2P3	8.13	0.00	4.49	5.39	0.00	8.05	0.00	4.37	5.31	0.00	8.29	0.00	4.78	5.66	0.00	8.54	0.00	5.00	5.76	3.17
A2C2P4	7.93	0.00	4.28	5.29	0.00	7.83	0.00	4.01	5.19	0.00	8.05	0.00	4.60	5.43	0.00	8.26	0.00	4.86	5.59	3.18
A2C2P5	8.15	0.00	4.60	5.52	0.00	8.07	0.00	4.49	5.43	0.00	8.32	0.00	4.78	5.70	0.00	8.56	0.00	5.13	5.79	3.10

CO – Control, A2 – Dipped in distilled water with preservative, C2 – Concentration (Half), P1 to P5 – Preservatives, DO to D3 – Days after manufacture

are major spoilage organisms in the product.

Shelf Life of Chhana

The keeping quality of chhana was adjudged on the basis of sensory score (100-point), general acceptability (9-point hedonic scale), chemical and microbiological quality. It was observed that the control samples started deteriorating after two days of storage at 25°C. These samples were completely unacceptable on fourth day. The treated samples were found to be acceptable (total score, over 70; hedonic scale, 7.52) even on fourth day. The microbial counts were much lower than those prescribed by BIS (1983). Although the changes in chemical and microbiological quality (except yeast and molds) were not studied further beyond fourth day, but based on sensory attributes and yeast and mold counts, it was noted that the samples treated with preservatives were acceptable upto 6 to 7 days with full concentration (C1) and upto 5-6 days with half concentration (C2) of the preservatives used.

The chemical quality of chhana prepared from Sahiwal cows as reported in this study is in accordance with the reported data (Aneja *et al.*, 2002). However, published literature on changes in chemical constituents as influenced by treatments with preservatives during storage at ambient temperatures are meager to support the results of present investigation. However, Yadav *et al.* (1985) have reported the effect of sodium benzoate and potassium metabisulphite on protein, fat and total solids contents of chhana during storage and found a decrease in protein and total solids contents of chhana but no change in the fat content. Such results support the present data. Published data are lacking on effect of calcium propionate, potassium sorbate and oxytetracycline on changes in chemical constituents of chhana during storage, to corroborate out results.

Results on microbiological quality of chhana are also in agreement with Aneja *et al.* (2002). Published literature on microbiological quality of fresh and market panner, which is a similar product, is abundant (Singh and Singh, 2000; Kumari and Kalimuddin, 2002; Divya Srivastava, 2004), which support the present microbiological quality of fresh chhana. However, data on changes in bacteriological quality of chhana as affected by various preservatives during storage are scanty to support present data. Aneja *et al.* (2002) have reported that during storage, the product (chhana) develops a sour smell and bitter taste at 25-37°C, while its surface is sparsely covered with moulds such as *Aspergillus*, *Mucor*, *Rhizopus*, *Fusarium* etc. which are major spoilage organisms. Yadav *et al.* (1985) have used sodium benzoate and potassium metabisulphite in various concentrations (0.1 to 0.2%), to prolong the keeping quality of chhana at room temperature. The shelf-life enhancement of chhana using sodium benzoate, sodium propionate and sugar has also been

demonstrated (EIRI, 2006), Sarkar *et al.* (2002) investigated the effect of sodium and potassium metabisulphite on shelf-life of cow milk burfi and observed that irrespective of storage temperature, the added preservatives lowered down the rate of increase of acidity, suppressed microbial growth and retarded deterioration of organoleptic quality, thereby increasing the shelf-life of the product. These reports substantiate the results of present investigation, which indicate that the shelf-life of chhana could be extended at ambient temperature by use of the preservatives employed in the present study.

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A study on constraints in the dairy development

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Abstract

The study was conducted in Bichpuri and Bah block of Agra district during the year 2005-06. The study covered 150 cases (75 small farmers and 75 marginal farmers). The major problems reported by the farmers were related to breeding i.e. not availability of A.I. centres with in their approach and lack & good quality of service bull. And another problem was related to feeding i.e. not availability of green fodder throughout the year and higher price of feed to be fed to animals. The other problem was related to management i.e. lack of funds and marketing facility for marketing of milk to get proper price. Thus there is a need to remove these problems to increase dairy business through weaker section families to raise their income. Further, there is need to educate the farmers regarding better practices of dairying along.

Key words: breeding, dairy business, weaker section

Introduction

Animal husbandry in India is an integral part of agriculture sector and plays an important role in the rural economy. It is closely interlinked with the socio-economic matrix of rural community. The development of livestock sector has been receiving a significant priority in India in the last two decades. The livestock sector provides a nutritive food material, draught power in agriculture and for transportation of agricultural commodities in areas where the mechanical transports are not available. The livestock dung is used to enrich soil fertility and thus helps in increasing crop production. The sale of livestock and livestock products make a considerable cash income to rural people through out the year. In fact, next to agriculture, dairying has been proved to be a major source of income and employment to the rural masses.

Scientific research in the field of animal husbandry is moving very fast. There is no dearth of technical know-how in these days of advanced technology, but the most complex and significant problem is dissemination of new technology and its utilization by the animal keepers. In the adoption of recommended practices, the cattle keepers have to face several problems of breeding, feeding, housing, milking, calf rearing and health care management along with policy and organizational constraints, financial, technical and social problems. As a result of these problems, an adoption gap gets created.

Nutrition is one of the important aspect of livestock production. Improved animal nutrition has positive

correlation with productive performance of animal. Fortunately, now there is abundance of technology available in animal feeding which are communicated from time to time to dairy farmers through various extension agencies. However, the adoption of these technologies at farmers level is negligible i.e. why the dairy is not developing well. Thus in present study the attempt has been made to study the constraints in dairy development in the area under study.

Methodology:

The present study covered two blocks (Bah and Bichpuri) of agra district and eight villages (4 villages in each block). The total number of cases under study was 150 (75 small farmers and 75 marginal farmers). The small farmers and marginal farmers were classified in to thee herd size groups viz I herd size - (having one milch animal), II herd size - (having two milch animal) and III herd size - (having three and more milch animal). The number of cases falling in I, II and III herd size groups was 35, 25, and 15 respectively in small farm size group while in case of marginal farmers, the number of cases in I, II and III herd size groups came to 45, 20 and 10 respectively. The data were related to year 2005-2006.

Result and discussion:

The major constraints reported by the animal keepers were related to breeding, feeding and management as discribed below:

(A) Problem of breeding

The problem of breeding includes-(I) The location of A.I. centre, (II) Non-availability of A.I. centre facilities, (III) Non-availability of better breed bull (IV) Non-availability of good breed of milch animals.

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Table 1: Number of cases reported the problem of distantly located of A.I. centre in different farm size groups

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	13	37.14	45	22	48.88
II	25	14	56.00	20	12	60.00
III	15	10	66.66	10	6	60.00
Overall	75	37	49.33	75	40	53.33

Table 2: Number of cases reported the problem of non-existence of A.I. centre in different farm size groups

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	8	22.85	45	22	48.88
II	25	6	24.00	20	8	40.00
III	15	5	33.33	10	4	40.00
Overall	75	19	25.33	75	34	45.33

Table 3: Number of cases in different farm size groups reported the problem of non-availability of better breed bull in the villages.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	18	51.42	45	40	88.88
II	25	18	72.00	20	16	80.00
III	15	12	80.00	10	8	80.00
Overall	75	48	64.00	75	64	85.33

Table 4: Number of cases reported the problem of non-availability of good breed of animals in case of small and marginal farmers.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	14	40.00	45	21	46.66
II	25	12	48.00	20	12	60.00
III	15	10	66.66	10	6	60.00
Overall	75	36	48.00	75	39	52.00

(I) Problem reported by the milk producers regarding location of A.I. centre:

The following table shows the number of cases reported the problem of distantly located of A.I. centre

The table 1 indicates that about 49.33 per cent in case of small farmers and 53.33 per cent cases in case of marginal farmers reported the problem of distantly located of A.I. centres which are not approachable to the farmers.

(II) Non-availability of A.I. centre facilities:

The small farmers and marginal farmers also reported the problem of non-existence of A.I. centre in the area. Therefore, they can't avail such facilities. The following table shows the number of cases reported such problem.

The table 2 indicates that about 25.33 per cent cases in case of small farmers and 45.33 per cent in case of marginal farmers reported the problem of non-

existence of A.I. centre in the area. Therefore, there is a need for opening of A.I. centres in the area. Where no such facility is found even at distance place.

(III) Non-availability of better breed bull:

The small farmers and marginal farmers also reported the problem of non-availability of better bull. Therefore, they can't avail better breed facility. The following table shows the number of cases reported such problem.

The table 3 indicates that about 64 per cent cases in case of small farmers and 85 per cent in case of marginal farmers reported the problem of non-availability of better breed bull. In the villages in such situation, the local breed bull services are utilized in the villages in general by majority of farmers.

(IV) Non-availability of good breed of milch animals:

The small farmers and marginal farmers also reported the problem of non-availability of good breed

Table 5: Number of cases reported the problem of insufficient quantity of cake and bran fed to animals in different farm size groups.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	18	51.42	45	33	73.33
II	25	13	52.00	20	14	70.00
III	15	7	46.66	10	8	80.00
Overall	75	38	50.66	75	55	73.33

Table 6: Number of cases in different farm size groups reported the problem of inadequate availability of green fodder in the area.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	14	40.00	45	23	51.11
II	25	13	52.00	20	12	60.00
III	15	10	66.66	10	8	80.00
Overall	75	37	49.33	75	43	57.33

Table 7: Number of cases reported the problem of higher price of cattle feed in case of small and marginal farmers.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	28	80.00	45	35	77.77
II	25	18	72.00	20	18	90.00
III	15	10	66.66	10	7	70.00
Overall	75	56	74.66	75	60	80.00

Table 8: Number of cases in different farm size groups reported the problem of lake of knowledge of feeding standard / balanced ration to be fed to milk animal to take proper milk production.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	20	57.14	45	38	84.44
II	25	17	68.00	20	18	90.00
III	15	10	66.66	10	7	70.00
Overall	75	47	62.66	75	63	84.00

of milch animals. The following table shows the number of cases reported such problem.

The table 4 indicates that about 48 per cent cases in case of small farmers and 52 per cent in case of marginal farmers reported the problem of non-availability good breeds of milch animals. Thus there is a need for increasing the animal breeding facility in the area through A.I. centres.

(B) Problem of feeding:

The problem of feeding includes- (I) Insufficient quantity of cake and bran fed to animal, (II) Inadequate availability of green fodder, (III) Higher price of cattle feed, (IV) Lack of knowledge of feeding standard and balanced ration among the milk producers.

The following table shows the no. of cases reported the problem of insufficient quantity of cake and bran fed to animals in different farm size groups.

The table 5 indicates that about 50.66 per cent cases in case of small farmers and 73.33 per cent in case of marginal farmers reported the problem of insufficient quantity of cake and bran fed to milch animals. It was due to higher cost of cake and bran found in the locality and lack of funds with the farmers.

(II) Inadequate availability of green fodder in the locality:

The small farmers and marginal farmers also reported the problem of inadequate availability of green fodder. The following table shows the no. of cases

Table 9: Numbers of cases reported the problem of non-availability of proper cattle shed facility to animals for animals in different farm size groups.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	7	20.00	45	9	20.00
II	25	5	20.00	20	8	40.00
III	15	8	53.33	10	6	60.00
Overall	75	20	26.66	75	23	30.66

Table 10: Number of cases in different farm size groups reported the problem of lack of availability of funds to manage dairy business.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	20	57.14	45	36	80.00
II	25	17	68.00	20	13	65.00
III	15	9	60.00	10	6	60.00
Overall	75	46	61.33	75	55	73.33

Table 11: Number of cases reported the problem of lack of proper veterinary services in the area.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	6	17.14	45	23	51.11
II	25	8	32.00	20	12	60.00
III	15	6	40.00	10	6	60.00
Overall	75	20	26.66	75	41	54.66

reported such problem.

The table 6 indicates that about 49.33 per cent cases in case of small farmers and 57.33 per cent in case of marginal farmers reported the problem of inadequate quantity of green fodder availability in the locality. This problem was reported more in case of III herd size of small farmers as well as marginal farmers. (III) *Higher price of cattle feed:*

The small farmers and marginal farmers also reported the problem higher price of cattle feed. The following table shows the no. of cases reported such problem.

The table 7 indicates that about 74.66 per cent cases in case of small farmers and 80.00 per cent in case of marginal farmers reported the problem of highest cost of cattle feed. This problem was reported by all categories of milk producers in general, the marginal farmers reported more such problem as compared to small farmers.

(IV) *Lack of knowledge of feeding standard and balanced ration among the milk producers to get proper milk production from animals:*

The small farmers and marginal farmers also reported the problem regarding lack of knowledge of feeding standard i.e. how much concentrate and fodder be fed to the milch animals to take proper production

of milk. The following table shows the number of cases reported such problem.

The table 8 indicates that about 62.66 per cent cases in case of small farmers and 84.00 per cent in case of marginal farmers reported the problem of lack of knowledge of feeding standard. The majority of cases in case of small farmers and marginal farmers reported such problem. Thus there is a need to educate the farmers regarding balanced ration to be fed to animals for better milk production.

(C) *PROBLEM OF MANAGEMENT:*

The problem of management includes-(I) Non-availability of proper cattle shed, (II) Lack of funds, (III) Lack of veterinary services, (IV) Lack of insurance facility. (V) Lack of proper marketing facility. (I) *Non-availability of proper cattle shed:*

The following table shows the numbers of reported the problem of non-availability of proper cattle shed facility for animals.

The table 9 indicates that about 26.66 per cent cases in case of small farmers and 30.66 per cent in case of marginal farmers reported the problem of non-availability of cattle shed. This problem was reported more by the families of III herd size groups in case of small farmers as well as marginal farmers.

(II) *Lack of funds:*

Table 12: Number of cases in different farm size groups reported the problem of lack of cattle insurance facility in the area/lack of awareness regarding such facility.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	10	28.57	45	23	51.11
II	25	13	52.0	20	11	55.00
III	15	9	60.00	10	7	70.00
Overall	75	32	42.66	75	41	54.66

Table 13: Number of cases in different farm size groups reported the problem of lack of proper marketing facility for milk in the area.

Farm Size Herd size	Small farmers			Marginal farmers		
	Sample Size	Cases reported	% of cases	Sample Size	Cases reported	% of cases
I	35	19	54.28	45	30	66.66
II	25	13	52.00	20	12	60.00
III	15	7	46.66	10	5	50.00
Overall	75	39	52.00	75	47	62.66

The small farmers and marginal farmers also reported the problem of lack of funds with them to manage dairy business. The following table shows the number of cases reported such problem.

The table 9 indicates that about 26.66 per cent cases in case of small farmers and 30.66 per cent in case of marginal farmers reported the problem of non-availability of cattle shed. This problem was reported more by the families of III herd size groups in case of small farmers as well as marginal farmers.

(II) Lack of funds:

The small farmers and marginal farmers also reported the problem of lack of funds with them to manage dairy business. The following table shows the number of cases reported such problem.

The table 11 indicates that about 26.66 per cent cases of small farmers and 54.66 per cent of marginal farmers reported the problem of not-availability of veterinary doctor's services in the villages. The cases reported such problem came more in case of marginal farmers as compared to small farmers.

(IV) Lack of cattle insurance facility:

The small farmers and marginal farmers also reported the problem of lack of insurance facility of cattle. They are not aware with the facility. The following table shows the number of cases reported such problem.

The table 12 indicates that about 26.66 per cent cases of small farmers and 54.66 per cent of marginal farmers reported the problem of lack insurance facilities in the area as well as they have no knowledge regarding such facility also.

(V) Lack of proper marketing facility:

The farmers under study also reported the lack of proper marketing facility of milk. The following

table shows the number of cases reported the problem lack of proper marketing facilities of milk in the area.

The table 13 indicates that out of 75 cases 39 cases (52 per cent) in case of small farmers reported the problem of lack of proper marketing facilities in the villages, while in case of marginal farmers out of 75 cases 47 farmers (62.66 per cent) reported the problem of lack of proper marketing facilities in the villages. It resulted in lower price of milk obtained by them from the private vendors who purchased the milk from the farmers, therefore, there is a need to develop a organized marketing facilities in the locality so that farmers may get proper price of their the milk.

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Organisation and Performance of Dairy Cooperative Societies in Udham Singh Nagar Distt. Of Uttarakhand

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Abstract

Agriculture is very important sector of Indian economy providing employment, livelihood, food, nutritional and ecological securities to the country. Despite significant achievement on agricultural front, problem of poverty and unemployment has still been haunting rural economy. Crop production is prone to both drought and floods, leading to uncertainty in income of farmers specially marginal and small farmers. Thus dairying has emerged as major subsidiary occupation in agriculture for rural masses. India has emerged as a largest producer of milk in the world. Uttarakhand is characterized by the small milk producers having one to two milch animals using poor production technology. Thus their marketed surplus is very small, which makes them unable to sell their surplus economically in the nearby urban places. Though launched on Anand pattern, dairy cooperatives in Uttarakhand were proved not so successful. Less collection of milk in societies shows either lack of interest of producers in the milk unions or that the milk unions are out of the reach of the milk producers. This necessitates the analysis of organization and performance of these dairy societies . The important findings of the study showed that there is a need to make certain criteria, tests by the administration to keep checks on biasness, so that these societies get efficient and skillful management and can work even more efficiently. Various financial test ratio used to judge the viability of dairy societies showed that there is a need to increase asset strength of small and medium societies in order to improve their stability and economic viability. Reasons responsible for closed down societies showed that there is an urgent need to overcome the constraints by imparting training to the workers for animal health and care, efficient management to the secretary, increased milk production, timely and adequate supply of technical inputs and machineries to the members of the societies.

Key Words: Primary Milk Producers Cooperative Societies, Economic Viability, Dugdh Utpadak Sahkari Sangh (DUSS), Financial Test Ratios.

Introduction

Agriculture is very important sector of Indian economy providing employment, livelihood, food, nutritional and ecological securities to the country. Green revolution has enabled the country not only to achieve self-sufficiency in crop production, but also to earn foreign exchange. Despite significant achievement on agricultural front, problem of poverty and unemployment has still been haunting rural economy. Crop production is prone to both drought and floods, leading to uncertainty in income of farmers specially marginal and small farmers who do not have owned source of assured irrigation. Dairying has emerged as major subsidiary occupation in agriculture for rural masses. This has been so because of the fact that majority of farmers are small, marginal and have surplus family labour along with limited land holding. Therefore dairy enterprise suits well to the situation as it is labour intensive in nature and therefore provide

better opportunity for gainful employment of surplus family labour. While income from crop production is seasonal, dairying provides a stable year round income, which is an important economic incentive for the small farmers. ¹

Milk and Milk Products provides complete nutrition to all walks of life. Milk is essential input of dairy industry. ²GDP growth rate in agriculture has been around two per cent during the past two decades but livestock sector is consistently growing at the rate of 4-5 per cent (Indian Dairyman). This has paved the way for India to become the largest producer of milk in the world with an annual production of 112.5 million tonnes by 2009-10 (Economic Survey 2010-11). Livestock and fisheries sector contributed about 29.7 percent of the value of output from agricultural and allied activities. In addition India is a net exporter of milk and milk products and Indian livestock sector

contributes about 0.6percent in country’s export. Hence dairying has important role in economic growth of the country. Contrary to this the per capita availability of milk has increased from 112 grams per day in 1968-69 to 263 grams per day in 2009-10, but is still low compared to the world average of 265 grams per day. Therefore there is a need to improve further upon its performance.

Dairy cooperatives have a direct connection with dairy Industry. Dairy development started in British tenure with establishment of military dairy farms for meeting the requirement of ghee and milk in India. First Dairy Cooperative in the country started with katra cooperative milk society (1917) in Allahabad. But real stimulus to cooperative dairy industry in the country started with the establishment of Khaira District cooperative milk producers union Limited (Amul) on 14 December 1946. After formulation of Uttarakhand on 9th November 2000 there was emergence of functional cooperative society “Uttarakhand Cooperative Dairy Federation Ltd” with the trade name “Aachal” for milk procurement and processing. Uttarakhand is characterized by the small milk producers having one to two milch animals backed by poor production technology. Thus their marketed surplus is very small, which makes them unable to sell their surplus economically in the nearby urban places .As a result, milk producers are exploited by monopoly powers of milk vendor and middlemen operating in the area. Marketing is day by day becoming problem for resource poor producers. This led to the cooperative movement in dairy production and primary milk producers cooperative societies were organised to cope up with the problems faced by small and individual milk producers in the state. Though launched on Anand pattern, dairy cooperatives in Uttaranchal were proved not so successful. Less collection of milk in societies shows either lack of interest of producers in the milk unions or that the milk unions are out of the reach of the milk producers and many of them were closed down. This necessitates the analysis of organization and performance of these societies and also to study the factors responsible for closed down societies. Keeping in mind the above facts, the present study had been undertaken with following specific objectives.

1. To study the organization of dairy cooperative societies and their linkages with the DUSS (Dugdh Utpadak Sahkari Sangh).
2. To analyse the economic viabilities of dairy cooperative societies.
3. To study the factors responsible for the closed down societies.

Methodology

The present study was conducted in Udhm

Singh Nagar District of Uttarakhand. As among 13 districts of this state Udhm Singh Nagar ranks first in the procurement of milk under organized sector through cooperative milk marketing. In the first step of selection of Primary Milk Producers Societies (PMPS), all the registered societies under Dugdh Utpadak Sahkari Sangh (DUSS), Rudrapur were stratified into functional societies and closed down societies. Out of total societies registered at DUSS, Rudrapur 424 were functional societies and 79 were closed societies. The functional societies were further classified into three sizes/categories according to the daily milk procurement Viz small, medium and large societies. The societies procuring 0-100lts. milk per day were considered as small societies, societies procuring 100-200lts. milk per day were considered as medium sized societies and those societies procuring more than 200 lts. milk per day were considered as large societies. Then from each of these category ten societies were randomly selected for the detailed study. Thus a total of 30 functional societies were taken for the study purpose. A random sample of 20 closed down societies was taken for the study purpose.

In order to achieve the first objective of the study i.e. to study the organization of Primary Milk Producers Cooperative Societies and their linkages with the union, information regarding staffing pattern of Primary Milk Producer’s Societies , management committee of PMPS and the linkages between the societies and the union in their working were obtained. The organization and working of societies was examined in the context of the bylaws of the societies and fulfillment of the functions/objectives of the societies was obtained from the records maintained at the union and society level and by personal interviews with the officials.

To analyse economic viability of PMPS under second objective following financial test ratio’s were calculated:

$$i. \text{ Operating Ratio} = \frac{\text{Total operating expenses}}{\text{Gross income}}$$

Where total operating expenses included milk purchase, salary expenditure, animal feed purchase, seed purchase, mineral mixture purchase, vaccine purchase, semen purchase, retail expenditure etc. While Gross income was calculated by summing up the total receipts separately viz. milk sale, commission from milk sale, local milk sale, animal feed sale, sale of vaccine, semen, mineral mixture, seed, ghee etc. This ratio is the measure of economic efficiency of the societies and it should be less than one(positive) to prove economic viabilities of these societies.

$$ii. \text{ Gross Ratio} = \frac{\text{Total Expenses}}{\text{Gross Income.}}$$

Where total expenses included fixed and operating expenses. Items included under fixed expenses were depreciation on dead stock, depreciation on building, audit fee. And operating expenses and gross income were considered same as for computing operating ratio. The profitability of the societies is measured by using gross ratio. The society will be considered as economic feasible society if its gross ratio is less than one(positive).

Net Profit

iii. Rate of Return on total expenses = $\frac{\text{Net Profit}}{\text{Total expenses}}$

Net profit is the difference between gross returns and operating expenses and total expenses includes fixed and operating expenses as considered in case of computing gross income. For proving societies to be economically viable, rate of return over total expenses should be positive.

Total assets

iv. Net Capital Ratio = $\frac{\text{Total assets}}{\text{Total liabilities}}$

Items included under total assets of the societies were Ghee stock, mineral stock, animal feed stock, vaccine stock, semen stock, dead stock, bank saving account, share in Sangh, building value. Total liabilities on the other hand included producers overdues, sangh animal feed, sangh ghee, sangh mineral, payments due, share capital, sangh Milk Testing Unit (M.T.E). This ratio indicates liquidity position of the societies, it should be greater than one.

Ø The last objective of the study i.e. to analyse the factors responsible for closed down societies was achieved by applying Grading method to the responses obtained from the members of the societies.

From this a list of weaknesses/ shortcomings was sorted out and then ten-point scale method was adopted to find out the severity of weakness as detailed in table no 1.

Table 1: Ten point scale method

Grade Scale	Grade	Degree of Severity
> 7.5	A	Most Severe
3-5-7.5	B	Severe
< 3.5	C	Least Severe

Results and Discussion

Organization of Primary Milk Producers Societies and their linkages with the Union.

Milk Producers cooperative societies work at the grass root level (village) for the socio-economic welfare of the cooperative members. The various steps involved in organizing a milk producers cooperative society may be enumerated as follows :

1. The union staffs visit a particular locality and ponder upon the potential of starting a society in that area, by

discussing the matter with the milk producers of that locality.

2. Some of the milk producers voluntarily join together and make up their mind to market their milk through cooperative union, express their will to the field supervisor in the Union office by handing over an application to him requesting to organize their society.
3. Then the society is kept under inspection for three month. Milk is tested in terms of its quality by measuring its fat and SNF. Also during this period the member coordination and involvement is judged. On the basis of their three months performance and assurance given by the society that it will provide a minimum of 300lts of milk in 180 days during its cooperative year is the necessary condition for the registration of the society.
4. After the lapse of ninety days registration is done at the Regional Head Office.
5. At the time of grant of membership of the society, the society should purchase one share of DUSS of Rs. 200 . The members joining the society are required to deposit Rs. 25 in which Rs. 20 is the share money, which is refundable and Rs. 5 is the entry fee which is non refundable.
6. After the registration of the society the field supervisor advises the society to arrange a proper site for establishing the "Milk collection depot". After it is done a meeting of all the members of the society is arranged in order to pass the necessary resolutions and bylaws of the society and complete any left over formalities.

Membership and management of the PMPS

Membership : A PMPS is organized if it is having a minimum of 30 members registered under the name of the society. Age limit to become members of the PMPS is 21 years.

Management Committee : PMPS includes nine members that are elected by the members of the society. Election of the chairman of the society is also among these nine member of the management committee. Management committee has three reserved seats. One for Schedule Caste/Schedule Tribe (SC/ST), another for backward classes and third seat is for women incase these seats are not fulfilled by the members of the society, then the state government can appoint members for these reserved seats on their behalf. The election for the management committee is held after every three year. Incase members of the members committee are found to be defunct then the members of the society can also organise election again with in three years. The election for the sachiv of the society is done through voting method by the member of the society. The job of the sachiv is to collection and sale of milk after testing its fat and SNF

Table 2(A): Financial test ratios of the small societies

Ratios	Yr.	Name of the societies									
		1	2	3	4	5	6	7	8	9	10
Operating Ratio	01	0.995	0.981	0.891	0.912	0.834	0.940	0.880	0.854	0.915	1.000
	02	0.960	0.915	0.973	0.878	0.836	0.864	0.984	0.952	0.802	0.910
	03	0.992	0.906	0.965	0.885	0.844	0.881	0.980	0.971	0.808	0.963
Gross Ratio	01	0.996	0.984	0.893	0.914	0.837	0.941	0.884	0.859	0.919	1.000
	02	0.967	0.916	0.978	0.882	0.840	0.865	0.989	0.957	0.805	0.920
	03	0.996	0.912	0.967	0.892	0.847	0.883	0.989	0.970	0.811	0.967
Rate of Return over Total expenses	01	0.005	0.018	0.122	0.096	0.197	0.063	0.135	0.169	0.091	0.002
	02	0.041	0.093	0.026	0.137	0.194	0.156	0.115	0.050	0.245	0.008
	03	0.007	0.102	0.036	0.128	0.183	0.134	0.015	0.028	0.236	0.038
Net Capital Ratio	01	1.070	0.930	1.230	0.950	1.160	0.900	1.040	1.120	0.960	0.920
	02	0.950	1.080	0.990	1.096	1.280	0.980	1.030	0.990	1.007	1.020
	03	0.950	1.040	0.990	1.040	1.050	1.050	1.030	0.950	1.090	0.970
Net Worth	01	515.0	3011.4	18894.4	3023	15110.0	9178.9	5962.0	6219.1	2405.7	31730.3
	02	580.1	8235.6	-119.2	1504.9	7257.0	1863.7	4493.0	301.0	208.1	50582.1
	03	-710.0	4262.0	-47.0	556.8	3361.2	3161.3	981.1	-3136.0	3514.7	-11509.4

Table 2(b): Financial test ratios of the medium societies.

Ratios	Yr.	Name of the societies									
		11	12	13	14	15	16	17	18	19	20
Operating Ratio	01	0.965	0.760	0.950	.942	0.975	0.770	0.953	0.857	0.967	0.894
	02	0.994	0.860	0.938	.828	0.863	0.840	0.822	0.919	0.875	0.955
	03	0.980	0.947	0.792	.828	0.880	0.900	0.954	0.90	0.970	0.951
Gross Ratio	01	0.968	0.770	0.956	.947	0.982	0.780	0.955	0.86	0.972	0.899
	02	0.998	0.864	0.942	.833	0.872	0.844	0.823	0.923	0.878	0.958
	03	0.990	0.950	0.796	.833	0.922	0.905	0.957	0.908	0.98	0.955
Rate of Return over Total expenses	01	0.036	0.301	0.048	.060	0.025	0.286	0.049	0.165	0.031	0.117
	02	0.005	0.160	0.064	.206	0.156	0.189	0.215	0.086	0.142	0.046
	03	0.010	0.050	0.260	.206	0.122	0.109	0.048	0.103	0.023	0.051
Net Capital Ratio	01	1.061	1.120	1.010	.731	0.775	0.930	0.676	1.14	1.090	1.370
	02	0.880	1.420	1.280	1.33	1.030	1.01	1.05	1.00	1.200	1.080
	03	0.926	1.040	1.350	1.13	0.970	1.04	1.013	1.01	0.970	1.010
Net Worth	01	1807	3494.1	561.0	8428.9	37891.0	-1994	18140.7	6240.2	354.98	5805.0
	02	3541	14761.6	17414.3	6253	912	275.7	2723.0	300.3	13355.1	13439.0
	03	2314	2370	13894.6	4104	-1096	1058.6	980	997	1533.95	741.7

* 11-20 indicates chronological arrangement of selected societies under study

percentage; maintain various financial accounts; purchase and sale of mineral mixture, feed, seed for fodder and other milk products. Working period for sachiv is three years and after three years elections are held again to appoint new sachiv.

