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Performance evaluation of seed cum ferti drill and rabi seed drill

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Abstract

Seed cum ferti drill and Rabi seed drill plays important role in the placement of seed and fertilizer at pre determine depth. Calibration of M.A.U. manufactured seed cum Fertidrill and rabi seed drill was done by laboratory and field method. The implements were tested for different parameters like working width, depth, placement of seed and fertilizer. Seed rate for sorghum crop was 10.50kg/ha, for wheat 110.60 kg/ha, for mung 14.66 kg/ha and for fertilizer it was 84.66 kg/ ha. Draft recorded was 65 to 70 kg, The operating depth of the rabi seed drill was 13 cm. Field efficiency for seed cum ferity drill was 85 % and for Rabi seed drill was 80%

Introduction

India has 85 million of draft animals hence the further prospect of Indian farming largely depends upon the utilization of animal power through different matching implements in effective work. Sowing is the prime important operation in cultivation practice of any crop. Sowing is an art of placing seeds in the soil to have good germination in the field.

Most of the Indian farmer sow the seeds behind the plough and apply the fertilizers either behind the plough or by broadcasting. The device used both for sowing and fertilizer application is known as seed cum ferti drill. Importance of seed cum ferti drill is timely sowing, accurate and uniform placement of seed and fertilizer needs hardly to be emphasized.

Rabi seed drill is a seed drill used during Rabi season. When there is less moisture content in the soil it can be helpful to put the seed and fertilizer up to 13 to 15 cm depth in soil. It also helps in the moisture conservation, as trend is left over by the furrow opener.

Materials and Methods

I. Specifications

Specification of fabricated seed cum ferti drill

1. Make : M.A.U Parbhani
2. Type : Bullock drawn, 3 rows adjustable
3. Power source : A bullock pair
4. Total weight of seed cum ferti drill : 50 kg (without beam and seed)
5. Spacing : 22.5 cm, 30 cm, 45 cm
6. Seed metering devices :Fluted feed roller for both seed and fertilizer
7. Furrow opener : shoe type
8. Power transmission : From ground wheel of dia 35 cm through sprocket and chain arrangement
9. Hopper dimension : 30 cm x 10 cm x 18.5 cm
10. Overall dimension : 135 cm x 135 cm x 125 cm

Specification of fabricated MAU Rabi seed drill

1. Make : M.A.U Parbhani
2. Type : Bullock drawn, 3 rows adjustable
3. Power source : A bullock pair
4. Main frame : Mild steel channel section
5. Tines : Boot shaped with flanges projection
6. Metering : Manually

II. Performance evaluation

Calibration test for seed cum ferti drill (laboratory test)

Seed drill was calibrated by following method.

1. Circumference of driving wheel was measured.
2. The effective width of the machine was calculated by measuring the distance between two furrow openers
3. Area covered in one revolution of wheel was calculated.
4. Number of revolutions required to cover one hacter area was calculated. This was calculated dividing 10,000 m^2 by area covered in one revolution.
5. For the fixed number of revolutions, the weight of the seed was measured which was collected below each furrow openers in the bags
6. Area covered by seed drill was calculated by the following formula

$$S = \eth D N \times W$$
$$= \eth D N \times S \times F$$

Where

A = Area covered by seed drill
D = Diameter of ground wheel
N = Number of revolutions of ground wheel
S = Spacing between two successive furroweners
F = Number of furrow openers

7. Seed rate was calculated by formula

$$\text{Seed rate (kg/ ha)} = \frac{\text{weight of seed collected}}{\text{Area covered}}$$

8. Above procedure was repeated till the required seed rate was obtained.
9. Same procedure was followed for calibrating the seed drill for fertilizer.

III. Field performance of imlements

The field test of seed cum ferti drill was conducted

at Raipur (dist Parbhani) field test of Rabi seed drill was conducted at dry land research center M.A.U. Parbhani. The size of plot was 20 x 20 m Test was conducted as per RNAM test code.

1) Speed of operation: Two sticks were inserted in the field, 10m apart. The time required to pass the distance between two sticks by the front end of seed drill was recorded by using stop watch.
2) Moisture content of soil: The soil sample was taken from 3 places randomly in the field and moisture content was determined by oven dry method.
3) Draft requirement: Dynamometer was attached between the yolk and the implements. The implement was operated and draft was measured for pulling indicated by dynamometer
4) Field efficiency: The actual area covered in an hour was calculated. The theoretical area covered by the implement was also calculated.

The width of blade and speed of operation were recorded and the field efficiency was calculated by following formula.

$$\text{Field efficiency} = \frac{\text{Actual area covered in 1 hr}}{\text{Theoretical area covered in 1 hr}} \times 100$$

Result and Discussion

The performance of seed drill was observed by conducting calibration of different crops such as sorghum, wheat etc.

Testing of seed drill

Laboratory test was performed on fabricated seed cum ferti drill

A) For Sorghum : Seed rate observed for 2.5, 3.0 and 3.3 mm setting roller by seed rate adjusting knob, a seed rate for sorghum crop was 9.05 kg/ha,10.05 kg/ha and 11.94 kg/ha respectively and recommended seed rate was 8 to 10 kg /ha

B) For Wheat : Seed rate observed for 14 mm,16mm and 18mm settings of fluted roller by seed rate adjusting knob was 97.8 kg/ha,110 kg/ha and 124.28 kg/ha respectively and recommended seed rate for wheat was 100 to 120 kg/ha.

C) For Mung : Seed rate observed for 2.7 mm, 2.8mm and 3mm settings of fluted roller by seed rate adjusting knob was 12 kg/ha,15 kg/ha and 17 kg/ha respectively and recommended seed rate for wheat was 12 to 15 kg/ha.

D) For fertilizer (urea) : Application of fertilizer rate for 22.3 mm, 22.6mm and 22.9mm settings of fluted roller by using fertilizer rate for urea observed was 40 kg/ha, 42 kg/ha and 44 kg/ha respectively.

Field Test

1. Depth : During the field trial, depth of planning with M.A.U. seed drill was observed as 7 to 7.3 cm and for Rabi seed drill was 13 cm
2. Draft : The seed cum ferti drill and rabi seed drill needed a draft in the range of 65 to 70 kg
3. Field efficiency : Field efficiency for seed cum ferity drill was 85 % and for Rabi seed drill was 80%.