During the course of study it was found that few functional societies are at its functioning even with less than 30 members, which is a necessary condition according to the bylaws of PMPS. Secondly it was found that election of the chairman of the societies had political interference with DUSS, which otherwise solely depends on the majority of the votes given by the members of the society. Thirdly supervisors did not make any regular visit to look upon the performance

of the societies. Neither they are interested to look upon the efficient working of sachiv. There was lack of surprise checks by the supervisors.

Economic viability of Primary Milk Producers Societies was assessed examining various financial test ratios:

For PMPS to be economic viable Operating ratio, Gross ratio, Rate of return over total expenses and Net capital ratio was computed for each society employing formula discussed earlier and is indicated in Table 2. The operating ratio calculated during last three years ranged between 0.8 to 1.0 in case of small societies, 0.76 to 0.97 in case of medium societies, 0.81 to 0.97 in large societies. Maximum operating ratio was

Table 2(c): Financial test ratios of the large societies.

Ratios	Yr.	Name of the societies									
		21	22	23	24	25	26	27	28	29	30
Operating Ratio	01	0.975	0.953	0.890	0.959	0.965	0.820	0.904	0.907	0.892	0.908
	02	0.860	0.810	0.920	0.903	0.889	0.918	0.805	0.897	0.867	0.900
	03	0.940	0.922	0.920	0.942	0.916	0.936	0.971	0.935	0.744	0.938
Gross Ratio	01	0.970	0.955	0.900	0.962	0.967	0.830	0.906	0.910	0.894	0.910
	02	0.872	0.812	0.930	0.907	0.892	0.921	0.806	0.899	0.877	0.902
	03	0.949	0.925	0.930	0.946	0.919	0.938	0.972	0.937	0.750	0.939
Rate of Return over	01	0.025	0.048	0.113	0.042	0.036	0.206	0.105	0.102	0.119	0.100
Total expenses	02	0.150	0.230	0.076	0.106	0.124	0.088	0.242	0.114	0.151	0.109
	03	0.202	0.083	0.070	0.060	0.090	0.067	0.029	0.068	0.330	0.065
Net Capital Ratio	01	1.89	1.680	2.050	2.060	1.16	1.740	1.002	1.320	2.080	1.690
	02	1.88	0.990	2.050	2.030	2.700	2.010	1.080	1.206	2.060	1.490
	03	1.86	1.680	1.830	1.910	2.800	2.730	2.520	1.450	2.008	1.460
Net Worth	01	868.5	113260	112147	30734.7	96641.0	579618.56	422.8	40666.9	127400	64989.9
	02	82849.9	-183	101291	217553	108503.27	670386	15724.5	27840	142900	53027
	03	106140	411271	113012	123853	138062.5	171195	156948.9	49949.3	81527	49982

* 21-30 indicates chronological arrangement of selected societies under study

found in small size societies and minimum operating ratio in medium sized societies i.e. 0.76 which indicates that total operating expenses incurred to earn one rupee income on medium societies was less than small and large societies. Maximum operating ratio were found in small societies due to lack of availability and efficient utilization of resources and proper management among small societies. Thus we can conclude that the medium sized societies were working more efficiently as compare to large and small societies. Gross ratio worked out during the last three years for the small sized societies ranged between 0.80 to 1.0 and for medium sized societies it ranged between 0.82 to 0.99 and lastly for large societies ratio had decreased ranging between 0.75 to 0.97. Minimum gross ratio was found in large societies and were found to be more profitable one as compared to small and medium societies. Maximum gross ratio appeared in small societies i.e. 1.0 such a picture depicts that some small societies were not much efficient and not even profitable. The rate of return over total expenses indicated the efficiency of a firm/society. This ratio was found maximum in medium sized societies i.e. 0.286 and minimum in small sized societies i.e. 0.007 during the last three years. This result also showed that medium sized societies were more efficiently working than small and the large societies. Net capital ratio was calculated to assess the performance of the selected societies. This ratio indicates the liquidity position of the societies and thus determine their stability. This ratio was found to be highest in large sized societies i.e. 2.7 indicating high asset strength

as compared to small and medium societies and minimum ratio found in medium societies i.e. 0.775 indicating though they were having high efficiency ratios but if their asset strength (lacking supply of efficient machinery and equipments by the Union) is not improved over time they can be insolvent.

Thus from the above discussions, we can conclude that medium sized societies were more efficient as compare to small and large societies, but large societies had more asset strength.

Reason responsible for closed down societies

Table 3 : Reasons responsible for the closed down societies.

Particulars	Grade Scale
Inefficient working of secretary/absence of secretary	7.5
Low price of milk/unsatisfactory pricing method	6.0
More societies open in near by places	5.0
Passive participation of members	4.0

The investigation carried out through the course of study reveals that there are certain weakness in the functioning of Primary Milk Producers Societies that led the societies to closed down societies. Table 3 indicates reasons for closed down societies.

The cooperative generally undertakes election after every three years. In case the chairman or the secretary is found to be defunct, than elections can be done within 3 years again. But during the course of

study, it was found that some of the societies were closed down, just because of inefficient working of secretaries while in others non appointment of the secretaries was the problem. This constraint was allotted 7.5 grade scale out of 10. Low price of milk with 6.0 grade scale was another factor responsible for closed down societies. Members of the societies pointed that they get low price of milk as compared to the price they can get from the other agencies (private milk vendors) was a reason for the societies to be closed down .Opening of new societies in nearby places of existing one with 5.0 grade scale and passive participation of members with 4.0 grade scale were the severe weakness of the closed down societies.

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Efficiency of resources used in paddy cultivation

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Abstract

Student was conducted on 100 sample farmers selected through purposive random sampling from Paliganj block of District-Patna, Bihar. Sample farmers were categorized as marginal, small and medium size of farms. Cobb-Douglas function was applied to analyse the data and interpretation of the result. Production of paddy was characterized by decreasing return to scale. Coefficient of multiple determination of all four independent variables indicated 82.97, 84.76 and 88.21 per cent of verification, in dependent variable respectively. Resources like seed, manure & fertilizer and human labour were significantly related with the production. MVP to factor cost were found positive indicating future scope for increasing the investment on resources used.

Key words: farmers, purposive, random, Cobb-Douglas, human labour

Introduction

In fact, rice is the staple food for human being living in the world. Asian region contributed major share of the rice production, in general, and India, in particular. Success of national food security mission entirely depends upon increased production of rice, in India. Rice is capable to fulfill the food requirement of increasing population of the world. Rice has export potential to earn foreign currency.

India ranks first in both area and production of Paddy. Paddy was grown on about 43.77 million has of land with production of 96.69 million tones and productivity 22.10 qtls. Per ha (2007-08). Paddy is leading crop of Bihar State, but no scientific study on resource use efficiency of paddy crop has been so far conducted to workout the significant contribution of resources in paddy production. Seeing the above facts in due consideration the study on "Efficiency of resources used in paddy cultivation" assumes special significance and importance. The study was conducted with the objective to workout resource use efficiency in paddy cultivation.

Methodology

Two stage purposive cum random sampling technique was applied to select the ultimate respondent. Hundred farmers were selected following the proportionate random sampling technique. Primary data were collected through personal interview with the use of pre-structured and pre tested schedule. The data pertained to agriculture year 2009-2010. Simple tabular and functional analysis was used to analyse the data and presentation of the result.

Results and Discussion

Resource use efficiency

The production function analysis was carried out to determine the efficiency of various resources (seed, manure, fertilizer, irrigation and human labour) used in the production of paddy. Cobb-Douglas production function was applied to find out the result.

(i) Elasticity of production

The estimated value of elasticity of production, standard error, co-efficient of multiple determination (R^2) and Return to scale for paddy production by different size group of farms are given in Table-1.

It is depicted from the table that coefficient of multiple determination (R^2) of marginal small and medium group of farms were 0.829797, 0.87616 and 0.882166 respectively.

The coefficient of multiple determination of all four independent variables viz., seed, manure and fertilizer, irrigation and total human labour indicated 82.17, 84.76 and 88.21 per cents of variation in dependent variable at marginal, small and medium categories of the sample farms respectively.

The consumption of manure and fertilizer was statistically significant for marginal, small and medium farm at 1% level of probability. But seed being a critical input was found significant at 5% probability level on medium size groups of farms and 1% probability level on marginal and small size of sample farms. The use of total human labour was statistically significant at 5% probability level only for marginal farms. Significant relationship of human labour in case of marginal group of farms emphasis the importance of family labour. Irrigation did not show any significant

Table 1 : Elasticity of production in paddy on different size group of sample farms.

Size group of farms	Production Elasticity				Sum of elasticity return to scale	R ²
	X ₁	X ₂	X ₃	X ₄		
Marginal (0.047093)	0.125916** (0.037073)	0.49424** (0.041252)	0.014112 (0.017713)	0.133869**	0.768138	0.829797
Small (10.633843)	0.254662** (0.061773)	0.399405 (0.05453)	0.089841 (0.026801)	0.015916	0.759868	0.847616
Medium (0.093075)	0.290088* (0.113822)	0.467352** (0.0694700)	0.085084 (0.032125)	0.020604	0.863129	0.882166

Figures in parenthesis indicates standard error of respective variable.

** Significant at 1% probability level.

* Significant at 5% probability level.

X₁, X₂, X₃ & X₄ Symbolized for seed, manure and fertilizer, irrigation and human labour cost respectively.

relationship with the dependent variable.

Return to scale in case of marginal, small and medium group of farms were 0.768138, 0.759868 and 0.863129 respectively. Returns to scale in case of all three categories of farms were found less than unity, which indicates that production of paddy is characterized by decreasing return to scale on the each farm situation. It is therefore inferred that increasing all the factors by 1 per cent simultaneously results in increase of the return by less than 1 per cent on each farm situation.

Table 2 : Marginal Value Productivity (MVP) in paddy on different size group of sample farms.

Size group of farms	Marginal Value Productivity			
	X ₁	X ₂	X ₃	X ₄
Marginal	7.9383	13.2720	0.5846	0.6747
Small	7.8160	9.6266	2.0125	0.0842
Medium	10.7095	9.7731	1.8281	0.0963

X₁=Seed

X₂=Manure and fertilizer

X₃=Irrigation

X₄=Human labour

Marginal Value Productivity (MVP)

The MVP of different input factors are presented in table-2. It is depicted from the table that

in case of all the three categories of the farms, for seed, manure & fertilizers, irrigation and human labour (X¹, X², X³ & X⁴) variables, the values of MVP to the factor costs were found positive indicating that there is future scope for increasing in the investment on all these factors specially seed and manure fertilizer in each farm situation to realize more return than the existing use of inputs.

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Effect of integrated nutrient management on barley (*hordeum vulgare* L.) Under alluvial soil of Western Uttar Pradesh

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Abstract

A field experiment was conducted on sandy loam soil at research farm of R.B.S. College, Bichpuri, Agra during the rabi season of 2008-09 and 2009-10 to find out the suitable nutrient management strategies for barley. The results revealed that grain and straw yield of barley increased significantly with increasing levels of NPK. The grain and straw yield of barley was higher under 75% NPK fertilizers supplied in combination with 5 t FYM ha⁻¹ + 20 Kg ZnSO₄ ha⁻¹. Application of 5 t FYM along with different levels of NPK increased the grain and straw yield significantly at each level of NPK fertilizer alone, while addition of 20 Kg ZnSO₄ ha⁻¹ along with different NPK levels also increased the grain and straw yield up to the level of significance, when compared with fertilizer alone. Application of FYM and ZnSO₄ in combination with different levels of NPK increased significantly the protein content and production in grain over most of the treatments. The maximum values of NPK uptake by barley grain and straw were recorded under 75% NPK+ 5 t FYM ha⁻¹ + 20 Kg ZnSO₄ ha⁻¹ treatment and minimum under control.

Key words: Suitable, Nutrient management, Strategies, uptake

Introduction

Barley is an important Rabi cereal crop in northern plains of India comprising the states of Uttar Pradesh, Haryana, Rajasthan, Punjab, Madhya Pradesh and Uttranchal. Its greatest concentration is in the states of Uttar Pradesh, Rajasthan and Bihar which account for approximately 52, 18 and 11 percent of the total area, respectively. The major portion of grain produced is consumed as flour to prepare "Chapaties" or to make "Sattu" by roasting and grounding grains. It is also used to prepare malt for manufacturing beer and whisky and other products such as industrial alcohol and vinegar. The crop needs less water and is more tolerant to salinity and alkali condition than other winter cereals. The crop possesses very high tolerance to drought and salt. In India, barley is cultivated in an area about 0.70 m ha producing nearly 1.40 mt. of grain with productivity of 2120 kg/ha. The application of FYM in the soil helps in increasing the fertility of the soils as well as physical condition including its water holding capacity. Organic manures, which were perhaps the major sources of plant nutrients in traditional agriculture, received less emphasis with the advent of high analysis chemical fertilizers. Without detracting from the fact that chemical fertilizer will continue to be main instrument for quickening the pace for agricultural production the recent researches

indicate that a judicious combination of organic manures and fertilizers can better maintain the long-term soil fertility and sustain high levels of productivity. Therefore, use of both organic manure and chemical fertilizers in appropriate proportion assume special significance as complementary and supplementary to each other in crop production.

Materials and Methods

A field study was carried out during rainy season of 2008-09 and 2009-10 at the research farm of R.B.S. College, Bichpuri, Agra (U.P.). The soil was sandy loam in texture, low in organic carbon (3.2 g kg⁻¹), available nitrogen (194.7 kg ha⁻¹), moderate in phosphorus (14.8 kg ha⁻¹) and potassium content (212 kg ha⁻¹), with a slight alkaline in reaction (8.05 pH). The experiment was laid out in randomized block design with 10 treatments and three replications. Ten treatments were: T₁ (control), T₂ (100% N), T₃ (100% NP), T₄ (100% NPK), T₅ (75% NPK), T₆ (50% NPK), T₇ (50% NPK) + 20 Kg ZnSO₄ ha⁻¹, T₈ (50% NPK) + 5 t FYM ha⁻¹ + 20 Kg ZnSO₄ ha⁻¹, T₉ (75% NPK) + 20 Kg ZnSO₄ ha⁻¹ and T₁₀ (75% NPK) + 5 t FYM ha⁻¹ + 20 Kg ZnSO₄ ha⁻¹. The whole amount of P, K, and ZnSO₄ was applied as basal dressing and N was applied 50% basal, 25% at tillering stage and 25% at ear initiation. FYM was applied 10 days before sowing the barley as per treatments. The grain and straw yields

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were recorded at harvest. Nitrogen content in grain and straw was determined by modified Kjeldahl method. Oven dried grain and straw samples were digested in mixture of HNO_3 : HClO_4 (3:1) and P & K were determined by adopting standard methods (Jackson, 1973). Zinc, Fe, Cu and Mn in the acid extract were determined on atomic absorption spectrophotometer (Lindsay and Norvell, 1978).

Results and Discussion

Grain and straw yields of barley increased significantly with increasing levels of NPK fertilizers over control. Maximum grain (45.59 q ha^{-1}) and straw (66.69 q ha^{-1}) yields were obtained with T_{10} , which was significantly higher over the rest of the treatments (Table 1). Grain yield increased by 5.73 percent with 75% NPK + 5 t FYM ha^{-1} + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$ treatment in comparison to T_4 (100% NPK) treatment.

It is quite clear that 75% NPK + FYM + ZnSO_4 increased the yield of barley by 6.88 and 2.47 ha^{-1} (17.77 and 5.73 percent) as compared to the grain yield of barley with 75% and 100% NPK fertilizers

alone, respectively.

The grain yield increased by 4.00 percent with 75% NPK + 5 t FYM ha^{-1} + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$ treatment in comparison to 100% NPK treatment. Similarly, 7.93 percent enhancement in straw yield was noted with 75% NPK + 5 t FYM ha^{-1} + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$ treatment over 75% NPK alone. Similar results were reported by Katiyar and Uttam (2008), Miller *et al.* (2009).

Different levels of NPK fertilizers and their combination with 5 t FYM ha^{-1} or 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$ or FYM + ZnSO_4 increased the protein percentage and yield in barley grain significantly over 100% NPK alone. Use of fertilizers alone also responded for improvement in protein content and yield over control.

Data recorded on uptake of nutrients (N, P, K, Zn, Fe, Cu and Mn) revealed that the uptake of these nutrients increased with increasing grain and straw yield of barley under different treatments (Table 2).

Maximum values of uptake of these nutrients by barley grain and straw were recorded under 75%

Table 1: Effect of integrated nutrients management on grain and straw yield of barley (Mean of two years)

Treatments	Yield (q ha^{-1})	
	Grain	Straw
T_1 Control	29.15	51.79
T_2 80 kg N ha^{-1}	33.95	55.64
T_3 80 kg N, 40 kg $\text{P}_2\text{O}_5 \text{ ha}^{-1}$	35.39	58.17
T_4 100% R D of NPK (80 kg N : 40 kg P_2O_5 : 40 kg $\text{K}_2\text{O} \text{ ha}^{-1}$)	43.12	64.22
T_5 75% NPK (60 : 30 : 30 kg NPK ha^{-1})	38.71	61.79
T_6 50% NPK (40 : 20 : 20 kg NPK ha^{-1})	32.67	55.14
T_7 50% NPK + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$	32.77	56.20
T_8 50% NPK + 5 t FYM ha^{-1} + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$	38.30	61.66
T_9 75% NPK + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$	41.14	62.96
T_{10} 75% NPK + 5 t FYM ha^{-1} + 20 kg $\text{ZnSO}_4 \text{ ha}^{-1}$	45.59	66.69
CD (P = 0.05)	1.11	1.20

Table 2: Effect of integrated nutrient management on total uptake of nutrients by barley (Mean of two years)

Treatments	Uptake (Kg ha^{-1})			Uptake (g ha^{-1})			
	N	P	K	Zn	Fe	Cu	Mn
T_1	68.3	10.5	90.3	117.9	1182.7	47.8	502.1
T_2	81.6	13.5	127.0	165.2	1669.9	72.4	589.2
T_3	92.7	14.3	138.4	181.2	1780.9	77.7	650.7
T_4	117.7	21.8	183.7	221.8	2285.9	116.3	788.3
T_5	102.1	17.2	162.3	193.1	2085.7	95.1	723.6
T_6	79.6	12.3	126.5	158.4	1414.2	62.1	564.6
T_7	78.2	13.0	129.2	184.9	1528.9	66.1	584.1
T_8	98.8	16.3	161.8	223.2	2006.3	86.7	710.6
T_9	110.1	19.8	176.8	230.0	2205.5	112.9	756.3
T_{10}	132.6	24.4	199.0	273.7	2470.4	127.2	845.9
CD (P = 0.05)	13.20	1.75	8.29	29.66	50.54	2.21	17.55

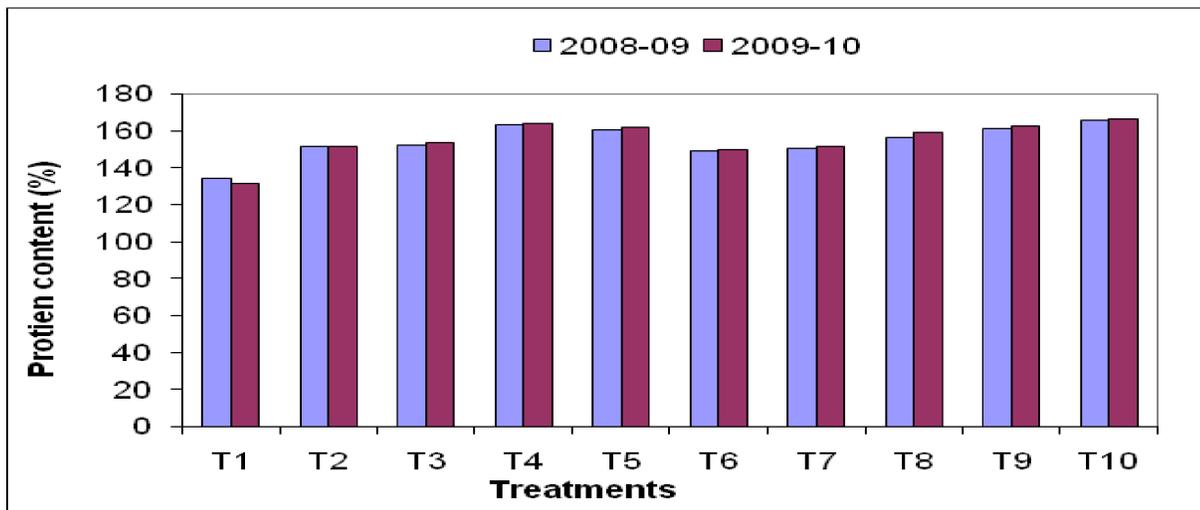


Fig. 1: Effect of INM treatments on protein content in grain of barley crop

NPK + 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ treatment, while minimum under control. The uptake of these nutrients was also greater under those treatments where addition of 5 t FYM ha⁻¹ or 20 kg ZnSO₄ ha⁻¹ or FYM + ZnSO₄ was done with different levels (50 and 75%) of NPK fertilizers. Application of 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ were found to be better as compared to 20 kg ZnSO₄ ha⁻¹ alone in respect of uptake of nutrients by the crop at each level of NPK fertilizers.

The higher availability of nutrients with the application of FYM to the soil probably led to improvement in grain and straw yield and consequently the higher uptake of nutrients by the crop. Similar results were reported by Sanhy *et al.* (2001), Abd and Hady (2007) and Kumar *et al.* (2010).

It can be concluded that there was a significant increase in yields of barley due to application of both FYM and ZnSO₄. The uptake of nutrients by the crop was also influenced by their application. These results indicate that in the alluvial soils of Western Uttar Pradesh 75% NPK + 5 t FYM ha⁻¹ + 20 kg ZnSO₄ ha⁻¹ treatment could be give best results in near future.

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Profitability Analysis of Improved Water chestnut Cultivation Technologies in Seoni District of Madhya Pradesh

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Abstract

This study has attempted to assess farmer's opinions on distinguishing features and profitability of improved water chestnut cultivation technology. The technology includes Varietal replacement in Water Chestnut through introduction of improved variety 'Lalgulara' along with full package of practices. Earlier, farmers were adopted their own package of practices in Water chestnut. The improved package and practices provided to the target farmer includes, application of 300 kg SSP + 80 kg MOP + 60 kg Urea/ha along with cutting treatment with monocrotophos, Spray of tricantonal 250 ml+ monocrotophos 1 litre + tripol 250 ml 50 days after transplanting and control of pests and diseases have helped to increased yield of water chestnut by more than 2 fold. The benefit cost ratio for improved water chestnut cultivation technologies was 2.35 while this ratio was 1.16 for Farmer Practice. Farmers got higher net profit on per unit area as well as per unit capital bases.

Key words: Waterchestnut; High Yielding Varieties; Profit

Introduction

Water chestnut, (Trapa, Sp) is an important annual aquatic plant which produces fruit in a fresh water environment. Crop is grown for the edible fruit as well as supplement fruit in large area of Madhya Pradesh about 6000 ha and other part of the country. This plant is a minor but popular aquatic plant distributed in various parts of the country. It is also a very useful plant because shallow fresh water can be used for fruit production. Water chestnut is predominantly cultivated in Seoni District of Madhya Pradesh. This study attempted to estimate profitability of improved water chestnut cultivation technology vis-à-vis traditional water chestnut cultivation technology on farmer's field. The specific objectives of this study were:

1. To assess farmer's responses on improved water chestnut cultivation technology and those which change its profitability and adoption level.
2. To estimate comparative profitability of improved water chestnut cultivation technology vis-à-vis traditional cultivation technology.

Materials and Methods

Madhya Pradesh (M.P.) is the largest water chestnut producing state in India. Which is also the best representative of Indian water chestnut production Scenario, hence in order to establish a improved water chestnut cultivation technology. Krishi Vigyan Kendra,

Seoni has conducted front line demonstration on improved water chestnut cultivation technology under paddy field where the farming water is abundant. The front line demonstration was conducted between 2008 to 2010 at three different villages, namely Borikhurd, Takhlakal & Gokalpur located in Barghat block of Seoni district under KVK operational area. The area under each demonstration was 0.2 ha. (½ acre). District were critically surveyed and selected for FLD well before the conduct of demonstrations. Training programmes were organized in the village on improved water chestnut cultivation technology which included the selection of quality, planting material improved planting technology, INM and IDM practice. Thus the total no of farmers under FLD came to 40. Farmers perceptions on yield, price of produce, disease resistant, seed availability and other specific problems associated with improved water chestnut cultivation technology. Farmers perceptions on all these aspects were collected information on operation wise cost of cultivation was also taken from the respondents. Yield date was collected from control (Farmers practice) and demonstration plots and cost of cultivation, net income and cost benefit ratio were computed and analyzed.

Results and Discussion

Farmers perception on yield, price of produce, disease resistant and seed availability in recommended practice vis- a-vis average of farmers practice grown on farmers field are presented in Table-1. Majority of

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the farmers (about 79 %) was of the view that yield levels of recommended practice were high that of the farmer practice. Very high proportion of farmers expressed that recommended practice is more disease resistant and fetches higher price in the market as compared to other varieties grown on their farm . More than 80 % respondent's farmers believed that quality of planting material available for recommended practice is better than the other planting material.

Table 1: Farmers responses (%) on improved water chestnut cultivation technology compared with traditional cultivation technology.

Response	Yield	Price	Disease Resistance	Planting material availability
Better	79.23	92.30	84.61	53.85
At per	9.23	3.85	11.54	34.61
Worse	11.54	3.85	3.85	11.54

Comparative cost of cultivation of recommended practice vis- a-vis farmer practice at farmers field was estimated (Table 2) As opined by majority of farmers the estimated yield of RP is very high to FP varieties. Although planting material rate of RP was slightly high than the FP of other varieties .yet the cost of planting material was considerably higher (about 20 %) due to higher seed rate of RP.Farmers spent about 52% higher on fertilizers, Farm yard manure for RP as compared

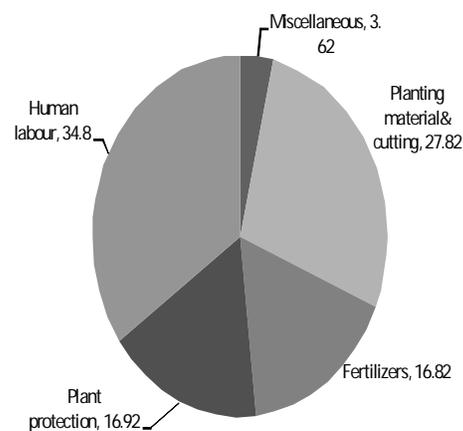


Fig. 1: Breakup of cost of cultivation of recommended practice

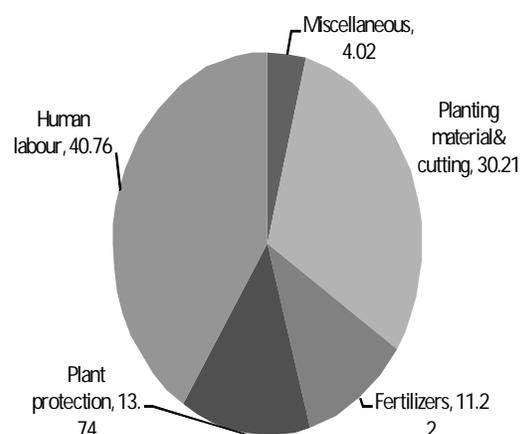


Fig. 2: Breakup of cost of cultivation of farmers practice

Table 2: Cost of Cultivation of improved water chestnut cultivation technology vis-à-vis traditional cultivation technology.

Particulars	Improved water chestnut cultivation technology	Traditional cultivation technology
Yield(q/ha)	93.2	52.7
Planting material No of cutting/ha	2500	2000
Cost of cutting/ha @ 3 Rs/Cutting	7500	6000
Cutting treatment with monocrotophos 500 ml/ha	175	0
Fertilizers (Rs/ha)	4640	2230
Plant Protection (Rs/ha)	4170	2730
Growth Promoters Tricantonol(Rs/ha)	500	0
Human Labour(Rs/ha)	9600	8100
Miscellaneous Expenditure	1000	800
Total variable cost of cultivation (Rs/ha)	27585	19860
Variable cost of production (Rs/qt)	295.1	376.8
Price received in the local market (Rs/qt)	992.7	814.5
Gross income (Rs/ha)	92519.6	42924.1
Net income at variable cost of cultivation	64934.6	23064.1
Benefit cost ratio at variable cost of cultivation	2.35	1.16

to FP.

Cost of Cultivation for RP was nearly 28 % higher while the cost of production was about 27 % low as compared to FP. The difference in cost of cultivation and cost of production was due to higher yield (about 44 %) of RP compared to FP. Per hectare gross income from RP cultivation was about 54 % higher than FP while the net income from this technology was about 65 % higher. The benefit cost ratio for RP was 2.35 while it was 1.16 for FP. The higher increment in gross 54 % and net 65 % income from this technology against lower increment in cost of cultivation 28 % and cost of production 27% indicates higher incremental output-input ratio of RP. These results thus show that it is more profitable to adopt RP as compared to FP. Planting material cost including cutting treatment, was the most expensive cost component in water chestnut cultivation accounting for nearly 28 % of the cost in case of RP and about 31% in FP (Fig 1 & 2)

Human labour and fertilizers (including FYM) accounted for nearly 52 % of the cost of cultivation

both in the case of RP as well as FP. The contribution of human labour in the variable cost of water chestnut cultivation was nearly 35 % in RP and 41 % in FP. The cost of plant protection chemicals was just about 17 % of the total cost of water chestnut cultivation while it was about 14 % in FP. Although the proportion of expenditure on different components is more or less the same as shown in Fig 1 & 2, The data clearly revealed that the increase in yield & net income observed due to improved water chestnut cultivation technology.

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To study the knowledge level and attitude of the respondents towards the programmes of the KVK's

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Abstract

The knowledge is an important factor in adoption of any new technology. On the basis of finding and observations, it was found that majority of respondents had average knowledge level regarding the programmes of the Krishi Vigyan Kendra. Majority of respondents have non-favorable attitude regarding the programmes of the Krishi Vigyan Kendra. Beneficiaries differ significantly in case of knowledge, attitude and skill. It is due to the exposure with Krishi Vigyan Kendra of the beneficiaries. Higher socio-economic status possesses better knowledge and positive attitude regarding programmes of the Krishi Vigyan Kendra than the beneficiaries with lower socio-economic status.

Keywords: Knowledge, Attitude, Respondents

Introduction

The transfer of technology basically depends upon three systems i.e. the knowledge generating system, the knowledge disseminating system and knowledge consuming system. The members of the knowledge generating system are research institutes. The members of knowledge disseminating system consist of extension personnel and other transfer of technology agencies. Besides this the knowledge disseminating system also includes the input supply agencies such as lead banks, fertilizer corporations and seed suppliers'. The main function of knowledge disseminating system is to transfer the technology to knowledge consuming system and collect feedback and pass it on to knowledge disseminating system. The knowledge consuming system consists of farmers and actual users of technology.

The most effective transfer of technology is possible when all the three systems knowledge generating system, the knowledge disseminating system and knowledge consuming system work in close co-operation. There should be an effective interaction and desired relationship between all the three systems. Keeping these things in mind a study was done on knowledge level and attitude of the respondents towards the programmes of the KVK's.

Methodology

Selection of the Krishi Vigyan Kendras

The present study was conducted in three Krishi Vigyan Kendra i.e. Krishi Vigyan Kendra, Shahjahanpur, Krishi Vigyan Kendra, Sultanpur and Krishi Vigyan Kendra, Bareilly.

Selection of villages

Five villages were selected from the each

selected KVK for the selection of the respondents, two adjacent to KVK, two in the radius of 20-25 kilometres and one beyond 25 kilometres from the KVK. Only such villages selected where farmers attended the training programmes of the KVK. 20 respondents were selected from each selected village.

Selection of Respondents

The lists of beneficiaries of three selected Krishi Vigyan Kendra were prepared. 100 beneficiaries from each selected Krishi Vigyan Kendra were selected randomly as respondents for the study. By this the total 300 beneficiaries were selected from three Krishi Vigyan Kendra's.

Socio-economic status

Scoring techniques of socio-economic status suggested by Trivedi and Pareek (1964) with slight modification was followed.

Determination of knowledge:

With a view to select the question, to test the knowledge of respondents all available literature about rice production technology relevant to the study area were collected. A broad framework was then developed. Discussions on recommended practices of production technology were held with the scientists. Based upon that, a list of questions was prepared with respects to recommended package of practices. It was decided to ask only those questions which would neither be too difficult nor too easy for respondents to answer. The pre-testing was also done on 20 farmers other than the respondents of the study. Questions which were answered by all and which could not be answered by any respondent were excluded from the knowledge test. However those

questions, which had their importance in the recommended package of practices of production was not excluded from the knowledge test. Thus based on the pre-test, suitable modification and deletions of questions were done. For quantifying the level of knowledge of respondents a score of one (1) was assigned to each correct reply and zero (0) to incorrect or no reply. The total no of items in the knowledge test were '20'. Thus a respondent could get a maximum of 20 and a minimum of zero score. Knowledge score obtained by the respondents were then divided into three classes as low, medium and high.

Measurement of attitude

Thurston (1969) defined attitude as 'the degree of positive and negative effects associated with some psychological object'. In the literature of psychology the term effect and feeling are used interchangeably. An individual who has associated positive effects on feeling with some psychological object is said to be like that object or to have a favorable attitude towards the object. The statements were developed to measure the attitude of respondents about Krishi Vigyan Kendra. A number of statements reflecting favorable and unfavorable attitude towards Krishi Vigyan Kendra were made after review of related literatures. The responses of beneficiaries on each statement are as follows:

Yes	-	Agree
May be	-	Undecided
No	-	Disagree
The scoring was done on the following criteria:		
Agree	-	3
Undecided	-	2
Disagree	-	1

Collection and analysis of the data

The data was collected from the selected respondents with the help of pre-tested interview schedule by the researcher herself. The data from the sample farmers were collected personally with the help of interview schedule by survey method. After that, the data so collected was arranged, classified, qualified and tabulated systematically.

Results and discussion

Knowledge of farmers towards programmes of Krishi Vigyan Kendra

The knowledge is an important factor in adoption of any new technology. To measure the knowledge level of beneficiaries of the Krishi Vigyan Kendra, we were asked 20 questions regarding the programmes of the Krishi Vigyan Kendra. The answers were recorded as Yes/No. The knowledge score of the beneficiaries is presented in table 1 is given below.

Table 1: Knowledge Level of beneficiaries

S.N.	Categories	Number of Beneficiaries	Percentage
1	Low (upto-10)	106	35.33
2	Medium (11-15)	112	37.34
3	High (above-16)	82	27.34
	Total	300	100

A critical look of the table 1 focuses that the majority of respondents (37.34 percent) were found possessing medium level of knowledge, 35.33 percent of the respondents show the low level of knowledge and 27.34 percent of respondents had high level of knowledge. On the basis of above finding it can be said that majority of respondents had average knowledge level regarding the programmes of the Krishi Vigyan Kendra.

For the testing of the association between personal socio- economic status and knowledge level of the beneficiaries of the Krishi Vigyan Kendra, the following table 2 was prepared.

Socio-Economic Status

It was measured with the help of socio-economic status scale developed by Trivedi and Prateek (1964). Beneficiaries were categorized in three categories viz. high, medium and low. The distribution of farmers in the three categories is presented in the table given below.

It is apparent from the Table 2 that 51.66 percent beneficiaries were from medium socio-economic status group while 26 percent beneficiaries were from high socio-economic status group. 22.34 percent beneficiaries were from lower socio-economic status group. Thus, it can be concluded that majority of beneficiaries were from medium socio-economic status background.

It can be observed from the data presented in Table 3 that the X^2 value was found to be 17.17 which is highly significant. So null hypothesis is rejected and we can say that beneficiaries with higher socio-economic status possess better knowledge regarding programmes of the Krishi Vigyan Kendra than the beneficiaries with lower socio-economic status. It may be due to the factor that Krishi Vigyan Kendra provides very new and latest information in their trainings.

Attitude of the farmers towards programmes of Krishi Vigyan Kendra

For determining the attitude of the farmers on regard to Krishi Vigyan Kendra, a set of 20 questions were asked. The attitude responses of the farmers on each statement are presented in table 3.

Table 2: Socio-economic status of the beneficiaries

S.N.	Categories	Number of Beneficiaries			Total
		KVK Shahjahanpur	KVK Sultanpur	KVK Bareilly	
1.	High (Score above 35)	22 (22.00)	26 (26.00)	30 (30.00)	78(26.00)
2.	Medium (Score 18 - 34)	52 (52.00)	44 (44.00)	59(59.00)	155(51.66)
3.	Low (Score up to 17)	26(26.00)	30(30.00)	11(11.00)	67(22.34)
	Total	100	100	100	300

Table 3: Association between socio-economic status and knowledge level of the beneficiaries

Socio-economic status of the beneficiaries	Knowledge level			X ² value
	Low	Medium	High	
Low	42 (14.0)	28 (9.33)	26 (8.67)	17.17*
Medium	49 (16.33)	51 (17.0)	17 (5.66)	
High	23 (7.67)	42 (14.0)	22 (7.33)	

* Denotes five percent significance level

Table 4: Attitude score of beneficiaries

S.N.	Categories	No. of Beneficiaries	Percentage
1	Low (upto-20)	117	39.00
2	Medium (21-40)	119	39.67
3	High (above-41)	64	21.33
	Total	300	100

From the Table 4 it is clear that the majority of beneficiaries (39 percent) were found possessing low attitude score means they have mostly disagreed with the programmes of the Krishi Vigyan Kendra, 39.67 percent of the beneficiaries were possessed medium attitude score and 21.33 percent of beneficiaries showed favorable attitude towards programmes of the Krishi Vigyan Kendra. On the basis of above finding it can be concluded that majority of respondents have non-favorable attitude regarding the programmes of the Krishi Vigyan Kendra.

Association between personal socio- economic status and attitude of the beneficiaries of the Krishi Vigyan Kendra

Table 5: Association between socio-economic status and attitude of the beneficiaries

Socio-economic status	Attitude score			X ² value
	Low	Medium	High	
Low	33 (11.0)	48 (16.00)	22 (7.33)	14.36*
Medium	46 (15.33)	52 (17.33)	25 (8.33)	
High	29 (9.67)	22 (7.33)	23 (7.66)	
Total	108	122	70	

* Denotes five percent significance level

It can be derived from the data presented in Table 5 that the X² value was found to be 14.36 which

is highly significant. So null hypothesis is rejected and we can say that beneficiaries with higher socio-economic status possess more favorable attitude regarding programmes of the Krishi Vigyan Kendra than the beneficiaries with lower socio-economic status. It is obvious that the individual with socio-economically sound background look and select suitable and scientific new information for boosting up production and increasing their level of income. Because of this they possess favorable attitude towards KVKs.

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Socio-economic Attributes of Vegetable Growers in Eastern Uttar Pradesh

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Abstract

The study was conducted in randomly selected 4 villages in Khorabar block of Gorakhpur district on 100 vegetable growers selected through proportionate random sampling technique. The majority of respondents were of middle aged and literate including formal and informal education. Backward caste farmers were dominantly engaged in vegetable enterprises and joint family system was dominantly in existence having 7 to 11 members in their families. Maximum vegetable growers were marginal farmers reported agriculture as their main occupation. Pucca or mixed type of houses were more. Almost all vegetable growers were above the poverty line. Bullocks were dominant farm power along with farm implements. The cycle was main conveyance with all vegetable growers. The radio followed by television was possessed by majority but livestock condition was poor. Good extension contact was observed. The economic motivation, scientific orientation and value-orientations were observed of medium levels.

Key words: block, proportionate, vegetable, extension, value-orientations

Introduction

Diversity is the main characteristic of Indian society. There are well known to a specific occupation right from primitive time. The Yadavas are well known to engage with milk enterprise, Maurya with vegetable production, Jat and Lodhi with agriculture, baniya with business and so on. These majority engaged with these sectors have some specific characteristics. But, the trend has been changing in the economic and materialistic time. As the time is changing the cropping systems, social systems, enterprises systems are also changing and the land is becoming shorter due to division of families.

The vegetables are an excellent choice as a cash crop. Vegetable crops can be grown quickly, produce good yields and generate higher prices as compare to cereals. Vegetable crops are suited for production on small land parcels. Vegetable based industries are emerging as powerful engines for economic growth in rural India. Therefore, it was intended to undertake this survey with the following objectives:

Objectives:

1. To study the personal, social, economical and communication attributes of vegetable growers.
2. To study the economic motivation, scientific orientation and value orientations of vegetable growers.

Methodology

The study was carried out in one of the blocks i.e. Khorabar in Gorakhpur district (U.P.). In this block, maximum vegetable area was observed. A list of all the villages in which vegetables were growing by the farmers in the block was prepared and arranged according to area under vegetable then 4 villages were

selected randomly. A list of vegetable growers of different categories i.e. marginal, small, medium and large farmers for each sampled villages was prepared and 100 respondents from said categories were selected through proportionate random sampling technique. To study the economic motivation and scientific orientation, the scales were employed developed by Supe(1969) and for studying value-orientations, the scale was used developed by Singh and Murthy(1969) with suitable modifications.

Findings

Age: Majority (81%) of the respondents was observed in the middle age category followed by old(15%) and young(4%) respectively (Table 1). Hence, it focuses that the middle agro farmers were mostly engaged in vegetable production in the area of study. The average age was computed to be 46 years with minimum of 30 and maximum 70 years.

Education: The Table 1 shows that out of total respondents, 85% were literate and 15% illiterate. Among 85% literate, 24 and 17% were found having primary and middle standard of education. The other categories of education, like intermediate, high school, graduate, can read and write were found with 13, 11, 10, 9 and 01% respectively. Hence, it may be said that the educational standard of the respondents was considerably good in comparison to average literacy rate of the state and country as such.

Caste: The Table 1 indicates that the maximum number of the respondents (59%) were found belonged to backward caste, followed by general (26%) and scheduled caste (16%) respectively. Thus, it may be

Table: 1: Condition of socio economic attributes of vegetable growers.

N=100			
Variables	Respondents (%age)		
		60001-80000	10
		80001-100000	05
		Above 100000	04
		j.Farm power possession	
		Bullock	60
		Tractor	17
		Electric motor	24
		Pumping set	45
		No farm	25
		k.Farm implements Possession	
		Cultivator	75
		Disc plough	30
		Thresher	43
		Seed drill	02
		Desi plough	86
		Pata	76
		Kudal	100
		Shaval	97
		Winnover	36
		Chalf cutter	69
		l. Transportation material possession	
		Bullock cart	22
		Jeep	11
		Car	05
		Truck	04
		Cycle	98
		Trolley	16
		Scooter/bike	64
		m. Communication media possession	
		Radio	88
		T.V.	59
		Tape recorder	55
		Telephone/mobile	46
		News paper	33
		Agril. Magazines	06
		Agril. Books	21
		General magazines	40
		n.Live stock possession	
		Buffalo	76
		Cow	41
		Goats	22
		Pig	33
		Sheep	04
		o. Utilization pattern of credit supply sources	
		Cooperative society	23
		Land development bank	23
		RRB	18
		SBI	32
		PNB	11
		Money lender	78
		Relatives	70
		Neighbours and friends.	64
		p. Contact with information sources	
		Formal	0.138
		Informal	0.753
		Mass media	0.268
		More than one item have been shown by the respondents hence the total percentage of all the items would be more than 100.	
a. Age Composition			
Young (below 38 yrs)	04		
Middle(39-58 yrs)	81		
Old (above 58 yrs)	15		
Mean	48.66		
S.D.	10.11		
Mini.	30		
Maxi	70		
b. Education :			
1) Illiterate	15		
2) Literate	85		
Can read and write	09		
Primary	24		
Middle	17		
High School	11		
Intermediate	13		
Graduate & above	10		
c. Caste			
General Caste	15		
Backward caste	59		
Scheduled caste	26		
d. Family Type			
Single	30		
Joint	70		
e. Family size			
Up to 6 members	18		
7-11 members	61		
More than 11 members	21		
Mean	9.06		
S.D.	2.69		
Mini.	4		
Maxi	15		
f. Size of land holding			
Marginal (< 1 hect.)	41		
Small (1-2 hect.)	28		
Medium (2-4 hect.)	21		
Large (> 4 hect.)	10		
Mean	1.8		
Mini	0.064		
Maxi	7.2		
g. Occupation			
Agriculture	61		
Service	16		
Caste based	05		
Business	18		
h. Type of house possession:			
Hut	03		
Kuccha	19		
Mixed	36		
Pucca	42		
i. Annual Income			
Below 20,000	02		
20001-40000	55		
40001-60000	24		

concluded that the backward caste was found dominantly engaged in vegetable production in the area of study.

Family type: The Table 1 depicts that the joint family system was found to be dominant (70%) over single family system (30%) among vegetable growers. It means, joint family system is still dominant in the area of study.

Family size: It is evident from the Table 1 that 61 percent respondent were observed such who had 07 to 11 members, 21 percent had more than 11 members and 18 percent were found having up to 06 members in their families.

The average size of family was observed to be 9 members with minimum and maximum in the range of 04 to 15 number of family members. It might be due to dominant joint family system existence in the study area.

Size of land holding: The Table 1 indicates that a maximum number of the respondents (41%) was found in marginal land holding category followed by small, medium and large categories of farmers with 28, 21 and 10 % respectively. The average size of land holding was found to be 1.8 hectare. with minimum of 0.064 and maximum of 7.2 hectares. Therefore, it may be said that the small and marginal farmers were mostly there in the study area.

Occupation: The highest number (61%) of the respondents reported agriculture as their main occupation followed by business (18%), service (16%), caste based occupations (5%) respectively. Hence, it may be noticed that a considerable number of the respondents had occupations other than agriculture for their livelihood.

House possession: Pucca and mixed type of houses were observed maximum as the data indicates in table 1. Hence, the dwelling condition of the respondents was considerably good.

Annual income: The maximum number of the respondents were found in the Annual income range of Rs., 18000 to 150000 with an average of Rs. 47720. Further, maximum number of the respondents (55%) belonged to the category of Rs. 20001 to 40000 followed by 24 and 10 percent respondents to income range from Rs. 40001 to 60000 and Rs. 60001 to 80000 respectively (Table 1)

Farm power possession: Of the total respondents, two third had farm power at their farms. Further, the majority (60%) possessed bullocks followed by pumping set (45%), electric motor (24%) and tractor (17%) respondents respectively. Thus, it focused that the bullocks were the main farm power with vegetable growers in the area.

Farm implements possession: The Table 1 indicates that respondents were reported having Kudal followed by shavel desiplough, pata, cultivator, chaffcutter, thresher, winnower, discplough and seed drill with 97, 86, 76, 75, 69, 43, 36, 30, and 02 percent respectively.

Therefore, the condition of farm implements with the respondents revealed considerably good.

Transportation material possession: An overwhelming majority of the respondents (98%) were found possessing cycle as a main conveyance followed by scooter/bike (64%), bullock cart (22%), trolley (16%), Jeep (11%) and car (05%) respectively. Some of them (04%) were having truck with them (Table 1).

Note: It would be better to note here that the maximum farmers were having marginal or small piece of land, but the condition of farm power, farm implements and transportation materials was considerably good because the farmers use these materials for providing services to other farmers on hired basis.

Communication media- possession: The cent percent respondents were found having mobile/telephone with them followed by radio (88%), television (69%), general magazine (40%), news papers (33%) and agril books (21%) respectively. The telephones/mobiles agril magazines and journals were also reported with as 46, 06 and 02 percent respondents. Hence, it may be concluded that radio and T.V. were main communication media with the respondents (Table 1)

Live stock possession: The Buffaloes, cows, goats, sheep and pig were found mainly having by respective percentage of 76, 41, 22, 04 and 03 respondents respectively. Hence, (Table 1) it may be said that the respondents do not care more as for as livestock rearing in concerned.

Utilization pattern of credit supply sources: There were different credit sources from where the respondents fulfilled their credit needs. The non formal credit sources like money lenders, relatives, neighbours and friends were still dominant sources at this time in the area of study. The other agencies mentioned in the table also fulfilled the credit requirements of the respondents (Table 1).

Contact with information sources: The Table 1 clearly reveals that informal sources of information seem to be most important (mean score 0.752) as generally utilized by most of the respondents. The other i.e. mass media and formal sources were also utilized by the respondents with considerable extent i.e. 0.268 and 0.138 scores respectively. The overall mean of scores for formal, informal and mass media information sources was found to be 0.386 which may be considered neither good nor bad.

Economic motivation: The Table 2 shows that an overwhelming majority of respondents (97%) were found having medium level and only 3 percent were such who had low level of economic motivation. The average mean of scores was observed to be 24.01 with a range of minimum 20 and maximum 26. Hence, it can be concluded that the economic motivation among the

respondents was of medium level.

Table 2: Scientific orientation ,economic orientation and value orientations of vegetable growers.

Variables	Respondents (%age)
a. Scientific orientation	
- Low (up to 23 score)	4
- Medium(24-28 scores)	80
- High(>28 score)	16
- Mean	25.66
- S.D.	2.49
- Mini.	17
- Maxi	30
b. Economic motivation	
- Low (up to 23 score)	3
- Medium(24-28 scores)	97
- High(>28 score)	-
- Mean	24.01
- S.D.	2.67
- Mini.	20
- Maxi	26
c. Value-orientations	
- Low (up to 23 score)	15
- Medium(24-28 scores)	74
- High(>28 score)	11
- Mean	29.67
- S.D.	2.76
- Mini.	22
- Maxi	38

Scientific orientation: A majority of the respondents(80%) was found having medium level of scientific orientation followed by large (16%) and low(4%) respectively. The mean of scores was observed to be 26.66 with a range of minimum 27 and maximum 30(Table 2). Hence, it can be inferred that most of the respondents had medium level of scientific orientation (Table 2).

Value orientations: The Table 2 indicates that Little less than two third of the respondents(74%) were found having medium followed by 15 percent and 11 percent who had low and high level of value orientations. The mean of scores was computed to be 29,67 with a range of minimum 22 and maximum 38. Therefore, it may be concluded that most of the respondents were in the medium level of value orientations.

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Emerging trends of Corporate Social Responsibility in India: An overview

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Abstract

Right and Responsibility are two sides of the same coin but usually we talk more of right and less of responsibility. Put it differently, it is 'Art of Giving' and 'Art of Getting'. The word Getting gives immense pleasure and Giving gets bit pain because of human nature. In the context of commercial undertakings, It is their moral responsibility to give in return to the society because all the resources for performing commercial functions are actually supplied by the society. CSR demands their continuous commitment towards the economic and social development of communities in which they operate. Since India is known as country of great Gurus and Saints so, somewhere the spiritual knowledge given by these great Atmas still prevails, that is why our big business giant have started focussing more toward this noble cause. In this paper an attempt has been made to analyze the fundamental changes in paradigm of corporate social responsibility and the new innovative practices being applied for its implementation in the last decade in India

Key words: Commitment, Guru, Atmas, Discourse, Saint.

Introduction

The concept of social responsibility is beyond any legal definition and cannot be confined to statutory obligations. Indeed it is the moral obligation to do something for the betterment of other without expecting anything in return. So far as our business houses are concerned they required to follow this principle more seriously as they take resource from the society and when things are taken, in that situation they are required to be given back in one way or another. One way in this regard is to see that organizations at least consider the interests of society by taking responsibility for the impact of their activities on customers, suppliers, employees, shareholders, communities and other stakeholders as well as the environment. This obligation is virtually a true way in which organizations can voluntarily show their gratitude toward the stakeholders by taking a step to improve the quality of life for employees and their families as well as for the local community and society.

Objective of the study:

Following are the underlying objectives of the study.

1. To study the tradition and trend of corporate social responsibility in India.
2. To study the relevance of corporate social responsibility in business.
3. To examine the type of corporate social responsibility initiatives undertaken by companies in India.
4. To study the issues and challenges for corporate social responsibility in India.

Research Methodology

In order to achieve the objectives, available secondary data on internet in the form of CSR survey

conducted by various agencies had been used. Information had also been collected from journals, magazines and from various research reports.

Results and Discussion

CSR Survey:

Time to time research agencies have conducted survey for knowing about the type of social responsibility business house are following. Findings of few are as follow:

Partners in Change:

From a sample of 536 companies across India, study revealed that philanthropy is the most significant driver (64 per cent) of CSR, followed by image building (42 per cent), employee morale (30 per cent) and ethics (30 per cent) respectively. The 2004 survey findings present a marked increase in the number of companies developing and adopting CSR policy as against the earlier findings in 1999 and 2000.

Business Community Foundation for TERI-Europe:

The survey sought to explore the perception of workers, company executives and general public about social, economic and environmental responsibilities. It was found that all companies irrespective of size or sector have awareness of CSR and its potential benefits.

Times Foundation:

Survey revealed that over 90 per cent of all major Indian organizations surveyed were involved in CSR initiatives. The leading areas that corporations were involved in were livelihood promotion, education, health, environment, and women's empowerment. Most of

CSR ventures were done as internal projects while a small proportion were as direct financial support to voluntary organizations or communities..

KPMG's Aid and Development Service:

Survey concluded that Most of companies tend to give to charities than make long-term development commitments. When a company voluntarily opens up for self-evaluation, it creates value for shareholders when competing with other companies. However KPMG-CSR survey has presented a range of motivating factors and drivers for CSR which are discussed in Table 1.

Table 1: Marketing factors and their priority

Drivers	Priority in (%)
Economic Considerations	74
Ethical Consideration	53
Innovations and Learning	53
Employee Motivation	47
Risk Management or risk reduction	47
Access to capital or increased shareholder value	39
Reputation or brand	27
Market share improvement	21
Strengthened supplier relations	13
Cost saving	9
Improved relationship with governmental authorities	9
Others considerations	11

(Source: KMPG Survey Report)

Asian Governance Association:

Focus of the survey was the ranking of the countries on the bases of CSR parameter, which ranks the top 10 Asian countries on corporate governance parameters, India has consistently ranked among the top three along with Singapore and Hong Kong, for the last eight years.

Automotive research company:

In this study, India has been ranked second in global corporate social responsibility. The study was based on a public goodwill index and India received

Table 2: Different phases of CSR in India

Phases	Period	Year	Nature of CSR
First	Pre-industrialization	1800	CSR activities were undertaken in the form of philanthropy with religious belief.
Second	Pre-industrialization	1800-1914	CSR activities were undertaken in the form of donations with social welfare objectives.
Third	Industrialization	1950- 1980	CSR activities were undertaken in the form of responsible behaviour with progressive approach.
Forth	Post- industrialization	1980	until Today CSR activities are being performed in various form by keeping in view multi stakeholders benefit.

119 points in the index against a global average of 100. Thailand was at the top slot with 124 points.

Karmyog CSR Rating:

It rated 500 largest Indian Companies based on their CSR activities. The companies were rated on 0 to 5 levels based on criteria's like products & services, reach of CSR activities, expenditure on CSR, harmful processes etc. On the bases of above mentioned survey detail, we can talk about area of corporate social responsibility.

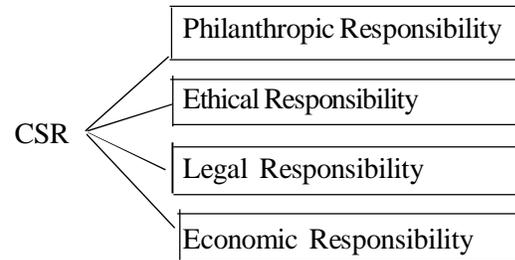


Figure 1: Area of CSR

Trend of CSR:

To understand the history of CSR along with its changing nature, there is a need to go through different phase of CSR in India.

Indian scenario:

India is a country of great Gurus and Saints and their spiritual discourse teaches us the theory of karma and paves the way for other to perform the same for the benefits of all. Concept of corporate social responsibility is not new for India. India was aware of corporate social responsibility due to the efforts of organisations such as the Tata Group, Birla and Reliance Industries etc. With the passages of time organization have started showing their concern toward this noble cause with different magnitude. Following detail shows the list of innovative programmes which Indian firms are now carrying out as gesture for the welfare of society.

Moreover, a positive gesture shown toward the society either by entrepreneur or by NGO's which has been noticed recently, are really praise worthy.

Liquor icon Vijay Malaya brought 'Belonging of Gandhi

Table 3: Innovative programmes carried out by Indian farmers for the welfare of the society

S.No.	Organization	Nature	CSR Initiative.
1.	BHEL	Electronic	Disaster management..
2.	Lupin India Ltd,	Pharmaceuticals	Agricultural based project.
3.	SAIL	Steel.	Medical, Environment conservation and education etc.
4.	Ranbaxy	Pharmaceuticals	Mobile healthcare vans and Urban welfare centres that reach over a lakh people in country.
5.	Tata Consultancy	IT	Fully-equipped computer training laboratory and Research Centre for imparting basic computer knowledge.
6.	Bharat Electronic, Ltd	IT	Cyclone proof houses for the victims of the super cyclone.
7.	Mahindra & Mahindra Automobile		Employee Social Option scheme for better social life.
8.	GlaxoSmithe	Pharmaceuticals	Medical check-up health camps and health awareness programs.
9.	Bajaj	Electronic	Education, Rural Development & Environment.
10.	Aptech Limited,	Computer education	Fostering education throughout the country since inception

Source: Data from internet

Ji' by paying worth crores of rupees as mark of respect for the 'Nation' as well as for this 'Mahan Atma'.

Aircel's initiative to 'Save Tiger' is also thing which is praise worthy.

NDTV initiative to 'Go Green', 'Save Costal' and 'Education drive' is equally creditable act for the betterment of society.

- Cellular icon Idea's slogan to 'Save Paper' is good initiative to perform social obligation.
- JCB India adopted a Government school, in the vicinity of the company premises as its social responsibility.

Drivers pushing business towards CSR:

Corporations are powerful institutions that can make a significant difference to society. That difference can be a positive contribution or it could equally be harmful. Learning about Corporate Social Responsibility contributes to better thinking about what is morally right and wrong with the decisions and activities of these institutions. This knowledge can produce decisions and behaviour that meet the demands of stakeholders for greater accountability (Gail,2010). Corporate reputation provides a powerful competitive edge when tendering for lucrative contracts. In fact, many potential clients who operate their own CSR programmes want to see their suppliers are pursuing similar altruistic aims. Perhaps a somewhat less altruistic justification for CSR is that society often finds it easier to overlook or forgive some less desirable business decisions if the organisation is seen to be investing heavily for the benefit of society (turn the coin.com). Investors are changing the way they assess companies' performance, and are making decisions based on criteria that include ethical concerns. The Social Investment Forum reports that

in the US in 1999, there was more than \$2 trillion worth of assets invested in portfolios that used screens linked to the environment and social responsibility. A separate survey by Environics International revealed that more than a quarter of share-owning Americans took into account ethical considerations when buying and selling stocks (www.iisd.org).