Table 1: Laboratory calibration test data for seeds

Settings of flutted roller (mm)	Weight of seed (gm) collected from furrow opener No. 1	2	3	Total wt.of seed (gm)	Seed rate (kg/ha)	Average seed rate (kg/ha)
A) Sorghum						
2.5	8.33	8.10	8.57	25.00	9.05	10.50
2.9	10.10	9.27	10.67	30.04	10.50	
3.3	11.73	10.50	12.97	35.20	11.94	
B) Wheat						
14	59.50	59.00	60.00	179.00	97.80	110.60
16	67.43	66.42	68.44	202.29	110.00	
18	76.72	76.10	76.16	228.50	124.28	
C) Mung						
2.70	9.78	9.82	9.80	29.42	12.00	14.66
2.75	12.26	12.20	12.32	36.78	15.00	
3.00	13.88	13.89	13.40	41.68	17.00	
D) Fertilizer						
1) Urea						
8	47	50	49	146	80	84.66
11	51	52	54	157	84	
14	53	54	58	165	90	

Table 2: Field performance of MAU Seed cum ferti drill

Sr.No. Particulars	Sorghum				Wheat		
	I	II	III	Average	IV	V	Average
1. Plot area (m^2)	200	200	200	200	400	400	400
2. Average depth of sowing (cm)	7.4	7.5	7.3	7.4	7.4	6.9	7.1
3. Width of operation (cm)	135	135	135	135	135	90	112.5
4. Average speed of operation (km/hr)	2.25	2.22	2.25	2.24	2.7	2.7	2.7
5. Average draft (kg)	65	65	65	65	63	64	63.5
6. Seed rate obtained (kg/hr)	10	10	10	10	98	117	107.5
7. Germination (%)	85	80	86	84	85	86	85.5
8. Effective field capacity (ha/h)	0.257	0.253	0.256	0.255	0.306	0.198	0.252
9. Theoretical field capacity(ha/h)	0.303	0.301	0.302	0.302	0.35	0.243	0.296
10. Field efficiency (%)	85	84	85	84.6	85	83	84
11. Moisture content in soil (%)	21.7	20.9	20.9	21.2	21.7	20.9	21.3
12. Fertilizer rate observed	40	40	40	40	46	32	39
13. Placement of fertilizer w.r.t. seed	2	4	5	3.5	2	5	3.5

Table. 3: Field performance of the Rabi seed drill

Sr. No. Particulars	Trails			
	I	II	III	Average
1 Plot size (20mx20m)	400	400	400	400
2. Width of operation (cm)	135	135	135	135
3. Depth of operation (cm)	13	14	13	13.33
4. Draft (kg)	69	72	68	69.33
5. Time to cover the plot (min)	12	10	12	11
6. Depth of fertilizer application (cm)	8	8	9	8.33
7. Speed of bullock	1.9	2.1	1.9	1.96
8. Actual field capacity(ha/hr)	0.20	0.24	0.20	0.21
9. Theoretical field capacity (ha/hr)	0.031	0.035	0.031	0.033
10. Field efficiency	80	85.71	80	80

Summary and Conclusion

Seed cum ferti drill and Rabi seed drill plays important role in the placement of seed and fertilizer at pre determine depth. The implements were tested for different parameters like working width, depth, placement of seed and fertilizer.

Seed cum ferti drill

1. During operation, depth of operation the seed and fertilizer was observed as 7 to 7.3 cm.
2. Draft recorded was 65 to 70 kg, which can be made available with medium size pair of bullocks.
3. Average moisture content in the field was 20.9 %.
4. Fertilizer was placed around the seed by 2-5 cm.
5. Field efficiency was observed 80%.

Rabi seed drill

1. Draft requirement was within the capacity of bullock pair.
2. The operating depth of the rabi seed drill was 13 cm.
3. There was efficient used of soil moisture for germination.
4. Field efficiency was 80 %.

References

Abdul, M.D. (1998). Design and development of multicrop multi row seed drill. Agricultural mechanization in Asia Vol.30 No.4 : pp.30-33

Bebera, R.K..,et.al (1995). Evalution of seeding devices for dryland paddy.AMA Vol.26(4): pp.17-21

Dhaliwal, I.S.; GurubachAN Singh and Deol. (1993). Development and evalution of dual seed drill mechanism for oil seed and wheat. Agril. Engg. Vol 18 (2) : pp.16-20

Gowada, M.C.K.; Devaraja and Vishwanath, S.R. (1998). Field evaluation of C.I.A.E. model bullock drawn seed cum fertilizer drill for soybean . Current Research Universityof Agricultural Sciences,Banglore. Vol. 27(6) : pp.111-113

Ganda, C.N. and A.A.Choudhari (1998). Modification and testing of bullock drawn seed drill . P.K.V. Research Journal , Vol. 22 (1): pp.127-128

Tale V.P,Taley S.S. and Bhende, S.M. (2003). Testing evaluation of multi planter cum seed drill XXXVIII annual convention of ISAE, Dapoli. pp:30

Verma A., Quasim M.et al. (2003). Promotion and evaluation of seeding implement XXXVIII annual convention of ISAE ,Dapoli,. pp: 23.

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Effect of phosphorus and molybdenum on growth and quality of cowpea (Vigna unguinculata) fodder under concentration of sodic water

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Abstract

A green house experiment was laid out on cv. Russian Giant in factorial randomized design to evaluate various RSC levels of water, phosphorus and molybdenum on growth and nutrient contents of cow pea fodder crop at R.B.S. College, Bichpuri, Agra during two consecutive kharif seasons of 2004 and 2005, respectively. The soil of the experimental pots was sandy loam with low organic carbon available N and medium in available P and K with pH 8.5. The results of the investigations inferred that each increase in each increase in RSC levels of water had reducing impact on growth (plant height and dry weight) and nutrient content (N,P,K, Ca, Mg and Mo) during both the years. 60 kg P_2O_5/ha proved beneficial in case of growth and nutrients content in cowpea. The growth and nutrients content also increased with applying the maximum dose (0.5 kg/ha) of molybdenum.