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Effect of levels and depth of sprinkler irrigation for mustard (*Brassica juncea* L)

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Abstract

An experiment was conducted at farmer's field in Gang canal command on sprinkler irrigation in mustard for three consecutive years during rabi 2004-05 to 2006-07. The treatments comprising of the combination of 3 levels of sprinkler irrigation (One irrigation at 50 DAS, two irrigations at 40 & 80 DAS and three irrigations at 35, 70 & 105 DAS) and 3 depths of irrigation (4, 5 and 6 cm) along with one control treatment of border strip irrigation at 40 and 80 DAS. The total ten treatments were replicated three times in Randomized Block Design. On the basis of experimentation, it was found that the application of two irrigations through sprinkler to mustard crop gave significantly higher seed yield. The significantly higher seed yield of mustard (2334 kg/ha) was also recorded with the application of 6 cm irrigation water/irrigation. Two irrigations to mustard at 40 & 80 DAS each of 6 cm depth through sprinkler has been found the optimum irrigation schedule for the mustard crop. It increased 15.7 % seed yield and saved 20.1 % irrigation water over conventional boarder strip irrigation. The water use efficiency (8.11 kg/ha mm) was also higher in sprinkler irrigation as compared to border strip irrigation (5.74 kg/ha mm).

Key words: mustard, sprinkler, optimum, schedule, irrigation

Introduction

Increasing demand of water in agriculture, industries and drinking purpose with increasing population and its mismanagement have depleted our water resource considerably to a low level. For sustain agriculture production in accordance of the population growth, one of the immediate efforts is to be bring larger area under irrigated cultivation. As much as 40% losses are known to occur in earthen channel conveyance, which goes up to 70% when total seepage in field distributions are accounted for in conventional method of irrigation under depleting water resource conditions. The availability of irrigation water in agriculture is becoming the most critically limiting input in crop production. Use of sprinkler irrigation system has been encouraged in present decade as a mean of efficient utilization of water resource and water saving. But precise information with regard to its efficacy against border strip method of irrigation and its appropriate scheduling for different crop grown under different agro-climatic conditions are lacking. It is therefore necessary and useful to carry out an investigation to determine its efficacy in terms of water saving vis-à-vis yield in comparison to border strip method of irrigation and to work out its optimum schedule of irrigation for mustard crop. Mustard is the second important oilseed crop of the country, after groundnut it play a significant role in the oil economy. In spite of the potential of the varieties, our average

productivity is very low (about 1.0 t/ha) as compared to other countries ie UK (about 4.0t/ha) France (about 3.0t/ha). Rajasthan is the leading state with nearly 43 percent of the total area of mustard. Mustard is grown on conserved moisture in major area and the crop face moisture stress. By adopting sprinkler irrigation system, the yield of mustard may be increased by 30-40% with same quantity of irrigation water. Due to the gradual depletion of water resources, the situation is again changing and time may come, when farmers may hardly get water to apply sufficient water to irrigate their crop. The present study was under taken to determining the optimum amount of irrigation water required in producing appreciable and sustainable mustard yields.

Materials and Methods

An experiment was conducted at farmer's field in Gang canal command on sprinkler irrigation in mustard for three consecutive years during rabi 2004-05 to 2006-07. The treatments comprising of the combination of 3 levels of sprinkler irrigation (One irrigation at 50 DAS, two irrigations at 40 & 80 DAS and three irrigations at 35, 70 & 105 DAS) and 3 depths of irrigation (4, 5 and 6 cm) along with one control treatment of border strip irrigation at 40 and 80 DAS. The total ten treatments were replicated three times in Randomized Block Design. The soil of experimental site was sandy loam in texture, low in organic carbon

(0.14%), medium in available P_2O_5 (39 kg/ha) and high in available K_2O (393 kg/ha). The pH (1:2) and EC (1:2) of the soil were 8.30 and 0.72 dS/m, respectively. A uniform basal dose of 30 kg N/ha + 32 kg P_2O_5 /ha was applied at the time of sowing and rest of N (30 kg N/ha) was applied through top dressing at first irrigation. Mustard variety Luxmi was sown during all the years.

Results and Discussion

On the basis of experimentation, it was concluded that the flood irrigation gave at par yield with the average yield received from sprinkler irrigation system. The application of two irrigations through

sprinkler to mustard crop gave significantly higher seed yield (2259 kg/ha) over one (1824 kg/ha) and border strip irrigation (2017 kg/ha), respectably. However, three irrigations to mustard through sprinkler irrigation did not show any significant response over two irrigations (Table 1). The yield attributing characters like number of pods /plant, number of seeds /pod, primary branches /plant and test weight also increased significantly up to two irrigations through sprinkler (Table 2). Singh et al 2006 found an increase in the seed yield in mustard with the sprinkler irrigation in Bihar, Yadav et al 1994 observed that mustard crop gave highest yield with two irrigations. Water expense

Table 1: Effect of irrigation schedules and depth of irrigation water on mustard productivity

Treatments	Seed yield (kg/ha)				Stover yield (kg/ha)			
	2004-05	2005-06	2006-07	Pooled	2004-05	2005-06	2006-07	Pooled
1 irrigation (I_1)	2098.11	1849.64	1523.15	1823.63	3339	2971	2541.94	2950.39
2 irrigations (I_2)	2312.23	2181.97	2282.41	2258.87	3530	3230	3509.08	3423.03
3 irrigations (I_3)	2332.37	2328.53	2372.69	2344.53	3597	3297	3562.56	3485.67
S. Em. \pm	63.59	65.72	64.15	37.23	71	94	143.08	61.95
CD at 5%	188.91	195.23	190.57	105.30	NS	NS	425.07	175.20
4 cm (D_1)	1919.88	1870.51	1847.22	1879.20	3389	3068	3071.11	3176.26
5 cm (D_2)	2350.66	2137.67	2152.78	2213.70	3488	3162	3226.03	3292.01
6 cm (D_3)	2472.18	2351.95	2178.24	2334.13	3589	3267	3316.44	3390.81
S. Em. \pm	63.59	65.72	64.15	37.23	71	94	143.08	61.90
CD at 5%	188.91	195.23	190.57	105.30	NS	NS	NS	5NS
Sprinkler	2247.57	2120.05	2059.41	2142.34	3489	3166	3204.53	3286.36
Border strip	2104.13	2002.08	1944.44	2016.89	3519	3150	3048.07	3238.91
S. Em. \pm	110.14	131.43	128.29	74.47	124.3	164	286.16	123.90
CD at 5%	NS	NS	NS	NS	NS	NS	601.23	260.32

Table 2: Effect of irrigation schedules and depth of irrigation water on yield attributes and on Water use efficiency of mustard

Treatments	Plant Height (cm)	Primary Branches/plant	Secondary Branches/pod	No. of seeds/plant	No. of pods/(g)	Test weight	Plant stand/ meter row length (kg/ha mm)	Water use efficiency
1 irrigation (I_1)	147.16	4.24	8.01	14.61	232.30	4.42	6.51	8.33
2 irrigations (I_2)	158.75	4.93	9.04	15.00	284.64	4.61	6.46	8.37
3 irrigations (I_3)	166.27	5.11	9.75	15.65	301.57	4.72	6.44	7.63
S. Em. \pm	1.96	0.13	0.21	0.26	6.43	0.05	0.18	0.14
CD at 5%	5.54	0.37	0.60	0.73	18.19	0.15	NS	0.40
4 cm (D_1)	154.70	4.31	7.90	14.64	240.30	4.49	6.33	7.68
5 cm (D_2)	158.75	4.83	9.04	15.18	279.21	4.60	6.52	8.36
6 cm (D_3)	158.73	5.14	10.06	15.45	298.01	4.66	6.55	8.28
S. Em. \pm	1.96	0.13	0.21	0.26	6.43	0.05	0.18	0.14
CD at 5%	NS	0.37	0.60	0.73	18.19	NS	NS	0.40
Sprinkler	157.39	4.76	9.00	15.09	272.84	4.60	6.47	8.11
Border strip	166.41	4.80	9.00	14.64	260.02	4.47	6.34	5.74
S. Em. \pm	3.92	0.26	0.42	0.52	12.86	0.11	0.36	0.28
CD at 5%	8.23	0.55	0.89	1.08	27.02	NS	NS	0.59

efficiency is generally considered as a conservative term and is expressed as the ratio of economic yield to water supply expressed in term of ET or transpiration on daily or seasonal basis. The water expense efficiency was maximum (8.37 kg/ha mm) when two irrigations through sprinkler to mustard crop was applied, while it was minimum (7.63 kg/ha mm) with the application three irrigation to the mustard crop (Table 2). Sharma and Singh 1993 also observed lower level of water use efficiency with higher amount of irrigation water.

Further, the seed yield of mustard increased significantly with every increase in depth of irrigation from 4 to 6 cm. The significantly higher seed yield of mustard (2334 kg/ha) was recorded with the application of 6 cm irrigation water/ irrigation over its lower depths. Almost similar trend was observed in case of plant height, primary and secondary branches/plant and number of pods/plant during all the years. Dobariya and Mehta 1994 found that application of 50mm irrigation depth was optimum with higher water use efficiency at Gujrat.

Two irrigations to mustard at 40 & 80 DAS each of 6 cm depth through sprinkler has been recommended. It increased 15.7 % seed yield and

saved 20.1 % irrigation water over conventional boarder strip irrigation. The water use efficiency (8.11 kg/ha mm) was also higher in sprinkler irrigation as compared to border strip irrigation (5.74 kg/ha mm).

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Coefficient of correlation between entrepreneurial behaviour and empowerment level of women entrepreneurs

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Abstract

A woman, who is exhibiting enterprise survival, sustaining and making successful oriented behaviour is known as entrepreneur. Being an entrepreneur without being from familial business background, she gets empowerment in all spheres of life. So in the present study, an effort is made to know the relationship between entrepreneurial behaviour and empowerment level of women entrepreneurs. Fifteen women entrepreneurs' from each zonal area was selected running both boutiques and beauty parlours in Agra city. Primary data were collected through interview schedule. Based on the nature of data and relevant information, coefficient of correlation was used as a statistical measure. The study concluded that significant and positive correlation was found between entrepreneurial behaviour. The findings of this study will help to fresh researchers in finding new ways of sharpening indicators of entrepreneurial behaviour in their study, so that empowerment level of women entrepreneurs could increase.

Key words: entrepreneurial behaviour, empowerment

Introduction

Entrepreneurial behaviour of women entrepreneurs exhibits such kind of behaviour for promoting entrepreneurial performance in the entrepreneurial world. General behaviour consists of knowledge, attitude and skills. In case of entrepreneurial behaviour, women entrepreneurs have some required attributes and exhibits same required attributes for making their enterprise sustainable, survivable and successful. Mainly these attributes are; achievement motivation, risk-taking, locus of control, organisational skills, individual responsibility, knowledge of results of decision, money as a measure of results, creativity, setting objectives, self-confidence, need for independence, autonomy, energy, self-esteem, innovation, leadership, self-reliance etc. Having and exhibiting above entrepreneurial attributes, women entrepreneurs become capable in facing/confronting coming hidden challenges in the path of entrepreneurial and familial life success. Therefore, by keeping the practice of these entrepreneurial attributes of women entrepreneurs become empowered. Empowered women entrepreneurs can be easily identified in difference of their body, mind and soul, means their way of walking and postures, intellectual performance in taking decisions and their devoteeness to their enterprise and family. In the present paper correlation coefficient is analysed between entrepreneurial behaviour and empowerment level of women entrepreneurs.

Research Methodology

Agra division of Uttar Pradesh was selected as

the locale for the present study by using purposive sampling. Agra division comprises of seven districts. Out of which, Agra district has been selected randomly. For the purpose of administration, Agra district was divided into two areas; Agra urban and Agra rural. Agra urban was selected randomly for the present study. According to the requirements and to have balanced distribution of the respondents, the investigator divided Agra city into four zones; North-East Zone; North-West Zone; South-East Zone and South-West Zone. Fifteen women entrepreneurs running both boutiques and beauty parlour from each zonal area were selected. Thus, sixty women entrepreneurs were selected for the present study. Descriptive type of research design was used.

Based on the nature of data, relevant information and calculating correlation coefficient between entrepreneurial behaviour (achievement motivation and risk taking willingness) and levels of empowerment of women entrepreneurs like decision making, sense of personal efficacy and achievements after venturing into an enterprise. Karl Pearson's co-relation coefficient was used as statistical measure.

Results and Discussion

Relationship between entrepreneurial behaviour and empowerment level of women entrepreneurs was studied under three heads namely; correlation coefficient between entrepreneurial behaviour and decision making, entrepreneurial behaviour and sense of personal efficacy, and entrepreneurial behaviour and achievements after venturing into an enterprise.

Table 1: Correlation coefficient between entrepreneurial behaviour and decision making of entrepreneurs.
N = 60

S.No.	Entrepreneurial behaviour	Correlation coefficient (r)
1.	Achievement motivation	+ 0.264*
2.	Risk-taking willingness	+ 0.287*

* significant at 5% level of significance

The values presented in table 1 shows a significant and positive correlation between entrepreneurial behaviour and decision-making of entrepreneurs. The indicators of entrepreneurial behaviour are achievement motivation ($r = + 0.264^*$) and risk-taking willingness ($r = + 0.287^*$). This suggests that with the increase in achievement motivation and risk-taking willingness, decision-making power among entrepreneurs also increase.

Table 2: Correlation coefficient between entrepreneurial behaviour and sense of personal efficacy of entrepreneurs.
N = 60

S.No.	Entrepreneurial behaviour	Correlation coefficient (r)
1.	Achievement motivation	+ 0.374**
2.	Risk-taking willingness	+ 0.293*

* significant at 5% level of significance

** significant at 1% level of significance

The relationship between entrepreneurial behaviour and sense of personal efficacy of entrepreneurs was examined with Pearson's coefficient of correlation.

The values presented in table highlights a significant and positive correlation between entrepreneurial behaviour and sense of personal efficacy of entrepreneurs. The indicators of entrepreneurial behaviour are achievement motivation ($r = + 0.374^{**}$) and risk taking willingness ($r = + 0.293^*$). This suggests that with the increase in achievement motivation and risk-taking willingness, sense of personal efficacy among entrepreneurs also increase.

Similar findings have been reported in few earlier studies also. For example, Prasad (1983) had reported a high and significant relationship between self-reliance and achievement in the case of rice farmers.

Bandura et al. (1997) found that a strong sense of personal efficacy is related to better health, higher achievement and creativity, and to better social integration.

Vinayagam (1998) had reported that high self-reliance was attributed to high entrepreneurship behaviour.

Table 3 : Correlation coefficient between entrepreneurial behaviour and achievements after venturing into an enterprise of entrepreneurs.
N = 60

S.No.	Entrepreneurial behaviour	Correlation coefficient (r)
1.	Achievement motivation	+ 0.398**
2.	Risk-taking willingness	+ 0.348**

** Significant at 1% level of significance

The relationship between entrepreneurial behaviour and achievements after venturing into an enterprise of entrepreneurs was examined with Pearson's coefficient of correlation.

The values presented in table indicates a significant and positive correlation between entrepreneurial behaviour and achievements after venturing into an enterprise by entrepreneurs. The indicators of entrepreneurial behaviour are achievement motivation ($r = + 0.398^{**}$) and risk-taking willingness ($r = + 0.348^{**}$). This suggests that with the increase in achievement motivation and risk-taking willingness, achievement among entrepreneurs also increase.

Conclusion

Significant and positive correlation was found between entrepreneurial behaviour and empowerment indicators namely; decision-making power, sense of personal efficacy and achievements after venturing into an enterprise. It can be summarised from the findings that women having need, exhibiting behavioural attributes, will power, desire in achieving predetermined entrepreneurial goals and bearability of risk-taking willingness, entrepreneur become empowered in both the role as an entrepreneur and as housewife. If a woman is sole proprietor of the enterprise, she will take all kind of decision, have deeper sense about herself and be responsible for achievements after venturing into an enterprise that will affect their personality in all sphere of life.

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Factors affecting the quality of work life among women workers – A study of Jammu sased SME Units

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Abstract

Women are largely underrepresented in the SMEs workforce. Our study examines the factors related to the work environment that may contribute to the high turnover of women in the SMEs workforce. The literature links Quality of Working Life (QWL) to turnover intention, and turnover intention to turnover. In this study, we conducted secondary data analysis of questionnaire data collected from a sample of 60 employees of different SMEs around Jammu region. This research study examines the impact of gender and job type on various indicators of QWL, as well as on the relationship between job factors and QWL. The results show that, specifically for women in skilled jobs, task identity is highly associated with QWL. The following QWL factors were examined: Job Satisfaction, Fatigue, Tension, Organizational Involvement and Burnout. The following predictors of QWL were studied: Job Demands, Role Ambiguity, Decision Control, Challenge and Demographics (age, marital status, parental status, and education).

Key words: SMEs, questionnaire, skilled, Challenge and Demographics

Introduction

In its broadest sense, QWL means the sum total of values, both material and non-material, attained by a worker throughout his career life. QWL includes aspects of work-related life such as wages and hours, work environment, benefits and services, career prospects and human relations, which is possibly relevant to worker satisfaction and motivation. In fact the notion of QWL is closely related to the quality of life concept. Parallel concept such as humanization of work is also used. In Europe, the usual expression is “improvement of working conditions”, “working environment”, “democratization of workplace” while in the socialist countries, the term is “workers protection” and in the case of Japan, similar concepts of hatarakigai and ikigai are used.

It is evident from history that, work occupies an important place in the life of human beings. How people have thought and felt about the working experience has also been an age-old concern for both workers and managers. The expression quality of working life (QWL) was probably coined originally at the first international conference on QWL at Arden House in 1972 (Davis and Cherns 1975). Mills (1978) probably coined the term quality of working life and suggested that it had moved permanently into the vocabulary of unions and management, even if a lot of people using it were not exactly sure what territory it covered.

During the twentieth century, our social science conceptualizations regarding work have been labeled scientific management, human relations, socio-technical systems theory, and now possibly holistic learning organizations. In the present study, we are concerned with how a women employee perceives a high-quality working-life experience in SMEs. There are a number of reasons why investigation of the perceptions of quality of working life for employees requires thorough research.

Many employees today are spending more time in the workplace in response to job insecurity, workplace demands, perceived career needs, financial pressures, and so forth. To a large extent, the rise in working hours has been greatest among members of dual-earner and dual-career families where both husbands and wives work. Increases in the mean number of hours people work, the growing number of women in the work force, and the increased participation of women with preschool children in the work force have contributed to concern about balancing the demands of work and family settings. Accordingly, the rising number of two-income households is heightening the concern for employees' quality of work life, as is the changing element of the meaning of success, and the changing expectations regarding self-fulfillment. The quality of life for the working population has been conceptualized as derived from satisfactions experienced through having a good

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job and a good life.

Objectives

We first compare QWL among women and men. We then examined whether the relationship between job characteristics / demographics and QWL varies for women and men.

Methodology

The selection of SMEs around Jammu region was captured from the database of J&K Industries directories and individual directories obtained from various Industrial hubs across Jammu region.

Participants within the participating companies were identified based on two characteristics:

(1) the respondents job was within the SMEs sector workforce; and (2) they have worked in their current job for two months or more. The data collection items were selected from the already developed tool which used a 139-item questionnaire (Carayon, Schoepke, Hoonakker, Haims, & Brunette, 2004). Data collection for this project started in September 2010 and was completed in May 2011.

Sample

The sample was classified under five companies varying of their employee size. Company-1: SME firm with 50 or more professionals with (n=20). Company-2: SME firm with 30-49 professionals with (n=16). Company-3: SME firm with 20-29 professionals with (n=12) Company-4: SME firm 10-19 professionals with (n=8). Company-5: SME firm with less than 9 professionals with (n=4). Table 1 shows the demographics of the sample as shown below.

Table 1: Sample Demographics

Gender	Total Respondents	% age
Male	34	56.67%
Female	26	43.33%
Total	60	100.00%

The total sample size was 60. The sample was so selected that each category of Company represented 40% of the respondents. The completed questionnaires were collected by the author(s). The response rate for employees was 79.4 per cent. This high response rate is probably due to the commitment of senior management to the study and the

Table 2: Sample Demographics

	Age of respondent	Gender of respondent	Marital Status of respondent	Parental Status of respondent	Hierarchy Level of Position of respondent	Educational Status of respondent
Mean	32.02	1.43	1.70	1.28	1.65	2.98
N	60	60	60	60	60	60
Std. Deviation	6.578	.500	.462	.454	.709	1.017
% of Total N	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

conscientious follow-up of the organizational representative for the project. The sample analysis revealed that there were 43.33% women and 56.67% men. The average age of the respondents being 32 years. The marital status being that most of the respondents are living alone. Parental status being that most of the respondents have children. Furthermore, most of the respondents belonged to Middle Level Management and possessed Graduation Degree; this has been represented as in Table 2.

Measurement Device

To measure job characteristics and QWL we used existing scales that were found to be valid and reliable in previous research. All scales we used in the questionnaire were rated on five point Likert Scale. The measures of Job Characteristics (JC) included the following scales: *Job Demands for the Skilled workforce* (adapted from Quinn et al., 1971; $\alpha = 0.87$); *Role Ambiguity* (Caplan, Cobb, French, Harrison, & Pinneau, 1975; $\alpha = 0.87$); *Decision Control* (McLaney & Hurrell, 1988; $\alpha = 0.89$); and *Challenge* (Seashore, Lawler, Mirvis, & Cammann, 1982; $\alpha = 0.82$). The following QWL factors were measured: *Job Satisfaction* (Quinn et al., 1971; $\alpha = 0.78$); *Fatigue* (Grove & Prapavessis, 1992; $\alpha = 0.88$); *Tension* (Swanson, 1997, unpublished data; $\alpha = 0.81$); *Organizational Involvement* (Cook & Wall, 1980; $\alpha = 0.72$); and *Burnout* (Leiter & Schaufeli, 1996; Maslach & Jackson, 1985; $\alpha = 0.91$).

Table 3 represents the QWL, JC and overall Cronbach's Alpha values for the parameters used for the study under reference,

Table 3: Overall Cronbach's Alpha value

	Cronbach's Alpha	No. of Items
QWL	0.698	5
JC	0.878	4
Over all	0.886	9

Results and Discussion

Analysis was conducted using the statistical software program IBM SPSS® 19.0. To look for significant differences between women and men in the QWL factors as well as JC factors, the mean values reported by women and by men (gender item) were compared using independent t-test, as shown in Table 4.

Table 4: Group Statistics for QWL factors w.r.t. Gender

	Gender of Respondent	N	Mean	Std. Deviation
QWL: Job Satisfaction	Male	34	1.59	0.857
	Female	26	2.00	0.748
QWL: Fatigue	Male	34	2.29	0.760
	Female	26	2.62	0.898
QWL: Tension	Male	34	2.15	0.892
	Female	26	2.27	0.667
QWL: Organizational Involvement	Male	34	1.85	0.892
	Female	26	2.12	0.711
QWL: Burnout	Male	34	2.29	0.676
	Female	26	2.54	0.508
JC: Job Demands	Male	34	1.79	0.808
	Female	26	1.92	1.055
JC: Role Ambiguity	Male	34	2.26	0.751
	Female	26	2.54	1.029
JC: Decision Control	Male	34	2.18	0.797
	Female	26	2.31	0.736
JC: Challenge	Male	34	1.91	0.866
	Female	26	2.58	0.945

The Independent t-test administered on QWL factors revealed that at 95% as well as 99% confidence level: Job Satisfaction and Tension were significant factors (with values of 'p' as 0.048 & 0.011 resp.), while other three items, viz, Fatigue, Organizational Involvement & Burnout were insignificant.

The Independent t-test administered on JC factors revealed that at 95% as well as 99% confidence level: only one item, viz, Role Ambiguity was significant factors (with values of 'p' as 0.034), while the items, viz, Job Demand, Decision Control were insignificant. Furthermore, Challenge item was found to be significant at 2 - tailed with significant value of 0.006.

Cross-Sectional Tables were constructed for finding out the statistical difference between five factors of QWL and JC factors with demographic items, viz, Age, Gender, Marital Status, Parental Status, Position of Respondent & Educational Qualification independently.

The cross-sectional tables revealed that the Person's Chi-Square values for the QWL factors as shown in Table 5 were found significant, w.r.t., respective demographics.

The cross-sectional tables revealed that the Person's Chi-Square values for the JC factors as shown in Table 6 were found significant, w.r.t.,

Table 5: Pearson's Chi-Square for QWL factors w.r.t. relevant Demographics

QWL Factor	Job Satisfaction	Fatigue	Tension	Fatigue	Tension
Demographic Item	Gender	Gender	Gender	Hierarchy Level	Hierarchy Level
Pearson's Chi-Square Value	10.473	14.682	6.810	12.455	9.920
Degree of Freedom (df)	3	3	2	6	4
Asymptotic Significant (2 sided)	0.015	0.002	0.033	0.053	0.042

respective demographics.

Table 6: Pearson's Chi-Square for JC factors w.r.t. relevant Demographics

JC Factor	Role Ambiguity	Challenge
Demographic Item	Gender	Gender
Pearson's Chi-Square Value	9.755	11.787
Degree of Freedom (df)	3	3
Asymptotic Significant (2 sided)	0.021	0.008

Table 7 shows the results of the regression analysis with the QWL factors as Dependent Variables while JC factors and relevant Demographics as Independent items, wherein the statistics are based on the cases where 'Gender=Male'.

The Durbin-Watson Statistics represents the test for serially correlated (auto-correlated residual) and the statistics for this clearly shows that Job Satisfaction, Tension, Organizational Involvement & Burnout are positive auto-correlation. In other words, Female respondents have shown positive auto-correlation with following factors of Quality of Work Life: Organizational Involvement & Burnout, while they have shown negative auto-correlation with following factors of QWL: Job Satisfaction, Fatigue & Tension.

Based on the literature, we expected that women in SME jobs would report poorer QWL than men in

Table 7: Regression Analysis with Durbin-Watson Statistics

Dependent Factor	Job Satisfaction	Fatigue	Tension	Organizational Involvement	Burnout
Independent Factor(s)	Job Characteristics (all four items); Demographics (Age, Marital Status, Parental Status, No. of Employees, Hierarchical Level, Educational Status)				
R Square Value	0.535	0.485	0.534	0.571	0.476
Adjusted R Square Value	0.333	0.261	0.331	0.384	0.249
Durbin-Watson Statistics (Gender=Male Selected)	1.390	2.023	1.934	1.976	1.975
Durbin-Watson Statistics (Gender=Male Not-Selected)	2.965	2.216	2.253	1.623	1.894

SME jobs (Baroudi & Igbaria, 1995; Igbaria & Greenhaus, 1992), leading to greater turnover for women in SMEs. It can be seen that in our sample women in SME jobs do report poorer QWL than men in SME jobs, as regard to job satisfaction. On the contrary, women report greater organizational involvement than men. Further research needs to be conducted to validate our results on QWL for SME employees. There were some differences between gender (women and men) with regard to the job characteristics that influenced QWL. Only for gender, Job Satisfaction, Fatigue & Tension are related, while Fatigue & Tension are also related to Hierarchy level. Further research needs to be conducted to understand the relationship that children and family play in QWL in the SME workforce. The strength of this study is the range of participating companies. Data was collected from Small & Medium companies, thus providing a diversity of working conditions and work environments of the SME workforce population. Another strength of this study is the questionnaire used to collect the data. The questionnaire was developed in a systematic process (Carayon, Brunette, Schwarz, Hoonakker, & Haims, 2003; Carayon et al., 2004), thus contributing to the validity of the measures.

A limitation of this study is the method in which the data was collected and segregated into five categories of companies with at least 40% of respondents from each category, thus limiting the generalizability of the results. In addition, data was collected in a limited time span period posed the risk of generalization in the analysis.

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Genetic Studies in Tomato (*Solanum lycopersicon* Mill.) Hybrids grown in Kymore Plateau

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Abstract

The present investigation revealed that the phenotypic coefficient of variation was higher than the corresponding genotypic coefficient of variation for all the traits under study. High phenotypic and genotypic coefficient of variation was recorded for the fruit yield per plant (kg). High heritability coupled with high genetic advance as percentage of mean was recorded for the number of fruits per plant. High heritability with moderate genetic advance as percentage of mean was observed in the number of flower clusters per plant and number of fruits per cluster.

Key words: Tomato, variability, heritability, genetic advance

Introduction

Tomato (*Solanum lycopersicon* Mill.) is a native of Tropical America (Thompson and Kelly, 1957). Tomato is the important vegetable amongst the solanaceous group. It is one of the most important protective fruit vegetable for both health and wealth because of its special nutritive value and wide spread production. The area and production of tomato in our country was about 5.72 lakh ha and 102.60 lakh tonnes respectively (National Horticulture Board database 2008-09). The ripened tomato fruits have medicinal properties and also contain vitamins A, B and C. It is reported to have anticancerous properties and also useful in chronic dyspepsia (Gupta and Gupta, 2004). The presence of genetic variability in a population is of prime importance for any successful breeding programme. Greater variability in crop plants provide an opportunity for selecting desirable types. Selection is effective in a population having high heritability in the population. Tomato is a classical example of self pollinated vegetable crops. Hybrids are reported to be more responsive to higher doses or fertilizers than the pureline varieties. Some new tomato hybrids are evaluated and tested by various research stations for judging their performance under different sets of agro-climatic zone of the country over popular hybrids.

Materials and Methods

The experiment was conducted at the Horticulture Research Complex, Department of Horticulture, Maharajpur, JNKVV, Jabalpur (M.P.) during the rabi season 2009-2010. The experiment was laid out in Randomized Complete Block Design with three replications and each replication consisted of thirty eight genotypes. Planting was done at a spacing

of 50 x 60 cm between rows and plants after the soil treatment. The data based on the mean of individual plants selected for observations were statistically analyzed by the method as described Panse and Sukhatme (1963) to find out the total variability present in the material under study. The heritability and genetic advance was estimated by the method given by Hanson *et al.* (1956) and correlation coefficients by the method as discussed by Miller *et al.* (1958).

Results and Discussion

Analysis of variance recorded high significant difference among all the growth and yield contributing characters under study. The efficiency of selection largely depends on the extent of genetic variability present in the population. Yield is regarded as a complex character and is influenced by many component traits both in positive and negative direction. Therefore, the use of biometrical studies on variability, heritability and genetic advance provides useful information for the selection of desirable traits. The genotypic coefficient of variation among the hybrids ranged from 3.83% to 26.23% for different characters. High genotypic coefficient of variation was observed for fruit yield per plant (26.23%) followed by number of fruits/plant (23.55%), acidity % (22.77%), number of flower cluster per plant (17.20%), number of fruits per cluster (15.44%), TSS (13.19%), weight of fruit/g (12.66%), length of fruit (13.19%), shelf life (11.65%), girth of fruit (10.72%), plant height at 30 DAT (10.43%), number of branches per plant (9.06%), plant height at 60 DAT (7.49%), plant height at 90 DAT (7.25%), days to 50 % flowering (6.63%), plant height at final picking (5.86%). While, low genotypic

coefficient of variation was recorded for days to first fruit setting (3.83). These results are in consonance with Asati *et al.* (2008) and Anjum *et al.* (2009). The phenotypic coefficient of variation ranged between 4.88% and 29.18% for different characters. Highest phenotypic coefficient of variation was observed for the characters viz., fruit yield per plant (29.18%) followed by the number of fruits per plant (24.26%), acidity % (24.05%), number of flowers per cluster (20.25%), shelf life (17.90%), TSS (17.50%), length of fruit (17.14%), number of fruits per cluster (16.81%), number of primary branches (15.86%), girth of fruit (14.77%), weight per fruit (14.30%), plant height at 30 DAT (12.30%), plant height at 90 DAT (11.04%), plant height at 60 DAT (10.84%), days to 50 % flowering (9.69%), plant height at final picking (9.56%). Minimum phenotypic coefficient of variation was found in days to first fruit setting (4.88%). A high phenotypic coefficient of variation was also observed by and Mishra *et al.* (2001), for the characters like plant height, number of flowers/cluster, number of fruits per plant and fruit yield per plant (kg). In the present investigation a low amount of phenotypic and genotypic coefficient of variation was observed for the characters viz. days to 50% flowering, plant height at final picking, days to first picking and days to first fruit setting. These results are in agreement with Shashikala *et al.* (2002). Significant differences between the genotypes were observed for all the quantitative characters studied indicating sufficient variability among the genotypes. Higher magnitude of phenotypic coefficient of variation than genotypic coefficient of variation indicated considerable influence of environment on the expression of all the characters under study. However, a low coefficient of variation among characters indicates less scope for selection.

Heritability determines the relative amount of heritable proportion of variability. High heritability was recorded for the number of fruits per plant (94.23%) followed by acidity (89.63%), number of flower clusters per plant (88.53%), number of fruits per cluster (84.37%), number of flowers per cluster (82.94%), fruit yield per hectare (80.83%), fruit yield per plant (80.81%), fruit yield per plot (80.79%), weight of fruit (78.37%), plant height at 30 DAT (71.93), days taken to first fruit setting (61.72%), total soluble solids (56.78%), length of fruit (53.25%), girth of fruit (52.76%), days to 50 % flowering (46.82%), plant height at 60 DAT (47.82%), plant height at 90 DAT (43.10%) whereas, moderate values were noted for shelf life (42.42%), plant height at final picking (37.57%) and number of primary branches per plant (32.65%). The heritability estimates were calculated for yield and its components. High heritability estimates were obtained for characters like number of fruits per

plant, acidity%, number of fruits per cluster, number of flower clusters per plant, number of fruits per cluster, fruit yield per plant (kg). A higher heritability indicates that there is a high response of hybrids to selection for the characters studied. Similar results were observed by Rajesh Kumar (2006) and Anjum *et al.* (2009). Moderate heritability was observed in the characters viz. weight of fruit (g) followed by plant height at 30 DAT and days to 50% flowering. A lower heritability was observed in the characters viz. number of primary branches per plant, plant height at the time of final picking, shelf life, girth of fruit (cm), length of fruit (cm) and total soluble solids (TSS). A lower heritability indicates that these characters are more influenced by the environment (Shashikala, 2002).

The genetic advance in percent of mean ranged from 6.21% to 48.59% for different characters under study. The highest genetic advance was observed for the characters like fruit yield per hectare (48.59%) followed by fruit yield per plant (48.58%), fruit yield per plot (48.57%), number of fruits per plant (47.10%), acidity % (44.41%), number of flowers per cluster (34.60%), number of flower clusters per plant (33.33%), number of fruits per cluster (29.23%), weight of fruit (23.09%), total soluble solids (20.47%), length of fruit (18.80%), plant height at 30 DAT (18.23%), girth of fruit (16.05%), shelf life (15.64%), number of branches per plant (10.66%), plant height at 60 DAT (10.68%), plant height at 90 DAT (9.80%), days to 50 % flowering (9.34%) however a low genetic advance was observed for the plant height at final picking (7.40%) and days taken to first fruit setting (6.21%). A high value of genetic advance was observed for the fruit yield per plant (kg), number of fruits per plant, acidity % and number of flowers per cluster. These findings are in agreement with Mohanty (2002) and Asati *et al.* (2008). The estimates of heritability along with genetic advance are more reliable than heritability alone for predicting resultant effect of selection according to Johnson *et al.* (1955).

High estimates of phenotypic and genotypic coefficient of variation, heritability and genetic advance as percentage of mean were observed for fruit yield per plant (kg), number of fruit per plant, acidity %, number of flower cluster per plant, number fruit per cluster, and number of flower per cluster. Thus these characters are comparatively more promising for improvement under breeding programme and can be utilized for developing high yielding tomato hybrids. High heritability coupled with high genetic advance as percentage of mean was recorded for number of fruit per plant, fruit yield per plant (kg) and acidity%, which leads as to additive gene action and their expression and phenotypic selection for their amenability can be brought about. High heritability with moderate genetic

Table 2: Grand Mean, Range, Phenotypic Coefficient of Variation, Genotypic Coefficient of Variation, Heritability Genetic advance in Tomato (*Solanum lycopersicon Mill.*) Hybrids

Characters	Grand Mean	Range Min.	Range Max. (%)	PCV (%)	GCV broad sense	Heritability in as (%)	Genetic advance of means
Plant height at 30 days (cm)	30.97	21.21	37.34	12.30	10.43	71.93	18.23
Plant height at 60 days (cm)	62.97	52.34	78.44	10.84	7.49	47.82	10.68
Plant height at 90 days (cm)	68.97	57.99	89.55	11.04	7.25	43.10	9.80
Plant height at final picking (cm)	71.09	62.21	90.20	9.56	5.86	37.57	7.40
No. of primary branches	8.38	6.34	11.01	15.86	9.06	32.65	10.66
Days to 50% flowering	41.05	35.67	47.00	9.69	6.63	46.82	9.34
Days to first fruit setting	53.49	47.33	59.33	4.88	3.83	61.72	6.21
No. of flower cluster/plant	39.12	25.0	51.33	17.20	88.53	88.53	33.33
No. of flower/cluster	5.27	3.00	7.66	20.25	18.44	82.94	34.60
No. of fruit /cluster	4.69	3.00	6.22	16.81	15.44	84.37	29.23
No. of fruit/plant	37.02	22.70	57.80	24.26	23.55	94.23	47.10
Length of fruit(g)	5.93	4.60	8.23	17.14	12.51	53.25	18.80
girth of fruit(g)	9.50	6.433	12.57	14.77	10.72	52.76	16.05
Weight per fruit(g)	44.92	35.73	63.89	14.30	12.66	78.37	23.09
Fruit yield /plant(kg)	0.751	0.388	1.524	29.18	26.23	80.81	48.58
T.S.S (o Brix)	4.41	3.13	5.93	17.50	13.19	56.78	20.47
Acidity %	0.28	0.18	0.42	24.05	22.77	89.63	44.41
Shelf life in days	11.65	15.00	7.83	17.90	11.65	42.42	15.64

advance as percentage of mean were observed in number of flower cluster per plant and number of fruit per cluster which might be attributed to additive gene action, conditioning their expression and phenotypic selection for their amenability can be brought about. These characters afford limited scope of selection and selection pressure may be applied to successive generation.

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Study of first gestation length in Gir cows

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Abstract

To ensure proper economic returns, the reproductive performances of Gir cows need to be improved. Some studies have been made for inoculum's the performances of the reproductive traits either from the point of view of gathering basis information or making attempts to reduce their unproductive life. Here, it was decided to "Study of first gestation length". The data for the research work were obtained on 178 Gir cows stationed at Kasturba Gandhi Gram Indore over 24 years covering the period of 1976 to 1999. The data were analyzed, the records were used to estimate the genetic and phenotypic parameters of first gestation length. The overall mean for first gestation length of Gir cows in present research work have been observed to be 279.86 ± 0.69 days. The effect due to period was found to be non-significant and the effect of season was found to be significant at 5% level in Gir cows.

Key words: Gir cows, gestation length, period, season

Introduction

India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4%. The country's milk production in 2010 was estimated to be 110 million tones. A large quantity of milk produced in the country amounting to over 46% is being consumed as liquid milk. The production and use of animal products in the use of human diet is receiving tremendous attention. With this object in view the need for developing Animal Husbandry is recognized very well. The other objects are to provide animal power for farmings and adoption of better land use pattern.

Gir breed which is rated as relatively better milk producer of indigenous breeds needs exploration of its production potentiality with a view to know its further prospect. Improvement can be made through proper management, feeding, handling and other environmental conditions which will influence expression of characters but a limit of which is set by heredity of individual. Thus to make permanent improvement in performance of animal, It is must to select superior animals for breeding purposes because they possess more desirable gene and gene combinations. Superiority due to genes is the only thing

that it is transmitted from the parent to their off- spring. The rate of improvement in performance from selection during any generation is dependent on these primary factors. Consequently it was decided to find out the earliest part time production which can effectively, accurately and precisely predicate the total lactation yield, so that selection could be exercised at an early stage to avoid delay in progeny testing programme for evaluation of breeding bulls. This will help improve the genetic gain by reducing generation interval and also save the maintenance cost of uneconomical animals through early culling in preliminary sire evaluation programme.

Methodology

The data for investigation were obtained from the Gir cows from Kasturba Gram Dairy Farm, Indore (M.P.). It is situated 7 km from Indore city on Khandwa road. The record of 178 cows spread over 24 years were studied. As the records were spread over a considerable period, grouping of consecutive records was, therefore, done to into 6 periods as follows:

1976-79	- P1
1980-83	- P2
1984-87	- P3
1988-91	- P4
1992-95	- P5
1996-1999	- P6

Classification of seasons was done keeping in view the ambient temperature between months so that minimum variation existed within a season and maximum between seasons. The year was divided into

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four seasons of 3 months each.

S1 -Summer season (April to June)

S2 -Rainy season (July to September)

S3 -Winter season (Oct. to Dec.)

S4 -Spring season (Jan. to March)

The population mean of average value of sample was estimated as:-

$$\bar{X} = \frac{1}{n} (X_1 + X_2 + X_3 + \dots + X_n)$$

$$\bar{X} = \frac{\sum x}{n}$$

Where, \bar{X} = is the Arithmetic mean

X= mean gestation length

n = is the Number of samples

Σ = Summation (Sigma)

Standard error of mean was estimated as:

$$S.E. = \frac{S.D.}{\sqrt{n}}$$

Where,

S. E. = Standard error of mean

S.D. = Standard deviation

n= No. of observations

The analysis of variance was used to test the differences between the period and season against the random error. "F" test was used to determine the significance of variation.

Results and Discussion

Milk production is the end result of long chain of events caused by numerous and complex physiological processes. It is established that many genes are involved in it. Genetic forces viz. selection and gene migration are being continuously employed by animal breeder to increase the frequency of desirable genes. For milk production, environment may contribute as much as 75% of total variation. First gestation length is an important factor contributing towards the economy of the dairy enterprises. Some scientists reported that gestation length will be lengthy when the cows calved male calves while female calves take shorter duration in Gir cows. The mean and standard error for first gestation length in Gir cows have been presented in Table-1. Analysis of variance has been shown in Table-2 and graphically represented in Fig. 1. In present investigation, the overall mean gestation length was found to be 279.86 + 0.69 days.

It is further observed from Table 1 that gestation length varied within narrow limits during the period 1976 to 1999. Such variation in first gestation length due to various periods was found to be non-significant (Table 2). However, the season of the year had a significant (p<0.05) effect on first gestation length in Gir cows, as revealed by the Anova table. The published data on first gestation length in Gir cows,

appear to be scanty. However, Babu Rao (1990) and Venkateswarlu et al. (1973) have reported data on first gestation length in Ongole cows, which is close to our study.

Table 1 : Mean and Standard error for first gestation length (days) in Gir cows

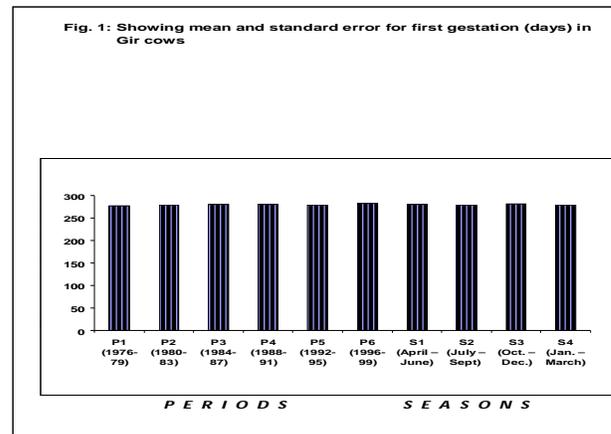
Classification	No. of observations	First gestation length	S.E.
Periods:			
P ₁ (1976-79)	21	276.86	1.25
P ₂ (1980-83)	29	279.49	1.08
P ₃ (1984-87)	43	280.54	0.88
P ₄ (1988-91)	61	280.63	0.74
P ₅ (1992-95)	21	279.42	1.27
P ₆ (1996-99)	3	282.28	2.78
Seasons:			
S ₁ (April – June)	32	279.88	1.15
S ₂ (July – Sept)	45	279.28	1.02
S ₃ (Oct. – Dec.)	53	280.73	0.91
S ₄ (Jan. – March)	48	279.56	1.44
Overall mean (μ)	178	279.86	0.69

Table 2 : Analysis of variance for first gestation length (days) in Gir cows.

Source of variance	D.F.	S.S.	M.S.S.	F' value
Periods	5	55.03	11.01	0.340NS
Season	3	752835.2	250945.1	38636.026*
Error	169	5471.8	32.1	

* Significant at 5% level

NS = Not significant



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Straw mulch and fertiliser N management effects on yield and N use efficiency of Rice-Wheat-Mungbean Systems in irrigated eco-system of Western Indo Gangetic Plains

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Abstract

food prices, causing political and economical instability and social unrest in both poor and developed nations. Further, cereal crops (rice, wheat and maize) grown in different sequences, contribute bulk of the food in south Asia where in production growth both in terms of grain and residue has slowed. Annual Land degradation and soil fertility decline are among the main causes of the stagnation and fall of agricultural production in many tropical countries, including those with intensive irrigated cropping systems. In past, green revolution has paid dividends through impressive agricultural growth, which helped to keep balance between demand and supply in the past four decades. But, the real challenges have surfaced in the recent years with ever increasing food demand due to burgeoning populations, degradation of natural resources and changing climatic conditions. The current food crisis witnessed a dramatic increase in world yield growth rates in rice and wheat was two to three times higher during 1966-94 than during 1995-2005. The challenges are further exacerbated with the sharp rise in the cost of food and energy, depleting water resources, vulnerability of soil to degradation and desertification and loss of biodiversity. In the last five decades in India nutrient use has increased by 1573%, total food grain production by 145% with an increase in area of just 3.5% and average yield increase of 125%. Therefore, the input use efficiency is decreasing at a fast pace, posing a threat of food insecurity and rapidly engulfing poor and underprivileged population. The experiment investigated N management (method and time of application, using the recommended rate of 120 kg N/ha) for wheat mulched with rice straw. There were eight N management treatments for the wheat mulched with rice straw, including the recommended practice (2/3 broadcast before sowing, 1/3 broadcast before the first irrigation after sowing). There was also an unmulched control treatment with N applied using recommended practice. Fertilizer application with three split doses (50% drilled at sowing + 25% broadcast before the each of the first and second irrigations) resulted in significantly higher grain yield, agronomic efficiency and N recovery efficiency than all other treatments. In the presence of mulch, drilling the urea at sowing gave higher yields and efficiency than broadcasting. In this paper, we have made efforts to synthesize the information available in relation to residue and nutrient management perspectives in Rice-Wheat-Mungbean Systems of Western Indo Gangetic Plains .

Key words: Productivity enhancement, cropping systems, soil organic carbon, sustainability, tillage

Introduction

Green Revolution, the rice-wheat cropping system now dominates the important food production areas of the Indo-Gangetic Plains and the Peninsular Region. About 60% of the total cropping area is under rice and wheat; these two staple grains have replaced more than 25 different crops in both the Kharif (rainy) and Rabi (summer) growing seasons. This system provides good returns to farmers and strengthens food

security, but sustainability is declining due to the lack of any adjustment in crop rotation although options for such adjustment exist. The situation in the Indo-Gangetic Plains is further aggravated as rice and wheat together account for 82% of the total area devoted to food grain production. In Punjab and West Bengal, more than 95% of the area of food grain production is now under rice and wheat. This phenomenon relegates pulses and coarse cereals to marginal lands. In Bihar, Haryana, Punjab, Uttar Pradesh, and West Bengal in India, the area planted to pulses declined from 8.03 million ha in 1971-75 to 5.22 million ha in 2004, giving way to rice in Kharif and wheat in Rabi seasons. Due to continuous cultivation of cereals in intensively

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cropped areas, nutrient (NPK) uptake increased by 663 kg against the applied 400 kg/ha to yield 8.8 t/ha in rice-wheat rotation, and 438 kg against the applied 358 kg/ha to yield 6.3 t/ha in rice-rice rotation (Ali and Kumar, 2004). Furthermore, the optimum NPK ratio of 4:2:1 widened to 8.5:3.1:1 at the national level; the western Indo-Gangetic Plains shows maximum distortion (37.1:8.9:1) where rice and wheat are grown in sequence on 82% of the total cropped area (Ali and Kumar, 2004). Inadequate use of organic fertilizers is another area of concern, as less than one ton of organic matter, Short Duration Mungbean: A New Success in South Asia 3 per ha is being added to the soil. This is leading to a rapid decline in the organic matter content of soils, particularly in Punjab (0.2% carbon content) (Ali and Kumar, 2004). Planting rice two months before the onset of the monsoon has dangerously lowered the water table at the rate of 300 mm per year. Excessive and indiscriminate use of irrigation water causes salinity to increase and water to stagnate. After the harvest of wheat and before the transplanting of rice, the land remains fallow for 65-70 days (late March/April to early July). This period could be used to raise a catch crop of summer mungbean. A low input, short duration, high value crop, mungbean fits very well into rice-wheat cropping systems and other crop rotations. Mungbean fixes nitrogen in the soil, requires less irrigation than many field crops to produce a good yield, and helps maintain soil fertility and texture. Adding mungbean to the cereal cropping system has the potential to increase farm income, improve human health and soil productivity, save irrigation water, and promote long-term sustainability of agriculture.

Straw mulch reduces the amount of radiation reaching and leaving the soil surface, and therefore reduces the maximum soil temperature and increases the minimum temperature (Prihar and Arora 1980). The effect of straw mulch on soil temperature can be an advantage where soil temperature is above the optimum for germination and growth, and a disadvantage where temperatures are lowered below the optimum (Lal 1989). On a clear sunny day during the hot months in northern India, the temperature reduction due to mulch can be 5–8 °C at 5 cm depth (Sandhu et al. 1980). Straw mulch also lowers soil evaporation, leading to higher soil water content and/or crop water use (Rahman et al. 2005; Sidhu et al. 2007). The magnitude of the reduction in evaporation depends on the straw load, soil water content and evaporative demand. The effects that mulching has on soil moisture and temperature will influence many soil and plant processes that ultimately determine the growth and yield of crops. Straw mulch may also reduce weed growth by mechanisms such as reduced

light, effects on soil temperature, physical suppression and allelopathy (Dhima et al. 2006).

Availability of crop residues in the rice-wheat system

Factual information on the availability of crop residues is not available, and what is reported is based on estimates taken from grain production and grain to straw ratios, which vary from report to report. Thus, Pal et al. (1985) estimated annual total crop residue production in India of 250 Mt, of which only about one-fifth is available for energy conversion. Bhardwaj (1981) estimated residue production of 185 Mt and Sarkar et al. (1999) estimated 356 Mt, of which one-third is available for soil incorporation or surface retention. Of the total crop residue production in India, wheat and rice together contributed about 60% (213 Mt). Recently, Pal et al. (2002) estimated the crop residue produced by rice and wheat crops to be 240 Mt, of which one-third is available for recycling. The total residue produced in the system was 126 Mt, of which 42 Mt is available for recycling. By taking the prevailing price, in Indian rupees (Rs), of 1 kg N as 9.35 Rs, of P as 15.40 Rs and of K as 7.45 Rs, the fertilizer replacement value was estimated to be 3.58 billion Rs/year.

Materials and Methods

On-farm trials were conducted in the RW system of five districts of (Meerut, Ghaziabad, Bulandsahar, Muzaffarnagar and Saharanpur) under the jurisdiction of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (Uttar Pradesh), India, (28°40'27.3 N to 29°28'11.3 N, 77°28'14.3 E to 77°44'18.3 E) from 2008-09 to 2010-11 involving 50 farmers. These trials were researcher-designed and farmer-managed on Straw mulch and fertilizer N management on RCT's, with a single replicate, repeated over many farmers. Therefore, the experimental design was an unbalanced block design in which the number of treatments varied from farmer to farmer, with the farmer as a replicate/block and as a combination of eight tillage and crop establishment techniques. The trial involved a three-crop (rice-wheat-mungbean) rotation planted as per the straw mulch and N management. The climate of the area is semiarid, with an average annual rainfall of 805 mm (75–80% of which is received during July to September), minimum temperature of below 4°C in January, maximum temperature of 41–45°C in May - June, and relative humidity of 67–83% during the year. The soils are generally sandy loam to loam in texture and low to medium in organic matter content. soil with a bulk density of 1.48 Mg m⁻³, weighted mean diameter of soil aggregates 0.74 mm, pH =7.9, total C = 8.3 g kg

Table 1: Details of treatments on N fertiliser management

Treatment	N rate			Straw management	Treatment details N management
	Sowing	1 st irrigation	2 nd irrigation		
T ₁ (No N)	0	0	0	Mulch	No N control
T ₂	120	0	0	Mulch	120 kg N drilled at sowing
T ₃	90	0	30	Mulch	90 kg N/ha drilled at sowing and 30 kg N/ha top dressed at second irrigation
T ₄	60	60	0	Mulch	60 kg N/ha drilled at sowing and 60 kg N/ha top dressed at first irrigation
T ₅	60	30	30	Mulch	60 kg N/ha drilled at sowing and 30 kg N/ha top dressed at first and second irrigation
T ₆	30	30	60	Mulch	30 kg N/ha drilled at sowing, 30 kg N/ha top dressed at first irrigation and 60 kg N/ha at second irrigation
T ₇	90	30	0	Mulch	90 kg N/ha applied as surface broadcast at sowing and 30 kg N/ha top dressed at first irrigation
T ₈ (control)	60	60	0	Burn	60 kg N/ha applied as surface broadcast at sowing and 60 kg N/ha top dressed at first irrigation

¹, total N = 0.83 g kg⁻¹, Olsen P = 28 mg kg⁻¹, and K = 128 mg kg⁻¹. Groundwater pumping is the predominant method of irrigation. Western UP has a diversified cropping system, with RW as the dominant cropping system. Wheat is grown after five to six dry-tillage operations and rice seedlings (3–4 weeks old) are transplanted in puddled fields after three to four dry-tillage operations.

On farm trials grew rice which was combine harvested prior to wheat establishment. Two straw management treatments were established at—straw retained (mulched) and straw removed (no mulch). In the ‘no mulch’ treatments the straw was burnt prior to sowing wheat. In the mulched treatments the loose straw in windrows from the combine harvester was distributed evenly across the plots prior to sowing with the Turbo Happy Seeder. The wheat (PBW343) was sown at 100 kg/ha with 20-cm row spacing's. All treatments were direct drilled into rice residues with the Turbo Happy Seeder except the control (T₈), in which the straw was burnt prior to direct drilling according to recommended practice. Details of the N fertilizer treatments are provided in Table 1. All treatments received a total of 120 kg N/ha as urea in a range of splits (from one to three). All urea applied at sowing was drilled 5–6 cm below the soil surface the day before sowing using a hand drill, except for T₈ and T₉ which used the recommended practice of broadcasting 60 kg N/ha before sowing. The purpose of drilling the fertilizer the day before sowing was to minimize contact of the seed with high concentrations of urea and so avoid fertilizer damage. Post sowing applications of urea were broadcast immediately before the first and/or second irrigations. A basal dose

of 26 kg P/ha as single superphosphate and 25 kg K/ha as muriate of potash was drilled below the seed at the time of sowing on 07 November, 2008. An area of 20 m² from the centre of each plot was harvested for grain and straw yield. Wheat grain and straw yields are reported on a dry weight basis. Grain and straw subsamples were collected at wheat harvest on 16 April 2009 for analysis of total N.

Statistical, economical and energy analyses

The data was statistically analyzed by using standard statistical packages. The economic and energy value of each input resource and operation and output (yield) was considered for the economical and energy analyses. The benefit: cost and energy output: input ratios were calculated and considered as economic and energy efficiency comparisons.

Results and discussion

Total system productivity

Commonly, conversion from conventional tillage to reduced-till systems with straw retention requires several crop cycles before potential advantages or disadvantages become apparent (Phillips and Phillips, 1984). In our trials straw retention increased productivity rapidly, starting from the second crop cycle. We believe this is an important findings because, if repeated on farmers fields, farmers will quickly realize the benefits and be more interested in adopting the technology. Total system productivity increased by 8-13% in straw retention with 80% N placement system over conventional. Total system productivity of rice, wheat and mungbean (R-W-M) was 12.8 t ha⁻¹yr⁻¹. For all crops the highest system yields occurred in full straw retained, but the differences between straw burnt and full straw retained were always

significant for the three crops. Lower system productivity also occurred from straw burnt due to reduced crop growth. Yields tended to be lower in with lower levels of straw retention for all crops. Similar observations were made by Sayre et al., 2005 in Mexico. Table 2: Total system productivity under tillage options and straw levels in rice-wheat-mungbean systems.

Treatment	Crop yield (t/ha)			
	Rice	Wheat	Mung	System
T ₁	1.45	1.96	0.65	4.06
T ₂	4.35	4.37	1.15	9.87
T ₃	4.53	4.98	1.20	10.71
T ₄	4.15	4.18	0.90	9.23
T ₅	4.25	4.29	1.05	9.59
T ₆	4.08	4.13	0.95	9.16
T ₇	5.63	5.26	1.91	12.8
T ₈ (burnt)	3.95	4.09	0.85	8.89
C D at 5%	1.15	0.43	0.74	-

N fertilizer management

Grain yields ranged from 1.96 t/ha in the

unfertilized treatment to 5.26 t/ha in the treatment (T₇) (Table 3). Agronomic efficiency of N (AE, kg grain/ kg N applied) ranged from 16.8 to 21.6. Recovery efficiency (RE), the difference between N uptake in the fertilized and control treatments as a percentage of the amount of fertilizer N applied, ranged from 38.7% to 49.3%. Grain and straw yields and total N uptake were significantly increased with N application over the No N control, and trends in total N uptake were similar to trends in yield (Table 2). Grain yield, total N uptake and RE with the recommended practice (T₈, with straw burnt and 60 kg N/ha broadcast at sowing and before the first irrigation) were significantly lower than with the 90kgN/ha broadcast at sowing and 30kgN/ha before first irrigation in the presence of residues (T₇). However, drilling the 1st 60 kg N/ha at sowing in the presence of rice residues (T₄) restored yield and N uptake to similar values to the control. These data suggest greater immobilization or N losses from surface-applied N in the presence of straw than when the straw was burnt before sowing, which is consistent with the findings of others (Philips et al. 1980; Rice



Fig 1: Happy Seeder for seeding into loose residues

Table 3: Effect of fertilizer N management on yield, total N uptake, agronomic efficiency (AE) and recovery efficiency (RE) of N in wheat

Treatment	N management	Grain yield (t/ha)	Straw yield (t/ha)	Total N uptake (kg/ha)	AE (kg grain/kg N)	RE (%)
T ₁	0,0,0	1.96	2.25	35.3	-	-
T ₂	120,0,0	4.37	5.44	90.6	18.7	46.3
T ₃	90,0,30	4.98	6.22	90.2	20.4	48.6
T ₄	60,60,0	4.18	5.21	83.7	17.9	41.3
T ₅	60,30,30	4.29	5.29	88.4	18.8	40.8
T ₆	30,30,60	4.13	5.12	86.3	18.2	38.7
T ₇	90,30,0	5.26	6.83	80.4	21.6	49.3
T ₈ (burnt)	60,60,0	4.09	5.17	89.7	16.8	45.6
LSD (0.05)	-	0.43	0.58	9.3	2.7	2.9

and Smith 1984; Patra et al. 2004). Drilling part of the fertilizer below the soil surface at sowing may have reduced these losses due to reduction in fertilizer N contact with straw (Rao and Dao 1996). Despite this, Sidhu et al. (2007) found an average 9–15% higher yield of wheat with the Happy Seeder sowing into rice residues, with the fertilizer broadcast at sowing and before the first irrigation, compared with farmer practice (conventional tillage after burning, where as we used zero tillage in (T_8) in the adjacent field. Grain yield of T_3 and T_7 was usually significantly higher than all other treatments. As with grain and straw yield and N uptake, AE and RE were highest in T_3 and T_7 and lowest in T_8 . There are several possible reasons for the superior performance of the triple split with the last application delayed to the time of the second irrigation. These include greater canopy cover and reduced presence of mulch due to decomposition, and reduction of the potential for N immobilization and ammonia volatilization. Drilling all the fertilizer N at sowing (T_2) resulted in grain yield similar to that of the recommended practice of applying N in two equal split doses at sowing and with the first post-sowing irrigation (T_4). When the amount of N drilled at sowing was reduced to 30 kg N/ha, with 30 and 60 kg N/ha before the first and second irrigations, respectively, grain yield was reduced significantly in comparison with T_3 and T_7 . These results suggest that delaying half the N fertilizer application until the second irrigation is too late.