Introduction

Cowpea (vigna unguinculata) is an important leguminous forage crop which contains about 24 per cent protein and a great source of calcium and iron for animal feeding. Phosphorus is essential element required for plant growth and root development as photosynthesis, cell division and transfer of the heredity etc. role of the phosphorus is symbiotic nitrogen fixation is well established. Molybdenum acts as enzyme in physiological and morphological process inside the plants. Deficiency of molybdenum has also been shown to decrease the concentration of sugar during carbohydrate metabolism, excessive molybdenum level in herbage seldom retards the plant growth, but is toxic to ruminant animals who are feel such molybdenum rich herbage. The excessive intake of molybdenum causes a disease in the animals called molybdenosis. Hence molybdenum is important in fodders as it determines the suitability of fodder for animal use. Irrigation waters with high residual sodium carbonate are the most hazardous one among problematic waters. Continuous of high residual sodium carbonate water increase sodium absorption ratio of the soil solution and finally results in high exchangeable sodium %, high pH and low hydraulic conductivity which would have detrimental effect on plants and soil in several ways (Eaton, 1950). Very little attention has been paid towards phosphorus and molybdenum fertilization on cowpea under sodic irrigation water, keeping the above facts in view, the investigations were undertaken to find out the suitable dose of phosphorus and molybdenum for raising good quality fodder of cowpea with the use of sodic irrigation water

Materials and Methods

The green house experiment was conducted during two consecutive kharif seasons of 2004 and 2005 at R.B.S. College, Bichpuri, Agra (U.P.). The soil of the experimental pots was sandy loam. Treatment comprising with 3 RSC levels of irrigation water viz. control, 10 and 20 meq/l, 4 phosphorus levels (0, 20, 40 and 60 kg/ha) and three molybdenum levels (0, 0.25 and 0.50 kg/ha as sodium molybdate). Cv. Russian Giant of cowpea was sown in earthen pots consisted 5.0 kg soil and lined with polyethylene sheet. The experiment was laid down with factorial randomized design and treatments were replicated thrice. RSC rich water was prepared by dissolving the $NaHCO_3$ salt in distilled water and the plants were irrigated five times (including pre-sowing irrigation) with the water of specified RSC. Five plants were maintained after germination up to three months and the given parameters were taken into consideration. At harvest, sample plants were washed with distilled water and again dried in the sun followed by oven at 70 ± 1^0C for six hours. Dried plant samples were analyzed and used for determining nitrogen, phosphorus, potassium, calcium, magnesium, sodium and molybdenum content(%).

Results and Discussion

Increasing levels of RSC of water were adversely affected plant height and dry weight in both the years (Table 1). Such harmful influences on plant growth due to higher concentrations of RSC water was also

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Table 1: Effect of RSC, phosphorus and molybdenum on growth and nutrient contents (%) of cowpea

Treatments	Plant height(cm)		Dry weight (g/plant)		Nitrogen (%)		Phosphorus(%)		Potassium(%)	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
RSC levels (meq/l):										
Control	44.54	45.62	2.48	2.48	1.26	1.27	0.25	0.26	1.50	1.55
10	35.40	34.47	2.16	2.10	1.18	1.19	0.23	0.23	1.40	1.43
20	24.49	23.78	1.51	1.52	1.12	1.12	0.21	0.21	1.28	1.30
CD at 5%	0.20	0.40	0.20	0.20	0.11	0.11	0.10	0.12	0.09	0.11
P_2O_5 (kg/ha):										
0	32.79	32.94	1.96	1.92	1.14	1.15	0.21	0.21	1.37	1.40
20	33.88	33.97	2.05	2.02	1.16	1.16	0.22	0.22	1.39	1.42
40	34.54	34.71	2.19	2.08	1.20	1.18	0.24	0.24	1.42	1.44
60	36.77	37.00	2.02	2.23	1.25	1.23	0.26	0.26	1.44	1.45
CD at 5%	0.30	0.50	0.28	0.32	0.15	0.15	0.13	0.16	0.11	0.13
Mo levels (kg/ha):										
0	33.38	33.51	1.95	1.96	1.16	1.16	0.22	0.22	1.34	1.38
0.25	34.47	34.64	2.04	2.05	1.18	1.19	0.25	0.25	1.37	1.41
0.50	35.51	35.71	2.12	2.13	1.122	1.23	0.27	0.27	1.40	1.45
CD at 5%	0.20	0.40	0.20	0.20	0.11	0.11	0.10	0.12	0.09	0.11

Table 2: Effect of RSC, phosphorus and molybdenum on calcium, magnesium, sodium and molybdenum contents of cowpea

Treatments	Calcium (%)		Magnesium (%)		Sodium (%)		Molybdenum (%)	
	2004	2005	2004-	2005	2004	2005	2004	2005
RSC levels (meq/l):								
Control	1.31	1.33	0.697	0.863	0.25	0.27	1.41	1.55
10	1.25	1.26	0.671	0.656	0.28	0.30	1.36	1.51
20	1.13	1.17	0.615	0.605	0.30	0.32	1.26	1.28
CD at 5%	0.11	0.11	0.010	0.010	0.02	0.02	0.03	0.04
P_2O_5 levels (kg/ha)								
0	1.21	1.23	0.654	0.643	0.26	0.29	1.31	1.44
20	1.22	1.25	0.658	0.646	0.27	0.29	1.33	1.47
40	1.23	1.26	0.665	0.650	0.28	0.30	1.35	1.50
60	1.25	1.27	0.668	0.653	0.29	0.30	1.37	1.51
CD at 5%	0.15	0.15	0.015	0.015	0.03	0.03	0.04	0.05
Mo levels (kg/ha):								
0	1.21	1.23	0.656	0.641	0.26	0.29	1.18	1.24
0.25	1.23	1.25	0.663	0.649	0.27	0.30	1.30	1.40
0.50	1.25	1.26	0.666	0.653	0.28	0.30	1.45	1.55
CD at 5%	0.11	0.11	0.010	0.010	0.02	0.02	0.03	0.04

observed by Pal and Singh (1990), Singh and Pal (1994) and singh et. al., 2005).

Similar detrimental effect of RSC rich water was found on nutrients content viz. N, P, K, Ca, Mg and Mo in both the years (Table 2). The detrimental effects of RSC levels of water on growth may be due to disturbances arised in soil physical properties and also direct adverse effect on root growth, protein synthesis, respiration and impaired metabolism of the plants.

A phosphorus dose 60 kg/ha resulted in significantly higher plant height and dry weight of cowpea plants (Table 1), may be because of higher P concentration in tissues of the plant parts, thereby more accumulation of nutrients could take place, which ultimately increased

plant growth and nutrient content in vegetative parts of the plants. Three findings are in favour of Singh and Singh (1989), Babbo et al., (1992) and Babbo and Ram (1995).

Each successive increment in Mo application had a significant increase in plant growth in the terms of plant height and plant dry weight over control. Treatment 0.5 kg/ha Mo had a marked improvement in quality of the cowpea green fodder in terms of nutrient content viz., N, P, K, Ca, Mg, Na and Mo, respectively. The application of Molybdenum, increase the growth and dry weight to be noted almost identical in both the years. Such improvement in growth and nutrients content of cowpea fodder crop might be due to accelerating effects of Mo to growing parts of root nodules of the plant which helps to promoting activation of Azotobacter bacteria in fixing abundant quality of atmospheric nitrogen in available form to the plants. The similar findings were reported by Paricha et al., (1983).

References

Babboo, R.; Kumar, R. and Verma, J.P. (1992). Yield and growth response of cluster bean to nitrogen and phosphorus application. Vegetable Science, 19(1): 97-101.

Baboo, R. and Rana, N.S. (1995). Nutrient uptake and yield of cluster bean (Lyamopsis tetragonoloba) as influenced by nitrogen, phosphorus and seed rate. Indian J. of Agronoly, 40(3):482-485.

Eaton, F.M. (1950). Significance of carbonates in irrigation water. Soil Science., 69:123-133.

Pal, B. and Singh, D.R. (1990). Effect of RSC of irrigation water on the performance of periwinkle. J. Agri. Sci. Res., 32(1&2):48-50.

Paricha, A.C.; Sahoo, N.C. and Kar, M. (1983). Significance of molybdenum and applied nitrogen on the chemical coparision and yield of green gram (Vigna radiate L.). J. Pl. Physiology, 26(3):305-313.

Singh, A.P. and Pal, B. (1994). Effect of sodic water irrigation on yield and nutrients removal by cowpea. Legume Research, 17(3):162-166.

Singh, R.V. and Singh, R.R. (1989). Effect of nitrogen, phosphorus and seeding rates on growth, yield and quality of guar under rainfed conditions. Indian J. Agronomy, 34(1):53-56.

Singh, P.K.; Pal, B.; pandey, Manoj and Singh, A.K. (2005). Effect of irrigation water containing RSC on the yield, chemical composition and uptake of nutrients by periwinkle leaves. Indian J. Agric. Res., 39(2):116-121.

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Yield enhancement through physiological traits under drought prone environment

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Abstract

In recent past, there has been a lot of progress in understanding the functional and structural changes in response to water deficit and the identification of potential drought tolerance characteristics which could improve crop performance in water limited environment. Traits, which could be beneficial over long time scale in dry environment, should include crop phenology, osmotic adjustment, rooting characteristics, and assimilate transfer from vegetative plant parts to grains. Where water remains in the sub-soil at maturity, a greater rooting depth should lead to improved yield stability. In oilseed brassica genotypes, the rooting depth at maturity showed significant positive association with number of siliquae per plant and biological yield under moisture stress conditions. The major yield benefits derived from osmotic adjustment in different crops lie in the maintenance of proper water supply from sub-soil during reproductive phase of growth, cooler canopy and continued growth processes under water deficit conditions. Remobilization of stem reserves between 20-30% in grain legumes (soybean, lupines), 40-70% in cereals and 20-24% in oilseed brassicas have been reported under water deficit conditions. Seed yield in wheat and chickpea also showed significant positive association to osmotic adjustment under water deficit condition.

Introduction

Rainfed lands in India are important today and will continue to be so in future. Currently about 63% of agriculture in India are rainfed. This area contributes nearly 44% food production and supports 40% of the human and 60% of livestock population. An understanding of constraint of water on yield and adaptation of plants to water deficits challenges both the breeder to develop a crop cultivar that will give a greater yield under

water deficit conditions and the agronomist to ensure that the most efficient use is made of the available water. It has been argued that to improve grain yield of crops in a dryland area one must increase the water passing through the crop in transpiration (T), increase the water use efficiency (W) and /or increase the proportion of total dry matter going to grain (H). The first of these (T) is largely in the domain of the agronomist and the last two (W, H) are in the domain of the breeder. The development of water deficits leads to a wide range of responses by the plants. The many of these responses may be secondary arising as a result of primary process being affected directly in response to water deficit (Turner & Begg 1981). The crop productivity will depend on the development of leaf area to intercept radiant energy and the role of photosynthesis to convert it into dry matter. However, the distribution of assimilate within the plant will determine the proportion of the total that is harvested as economic yield. This paper briefly reviews the physiological aspects of crop improvement of rainfed crops in drought prone areas.

Crop improvement

In recent past, there has been a lot of progress in understanding the functional and structural changes in response to water deficit and the identification of potential drought tolerance characteristics which could improve crop performance in water limited environment (Singh & Chaudhary 1995). Deep rooting and greater osmotic adjustment have improved water acquisition, leaf and cuticular characters have been modified to conserve water, and earliness in the reproduction has been used to avoid terminal droughts. It now appears increasingly possible to improve the several useful determinants of yield (T, W, H) by genetic means using modern techniques of screening for putative traits and their incorporation under suitable agronomic background to develop water use efficient cultivars for dryland areas.

Potential Traits

Traits, which could be beneficial over long time scale in dry environment, should include crop phenology, osmotic adjustment, rooting characteristics, and assimilate transfer from vegetative plant parts to grains. The role of these potential traits in improving crop productivity in dryland areas is discussed here.

1. Crop phenology: There is substantial genetic variability for crop phenology and its inheritance is also known in some cases. Modification of phenology so as to partially avoid critical stress periods represents

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the most successful way to increase yield, provided biomass is not sacrificed. Matching phenology with the environment may be achieved either by genetically modifying the crop through the manipulation of photoperiod or vernalization of sensitive/insensitive genes or by modifying management. Changing sowing time is useful management practice that may be required for some genotypes to avoid critical periods of stress or to maximize the environmental resource for the crop. Work in sorghum and maize is a good example of the use of plant phenology as an index of moisture stress (Blum, 1983). A short time interval between pollen shedding and silking is important for successful pollination in maize under water deficit conditions (Fischer 1996). In oilseed brassicas, the cv. RH 30 is shorter in duration, high yielder and has good response to varied situations of water availability in different seasons.

2. Rooting characteristics: The depth of rooting is often cited as an important criterion because it has a major influence in determining the potential supply of water from the deep soil. Where water remains in the sub-soil at maturity, a greater rooting depth should lead to improved yield stability. Expression of phenotypic plasticity in root characteristics, i.e. the ability of genotypes to express different rooting depth in response to physical environment can be found for several crops in literature (Singh & Chaudhary, 1998). Table 1 revealed that the contrasting genotypes of different crops had a difference of 29-49 cm in the depth of rooting by the time of maturity (Singh & Chaudhary, 1998).