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Prevalence of Helminths Infection in Cattle (Indigenous and Crossbred) of Agra Region of Western Uttar Pradesh

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Abstract

This study was carried out to identify the prevalence of helminth infection in cattle (both indigenous and crossbred) in all the seven districts of Agra Region. Helminths are worm-like organisms that live and feed off living hosts, receiving nourishment and protection while disrupting their hosts' nutrient absorption, causing weakness and disease. Infected animals excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation. The identification of helminths was carried out by qualitative examinations of fecal smear taken from the animals. In total 3276 samples were collected randomly from the animals, of which nearly 1428 samples were found positive and 1848 samples were found negative for helminth infection. Among the positive samples, maximum infestation was recorded for trematodes (17.64%), followed by cestodes (15.05%) and nematodes (10.90%). Control strategies includes implementation of practice of prophylactic anthelmintics based on prevalence data and farmers of these regions were advised for special care of these infestations in and around rainy seasons as maximum prevalence was found during this period. The most popular approach to control helminthiasis is exposure regarding the deworming schedules among the livestock owners. Livestock owners already planned to rear livestock on a somewhat regular basis shall initially be educated about the importance of deworming in livestock. Regular field campaigns and training programs on deworming shall be organized for strong positive externalities.

Key Words : Helminths, Cattle, Agra, Uttar Pradesh

Introduction

India economically relies on agriculture and derives nearly 20% of its GDP from agriculture sector. The majority of Indian population is dependent on Agriculture. The livestock plays an important role in sustaining their livelihood. Though in terms of population and productivity our bovine population stands number one in the world but still the average milk yield is very low. Optimal production from these animals can only be achieved, if they are managed in good environment and maintained disease free. Helminthiasis severely affects both health and production of our livestock. Parasitic worms, often referred to as helminths are a division of eukaryotic parasites. They are worm-like organisms that live and feed off living hosts, receiving nourishment and protection while disrupting their hosts' nutrient absorption, causing weakness and disease. Infected animals excrete helminth eggs in their faeces, which then contaminate the soil in areas with inadequate sanitation. Other animals may then be infected by ingesting eggs or larvae in contaminated feed, or through penetration of the skin by infective larvae in the soil (hookworms). Infestation can cause morbidity, and sometimes death, by compromising

nutritional status, affecting cognitive processes, inducing tissue reactions, such as granuloma, and provoking intestinal obstruction or rectal prolapse. Control of helminthiasis is based on drug treatment, improved sanitation and health education.

Chauhan *et al.*, (1994) reported 24.5% mortality and 40% morbidity due to parasitic diseases (liver fluke, parasitic gastroenteritis, etc) in various dairy farms of Kangra valley of India. In spite of significant losses that may run into millions of rupees (Shah and Chaudhary, 1995), the problem is neglected because of its chronic and insidious nature (Sanyal, 1996). The diverse agro-climatic conditions, animal husbandry practices and pasture management largely determine the incidence and severity of various parasitic diseases and its prevalence in different agro-climatic zones of the country would provide a basis for evolving strategic and tactical control of these diseases. In addition the prevalence of such condition varies with many factors such as rainfall, temperature, intermediate host, breed, age, sex, species of definite host, etc. Seasonal variation in number, size and species of gastropods in a habitat influences the prevalence and diversity of

their infections with larval helminthes (Mattison *et al.*, 1995). With all these in consideration the survey was conducted in all the districts of Agra region and fecal sample so collected were quantitatively analyzed to know the prevalence of heminthiasis in this region.

Materials and Methods

Initially a survey was conducted in all the seven districts of Agra region of Uttar Pradesh viz., Agra, Mathura, Hathras, Mainpuri, Aligarh, Etah and Firozabad and necessary information regarding feeding, management, deworming, vaccination, etc. were collected from the randomly selected livestock owners. The collected data was analyzed and found parasitic infestations in this region as an important aspect for generalized weakness and decreased production in the livestock. Thus fecal samples were collected on random selection basis from indigenous as well as crossbred cattle of nearly 18-20 villages of each district on the basis of analyzed information, thus comprising a total of 3276 fecal samples collected from all the seven districts of Agra region. All the fecal samples were collected by standard procedures directly from the rectum using disposable plastic gloves. Approximately 10 gm feces were collected from each animal and preserved by adding 10% formalin. The samples thereafter were taken to Regional Laboratory of Agra and were examined qualitatively by means of sedimentation technique and the ova of parasites were identified on the basis of morphological features as described in Soulsbey (1982). Detection of more than one type of helminthic ova in the feces was considered as mixed infection. The quantum of infection was derived in terms of percentage of the total sample examined that represents the prevalence of infection.

Results and Discussion

The indigenous and crossbred cattle of the seven districts show signs of inappetance, poor body condition, weakness and stunted growth in calves, decreased milk yield in lactating cattle and rough hair coat, diarrhea and few cases of bottle jaw condition were also apparent. Similar clinical signs have also been mentioned by Radostits *et al.*, (2000) and Chauhan *et al.*, (Chauhan, 1981). The fecal examination of

collected 3276 samples revealed that 1428 animals positive for helminth infection and 1848 animals were found negative for helminth infection in indigenous and crossbred cattle of seven districts of Agra region.

However, the prevalence of helminth infection in cattle (indigenous and crossbred) in all the seven districts of Agra region, viz., Agra, Mathura, Hathras, Mainpuri, Aligarh, Etah and Firozabad was found to be 35.51%, 49.04%, 30.12%, 30.65%, 47.73%, 81.01% and 52.24% respectively. Various workers Pal *et al.*, 1978; Chaudhary *et al.*, 1984; Chhabra and Gill, 1975; Katiyar *et al.*, 1983; Hirani *et al.*, 1999; Dhanachand *et al.*, 2000; Bedarkar *et al.*, 2000, have also reported similar findings from different parts of India. The results indicated in Table No. 1 revealed the highest prevalence of trematodes (*Fasciola* and *Paramphistomes*) were recorded in cattle of Aligarh district (23.36%) and lowest in cattle of Mainpuri (7.04%) district. This variation in prevalence of infection in seven districts may be attributed to difference in climatic parameters and adopted managerial practices by the livestock owners as well as variation in the availability of intermediate hosts (Lie *et al.*, 1968; Prasad and Verma, 1999). However the prevalence of *Paramphistomes* was negligible in all the surveyed districts, which may be due to a process of elimination that is taking place in nature. However this may also be related to the non-availability of an intermediate host, i.e., snail in case of *Paramphistomes* *sps.* or inter-specific competition in definitive host or intermediate host as reported in case of other helminthes (Prasad and Verma, 1999).

Similarly the results indicated in Table -1 revealed that prevalence of Cestode infestation was found to be highest in the cattles of Mainpuri district (19.85%) and lowest in Hathras district (11.02%). But the prevalence of Nematodes (*Ascaris* *sps.*, *Strongyloids* *sps.*, *Trichuris* *sps.*, *Strongylus* *sps.*) was found to be highest in the cattle of Etah district (49.72%) and lowest in the cattle of Agra district (2.24%). Since this region receive high rainfall (66 cm. average yearly rainfall) and presence of high relative humidity during rainy season (month of July to September) with extremes of temperatures that

Table 1: Result of fecal sample examination of the districts of Agra Region

S.No.	District	No. of Samples	Trematode	Cestode	Nematode	Total Negative	Total Positive
1.	Agra	490	105(21.43%)	58(11.84%)	11(2.24%)	316(64.49%)	174(35.51%)
2.	Mathura	363	75(20.66%)	72(19.84%)	31(8.54%)	185(50.96%)	178(49.04%)
3.	Hathras	581	93(16.01%)	64(11.02%)	18(3.10%)	406(69.87%)	175(30.12%)
4.	Mainpuri	398	28(7.04%)	79(19.85%)	15(3.77%)	276(69.34%)	122(30.65%)
5.	Aligarh	595	139(23.36%)	67(11.26%)	78(13.11%)	311(52.26%)	284(47.73%)
6.	Etah	179	28(15.64%)	28(15.64%)	89(49.72%)	34(18.99%)	145(81.01%)
7.	Firozabad	670	110(16.42%)	125(18.66%)	115(17.16%)	320(47.76%)	350(52.24%)
	Total	3276	578(17.64%)	493(15.05%)	357(10.90%)	1848(56.41%)	1428(43.59%)

*Values in parenthesis indicates percentage.

vary from 4.2°C to 48°C makes the animals prone to gastro-intestinal parasitic infestations.

Control Measures

For control measures in Agra and other regions with similar environmental habitats the strategic dosing against fluke diseases was given to control helminth disease according to the FAO recommendation (1994). The most popular approach to control helminthiasis is exposure regarding the deworming schedules among the livestock owners. The policymakers shall take advantage of existing infrastructure and institutions for the dispensation of livestock parasitic treatment. Livestock owners already planned to rear livestock on a somewhat regular basis shall initially be educated about the importance of deworming in livestock. Regular field campaigns and training programs on deworming shall be organized for strong positive externalities. The nature of the intestinal helminths and the medications available to treat them also favor universal deworming programs. Further flukicide drugs, viz., triclabendazole, fenbendazole, albendazole and oxclozanide, which are cheap and safe intervention that is not particularly specific, and so can be used fairly effectively against all three of the main intestinal helminths (or any coinfection of them) are recommended for such regions. Finally, because these worms cannot replicate inside of their hosts, reducing transmission may be the best way to reduce prevalence, and mass interventions on an annual or biannual basis may in fact be a reasonable means of achieving this goal. However the main drugs used and recommended for control of nematodes were piperazine citrate, levamisole, closental, mebendazole, triclabendazole. In addition farmers of these regions were advised to special care for these infestation in and around rainy seasons as maximum prevalence occurs during such periods.

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Dairy farmers of Agra district faced constraints in adoption of improved animal husbandry practices

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Abstract

The present study was under taken by Krishi Vigyan Kendra, Bichpuri, Agra with the specific objectives to indentify constraints faced by the dairy farmers in adoption of improved animal husbandry practices and their suggestions/responses to resolve them. Investigation was carried out through personal interviews and questionnaires in the purposively selected four KVK adopted villages of Agra district of Uttar Pradesh involving 60 respondents KVK trained dairy farmers. Most of the respondents had medium to high level of knowledge regarding improved animal husbandry practices, i.e. water management practices, reproductive practices and breed improvement, nutritional management practices, scientific milking and disease control practices. Majority of dairy farmers had economic problem and problems related to management practices, feeding practices. Few of the respondents faced problems regarding marketing. Most other dairy farmers made suggestions regarding facility of preservation of vaccine and semen at village level and loan/subsidy facilities for contraction of animal shed, purchase of dairy animals and regular trainings.

Key words: Constraints, Adoption, Improved Animal Husbandry Practices, Dairy Farmer.

Introduction

Livestock sector, an important segment of agrarian society in India, has provided sustainable income to millions of rural people since the time immemorial. During the last one decade India has achieved an enviable position as the highest producer of milk in the world. This achievement has been possible through the involvement of nearly 70 million rural farmers spread over 5, 80,000 villages across the country. India possesses enormous bovine wealth, but their per capita production is one of the lowest in the world due to reasons that the farmers do not adopt improved animal husbandry practices at the desired level.

As per 18th livestock census of year-2007 of Uttar Pradesh, the total livestock population of Agra district is 1576278, of which 206007 are cattle and 926660 buffaloes. Average estimated daily milk yield of milking crossbred cow is 8.20 kg., nondescript cow 3.45 kg. and buffalo 4.38 kg. The improved animal husbandry practices of dairying not only bridge the gap between adopted practices and recommended practices, but also increase the impact on extent of adoption of the same by dairy farmers keeping the

above problems in view, the present study was taken up with the specific practices to indentify constraints faced by the dairy farmers in adoption of improved animals husbandry practices.

Materials and Methods

The investigation was carried out in the purposively selected four KVK adopted villages under animal husbandry programs, namely- Gadidolta, Nooharika, Bhavanpura and Nagla Vishnu of Agra district of Uttar Pradesh during 2011-12. The dairy farmers having dairying as their major or subsidiary occupation were randomly selected from the selected villages. A comprehensive list of dairy farmers was prepared and 15 respondents were selected purposively from each village. Thus the sample size of randomly selected respondents comprised of 60 dairy farmers. The data was collected through the personal interviews and questionnaires to get most authentic first hand information keeping in view the objectives of the study. The results were interpreted in terms of frequencies and percentages of respondents.

Results and Discussion

The results of study were divided into three parts: (a) Adoption of improved animal husbandry practices by the dairy farmers, (b) Respondent dairy farmers faced the constraints in adopting modern animal husbandry practices and (c) Suggestions by dairy farmers to overcome limitations and problems in

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Table 1: Adoption of improved animal husbandry practices by the dairy farmers (N=60)

S. No.	Improved Animal Husbandry & Dairying Practices	Adoption		Adoption Gap	
		No.	Percent	No.	Percent
1	Breed improvement	46	76.67	14	23.33
2	Calf management	50	83.33	10	16.67
3	Nutritional management	44	73.33	16	26.67
4	Water management	45	75.00	15	25.00
5	Animal shed management	42	70.00	18	30.00
6	Clean milk production management	43	71.67	17	28.33
7	Disease control management	40	66.67	18	30.00
8	Reproductive management	35	58.33	25	41.63
9	Fodder production management	48	80.00	12	20.00

adoption of modern animal husbandry practices.

(a) Adoption of improved animal husbandry practices by the dairy farmers:

The data in Table 1 reveal that most of the respondents had adopted Calf management practices (83.33 %) were found to feed colostrums to their newly born calves within one hour of birth and taking care of all hygienic practices of naval cut, deworming, vaccination and feeding management of calves. 80 percent dairy farmers followed fodder production management practices and grow green fodder around the year. Majority of the respondents (76.67 %) selected their animals on the basis of milk production, lactation, health and breed characteristics. Most of the respondents had adopted water management practices. Seventy five percent dairy farmers provided clean, fresh and hygienic drinking water 3 to 4 times a day to the animals and also increased the frequency during summer season. Seventy three percent dairy farmers followed the scientific feeding practices of young heifers, lactating and pregnant animals. Feeding of balance ration and common salt on regular basis to the animals was not found in practice of 26.67 percent respondents. Less importance was given to the young growing heifer and dry animals by providing only bajara karbi and least quality of green grasses throughout the year. About 71 percent of dairy farmers had scientific milking methods with all the principals of clean milk, hygienic milk production, while 28 percent dairy farmers

did not adopt scientific milking management. Around 70 percent dairy farmers followed scientific housing management like regular cleaning of sheds, providing sufficient housing space to the animals, drainage facility, ventilation, manger etc. 66.67 percent of dairy farmers adopted disease control practices by regularly vaccinating their animals the Foot & Mouth Disease and Hemorrhagic Septicemia, and deworming their animals before and after conception. These findings are in conformity with the findings of Raval and Chandawat (2012).

(b) Respondent dairy farmers faced the constraints in adopting modern animal husbandry practices:

The results in Table 2 reveal that majority (91.67 %) of dairy farmers faced financial problems like high price of milch animals, animal feed, construction of animals sheds etc. They also faced problems of getting loans, their high interest rates and short duration of loan. Hence this constraint was ranked first by the dairy farmers. About 60 percent dairy farmers had problems related to management practices, like unavailability of skilled labour, unavailability of grazing land, comfortable housing systems for animals, low milk production of local animals, poor quality of drinking water. Therefore, management practices were ranked as second important constraint by the respondents. 55 percent dairy farmers had problems of knowledge regarding scientific dairy management practices, low price of milk, women unawareness, unavailability of

Table 2: Dairy farmers respondent faced the constraints in adopting modern animal husbandry practices (N=60)

S. No.	Constraints	Severity of constraints						Overall ranking		
		Very much		Much		Less			Overall	
		No.	%	No.	%	No.	%		No.	%
1	Problems in animal reproduction	12	20.00	10	16.67	6	10.00	28	46.67	V
2	Problem in feeding practices	10	16.67	11	18.33	9	15.00	3	50.00	IV
3	Problems in disease control practices	9	15.00	5	8.33	11	18.33	25	41.67	VI
4	Problems of management practices	16	26.67	12	20.00	8	13.33	36	60.00	II
5	Economics problems	40	66.67	12	20.00	3	5.00	55	91.67	I
6	Problems regarding marketing	10	16.67	8	13.33	6	10.00	24	40.00	VII
7	Other problems	10	16.67	12	20.00	11	18.33	33	55.00	III

Table 3: Suggestions by dairy farmers to overcome limitations and problems in adoption of modern animal husbandry practices

S. No.	Suggestion	Need of the farmers					
		Very Much		Much		Less	
		No.	%	No.	%	No.	%
1	Regular visit of veterinary doctor and subject matter specialist will be helpful	38	63.33	15	25.00	7	11.67
2	Loan/Subsidy facilities should be available for construction of cattle shed and purchase of milch animal	50	83.34	5	8.33	5	8.33
3	At least five members of Krishi Vigyan Kendra should be trained to solve the problem of AH&D	36	60.00	20	33.33	4	6.67
4	The state AH department should have facility of preservation of vaccine and semen	53	88.33	4	6.67	3	5.00
5	Regular training should be provided by KVK to dairy farmers to improve the knowledge for better adoption	48	80.00	10	16.67	2	3.33

literature/books, religious taboo to discard the low productive animals, and lack of linkage between dairy farmers, veterinarians, extension scientist, social leaders, village cooperative society, state animal husbandry department, Krishi Vigyan Kendra etc. So, these were collectively ranked third.

Fourth important constraint perceived by the respondents was feeding practices. Around 50 percent dairy farmers were not having knowledge of urea treatment and silage making, and were facing problems of green fodder scarcity during the months of summer and early monsoon. Problems regarding animal reproduction and disease control practices were 46.67 and 41.67 percent which ranked fifth and sixth. In these problems dairy farmers faced the problems of silent heat in buffalo, timing of AI, poor conception rate, unavailability of good quality bulls for natural service, lack of knowledge of first aid treatment, quality of vaccines and emergency veterinary services were also observed as constraints. Only 40 percent of respondents faced problems of marketing, like low price of milk and milk storage problems in summer seasons. This was found least important constraint as perceived by the respondents and ranked last.

(c) Suggestions by dairy farmers to overcome limitations and problems in adoption of modern animal husbandry practices:

The data in Table 3 suggest that how dairy farmers can overcome limitations and problems in adoption of improved animal husbandry practices. Most of the dairy farmers (88 %) made suggestion regarding facility of preservation of vaccine and semen, and strongly opined that state animal husbandry department should have appropriate and adequate facility of preservation of vaccine and semen. Therefore, majority of respondent expressed this suggestion as very much important. Majority of dairy farmers (83.34 %) suggested to provide loan/subsidy facilities for construction of animal shed, purchase of dairy animals and more subsidies should be given on inputs for

succession of their dairying practices and expressed it as very much important suggestion.

Eighty percent respondents suggested that providing regular training and demonstration to dairy farmers by KVK to improve their knowledge level for better adoption of scientific animal husbandry practices. Majority of respondents (63 %) made suggestion that visits of veterinary doctor and subject matter specialist should be arranged at regular interval for technical support and facilitation at doorsteps of the dairy farmers. Some of the respondents made suggestion that at least five members of the Krishi Vigyan Kendra should be trained to solve primary problems of animal husbandry. Study revealed that adoption levels of most of the modern animal husbandry practices were fairly good in the area with major constraint of financial support. Our finding were in close accordance with the most of finding of Chaudhary and Intodia (2000), Jitendra et al. (2011), Kumar et al. (2009) and Vyas and Patel (2001)

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Efficacy of herbicide on weed management in soybean (*glycine max* l.)

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Abstract

A field experiment was conducted on Experimental Farm at Agricultural Research Station, Ummedganj, Kota during Kharif 2007 and 2008 to study the Efficacy of herbicide on weed management in soybean (*Glycine max* L.). The experiment was carried out in randomized block design comprising twelve treatments viz T_1 : Clodinafop- propargyl @ 60.0 g a.i/ha as POE, T_2 : Clodinafop- propargyl @ 80.0 g a.i/ha as POE, T_3 : Clodinafop- propargyl @ 100.0 g a.i/ha as POE, T_4 : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 60.0 + 123.75 g a.i/ha as POE, T_5 : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0g a.i/ha as POE, T_6 : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25g a.i/ha as POE, T_7 : Acifluorfen sodium 20 % SL @ 123.75 g a.i/ha as POE, T_8 : Acifluorfen sodium 20 % SL @ 165.0 g a.i/ha as POE, T_9 : Acifluorfen sodium 20 % SL @ 206.25 g a.i/ha as POE, T_{10} : Imazethapyr 10 % SL 100.0 g a.i/ha as POE, T_{11} : Two hand weeding at 20 and 40 DAS and T_{12} : Weedy check with three replications. The soil of the experimental field was clay loam, alkaline in reaction (pH 7.56), medium in organic carbon (0.55 %), medium in available potassium (298.5 kg/ha) and phosphorus (20.5 kg/ha) and low in available sulphur (15.5 kg/ha). The recommended dose of nitrogen and phosphorus (20 & 40 kg/ha) was applied through diammonium phosphate (DAP). The variety of soybean (Pratap Soya-1) was used in this experiment. Results revealed that hand weeding twice at 20 & 40 DAS significantly reduced weed population and dry weight at 45 and 60 DAS, respectively. Hand weeding twice also increased significantly seeds weight (10.4 g), seeds/pod (3.0 Nos), pods/plant (36.07 Nos), seed yield (1329.0 kg/ha) and straw yield (1635.0 kg/ha) over other treatments and weedy check, respectively except Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE. However, Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE at 45 and 60 DAS gave significantly lower total weed population, dry weight of weeds and higher seed weight, pods/plant, seed index, seed and straw yield as compared to other treatments and weedy check, respectively.

Keywords: Soybean, Clodinafop- propargyl, Acifluorfen sodium, weed dynamics, yield attributes and yield

Introduction

Soybean (*Glycine max* L.) is an important rainy season crop grown more than 7.1 lac hectare in South-eastern parts of Rajasthan mainly Kota, Bundi, Baran and Jhalawar districts and produced 6.1 lac tonnes with average productivity is 859 kg/ha which is very low compared to national productivity 1006 kg/ha (Anonymous, 2009-2010). Weeds compete with crop plants for nutrients, moisture, sunlight and space; thereby reduce crop yields. To obtain good yield, it is essential to control the weeds at proper time using appropriate methods. Soybean (*Glycine max* (L.) Merr.) is the major oilseed crop of India, suffers from perceptible yield erosion 35 to 80 % on account of infestation with weeds (Billore *et al.* 1999 and Gupta *et al.* 2006). Cultural and mechanical methods of weed control are not always effective particularly if the crop experiences incessant rains in first critical 45 days (Prabhakar *et al.* 1992). This necessitates provision

of suitable options of herbicides to the farmers that can be cost effective and cope up with the scarcity of labour at the time of need. Although, the research has provided a few options involving pre-plant incorporation (Trifluralin and Fluchloralin), pre emergence (Alachlor, Pendimethalin, Metachlor and Clomazone) and post emergence (Imazethapyr, Quizalofop ethyl and Chlorimuron ethyl), there is a need to identify newer molecules for selective management of weed and to over come the problem of acquiring resistance by certain weeds against recommended herbicides. In view of this, it was considered appropriate to test the bio-efficacy of Clodinafop-propargyl against major weeds of soybean.

Material and methods

A field experiment was conducted consecutively for two rainy season (*kharif*) 2007and 2008 to evaluate the bio-efficacy of Clodinafop- propargyl

against weeds in soybean at Agricultural Research Station, Ummadganj farm, Kota, Rajasthan. The soil of experimental field was clay loam, alkaline in reaction (pH 7.56), medium in organic carbon (0.55%), medium in available potassium (298.5 kg/ha) and phosphorus (20.5 kg/ha) and low in available sulphur (15.5 kg/ha). The experiment consisted of twelve treatments i.e. 3 levels of Clodinafop-propargyl (60.0, 80.0 and 100.0 g a.i/ha), same three levels of Clodinafop-propargyl in combination with Acifluorfen sodium (123.75, 165.0 and 206.25 g a.i/ha) and same three levels of Acifluorfen sodium alone and one check chemical Imazethapyr 10 % SL @ 100.0 g a.i/ha. All the herbicidal treatments were applied as post emergence of weeds along with two hand weedings (20 & 40 DAS) and a weedy check repeated thrice in a randomized block design. Variety Pratap soya-1 was sown on 27th July 2007 and 02nd July 2008 and was harvested in October. A uniform dose of fertilizer, i.e. 20 & 40 kg N and P/ha was applied to all the treatments. The crop was raised using recommended package of practices.

The observation on yield and yield attributes were recorded at harvest. Weed population and oven dry weight was recorded at 30, 45 and 60 days after sowing. Statistical analyses were carried out by using standard statistical methods as suggested by Panse and Sukhatme (1985) for randomized block design. The major weeds flora in the experimental site included viz. *Echinochloa spp.*, *Cyperus rotundus* L., *Celosia*

argentea L., *Commelina benghalensis* L., *Digera arvensis* Forsk, *Boerhavia diffusa* L., *Convolvulus arvensis* L. and *Cynodon dactylon* L.