In oilseed brassicas and chickpea, there was consistent increase in the depth of rooting from germination to physiological maturity. However, in wheat only a few genotypes (WH 533 & WH 147) showed increase in the rooting depth from anthesis to physiological maturity (Singh & Chaudhary 1998). In oilseed brassica genotypes, the rooting depth at maturity showed significant positive association with number of siliquae per plant and biological yield under moisture stress conditions. Similarly in wheat genotypes in dry environment, rooting depth at jointing stage was positively correlated with the spike weight at anthesis and seed yield (Singh & Chaudhary 1998).

3. Osmotic adjustment: Osmotic adjustment involves an increase in the number of solute molecules inside the cells in response to a decline in external water potential. This has effect of reducing outflow of water from the cell, thereby reducing loss of turgor and in turn allows turgor driven processes such as stomatal opening and expansion growth to continue progressively at lower water potentials (Morgan 1984). It has no adverse effect on water use efficiency, but contributes to grain yield by increasing the water extraction from sub-soil during reproductive phase of growth in several crops (Singh 1998) by either increasing or maintaining harvest index. Osmotic adjustment has interlinkages and association with several traditionally known dehydration avoidance and dehydration tolerance traits, and thus leads to the differences in yield by modifying various morpho-physiological processes involving both macro level (soil water use, survival of meristems, leaf characteristics, root extension etc.) and micro level (turgor, stomatal conductance, hormonal balance, integrity of membranes etc.) changes under water deficit conditions (Singh 1998). The major yield benefits derived from osmotic adjustment in different crops lie in the maintenance of proper water supply from sub-soil during reproductive phase of growth, cooler canopy and continued growth processes under water deficit conditions (Singh 1998: Table 2). Among the high (cv. RC 781, Prakash) and low (*cvs.* RIK, RH 7513) osmotic adjustment class of oilseed brassicas, the former extracted 30-40 mm more water below 60 cm soil depth than the latter group of

Table 1: Differences for rooting depth in the genotypes of oilseed brassica, chickpea and wheat under water deficit conditions (Singh & Chaudhary 1998)

Crops	Genotypes	Rooting Depth (cm)		Shoot Length (cm)
		Observed	Differences	
Oilseed Brassicas (Siliquae Formation)	RH 7513	108	49	107
	HC 2	157		105
Chickpea (Pod Formation)	E 296	74	29	32
	S 1	103		29
Wheat (Anthesis)	WH 147	89	47	75
	HI 1011	136		88

genotypes (Singh *et al.* 1990). Also, medium osmotic adjustment class chickpea (*cvs.* C 214, G 130, H 208) absorbed 20-30 mm more water from sub-soil layers than the genotypes of low osmotic adjustment class (*cv.* P 324). Similar benefits of osmotic adjustment have also been reported in wheat and sorghum (Ludlow & Muchow 1990).

Table 2: Leaf relative water content (RWC) at critical value of leaf water potential (yw) and leaf osmotic potential (ys) and seed yield of oilseed brassica genotypes representing three osmotic adjustment classes under dryland conditions (Singh 1998)

Osmotic adjustment class	RWC (%) at -2.5 Mpa ψw	RWC(%) at -3.0 Mpa ψs	Seed yield (gm^{-2})
High	77.0	75.1	124.8
Medium	67.0	59.9	86.4
Low	60.0	46.8	58.8

4. Assimilate transfer to grain: When water deficit occurs, and the current photosynthesis source is inhibited, the role of pre-anthesis photosynthates as a source for grain filling increases. The mobilization of reserves from vegetative parts into the growing grains can be seen as appreciable reduction in the shoot dry weight (stem, leaves, vegetative part of reproductive organs) following anthesis across varied genetic materials (Singh & Chaudhary 1995). Remobilization of stem reserves between 20-30% in grain legumes (soybean, lupines), 40-70% in cereals and 20-24% in oilseed brassicas have been reported under water deficit conditions (Turner & Begg 1981; Singh and Singh 1994). Chaudhary *et al.* 1992 demonstrated a substantial amount of assimilate transfer not only from the shoot but also from the roots to grains in wheat genotypes under moisture stress conditions. Similar results for assimilates transfer from vegetative plant parts to grains were recorded in oilseed brassicas (Singh 1996**:** Table 3). Therefore, there is a need to consider the translocation of assimilates to grains both from roots and shoot in the genotypes for improving productivity under moisture stress conditions.

Other traits: Other traits which have their potential value in dryland area include canopy temperature, leaf water retention, transpiration efficiency, glaucousness, early vigour, threshing percentage in pearl millet (ratio of grain mass to panicle mass), number of second order branches and length of pod bearing branches in oilseed brassicas and chickpea, ear to stem ratio in wheat, ability to initiate pods despite drought in peanuts, leaf movement, developmental plasticity, photo-period sensitivity and a few other dehydration tolerance and avoidance characteristics (Singh *et al.* 1990; Ludlow & Muchow 1990, Singh & Chaudhary 1995; Boyer, 1996) could provide yield benefit in several crops under certain situations.

Table 3: Mobilization of dry matter from root + shoot to seed in oilseed brassicae under water deficit field conditions (Singh 1996)

Cultivars	Reduction /Increase (%) in biomass of vegetative plant parts
RH 785	-24.1
RH 786	-20.0
RH 30	-10.5
Parkash	-2.7
RH 7513	0.0
RC 781	19.2

Yield responses: The final test of genotypes containing drought resistant putative traits could be judged by their better yield performance in dry environment. On an average (mean of two seasons), the genotypes of medium and high osmotic adjustment classes gave 46.9% and 112.2% higher seed yield of oilseed brassicas than low osmotic adjustment class (Singh *et al.* 1990). Seed yield in wheat and chickpea also showed significant positive association to osmotic adjustment under water deficit condition (Singh 1998). Similar yield benefits were derived from sub-soil water use during reproductive phase of growth, transpirational cooling and leaf water retention as these characteristics highly correlated with the osmotic adjustment in oilseed brassicas, chickpea and wheat (Singh & Chaudhary 1998). Among these traits, the measurement of transpirational cooling (canopy minus air temperature difference) and leaf water retention are not only simple and rapid but have shown their potential value in breeding for improving drought tolerance in field crops.

Conclusions and Future Research Thrusts

In conclusion, the understanding of potential drought tolerant traits, their genetics and internal physiological consistency is essential for genetic improvement of drought tolerance in crop plants. However, still more work is required for (a) matching the degree of osmotic adjustment to maturity duration of genotypes for proper rationing of available water supply during crop life cycle, (b) to optimize root density/ root biomass for more allocation of assimilates to shoot for further improving the harvest index and productivity of dryland crops, and (c) in-depth studies to understand

mobilization patterns of photosynthates both from roots and shoot to grains for further improving the partitioning efficiency/productivity in dryland crops. There is also need for identification, evaluation and subsequent manipulation of genes and molecular markers controlling these putative traits and their adaptation responses under different situations of water availability.

References

Blum, A. (1983). Plant Breeding for Stress Environment. CRC Press, Boca Raton, Florida, USA. 43-78.

Boyer, J.S. (1996). Advances in drought tolerance in plants. Advances in Agronomy. 58: 187-218.

Fischer, K.S. (1996). Improving cereals for the rainfed system. In Physiology of Stress Tolerance in Rice. Singh V. P., Singh R. K., Singh B. B. and Zeigler, R. S. (Eds.). Narender Deva University of Agriculture and Technology, Faizabad (India) & International Rice Research Institute, Los Banos, Philippines. pp 269.

Ludlow, M.M. and Muchow, R.C. (1990). A critical evaluation of traits for improving crop yield in water limited environment. Advances in Agronomy. 43: 107-149.

Morgan, J. M. (1984). Osmoregulation and water stress in higher plants. Annual Review of Plant Physiology. 35: 299-319.

Singh, D.P. (1996). Reorientation of crop science research for sustained crop production. In Impact of Modern Agriculture on Environment, S. Arya, S. K. Arora, and R.K. Behl (eds.), CCS Haryana Agricultural University, Hisar : 37-55

Singh, D.P. (1998). Osmotic adjustment as an important characteristic for improving drought tolerance in field crops. In Sustainable Agriculture for Food, Energy and Industry. James and James (Eds), Science Publishers Ltd. UK. pp 547-552.

Singh, D.P. (2001). Drought Management in field Crops. In: Recent Advances in Agronomy, Indian Society of Agronomy, IARI, New Delhi (In Press).

Singh, D.P. and Chaudhary, B.D. (1995). Improving productivity of field crops under dryland condition: Selection of potential physiological traits and their screening. In: Plant Physiology and Biochemistry. B. B.Singh and K. Mengal (Eds.), Panima Publishing Corporation, New Delhi: 239-250.

Singh, D.P. and Chaudhary, B.D. (1998). Drought tolerance in field crops:from understanding to realization. In Crop Improvement for Stress Tolerance, Behl, R.K., Singh D.P and Lodhi, G.P. (Eds.), CCS Haryana Agricultural University, Hisar and Max Mullar Bhawan, New Delhi. 33-46.

Singh, D.P., Chaudhary, B.D., Singh, P., Sharma, H.C. and Karwasra, S.P.S. (1990). Drought Tolerance in Oilseed Brassica and Chickpea, CCS Haryana Agricultural University, Hisar, India: 10-15.

Singh, D.P., Pannu, R.K., Chaudhary, B.D., Singh, P. and Singh, V.P. (1992). Effect of moisture stress on root and shoot growth and their association with yield in oilseed brassicas. Haryana Journal of Agronomy. 8:25-33.

Turner, N.C., and Begg, J.E. (1981). Plant water relations and adaptation to stress. Plant and Soil 58 : 97-131

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Effect of various coagulants on sensory, chemical and microbiological quality of paneer

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Abstract

Paneer, prepared from buffalo milk (6% fat and 9% MSNF), using three coagulants, viz. citric acid, lactic acid and tartaric acid at 3 different coagulation temperatures (75°, 80° and 85°C) were assessed for sensory, chemical and microbiological qualities. Various results revealed that paneer samples prepared with 1% citric acid at 80°C elicited best scores for appearance, flavour, body and texture and overall acceptability. Two per cent citric acid and 1% lactic acid also produced equally good products. Citric acid also produced good product at 85°C. Tartaric acid did no yield acceptable quality product. The coagulation temperatures and their concentrations influenced the chemical quality of paneer. The total solids, protein, fat and ash contents were higher in the products prepared at higher coagulation temperatures. Further, 2% concentration of each coagulant resulted in recovery of more solids (total solids, fat and protein) than 1% level. Only a few viable organisms were found in fresh paneer samples. Coliform organisms and yeast and mould were completely absent indicating excellent bacteriological quality of the product.

Introduction

Approximately, five per cent of total milk produced in India is converted into paneer, which is a well-known heat-cum-acid coagulated indigenous milk product (Chandan, 2007). During the year 2002-03, estimated market size (traditional and organised) for paneer was Rs. 21

billion and its production was 3,959 metric tonnes, which increased to 4,496 metric tonnes during the year 2003-04 (Joshi, 2007). The demand for paneer is increasing consistently as it forms an important base for a variety of culinary dishes, stuffing material for various vegetable dishes, snacks and sweet meets (Srivastava and Goyal, 2007). Nutritionally, paneer is of great value in diet because it is a rich source of high quality proteins, fats vitamins and minerals. Conventionally, the raw material for manufacture of paneer is buffalo milk or blends of cow and buffalo milk.

Paneer production has largely been confined to the unorganized sector of the dairy industry. Recently, some diary plants in organised sector have also taken up manufacture of paneer by batch process. The traditional method of paneer manufacture has also been upgraded (Bhattacharya *et al.,* 1971). An industrial process for manufacture of frozen paneer has also been developed by National Dairy development Board.

Good quality paneer has a typical mild acidic flavour with slightly sweet taste. It has firm, cohesive, spongy body and closely knit smooth texture. It is sliceable and retains its size and shape on frying and cooking. The quality of paneer is influenced by the quality of raw milk, heat treatments, coagulants as well as temperature of coagulation, which cause variation in quality of paneer manufactured. The present study was, therefore, under taken to assess the influence of various coagulants normally used in different parts of the country alongwith its concentrations and temperature of coagulation on sensory, chemical and microbiological qualities of paneer with a view to optimise the process parameters to scale-up paneer manufacture.

Materials and Methods

Procurement of milk:

Buffalo milk was collected from the University Dairy and standardized to 6.0% fat and 9.0%, SNF using skimmed milk and/or cream.

Coagulants used:

Reagent grade coagulants, *viz.* citric acid, lactic acid and tartaric acids were used at one and two per cent concentration each. The temperatures of coagulation employed for paneer production were 75°, 80° and 85°C in each case of coagulant used.