Result and discussion

Effect on growth and yield of soybean

Pooled results revealed that, among yield contributing factors viz. number of branches/plant, number of pods/plant and number of seeds/plant was significantly influenced whereas the soybean seed index was not much influenced by the different treatments (Table-3). The maximum branches per plant was recorded in two hand weeding at 20 and 40 DAS and remained at par with Imazethapyr 10 % SL @ 100.0 g a.i/ha. Similarly in number of pods/plant, all the herbicidal treatments showed superiority over weedy check. Highest number of pods/plant was observed in two hand weeding at 20 and 40 DAS followed by Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE. Similarly maximum seeds/pod was observed in two hand weeding at 20 and 40 DAS which was found at par with Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE. However, boldest seed was obtained in two hand weeding at 20 and 40 DAS closely followed by Imazethapyr 10 % SL @ 100.0 g a.i/ha and Clodinafop- propargyl 8% +

Table 1: Effect of herbicide on grassy weeds density & its dry weight of weeds and weed control efficiency (WCE) in soybean (pooled data of 2 years)

Treatments	Grassy weeds				
	Weed density (No./m ²)		Weed dry weight (g/m ²)		WCE (%) at 60DAS
	45 DAS	60 DAS	45 DAS	60 DAS	
T ₁ : Clodinafop- propargyl @ 60.0 g a.i/ha as POE	18.50(4.42)	21.34(4.73)	26.64	31.24	69.04
T ₂ : Clodinafop- propargyl @ 80.0 g a.i/ha as POE	10.84(3.44)	13.50(3.81)	17.27	19.77	80.34
T ₃ : Clodinafop- propargyl @ 100.0 g a.i/ha as POE	10.33(3.37)	12.33(3.65)	14.44	17.00	83.16
T ₄ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 60.0 + 123.75 g a.i/ha as POE	14.34(3.92)	16.34(4.16)	19.57	23.67	76.51
T ₅ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE	8.67(3.11)	10.67(3.42)	12.57	15.63	84.43
T ₆ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE	8.17(3.03)	9.33(3.21)	11.14	12.60	87.48
T ₇ : Acifluorfen sodium 20 % SL @ 123.75 g a.i/ha as POE	35.00(6.00)	43.00(6.63)	54.90	64.07	35.98
T ₈ : Acifluorfen sodium 20 % SL @ 165.0 g a.i/ha as POE	33.33(5.86)	41.17(6.49)	48.50	57.90	42.07
T ₉ : Acifluorfen sodium 20 % SL @ 206.25 g a.i/ha as POE	31.00(5.66)	39.00(6.32)	52.24	60.94	39.08
T ₁₀ : Imazethapyr 10 % SL @ 100.0 g a.i/ha as POE	15.00(4.00)	17.50(4.30)	18.27	21.74	78.31
T ₁₁ : Two hand weeding at 20 and 40 DAS	2.67(1.92)	6.33(2.71)	1.45	4.90	95.18
T ₁₂ - Weedy check	59.33(7.77)	65.00(8.12)	87.44	100.03	-
CD (P=0.05)	4.20	4.23	6.98	6.76	-

DAS; Days after sowing

Figures are subjected to square root transformation per parentheses are original values

Table 2: Effect of herbicide on Broad leaf weeds density & its dry weight of weeds and weed control efficiency (WCE) in soybean (pooled data of 2 years)

Treatments	Broad leaf weeds				
	Weed density (No./m ²)		Weed dry weight (g/m ²)		WCE (%) at 60DAS
	45 DAS	60 DAS	45 DAS	60 DAS	
T ₁ : Clodinafop- propargyl @ 60.0 g a.i/ha as POE	45.34(6.81)	41.34(6.51)	61.50	67.25	10.84
T ₂ : Clodinafop- propargyl @ 80.0 g a.i/ha as POE	45.47(6.82)	39.17(6.34)	59.84	69.65	7.62
T ₃ : Clodinafop- propargyl @ 100.0 g a.i/ha as POE	42.50(6.60)	39.50(6.36)	60.50	69.39	8.08
T ₄ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 60.0 + 123.75 g a.i/ha as POE	14.35(3.92)	17.50(4.30)	15.12	20.20	73.33
T ₅ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE	9.34(3.22)	12.67(3.70)	9.94	13.77	81.80
T ₆ : Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE	7.67(2.94)	11.67(3.56)	9.42	14.14	81.39
T ₇ : Acifluorfen sodium 20 % SL @ 123.75g a.i/ha as POE	19.34(4.51)	27.17(5.31)	19.62	26.92	66.42
T ₈ : Acifluorfen sodium 20 % SL @ 165.0 g a.i/ha as POE	15.34(4.04)	18.17(4.380)	15.62	20.45	73.02
T ₉ : Acifluorfen sodium 20 % SL @ 206.25 g a.i/ha as POE	12.33(3.65)	16.50(4.18)	13.37	16.44	78.34
T ₁₀ : Imazethapyr 10 % SL @ 100 g a.i/ha as POE	15.00(4.00)	18.17(4.38)	16.60	19.15	74.70
T ₁₁ : Two hand weeding at 20 and 40 DAS)	3.50(2.12)	5.00(2.45)	1.23	5.25	93.06
T12- Weedy check	45.34(6.81)	41.34(6.51)	61.50	67.25	-
CD (P=0.05)	3.80	3.48	3.27	3.42	

DAS; Days after sowing

Figures are subjected to square root transformation parentheses are original values

Table 3: Effect of herbicide on growth, yield attributes and yield of soybean (pooled data of 2 years)

Treatments	Plant height at harvest(cm)	Branches/ plant (Nos.)	Pods/plant (No.)	Seeds/ pod(Nos.)	Seed Index(g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest Index(%)	Weed index(%)
T ₁	44.97	2.40	18.465	2.100	10.010	712	948	42.89	86.65
T ₂	45.37	2.67	22.930	2.400	10.080	930	1212	43.41	42.90
T ₃	44.97	2.73	23.065	2.365	10.120	921	1247	42.48	44.30
T ₄	46.90	3.27	26.770	2.470	10.290	1067	1398	43.28	24.55
T ₅	48.13	3.93	31.985	2.800	10.350	1237	1607	43.49	7.43
T ₆	47.09	3.60	31.485	2.770	10.150	1229	1607	43.33	8.10
T ₇	44.07	2.87	19.400	2.150	10.140	743	990	42.87	78.87
T ₈	44.50	2.93	22.670	2.465	10.160	897	1188	43.02	48.16
T ₉	44.37	2.80	23.370	2.470	10.080	921	1233	42.75	44.29
T ₁₀	48.00	3.80	25.165	2.365	10.370	1034	1355	43.28	28.52
T ₁₁	50.03	4.00	36.070	3.000	10.400	1329	1635	44.33	-
T12	44.50	1.80	12.170	1.535	9.360	441	623	41.44	201.36
CD (P=0.05)	5.45	0.48	3.55	0.29	1.04	141.9	165.5	0.51	

DAS; Days after sowing

Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and minimum value is being associated with weedy check. Two hand weeding also gave significantly maximum seed yield, which remained at par with Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE. These three treatments gave higher yield to the tune of 201.36 %, 180.50% and 178.68 % over weedy check and 19.63 % 16.68% over the Imazethapyr 10 % SL @

100.0 g a.i/ha as POE. In general all the herbicidal treatments gave superior seed yield over the weedy check. Similar trend was also recorded in case of straw yield and harvest index of soybean. The role of yield contributing factors and enhanced yield on account of chemical control of weeds has been documented earlier (Billore and Joshi 1998 and Billore *et al.* 2001)

Effect on weeds and weed control efficiency:

Application of herbicide is being evaluated for weed management in soybean significantly reduced the grassy and broad leaved (dicot) weed density and

its dry biomass at both the stage of observations i.e. 45 and 60 days after sowing (Table-1 & 2). All the weed management treatments showed linear declining trend in their weed control efficiency with advancement in crop age. Two hand weeding proved to be the best technique for the management of both types of weeds, were at par in their weed control efficiency with each other. Application of Clodinafop – propargyl 8 % + Acifluorfen sodium 16.5% SL @ 100.0 + 206.25 g a.i. as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE showed higher weed control efficiency than its other levels at 45 and 60 days after sowing. However Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop-propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE, were at par in their weed control efficiency with each other, while Clodinafop-propargyl 8% + Acifluorfen sodium 16.5 % SL @ 60.0 + 123.75 g a.i/ha as POE in case of dicot weeds and Clodinafop- propargyl @ 100.0 g a.i/ha as POE in grassy weeds at both the stages ranked III in their weed control efficiency. However, recommended post emergence herbicide Imazethapyr 10 % SL @ 100.0 g a.i/ha showed slightly lower weed control efficiency than Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE at both the stages of observations. The results generated gains support from the other reports (Billore and Joshi 1998, Billore et al. 1999 and 2001)

Total weed control efficiency was significantly higher in Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 100.0 + 206.25 g a.i/ha as POE

and Clodinafop- propargyl 8% + Acifluorfen sodium 16.5 % SL @ 80.0 + 165.0 g a.i/ha as POE while Clodinafop- propargyl @ 100 g a.i/ha as POE and Acifluorfen sodium 20 % SL @ 206.25 g a.i/ha as POE in dicot proved to be the better treatments in weed control efficiency. These results are in accordance with the observation made by Billore and Joshi 1998, Billore *et al.* 1999 and 2001

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Effectiveness of trainings for rural women's imparted by KVK, Bareilly (U.P.)

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Abstract

The present investigation was carried out at KVK Bareilly district of Uttar Pradesh and the study covers 200 trained, untrained farm women's to determine the extent of change of knowledge and skills in important practices imparted through institutional working covers of KVK. The results of study revealed that age group of 30 to 40 actively participated in training programme and as the age group increases the participation gets diseased. Majority of sample group belongs to illiterate and can read & write only group with percentage of 23.5% and 4% respectively. Maximum trained and untrained women belong to high and schedule caste group with percentage of 33.0% and 39.5% respectively. Maximum time spent by trained & untrained women was in farming (37%) and house hold works like cooking and other works (34.6%). Overall socio-economic status study revealed that 45.5% trainees belongs to medium status, 34% comes from low profile while rest 20.50% respondents belongs to high status. To study the extent of change in knowledge & skills index number "t" test was carried out which indicates that fruit & vegetable preservation practices was prioritized first followed by interior decoration and stitching and embroidery by trained & untrained respondents both. Over all rank for different practices by only trained respondents showed that the first ranked practice was interior decoration (13%) followed by stitching & embroidery (78.72%), grain storage 52.64 and fruit & vegetable preservation (30.84).

Key words: knowledge, respondents, stitching and embroidery, socio-economic

Introduction

Women play a significant role in the society as home maker and are increasingly becoming a bread winner. Majority of the rural women are illiterate with poor health condition. They are lacking in knowledge of modern labor saving devices and facilities to relive their drudgeries at home. They are ill-nourished less educated and have poor knowledge of child care practices.

Indian Council of Agriculture Research (ICAR) has established Krishi Vigyan Kendra's (KVKs) all over the country to impart skill and need based vocational training to the farmers, farmwomen rural youth and in service field level extension workers and to those who wish to go for self-employment. Farmwomen play an important role in farm-enterprise since time immemorial and support the family by earning through various type of work. Viz. sowing, weeding, fertilizer and its application, spraying, harvesting etc. The trainings play a vital role to update the knowledge, psychological, social health and nutritional status of farm women and their families.

The recent census figures point out that the 50 percent female population of India 77% belongs to rural women. Out of them about 81.23 percent are engaged in Agriculture and Agro-based enterprises. Rural women are traditionally known for their skills in the selection and storage of seeds, livestock arrangement, collection of fuel, fodder etc. Though in efficiency and performance, they are equal to male workers but in a traditional society where patriarchal system prevails, they are made to confine themselves within the four walls of the house. This limits their mental horizon and they are considered in complete isolation to make major decision in the family.

Now days, it is an increasing realization that for speedy rural development, the rural women need to be made aware of new Agricultural and home technologies which may raise their productivity, alleviate drudgery and save energy and time. The introduction of new technologies only helpful if they are applied by women properly. On account of illiteracy among large number of rural women, only a very small proportion of developed technologies have been adopted by the women. A need therefore, arises to improve their knowledge, skill and attitude through appropriate

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training programme.

The need for empowering rural women in Agriculture through effective training and extension services arises from the gradual discussion availability of arable land, increasing population presence and growing environmental degradations which have for reaching implication for food and nutritional security in future. Sustainable agriculture development will inquire access to inputs and new technologies on the one hand and training of farm women and extension service on the other hand (Yozana).

In order to uplift women's status in the society and make them enable to manage their family, it very essential that this knowledge and skills improved. Improvement in this knowledge and skills can only be made by bringing them under institutional trainings.

Therefore to visualize how much impact of trainings would make on home science practice adopted by rural women trainings this study was carried out.

Methodology

The study was conducted at Bareilly district of Uttar Pradesh, the operational area of the KVK under study. Out of 15 blocks in district, one block Brithy - chainpur was selected randomly. Out of four randomly selected villages, 25 trained and 25 untrained women's were selected from each villages on random basis, thus the total 200 women's were selected for this study. The data were collected with the help of well structured schedule by personally interviewing. The data was analyses using appropriate statistical methods.

Results and Discussion

The results presented in Table 1 revealed that the maximum percentages of trained women were from age group of 30-40 (44%) and it corresponding percentage was 16 for the untrained category. While in case of 40-50, the untrained women percentage of 39% was observed. These findings indicate that the interestedness of 30-40 year of age group is the highest amongst rest group.

Highest of 45.50% respondents belongs to medium socio-economic status and rest 34.00 and 20.50% respondents belongs to low and higher socio-economic status respectively (Table 2).

Extent of change in knowledge presented in Table 3 shows the significance of KVK trainings on fruit and vegetable preservation revealed that mean score for trained and untrained respondent were 32.71 and 27.14 respectively. The value of "t" was observed 3.75 which were significant at 5% level of significance for 18 degree of freedom. So the first priority was on fruit and vegetable preservation. While the second priority given by respondent to interior decoration and the applied "t" test to judge the significance between trained and untrained respondents was 7.56 which were significant at 1% level of probability. The interior

Table 1: Socio-economic background of rural women

S.No. Variables	Trained	Untrained	Total	%
Age				
1 Below 30 years	28	11	39	19.50
2 30-10 years	44	16	60	30.00
3 41-50 years	19	39	58	29.00
4 Above 50 years	9	34	43	21.50
Education				
1 Illiterate	19	28	47	23.50
2 Can read only	14	14	28	14.00
3 Can write only	3	5	8	4.00
4 Can read & write only	13	19	32	16.00
5 Primary	28	9	37	18.50
6 Middle	17	6	23	11.50
7 High school	5	4	9	4.50
8 Inter mediate	1	5	6	3.00
9 Graduate	0	4	4	2.00
10 Post graduate	0	6	6	3.00
Caste				
1 Schedule caste	54	25	79	39.50
2 Schedule Tribe	0	0	0	0.00
3 Other backward caste	26	29	55	27.50
4 High caste	20	46	66	33.00
Occupation				
1 Farming	32	43	75	37.50
2 Service	1	0	1	0.50
3 Business	9	3	12	6.00
4 Caste occupation	11	2	13	6.50
5 Landless labour	10	1	11	5.50
6 Daily wages	14	5	19	9.50
7 House wife	23	46	69	34.50
Family Occupation				
1 Farming	62	53	115	57.50
2 Service	17	36	53	26.50
3 Business	15	5	20	10.00
4 Caste occupation	1	2	3	01.50
5 Landless labour	2	1	3	01.50
6 Daily wages	3	3	6	03.00
Marital status				
1 Married	92	86	178	89.00
2 Unmarried	5	14	19	09.50
3 Widow	2	0	2	01.00
4 Divorce	1	0	1	0.50
Family Structure				
1 Joint	25	47	72	36.00
2 Nuclear	75	53	128	64.00
Income source				
1 Farming	26	46	72	36.00
2 Service	18	11	29	14.50
3 Business	10	12	22	11.00
4 Farming + Service	12	9	21	10.50
5 Farming + Business	11	7	18	09.00
6 Farming+ Caste occupation	5	4	9	04.50
7 Farming+L.L. Labour	9	1	10	05.00
8 Farming + Daily wages	9	10	19	09.50

decoration practice was gainfully utilized by the trainers to raise their living status and to improve their living habits. The results of analysis revealed that their is 50% increase in the knowledge of the rural women in stitching and embroidery due to this training programme and the "t" test was 4.09 which has significant at 5 percent level at 18 degree of freedom. It indicates the contribution of trainings of stitching & embroidery to the farm women.

Table 2: Overall socio-economic status of the trainees

S.No.	Socio-economic status	No. of respondents	%
1	High status	41	20.50
2	Medium status	91	45.50
3	Low status	68	34.00
	Total	200	100.00

Regarding child care practice the average score for trained women was 17.94, while it was 14.25 for untrained women's with the "t" test value of 4.51 which was significant at 1 percent for 18 degree of

Table 3: Extent of change in knowledge and skill

S.No.	Practices	Trained	Untrained	't' value	d.f.
1	Fruit & vegetable preservation	32.71(126.57)	27.74(100.00)	3.75*	18
2	Interior decoration	22.98(199.56)	12.33(100.00)	7.56**	18
3	Stitching and embroidery	22.11(143.12)	15.71(100.00)	4.09**	18
4	Child care practices	17.94(132.62)	14.25(100.00)	4.51***	18
5	Grain storage	13.02(120.72)	11.90(100.00)	4.49**	18

* Significant at 5% level of probability.

** Significant at 1% level of probability.

*** Significant at 0.1% level of probability.

freedom.

It is relevant to state that the storage practices are mainly looked after by the farm women's and their training may bring positive results. The training mean score was recorded 13.02 in case of trained women while in case of untrained it was 11.90 which advocate the significance of training on storage aspect and their impact.

Table 4: Respective rank of trained respondents.

S.No.	Practices	Index	Rank
1	Interior Decoration	136.72	I
2	Stitching and Embroidery	78.72	II
3	Grain Storage	52.64	III
4	Fruit & Vegetable preservation	30.84	IV
5	Child care practices	10.94	V

The contents presented in Table 4 revealed that interior decoration ranked 1st with index score of

136.72. While stitching and embroidery, grain storage, fruits and vegetable preservation and child care trainings ranked II, III, IV and Vth with index score of 78.72, 53.64, 30.84 and 10.94 respectively.

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Growth performance and contribution of different contract foundation cereals seed agencies in Haryana

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Abstract

The study pertains to Haryana state for the period from 1996-67 to 2006-07. Foundation seed is the first generation seed from breeder seed. The growth performance and magnitude of change of foundation cereals seed production was analyzed fitting the exponential function and C.V. to the data and the growth performance of HSDC, CSF, NSE, CCSHAU, IFFCO and KRIBHCO in foundation cereals seed was poor but in case of private sector was very high. Moreover, the growth performance of total foundation cereals seed in the state was found to be significant. The growth performance of government sector in foundation cereals seed was computed to be -1.8 and showing declining trend. The growth rate of private sector in foundation cereals seed was computed to be 4.5 and overall growth rate was to be 2.7 percent per annum and statistically significant over the period of 196-97-2006-07. The contribution of government sector in foundation cereals seed was decreased and the contribution of private sector in foundation cereals seed was increase. The rule and regulation of W.T.O. encouraged the active participation of private sector in the seed business in the state.

Key words:-Cereals, foundation seed, growth performance and contribution.

Introduction

Today seed industries and technologies are being involved to ensure the continuous supply of high quality seeds of crop plants to farmers. Since agriculture being a biological industry, its success depends upon use of good quality seed, and the pace of progress in food production will largely depend upon the spread with which high quality seeds of agricultural crops are generated and made available to the farmers when required. One of the quickest and easiest ways of increasing the agricultural productivity is to harness the higher and better quality yield offered by improved crop seeds.

Contract farming can be defined as a system for the production and supply of agricultural produce under forward contracts, the essence of such contracts being a commitment to provide an agricultural commodity of a type, at a time and price and in quality required by a known buyer. It basically involves four things-pre-agreed price, quality, quantity or acreage (minimum/maximum) and time.

Foundation seed is the first generation seed from breeder seed; usually produce under contract by a Foundation Seed Organization. It is labeled with white tag. Foundation seed is a vital link between the breeder's seed produced under the control of the plant breeder and the certified seed produce by the seed growers. It is the seed stock from which registered or certified seeds are produce. Foundation seed may be

grown by private association of seed growers, through a special project within an experimental station or university, or by a private seed company. Only the best seed growers with the right combination of experience, appropriate land, infrastructure facilities and ability are accepted as foundation seed growers. The supply of foundation seed should not exceed the demand, which call for advance planning.

After the initiation of new economic Policy, there is an influx of large number of seed companies both indigenous and multinational in nature are operating in the state. Cereals seed production by government agencies and private seed firms are flourishing in the state. Hence it becomes of paramount improvement to analyze the growth performance and contribution of different contract foundation cereals seed production agencies in the state in lieu of the liberalization, globalization and privatization of policies introduced in the country to cope with changing global scenario. The study would be useful for researchers, planners and policy makers in the formation of policies for overall development of seed industry.

Methodology

The present study makes use of secondary data for the period of 1996-67 to 2006-07. Secondary data of foundation cereals seed were collected from the annual report of the Haryana Seed Development Corporation and the Haryana State Seed Certification

Agency. For computing the trend in production of foundation paddy seed, the compound growth rate analysis was employed by fitting exponential type of function.

The equation of the exponential function is:-

$$Y = a \cdot b^t$$

Where,

Y = area / production / productivity

t = Time variable in years

a = Intercept indicating Y in the base period (t=0)

b = Regression coefficient

As:

$$\log y = \log a + t \log b$$

The compound growth rate (CGR) has been calculated as:

$$\text{CGR (\%)} = (\text{Anti log } b - 1) \times 100$$

To know the magnitude of variation among the observation, coefficient of variation of average expected production and actual production obtained were calculated with the help of following formula:

Where, S.D. is standard deviation and mean is arithmetic mean

Simple tabular and conventional percentage analysis was used for determining contribution of different agencies in total contract foundation paddy seed production in the state.

Results and Discussion

Agencies-wise and sector-wise, growth rates of total foundation cereal seed production in the state was estimated and shown by the table no. 1

Where,

HSDC = Haryana Seed Development Corporation

CSF = Central Seed Farm

CCSHAU = Choudhry Charan Singh Haryana Agricultural University Hissar

NSC = Nation Seed Corporation

IFFCO = Indian Farmers Fertilizer Cooperative Ltd

KRIBHCO = Kirshi-Bharti Cooperative Ltd

Table 1 showed that growth rates of CSF, NSC, CCSHAU, IFFCO, and KRIBHCO were computed to be -11.8, 15.2, -0.2, -8.0, .2 and -7.9 per cent per annum, respectively and found statistically non

significant. It could be concluded that the growth rate of these agencies were poor over a decade, the growth rate of HSDC was found to be 6.7 per cent per annum and found statistically significant. The R^2 value was 0.104. The compound growth rate of government sector in total foundation cereal seed was observed to be -1.8 percent per annum over a decade and found statistically insignificant and its R^2 value was .158. It could be concluded that overall growth performance of government sector in foundation cereals seed industry was very poor and showing declining trend in total foundation cereals seed over a period of last 11 years. The growth rate of private sector was to be 4.5 per cent per annum and found statistically significant and R^2 value was 0.468. It can be concluded that growth performance of private sector in total foundation cereals seed was found to be very high over a period of last 11 years. The overall growth rate of total foundation cereal seed in the state was 2.7 per cent and found statistically significant at 5 percent level and its R^2 value was 0.360. It could be concluded that the growth performance of overall foundation cereals seed in the state was to be showing a moderate increase.

Agencies wise and sector-wise, contribution in total foundation cereals seed production in the state was estimated and shown by the table no. 2 (in percentage)

Table 2 showed the contribution of HSDC in total foundation cereals seed was 0.92 per cent in 1996-97 and had increased up to 5.43 per cent in 2006-07. The contribution of CSF in total foundation cereals seed in the state in 1996-97 was 13.23 per cent and had decreased to 4.02 per cent in 2006-07. The contribution of NSC in total foundation cereals seed in the state in 1996-97 was 1.06 per cent and its share increased up to 3.93 per cent in 2006-07. The contribution of CCSHAU in total foundation cereals seed in the state in 1996-97 was 10.72 per cent and its share went down drastically up to 5.70 per cent in 2006-07. The contribution of IFFCO in total foundation

Table 1 : Agencies-wise and sector-wise, growth rate of total foundation cereal seed production in the state during 1996-97 to 2006-07

Agencies/ sectors	R^2	F	Sig F	B_0	B_1	CGR%	C.V.%
HSDC	0.104	1.045	0.333	1585.97	0.067	6.7	33.26
CSF	0.397	5.919	0.038	5618.10	0-118	-11.8	53.43
NSC	0.559	11.409	0.008	387.88	0.152	15.2	55.51
CCSHAU	0.001	0.005	0.944	3039.51	-0.002	-0.2	21.91
IFFCO	0.705	21.511	0.001	617.87	-0.080	-0.8	35.44
KRIBHCO	0.000	0.002	0.968	498.54	0.002	0.2	38.41
OTHERS	0.169	1.829	0.209	370.68	-0.079	-7.9	97.82
GOVT. SECTOR	0.158	1.694	0.225	12541.70	-0.018	-1.8	10.15
PVT. SECTOR	0.468	7.929	0.020	24851.17	0.045	4.5	21.18
TOTAL	0.360	5.091	0.050	37477.61	0.27	2.7	14.83

Table 2: Agencies wise and sector-wise, contribution in total certified cereals seed production in the state during 1996-97 to 2006-07 (in percentage)

Year	Govt. Sector							Total	Pvt. Sector	Total
	HSDC	CSF	NSC	CCSHAU	IFFCO	KRIBHCO	Other			
1996-97	-	13.23	1.06	10.72	1.88	2.14	0.50	39.55	60.45	100
1997-98	0.92	15.96	2.14	7.36	1.34	1.39	0.77	29.87	70.13	100
1998-99	5.92	11.40	1.63	4.81	0.99	0.44	0.55	25.73	74.28	100
1999-2K	4.90	4.60	2.16	6.60	0.91	1.54	0.57	21.28	78.72	100
2000-01	7.35	4.55	0.62	6.50	0.76	1.61	92.87	24.27	75.73	100
2001-02	6.73	13.68	2.16	7.58	1.14	0.96	0.91	33.176	6.83	100
2002-03	7.26	7.92	3.29	7.76	0.86	0.71	0.26	28.06	71.94	100
2003-04	7.20	1.72	2.65	8.49	0.73	1.21	0.40	22.41	77.59	100
2004-05	5.98	3.30	3.54	6.57	0.61	1.14	0.32	21.46	78.55	100
2005-06	4.91	4.68	4.31	4.89	0.50	1.07	0.26	20.62	79.38	100
2006-07	5.43	4.02	3.93	5.70	0.56	1.10	0.29	21.03	78.98	100

cereals seed in the state in 1996-97 was 1.88 per cent and its share decreased up to 0.55 per cent in 2006-07. The contribution of KRIBHCO in total foundation cereals seed in the state in 1996-97 was 2.14 per cent and its share decreased up to 1.10 per cent in 2006-07. Only NSC and HSDC contribution in the government sector was increase due to well infrastructure of these agencies. The contribution of government sector was nearly 39.55 per cent in 1996-97 and its contribution went down in 2006-07 up to 21.02 percent in total foundation cereals seed in the state. The contribution of private sector in total foundation cereals seed production was 60.45 per cent in 1996-97 and had increased to 78.98 per cent as (shown in fig. 1). The rules and regulations of WTO encouraged the active participation of private sector in the seed business.

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Performance of direct finance to agriculture according to size of land holdings

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Abstract

In this study the relationship between flow of Scheduled Commercial Banks credit to agriculture and size of land holding have been examined. Commercial banks have succeeded in establishing a trend in direct finance to farmers which goes in favour of small and marginal farmers rather than medium and large farmers having above 5 acres of land holding. Thus, it is clear that the share of small and marginal farmers (up to 5 acres) in total direct finance has been greater than their proportion in total cultivated area but somewhat less than their proportion in total number of such farm house holds. The existing institutional agricultural credit delivery system is complicated. It needs to be simplified. At this systematic, imparting training to borrowers regarding procedural formalities of financial institutions could be helpful in increasing their access to institutional credit.

The existing appraisal system even for small loans is time taking, subjective and costly. It would be appropriate if investment loans which involve bigger amount of funds and suffer from serious recovery problems are subjected to more systematic appraisal and follow up by NABARD.

Key words: Relationship, credit, house holds, systematic, imparting training, borrowers

Introduction

The performance of the Indian economy improved during 2005-06 with an estimated growth of 8.4 per cent as against 7.5 per cent (at 1999-2000 prices) in the previous year. Agriculture and allied activities is estimated to have registered a growth of 3.9 per cent, reviving from a low of 0.7 per cent in the previous year. The agricultural loans and advances disbursed by co-operative banks, commercial banks and RRBs increased by 44% and reached Rs.1,25,309 crore during 2004-05, with various initiatives taken by banks and monitored by NABARD in the implementation of the package for doubling of agricultural credit over a three year period (2004-07). The ground level credit flow to agriculture and allied activities reached Rs.1, 57,480 crore during 2005-06, which is 26 per cent more than that of the previous year.

Since nationalization, banking sector in India has been making rapid strides in banking development. Within a period of little more than two decades after nationalization, the number of total bank branches rose by more than seven times from 8,262 in June, 1969 to 60,101 in March, 1991. Rural branches in particular, have shown tremendous geographical expansion.

The number of Scheduled Commercial Banks branches in country in year 2005-06 is 69,118 in which

rural branches are 30,750 semi urban branches are 15,296 and 11,899 are urban branches and metropolitan branches are 11,173 (Basic Statistical Returns of SCBs, 2006, RBI).

Nationalization of 14 major banks in July, 1969 imparted a new sense of urgency and major impetus to branch expansion in unbanked areas especially in rural and semi-urban areas expeditiously. Along with the geographical expansion and coverage one of the important aspects of nationalization of banks was to extend adequate amount of credit facilities to agriculture sector in a manner which would promote equitable development of agriculture across different farm size groups. Therefore, the issue of disparities in the flow of direct finance by Scheduled Commercial Banks across different farm size groups has been examined for the period 1975-76 to 2004-05.

This paper tries to review the relation between flow of Scheduled Commercial Banks credit to agriculture and size of land holding of farmers. The objective of the paper is to examine the flow of bank credit for different size groups of farms and to know what size groups of farmers have benefited from the increased flow of agricultural credit from scheduled commercial banks.

Materials and Methods

The study is based exclusively on published data obtained from various sources. The study was confined

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to all the scheduled commercial banks operating in India. Relevant time series data on flow of bank credit to agriculture for different size groups of farms were collected from various publications of Reserve Bank of India (RBI) such as Reserve Bank of India Bulletins, Report on Currency and Finance etc.

Pattern of flow of bank credit (direct credit) to agriculture by size group of land holdings or target groups was examined. For this the borrower farmers were grouped into three broad categories, according to their holding size, up to 2.5 acres, 2.5 to 5.0 acres and above 5.0 acres. Further, the proportion of direct finance part in total agricultural credit was worked out. Also, for these three categories of target groups, composition of flow of direct finance in term of short-term and term loan was studied for the said period.

Results and Discussions

Flow of Scheduled Commercial Banks Credit for Different Size Group of Farms

Flow of Scheduled Commercial Banks needs to be examined in relation to flow of bank credit to agriculture is what size group of farmers have benefited from the increased flow of agricultural credit from scheduled commercial banks.

Results on flow of bank credit to agriculture (direct finance comprising short-term and long-term loans) according to the size of land holding are presented for marginal (less than 2.5 acres), small (2.5 to 5.0 acres) and medium and large farmers (above 5 acres) in table 1.

The results show that in pre-liberalization period the credit to marginal farmers increased steadily from 19.35 per cent in 1975-76 to 23.06 per cent in 1990-91

and in the post-liberalization period the credit to marginal farmers also increased from 14.18 per cent in 1995-96 to 26.59 per cent in 2005-06, except a small dip in 2000-01. In pre-liberalization period the credit to small farmers also increased same as marginal farmers, but in the case of medium and large farmers the percentage of credit declined from 63.37 per cent in 1975-76 to 53.46 per cent in 1990-91, while the total credit increased nineteen times from Rs. 641.16 crore in 1975-76 to Rs 12388.6 crore in 1990-91.

In the post-liberalization period the direct finance to small farmers increased from 24 per cent in 1995-96 to 26.18 per cent in 2005-06 except a small dip in 2000-01. The direct finance to medium and large farmers also declined from 51.80 per cent in 1995-96 to 47.22 per cent in 2005-06 and the total credit increased six times from Rs 17884.7 crore in 1995-96 to Rs. 111743 crore in 2005-06.

Table shows that total direct finance to farmers consistently increased from Rs. 641.16 crore in 1975-76 to Rs. 219340 crore in 2008-09. Depicting a continuously declining trend it reached to 45.29 percent in the year 2008-09 except a slight spurt in 2000-01.

Above results reveal that in the pre & post liberalization period the direct finance to marginal and small farmers increased and in the case of medium and large farmers the percentage of credit decreased. While the total credit in both the period (pre & post liberalization) was increased.

Above results further reveal that commercial banks have succeeded in establishing a trend in direct finance to farmers which goes in favour of small and marginal farmers rather than medium and large

Table 1: Scheduled Commercial Banks' Direct Finance (outstanding) to Farmers According to Size Group of Land Holdings

(Amount in Rs. Crore)

Year (ending June)	Up to 2.5 acres	2.5-5.0 acres	Above 5 acres	Total
Pre-liberalization period				
1975-76*	124.1(19.35)	110.69(17.26)	406.34(63.37)	641.16(100.0)
1980-81	476.8(20.49)	395.7(17.00)	1453.9(62.49)	2326.4(100.00)
1985-86	1525.9(22.82)	1482.9(22.17)	3677.8(55.00)	6686.6(100.00)
1990-91	2894.5(23.36)	2870.3(23.16)	6623.8(53.46)	12388.6(100.00)
Post-liberalization period				
1995-96	4325.6(24.18)	4295(24.01)	9265.2(51.80)	17884.7(100.00)
2000-01	7214.8(22.91)	7308.3(23.21)	16962.9(53.87)	31486(100.00)
2004-05	20499.2(26.12)	20758.56(26.45)	37218.40(47.42)	78476.16(100.00)
2005-06	29719(26.59)	29255(26.18)	52769(47.22)	111743(100.00)
2008-09	60199(27.44)	59792(27.25)	99349(45.29)	219340(100.00)

Sources: Handbook of statistics on Indian economy, RBI, various years. Farm size-wise data prior to 1975-76 not available

*end-March

Figures in parenthesis shows the percentage of total .

farmers having above 5 acres of land holding. Thus, it is clear that the share of small and marginal farmers (up to 5 acres) in total direct finance has been greater than their proportion in total cultivated area but somewhat less than their proportion in total number of such farm house holds. Therefore, the hypothesis that the share of marginal and small farms in the flow of bank credit is on the decline is not accepted.

Development policies envisage that direct finance to small and marginal farmers should reach to at least 50 per cent of the total direct finance to agriculture. This condition has been largely met by Scheduled Commercial Banks. Nevertheless, the banks should sustain meeting this minimum requirement.

Policy Implications

In view of the deficiencies present in the existing system of agricultural financing by banks, translation of macro-decisions on credit planning into micro-decisions of credit disbursement by banks at the branch level needs a careful examination.

The choice of a credit outlet is affected by a number of socio-demographic factors. The existing institutional agricultural credit delivery system is complicated. It needs to be simplified. At this systematic, imparting training to borrowers regarding procedural formalities of financial institutions could be helpful in increasing their access to institutional credit.

The customary approach to stimulating economic development of small farm agricultural stress the

necessity of generating loans for a large number of borrowers in a relatively short-span of time, particularly in India, where small farms dominate the agrarian structure. Viewed against it, the present credit delivery system for small loans needs a new look. Bank procedures and forms still prove to be cumbersome to the average Indian farmer. The existing appraisal system even for small loans is time taking, subjective and costly. It would be appropriate if investment loans which involve bigger amount of funds and suffer from serious recovery problems are subjected to more systematic appraisal and follow up by NABARD.

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Preferences of Viewers Towards Different Contents of Farm Telecasts

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Abstract

The role of mass media as an instrument for social, cultural and economic changes is such more vital today than over before. This is on account of the revolution in information sciences all over the world. Mass media can provide attention on different development programmes, mobilize people and give them opportunity to express their reactions. They can inform people about needs and problems, innovations and results. The study was carried out in two purposively selected blocks namely: Etmadpur and Khandouli of Agra district of Uttar Pradesh to find out the preferences of viewers in respect to timings, durations, frequencies, contents and modes of presentation of different farm telecasts broadcasted by Doordarshan Kendra Lucknow. Study revealed that most of the male and female respondents preferred to watch the farm telecasts between 6.00 to 7.00 PM during the winter season. During the summer season, majority of the respondents preferred to watch the farm telecast between 7.00 to 8.00 PM. The overall trend was the same for the pooled category of farmers. The most preferred duration of farm telecast viewing was ½ hour (M.S. 2.28). Majority of the males and females preferred to watch the telecasts 'Frequently' (2 -3 farm telecasts / week). Study also reveals that 'Agricultural finance and insurance' (M.S. 2.42) content was ranked first by male respondents, whereas females assigned first rank to 'Animal production and dairying' (M.S. 2.46) were preferred contents of farm telecasts. 'Agricultural finance and insurance' (M.S. 2.25) content was preferred by the all respondents. 'Discussion with farmers and scientists' (M.S. 2.52) mode of presentation was preferred by the male respondents, and 'Discussion-cum- demonstration' (M.S. 2.44) mode of presentation was preferred by the female respondents. Overall 'Discussion with farmers and scientists' (M.S. 2.39) was most preferred mode of presentation by the all respondents.

Key Words: Contents, Farm telecast, Information, Preference, Television, Viewers.

Introduction

The role of mass media as an instrument for social, cultural and economic changes is such more vital today than over before. This is on account of the revolution in information sciences all over the world. Mass media can provide attention on different development programmes, mobilize people and give them opportunity to express their reactions. They can inform people about needs and problems, innovations and results.

It is acclaimed that television provide words with visuals and sound effect like movie. However, it far surpasses the film by its high intimacy and the capacity to reach the largest number of people in the shortest possible time. People learn through both eyes and ears and thus remember things better. Television helps to mass to acquire the latest technology having very clear

concepts because people have a good chance to see and every steps, which ultimately encourages results positive response with the help of regular audio visual education. Awareness can be easily developed, interest can be aroused and the will to adopt the information among the farmer can be generated. People become habitual to see the programmes on television and become habitual to practice into the field situation. This process helps to continue learning about new technology. Various programmes can be telecasted in different languages. Doordarshan use to telecast programmes for farmers and field extension workers. The information related to the weather, rainfall, prices, potential markets, seeds, quality, techniques, technologies are shown in programmes. It has been also observed that through television the farmers can be made conversant with the sophisticated and changing technology in the shortest possible time.

Television constitutes an important medium widely used to disseminate information to its viewers. It has unique feature of combining audio visual technology, and thus considered to be more effective than audio media.

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It serves multiple purposes of entertainment, information and education. Besides performing motivational function it helps in providing discovery learning and cognitive development of its viewers.

In this information age, television has become popular of its tremendous and audible appeal. It has ability to convey life and events in action to develop a profound influence upon the viewers. It provides viewers with realistic experiences, which capture their attention and motivate them in proper direction. Keeping this in view, the present investigation was carried out to study the preferences of viewers in respect to timings, durations, frequencies, contents and modes of presentation of different farm telecast broadcasted by Doordarshan Kendra Lucknow.

Methodology

The study was carried out in two purposively selected blocks namely: Etmadpur and Khandouli of Agra district of Uttar Pradesh. Total 10 progressive villages (5 from each block) were randomly selected. Twenty two TV owner farmers (11Males and 11 Females) were randomly selected from each village, considering farmers who had television sets for the last three years, thus making a total sample of 220 respondents. The responses were obtained from the respondents in 3 categories as 'most preferred', 'preferred' and 'least preferred' contents of farm telecast for which they were assigned scores 3, 2, 1, respectively. The structured interview schedule was developed and was pre-tested on non sampled respondents. The data were collected through personal interview with the help of pre-tested schedule. The collected data were processed, tabulated, classified and analyzed in terms of mean scores, ranks and rank correlation.

Results and discussion

Preferred timings for viewing the farm telecasts

The preference of respondents, based on their timing of viewing of the farm telecast has been presented in Table 1. Table reveals that during the winter season, majority of the male respondents

preferred to watch the telecast between 6.00 to 7.00 PM (M.S. 2.41) followed by between 5.00 to 6.00 PM and between 7.00 to 8.00 PM and hence ranked accordingly 2nd and 3rd, respectively.

In case of female, majority of the respondents also preferred to watch the telecast between 6.00 to 7.00 PM (M.S. 2.28) followed by between 7.00 to 8.00 PM and between 5.00 to 6.00 PM hence ranked accordingly 2nd and 3rd, respectively. It was seen that there was hardly any difference between male or female preference for time of viewing the farm telecast. Most of the male and female respondents preferred to watch the farm telecasts between 6.00 to 7.00 PM during the winter season. It was due to the fact that because of the early sunset, they returned to their homes early after doing farm activities, and so it was convenient time for watching the television.

During the summer season, majority of the respondents preferred to watch the telecast between 7.00 to 8.00 PM (M.S. 2.44 male and M.S. 2.55 female) followed by between 6.00 to 7.00 PM and between 5.00 to 6.00 PM and hence ranked accordingly 2nd and 3rd, respectively. Again as in summer season, male and female agreed for the same timing as most acceptable that is 7.00 to 8.00 PM. In hot weather sunsets late, so farmers come home late from farms. Hence, one hour's delay was found in the preferred timing in the hot season as compared to the cold season. The overall trend was the same for the pooled category of farmers.

Preferred duration for viewing the farm telecasts

The preference of respondents, based on their duration of viewing the farm telecast has been presented in Table 2. Table indicates that majority of the males and females preferred to watch the telecast for a duration of ½ hour (M.S. 2.44 male and M.S. 2.12 female) ranked first followed by 15 – 20 minutes and above ½ hours and hence ranked accordingly 2nd and 3rd respectively.

The same trend was shown by the overall majority. The most preferred duration of telecast

Table 1: Preferred timings for viewing the farm telecasts.

S. No.	Timings	Male(n = 110)		Female(n = 110)		Pooled(n = 220)	
		Mean score	Rank	Mean score	Rank	Mean score	Rank
A. Winter season (October – March)							
i	Between 5.00 to 6.00 PM	1.94	II	1.58	III	1.76	III
ii	Between 6.00 to 7.00 PM	2.41	I	2.28	I	2.34	I
iii	Between 7.00 to 8.00 PM	1.49	III	2.14	II	1.81	II
B. Summer season (April – September)							
i	Between 5.00 to 6.00 PM	1.52	III	1.37	III	1.44	III
ii	Between 6.00 to 7.00 PM	1.92	II	2.06	II	1.99	II
iii	Between 7.00 to 8.00 PM	2.44	I	2.55	I	2.50	I

Table 2 : Preferred duration for viewing the farm telecasts.

S. No.	Duration	Male(n = 110)		Female(n = 110)		Pooled(n = 220)	
		Mean score	Rank	Mean score	Rank	Mean score	Rank
1.	15 – 20 minutes	1.98	II	1.94	II	1.96	II
2.	½ hour	2.44	I	2.12	I	2.28	I
3.	Above ½ hours	1.65	III	1.90	III	1.77	III

Table 3 : Preferred frequency for viewing the farm telecasts.

S. No.	Frequency	Male(n = 110)		Female(n = 110)		Pooled(n = 220)	
		Mean score	Rank	Mean score	Rank	Mean score	Rank
1.	Regularly(3-5 telecasts/week)	1.86	II	1.94	II	1.90	II
2.	Frequently (2-3 telecasts/week)	2.34	I	2.31	I	2.32	I
3.	Occasionally(One telecast/week)	1.80	III	1.46	III	1.63	III

Table 4: Preferred contents of farm telecasts.

S. No.	Contents	Male(n = 110)		Female(n = 110)		Pooled(n = 220)	
		Mean score	Rank	Mean score	Rank	Mean score	Rank
1.	Field crops	2.17	II	2.11	III	2.14	III
2.	Vegetable crops	1.81	V	1.96	V	1.88	VI
3.	Fruit production	1.62	XI	1.54	X	1.58	XII
4.	Animal production and dairying	1.94	IV	2.46	I	2.20	II
5.	Home science (Health, Nutrition and Family Welfare etc.)	1.64	X	2.24	II	1.94	V
6.	Rural development programmes	1.64	X	1.60	IX	1.62	X
7.	Agricultural finance and insurance	2.42	I	2.08	IV	2.25	I
8.	Agricultural marketing	1.69	IX	1.66	VIII	1.68	IX
9.	Agricultural enterprises i.e., Food processing, mushroom, bee keeping etc.	2.05	III	1.89	VI	1.97	IV
10.	Watershed and drought management	1.78	VI	1.80	VII	1.79	VII
11.	Agricultural machinery	1.74	VII	1.66	VIII	1.70	VIII
12.	Organic farming	1.71	VIII	1.49	XI	1.60	XI
13.	Farm forestry	1.55	XII	1.49	XI	1.52	XIII
14.	Medicinal and aromatic plants	1.55	XII	1.44	XII	1.50	XIV

$$r^2 = 0.757^{**}$$

** Significant at 0.01% level of significance.

viewing was ½ hour (M.S. 2.28). It was followed by 15 – 20 minutes and above ½ hours and hence ranked according to 2nd and 3rd, respectively.

Preferred frequency for viewing the farm telecasts

The preferred frequency of viewing the farm telecast has been presented in Table 3. Table shows that majority of the males and females preferred to watch the telecasts 'Frequently' (M.S. 2.34 male and M.S. 2.31 female) ranked first followed by 'Regularly' and 'Occasionally' and hence ranked accordingly 2nd and 3rd, respectively.

Similarly, overall majority of the respondents preferred most to watch the telecasts 'Frequently' (M.S. 2.32) followed by 'Regularly' and 'Occasionally', respectively.

This was because both male and female respondents felt that 2 -3 farm telecasts / week on

fixed days were sufficient. It would create a regular interest among the farmers and also the curiosity was maintained if the days were fixed for each and every farm telecast. Both males and females were equally enthusiastic about frequently watching TV. They waited for their favorite programmes.

Preferred contents of farm telecasts

The responses pertaining to preferred contents of farm telecasts has been worked out and presented in Table 4. Table reveals that 'Agricultural finance and insurance' (M.S. 2.42) content was ranked first by male respondents, whereas females assigned first rank to 'Animal production and dairying' (M.S. 2.46). The 2nd, 3rd and 4th ranks were assigned by male respondents to field crops, agricultural enterprises and animal production and dairying, respectively. In case of female respondents the 2nd, 3rd and 4th ranks were

Table 5: Preferred modes of presentation of farm telecasts.

S. No.	Mode of Presentation	Male(n = 110)		Female(n = 110)		Pooled(n = 220)	
		Mean score	Rank	Mean score	Rank	Mean score	Rank
1.	Lecture method	1.86	V	1.76	V	1.81	V
2.	Interview with scientists	2.25	II	1.81	IV	2.03	IV
3.	Discussion with farmers and scientists	2.52	I	2.26	II	2.39	I
4.	Discussion – cum – demonstration	2.02	IV	2.44	I	2.23	II
5.	Dramatized presentation	1.61	VI	1.52	VI	1.56	VI
6.	Reply to questions	2.15	III	2.01	III	2.08	III

assigned to home science, field crops and agricultural finance and insurance, respectively. Overall table indicates that 'Agricultural finance and insurance' (M.S. 2.25) content was assigned the first rank followed by animal production and dairying, field crops, agricultural enterprises and home science assigned rank 2nd, 3rd, 4th and 5th respectively.

The data in table further reveals that significant rank correlation was established in between male and female preferences regarding contents of farm telecast ($r^2=0.757$). This was something expected as they perform similar roles in the society.

This result might be due to the fact that farmers need more capital investment to get better benefits. As males they were more risk bearing and heads of family. They were eager to know about the various agricultural finance and insurance policies to safeguard the value of their products against natural calamities.

After that they preferred to view the programmes on field crops, it was because field crop production was main agricultural occupation on the entire area. So far as female respondents were concerned, they preferred most to view the programmes on animal production and dairying following by home science. It was due to the fact that the females usually look after the home and take care of livestock and home science activities. Research studies in the field of social science have indicated that 80% of animal care is done by females. Almost 100% of the home related jobs are done by them. All these lead to their differential choices of contents, while viewing the TV.

Preferred modes of presentation of farm telecasts

The preferences of the respondents regarding different modes of presentation of farm telecast are given in Table 5. Table shows that 'Discussion with farmers and scientists' (M.S. 2.52) mode of presentation was assigned the first rank by the male respondents, whereas females assigned first rank to 'Discussion–cum– demonstration' (M.S. 2.44). It was followed by interview with scientists, reply to questions, discussion–cum–demonstration, lecture method and dramatized presentation ranked 2nd, 3rd, 4th, 5th and 6th

by the male respondents, respectively. Whereas for female respondents, it was followed by discussion with farmers and scientists, reply to questions, interview with scientists, lecture method and dramatized presentation ranked 2nd, 3rd, 4th, 5th and 6th respectively.

Thus from the foregoing discussion, it may be concluded that the discussion with farmers and scientists (M.S. 2.39) was most preferred mode of presentation as ranked as 1st. It was followed by discussion–cum– demonstration, reply to questions, interview with scientists, lecture method and dramatized presentation ranked 2nd, 3rd, 4th, 5th and 6th respectively. The reasons for best preferred mode of presentation as discussion with farmers and scientists could be because they have similar discussion groups and situations in the village. They identified and empathized with the television group and liked it the best.

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PRA and its role in reorienting Agri/ Horticultural interventions for Technology Demonstrations in a Participatory Action Research mode in Semi arid region

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Abstract

To finalise the agri/horti intervention under NICRA project a PRA study was conducted for assessing the relative importance of different arable and horticulture crops and livestock species, problem identification and prioritization of interventions for augmenting the agri/ horticultural production to ensure the secured livelihood of farmers of Kadesara Kalan village situated in Lalitpur District of Uttar Pradesh. On the basis of matrix ranking, wheat and groundnut were ranked as the most preferred crop due to higher yield, more income during Rabi and Kharif seasons, respectively. In farmer's view, the income followed by market price, irrigation requirement and suitability to soil remained the important criteria for choosing a crop. Among the matrix ranking of vegetables/spices, ginger proved most preferred crop of this group because of more income, high value and market availability followed by tomato, turmeric, brinjal, chilies and potato. Fruit trees like aonla, guava, zizipus, mango, papaya, citrus, wood apple, mulberry and jack fruit are grown in the village in sporadic pockets but citrus and papaya were the dominant fruits followed by anola, guava, ber etc. based on the parameters like easy availability of market, domestic consumption, market price, suitability to kitchen garden etc.

Key words: PRA and Matrix ranking, domestic

Introduction

In changing climate scenario, about 80% of the world and 60% of the Indian Agriculture is rain-dependent, diverse, complex, under-invested, risky, distress prone and vulnerable. Uncertainties and seasonal migrations have been further compounded the complexity due to high frequency of the extreme weather events due to global warming (Samra *et al.* 2008). Bundelkhand anciently known as Chedi Kingdom is spread over approximately 70,000 sq km area comprising of seven districts of southern Uttar Pradesh and six districts of northern Madhya Pradesh (MP) between 23°10' and 26°30' N and 78°20' and 81°40' E. It lies between the Indo-Gangetic Plain to the north and the Vindhya Range to the south. It is a gently sloping upland, distinguished by barren hilly terrain with sparse vegetation. The region is unique in terms of agro-ecological elements.

Historically, Bundelkhand region of UP and MP used to have one drought in 16 years during 18th and 19th centuries which increased by three times during the period 1968 to 1992 and the probability rose to once in three years in recent past decades. Crop production, livestock rearing and seasonal outmigration provide more than 90%

of rural income in the Bundelkhand region. The Bundelkhand Region is marked by extremes of temperature, maximum temperature touching to 47° C during the summer months and dropping as low as 3° C in winter. The rainfall distribution pattern is irregular, with approximately 90% of annual rainfall in the region caused by the south-west monsoon during June to September. The annual rainfall of the region is 800-900 mm but most of it is lost to runoff. The scanty winter rainfall is useful for the cultivation of 'Rabi' crops, but it is usually inadequate without supplementary irrigation sources.

The matrix ranking is a method of assessing the relative importance of different options or prioritizing options of population subgroups against specified criteria (Conroy, 2002). It clearly spells the degree to which an alternative or option is preferred or prioritized against specific criteria (Brocklesbury, 2002). Cramb and Purcell (2001) established that emphasis should be on the identification of preferences from the point of view of local analysts which is an essential component of this tool. The present paper aims to study the problem identification, farmers' criterion for preferring a crop and proportional allocation of land and other resources for prioritization of interventions at farmers' fields through PRA.

Material and methods

A PRA exercise was conducted at village

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Sr. No.	Rabi Crops	Kharif Crops	Parameters Vegetables/ Spices	Fruit Trees	Animal Husbandry
1	More yield	More yield	More yield	More yield	Utility
2	More income	More income	More income	More income	Easy maintenance
3	Less disease and pest	Less disease and pest	Less disease and pest	Less disease and pest	Disease attacks
4	Less investment	Less investment	Less investment	Suitable to soil	Shed requirement
5	Suitable to soil	Suitable to soil	Less irrigation	Easy market	Feed and fodder requirement
6	Less irrigation	Less irrigation	Suitable to soil	Suitable to climate	Grazing requirement
7	Market price	Less duration	Early fruiting	Suitable to kitchen garden	Green fodder requirement
8	Staple food	Market price	Market price	Less care	Profitability
9	Animal feed and fodder	Ease of marketing	Market availability	Domestic consumption	Calving/kidding interval
10	-	-	-	Less duration	Produce marketing facility
11	-	-	-	Market price	Use of local resources
12	-	-	-	-	Social acceptability of rearing

Kadesara Kalan to understand the problems, suitability and preferences of the crops/ vegetables/ fruits and livestock species. An open meeting of the NICRA project respondents was held at village level. The scientists from various streams attended the meeting. Open views were invited from the farmers. The farmers were asked to opine the criteria's and weightage they look in a crop to grow. During the exercise farmers opined the following criteria's for the agricultural, horticultural crops and livestock species.

All the 12 respondents were asked to put the pebbles against the crops as per their choice of weightage on the basis of parameters decided after the brainstorming with scientists and farmers among their group. Accordingly ranks were allotted to each crop on the basis of number of pebbles allotted to each crop. After completion of the exercise the horizontal as well as vertical scoring was done. The crop recording maximum scoring was given the first rank (farmer's perfect choice) where as the criteria recording maximum score was given first rank (most preferred characteristic).

Results and Discussion

Matrix Ranking of Rabi crops

Among Rabi crops wheat was ranked first based

Table 1: Matrix Ranking of Rabi crops

S. No.	Character	Wheat	Barley	Mustard	Gram	Berseem	Lentil	Factor	Ranking
1	More yield	5	3	2	2	-	2	14	VII
2	More income	5	2	3	4	3	4	21	I
3	Less disease and pest	4	5	1	1	3	2	16	V
4	Less investment	2	4	4	2	1	2	15	VI
5	Suitable to soil	4	3	3	3	2	3	18	IV
6	Less irrigation	2	4	3	5	1	4	19	III
7	Easy marketing	4	2	5	5	-	4	20	II
8	Staple food	5	1	4	3	-	2	15	VI
9	Animal feed and fodder	1	4	3	3	5	-	16	V
	Choice	32	28	28	28	15	23		
	Ranking	I	II	II	II	IV	III		

on the criterias viz., staple food, more income and less disease and pest in comparison to other crops of the season in the area. In real field situation the fact is verified as it occupies more than 90% of the fields during the season. Being the staple food and less vulnerable to disease and pests, easy marketing etc. (Table 1) the crop occupies the areas/ pockets which are not suitable for wheat as per the land use classification. Among the parameters, the more income and easy marketing were ranked the most preferring criteria's.

Matrix Ranking of Kharif crops

Similar to above, among the Kharif crops, groundnut ranked first followed by sesamum (Table 2). Suitability to soil, higher market price, higher yield, ease of marketing and more income were the important factors which drove the groundnut to first rank. As regards to parameters, ease of marketing, income and soil suitability has been the preferred parameters. In actual field situation the groundnut occupies more than 60 per cent of the agricultural land in the village.

Matrix Ranking of Vegetables/Spices

Brinjal, potato, ginger, tomato, turmeric and chilies are the main crops of the village. Others vegetables are grown in traces. Ginger ranked as most preferred species among vegetable/spices by the villagers as it

Table 2: Matrix Ranking of *Kharif* crops

S. No.	Character	Groundnut	Black gram	Green gram	Maize	Sesamum	Paddy	Factor	Ranking
1	More yield	5	3	2	2	2	1	15	VII
2	Market price	5	4	2	2	3	1	17	V
3	Less disease and pest	3	2	1	2	2	4	10	VIII
4	Less investment	1	4	3	3	5	3	19	III
5	Suitable to soil	5	4	3	2	3	3	20	II
6	Less irrigation	4	4	2	1	5	2	18	IV
7	Less duration	1	4	4	2	2	3	16	VI
8	More income	5	4	5	3	4	1	22	I
9	Ease of marketing	5	4	3	3	4	3	22	I
	Choice	34	29	25	20	30	21		
	Ranking	I	III	IV	VI	II	V		

Table 3: Matrix Ranking of Vegetables/Spices

S. No.	Character	Brinjal	Potato	Ginger	Tomato	Turmeric	Chilies	Factor	Ranking
1	More yield	4	4	4	2	1	3	18	V
2	More income	2	3	5	3	4	3	20	III
3	Less disease and pest	2	3	5	4	3	4	21	II
4	Less investment	5	3	1	3	2	3	17	VI
5	Less irrigation	2	2	1	2	2	2	11	VIII
6	Suitable to soil	3	2	4	3	4	3	19	IV
7	Early fruiting	4	2	1	4	2	3	16	VII
8	Market price	1	2	5	3	5	2	18	V
9	Market availability	4	2	5	4	5	4	24	I
	Choice	27	23	31	28	28	27		
	Ranking	III	IV	I	II	II	III		

fetches more income and easy marketability (Table 3). Though it requires higher input cost but the higher returns tempted the farmers for this crop.

Matrix ranking of fruit trees

Among fruit trees aonla, guava, citrus, mango, ber and papaya are commonly grown in the village. Citrus was the first choice of the respondents. It was favored by the farmers as per the following parameters (Table 4).

Matrix ranking for livestock species

Cows, buffalo goats and sheep were the commonly reared animals of the village. The important factors deciding the choice of rearing of a species were ease of maintenance, utility, produce marketing facility and social acceptability etc. on the basis of the factors mention in the Table. 5. Buffalo was considered as the top priority in the livestock category.

Recommended interventions for climate resilience on the basis of matrix ranking

Based on the matrix ranking following interventions with some improvisation over the existing practices were decided as these appear to have easier adaptability.

Crop diversification:

Rabi Season

- The farmers were using local / Lok-1 variety of wheat which requires more number of irrigations. Looking at the water limited availability in the village, less water requiring species viz., mustard/ chickpea/ lentil and less

irrigation requiring wheat varieties (Harshita, Amrita, Amar) were introduced.

- In pockets of ample irrigation availability, high yielding wheat varieties (Naveen Chandausi and Swarna) were introduced.
- Line sowing was recommended instead of broadcasting in case of wheat which resulted in curtailing the seed rate to 100 kg/ ha instead of 250kg /ha.

Kharif season

- The varietal replacement intervention were introduced in following crops as per the matrix ranking.

Groundnut

- Improved variety (Utkarsh: Recommended for the region) over the local variety (Jhumku) was introduced.

Sesamum

- Improved variety (JTS-8, Sekhar, Type-78) were introduced to replace local varieties

Black gram

- Improved variety (Azad, Uttara) were introduced to replace local varieties

Moisture conservation

EX- Situ Moisture conservation strategies

- Check dam construction on drain line
- Construction of farm pond

In- Situ Moisture conservation strategies

- Deep summer ploughing alternate year
- Nutrient management through IPNS

Table 4: Matrix ranking of fruit trees

S. No.	Character	Aonla	Guava	Ber	Mango	Papaya	Citrus	Factor	Ranking
1	More yield	3	5	3	2	4	3	20	V
2	More income	3	4	2	2	5	3	19	VI
3	Less disease and pest	5	3	5	3	2	3	21	IV
4	Suitable to soil	4	3	4	3	3	4	21	IV
5	Easy market	5	5	5	5	5	5	30	I
6	Suitable to climate	5	3	4	2	3	5	22	III
7	Suitable to kitchen garden	1	5	1	2	5	5	19	VI
8	Less care	5	2	5	2	2	5	21	IV
9	Domestic consumption	3	5	2	4	4	5	23	II
10	Less duration	4	3	4	1	5	4	21	IV
11	Market price	3	4	2	2	5	3	19	VI
	Choice	41	42	37	28	43	45		
	Ranking	IV	III	V	VI	II	I		

Table 5: Matrix ranking for livestock species

Sr. No.	Character	Cow	Buffalo	Goat	Sheep	Bull	Factor	Ranking
1	Utility	4	5	3	2	3	17	II
2	Easy maintenance	4	5	3	3	3	18	I
3	Disease attacks	3	4	2	2	4	15	IV
4	Shed requirement	3	3	4	2	2	14	V
5	Feed and fodder requirement	4	1	3	4	2	14	V
6	Grazing requirement	3	5	1	1	3	13	VI
7	Green fodder requirement	2	1	3	3	3	12	VII
8	Profitability	3	5	4	2	-	14	V
9	Calving/kidding interval	2	2	5	5	-	14	V
10	Produce marketing facility	3	5	5	3	-	16	III
11	Use of local resources	1	3	5	4	1	14	V
12	Social acceptability of rearing	5	4	2	1	4	16	III
	Choice	37	43	40	32	25		

3. Timely weed control with residue incorporation
4. Preparation of Ridge and furrows for soil moisture conservation
5. Conservation furrow

Livestock:

Buffalo is the most efficient animal in the village as compared to cow, goat and sheep. The parameters identified for animal matrix ranking were utility, easy maintenance, disease attacks, shed requirement, calving/kidding interval, use of local resources etc. However, there is wide gap in the potential and realized productivity of the buffalo and other livestock species, hence, following interventions were introduced.

- Introduction of grasses on irrigation channels and bunds.
- Intervention for round the year availability of green fodder.
- Preparation of leaf bales with groundnut black gram and green gram residues.

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