Preparation of paneer:

The procedure followed for paneer manufacture was as suggested by Bhattacharya *et al.* (1971) and subsequently modified by Sachdeva (1983). The standardized buffalo milk was heated to 100°C for 5 minutes and subsequently cooled to 75°, 80° or 85°C. Various coagulants at desired concentrations were added slowly with continuous agitation till clear whey separated

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out. The curd was then left for 5-10 minutes in the whey and then drained through muslin cloth and pressed in a hoof at 2 kg/cm^2 pressure. Paneer block was dipped in chilled water for 2 hour and packaged in pre-sterilised LDPE packs and stored at 5°C.

Sensory evaluation:

A 9-point hedonic scale was used to evaluate the flavour, body and texture, appearance and overall acceptability of the product by a panel of five experienced judges (BIS, 1971).

Chemical and microbiological quality:

The total solids, fat, protein and ash contents of paneer were determined by methods described in BIS (1961) and BIS (1964). The microbiological quality (standard plate count, coliform count, yeast and mould count) of paneer was determined by BIS (1962).

Results and Discussion

The quality of paneer prepared from buffalo milk (6.0% fat and 9% MSNF) was assessed for its sensory attributes, chemical and bacteriological qualities.

Sensory attributes:

The samples of paneer prepared from buffalo milk (6%fat and 9% MSNF) using three different coagulants. *viz.* citric acid, lactic acid and tartaric acid at one and two per cent concentrations each employing three different coagulation temperatures, namely 75°, 80° and 85°C were assessed for sensory quality first on a 9-point hedonic scale. The results on various sensory attributes, *viz*. appearance, flavour, body and texture and overall acceptability have been compiled in Table 1.

The observations in Table 1 indicated that the samples of paneer made using 1 per cent citric acid at 80°C coagulation temperature (A_2B_1) elicited maximum score (8.40) for appearance, followed by paneer prepared with 2% citric acid at same temperature (A_2B_2). These coagulants and concentrations also produced good quality paneer at 85°C temperature. Lactic acid also yielded paneer of equally good appearance at 80°C coagulation temperature but tartaric acid produced inferior quality product at all temperatures. The flavour, which is the most important attribute, was also found best (score 8.3) in paneer prepared with 1% citric acid at 80°C temperature. Two per cent citric acid and 1% lactic acid also produced equally good product, with regards to flavour. Citric acid (1%) at 85°C coagulation temperature also resulted in good product (score 8.0). Tartaric acid produced inferior quality product with regards to flavour.

The body and texture of paneer also followed similar trend as the flavour. Here again, tartaric acid produced inferior body and texture. All the coagulants produced inferior quality appearance, flavours and body and texture at all concentrations at 75°C coagulation temperature. The overall acceptability score was highest (8.40) in case of product prepared with 1% citric acid at 80°C temperature. Again, 2% citric acid and 1% lactic acid also produced almost equally good product (scores 8.30 and 8.20). Citric acid also produced good product at 85°C temperature, where other coagulants were not as effective. Tartaric acid failed to produce acceptable quality product.

Table 1: Effect of various coagulants and temperatures of coagulation on sensory quality of paneer

Coagulation temperature	Coagulants B_1	B_2	B_3	B_4	B_5	B_6
			Appearance			
A_1	7.90	7.80	7.70	7.60	7.40	7.20
A_2	8.50	8.40	8.40	8.20	7.90	7.80
A_3	8.20	8.10	8.00	7.90	7.70	7.60
			Flavour			
A_1	7.80	7.70	7.60	7.50	7.30	7.10
A_2	8.40	8.30	8.20	8.10	7.90	7.70
A_3	8.10	8.00	7.90	7.80	7.60	7.40
			Body and texture			
A_1	7.70	7.60	7.50	7.40	7.20	7.00
A_2	8.30	8.20	8.20	8.00	7.70	7.60
A_3	8.00	7.90	7.80	7.70	7.50	7.40
			Overall acceptability			
A_1	7.80	7.70	7.60	7.50	7.30	7.10
A_2	8.40	8.30	8.20	8.10	7.90	7.70
A_3	8.10	8.00	7.90	7.80	7.60	7.40

Coagulation temperature: A_1 75°C, A_2 80°C, A_3 85°C
Coagulants: B_1 citric acid 1%, B_2 citric acid 2%
B_3 lactic acid 1%, B_4 lactic acid 2%.
B_5 tartaric acid 1%, B_6 tartaric acid 2%

Chemical quality: The total solids, protein, fat and ash contents of paneer were influenced by various coagulants, their concentrations and coagulation temperatures (Table 2). Results on variation in these chemical attributes suggested that the moisture content decreased with concomitant increase in total solids content as the coagulation temperature increased from 75° to 85°C. Almost all the coagulants with their varying concentrations (1 or 2%) elicited almost similar trends. However, 2% concentration of each coagulant produced higher total solids content with lower moisture contents and lower yields of paneer (data for yield not shown).

The protein contents of paneer were lowest in the products prepared at 75°C coagulation temperature, irrespective of the type of coagulant used. Higher protein content was noted in products prepared at 80° and 85°C temperatures. Two per cent concentration of each coagulant produced higher total solids content than one per cent concentration. In general, the protein contents were highest in the products prepared at 85°C temperature. The fat content of paneer was also influenced by various variables in the same manner as

the protein content, being highest in products prepared at 85°C and lowest at 75°C. Further, 2% concentration of coagulant yielded higher protein contents than 1% level. The ash (minerals) content of paneer also followed similar trend but it was not influenced by the concentration of coagulants.

Table 2: Effect of different coagulants and temperatures of coagulation on chemical quality of paneer

Coagulation temperature	Coagulants B_1	B_2	B_3	B_4	B_5	B_6
	Total solids (%)					
A_1	45.92	46.29	45.42	45.99	43.42	44.35
A_2	46.88	47.69	46.62	47.31	45.12	45.88
A_3	48.32	49.02	47.82	48.52	46.33	47.01
	Protein content (%)					
A_1	14.44	14.94	14.24	14.74	14.04	14.54
A_2	15.04	15.54	14.84	15.34	14.64	15.21
A_3	15.64	16.14	15.44	15.94	15.24	15.74
	Fat content (%)					
A_1	27.44	27.64	27.14	27.34	25.84	26.03
A_2	27.96	28.14	27.64	27.84	26.34	26.53
A_3	28.44	28.64	28.14	28.34	26.84	27.03
	Fat per cent (on dry matter basis)					
A_1	59.76	59.71	59.75	59.45	59.51	58.69
A_2	59.60	59.01	59.29	58.84	58.38	57.82
A_3	58.86	58.42	58.84	58.41	57.93	57.50
	Ash content (%)					
A_1	2.04	2.04	2.04	2.04	2.04	2.04
A_2	2.14	2.14	2.14	2.14	2.14	2.14
A_3	2.24	2.24	2.24	2.24	2.24	2.24
	Moisture content (%)					
A_1	54.08	53.71	54.58	54.01	56.58	55.65
A_2	53.12	52.31	53.38	52.69	54.88	54.11
A_3	51.68	50.98	52.18	51.48	53.67	52.99

Coagulation temperature: A_1 75°C, A_2 80°C, A_3 85°C
Coagulants: B_1 citric acid 1%, B_2 citric acid 2%
B_3 lactic acid 1%, B_4 lactic acid 2%.
B_5 tartaric acid 1%, B_6 tartaric acid 2%

The fat % on dry matter basis was also calculated and it was noted that all the samples of paneer elicited more than 50 per cent fat (57.50 to 59.75%) on dry weight basis and were in conformity with the PFA and BIS requirements. The moisture content of paneer samples (50.98 to 56.58%) was also within the prescribed limit (maximum 70% as per PFA act).

The quality of paneer depends on quality of raw milk used. Buffalo milk is considered more suitable for manufacturing good quality paneer with desirable qualities (Ghodekar, 1989; Sachdeva *et al.*, 1991). According to Ramasamya *et al.* (1999) best quality paneer can be prepared by using buffalo milk having 6% fat. These reports support the results of present investigation. The type of coagulant, its strength and temperature of coagulation affect the yield, sensory quality as well as chemical composition of paneer. Rao *et al.* (1984) and Sachdeva and Singh (1988) recommended coagulation temperature of 70°C, while Vishweshwaraih and Anantakrishnan (1985) and Shukla *et al.* (1984) suggested coagulation temperature of cow and buffalo milk as 80°C. Masud (2002) reported 85°C coagulation temperature for good yield and recovery of maximum milk solids in paneer. Bhattacharya *et al.* (1971) and Sachdeva and Singh (1988) suggested 1% citric acid as optimum for making good quality paneer from buffalo milk. These reports fully corroborate the results of present study. The data on chemical quality of paneer are also fully supported (Bhattacharya *et al.* 1971; Sweta Rai, 2004; Divya Srivastava, 2004).

Microbiological quality of paneer: The results on standard plate count (SPC) coliform count and yeast and mould count are presented in Table 3.

Table 3: Influence of coagulant and temperature of coagulation on microbiological quality of paneer

Coagulation temperature	Coagulants B_1	B_2	B_3	B_4	B_5	B_6
	Standard plate count (cfu/g)					
A_1	36.40	34.40	38.50	36.30	40.60	38.50
A_2	33.60	31.90	35.20	33.80	38.00	35.70
A_3	30.80	29.00	32.40	31.00	35.30	33.00
	Coliform count					
A_1						
A_2	NIL					
A_3						
	Yeast and mould count					
A_1						
A_2	NIL					
A_3						

Coagulation temperature: A_1 75°C, A_2 80°C, A_3 85°C
Coagulants: B_1 citric acid 1%, B_2 citric acid 2%
B_3 lactic acid 1%, B_4 lactic acid 2%.
B_5 tartaric acid 1%, B_6 tartaric acid 2%

These results (Table 3) indicated that the fresh samples of paneer prepared by using different coagulants at different temperatures contained a small number of viable organisms (29.00 to 40.60 cfu/g), Coliform organisms were completely absent in the product, as the strict sanitary conditions were observed in the preparation of product. No yeast and moulds were traceable in the product. The microbiological quality of fresh paneer largely depends on initial quality of milk, conditions of manufacture and subsequent handling (Aggarwal and Srinivasan, 1980; Yadav *et al.*, 1993).

Bureau of Indian Standards (BIS, IS: 10484-1983) have prescribed limits for SPC, coliform and yeast and mould counts in paneer. The present data on microbiological quality were well within prescribed limits and elicited excellent bacteriological quality.

References

Aggarwal, P.K. and Srinivasan, R.A. (1980). Mould contamination from dairy and farm environment. Indian J. Dairy Sci. 33(1) : 117-119.

Bhattacharya, D.S.; Mathur, O.N. Srinivasan, M.R. and Samlik, O. (1971). Studies on the method of production and shelf life of paneer. J. Food Sci. Technol. 8 (5) : 117-120.

BIS (1961). Methods of test for dairy industry. Pt. II. Chemical analysis of milk. IS: 1479. Bureau of Indian Sandards, Manak Bhavan, New Delhi.

BIS (1962). Methods of test for dairy industry. Pt. III. Bacteriological analysis of milk IS: 1479, Bureau of Indian Standards, New Delhi.

BIS (1964). Specifications for hard cheese, processed cheese and processed cheese spreads. IS: 2785. Bureau of Indian Standards, New Delhi.

BIS (1971). Guide for sensory evaluation of foods. Pt. II. IS: 6273. Methods and evaluation cards. Bureau of Indian Standards, New Delhi.

Chandan, R.C. (2007). Manufacturing of paneer. In Dairy India 2007. (Ed. Sharad Gupta). Pub. Dairy India Year book. A-25 Priyadarshini Vihar, New Delhi.

Divya Srivastava (2004). Influence of MAP on microbiological population and shelf life of paneer. M.Sc. thesis, Allahabad Univ. Allahabad.

Ghodekar, D.R. (1989).Factors affecting quality of paneer. A review. Indian Dairyman 41 (3) : 161-164.

Joshi, S. (2007). Making food processing viable. In Dairy India 2007. Pub. Dairy India Year book, Priyadarshini Vihar, New Delhi.

Masud, T. (2002). Effect of coagulation temperature and strength of coagulant used on the composition of paneer. Indian J. Nutri. Diet. 39 (12) : 548-550.

Ramasamya, D.; Shibu, A.V. and Gopi, H. (1997). Dairy technologists handbook. Int. book distributing co. Charbagh, Lucknow.

Rao, M.N.; Rao, B.V.R. and Rao, T.J. (1984). Paneer from buffalo milk. Indian J. Dairy Sci. 37 : 50-53.

Sachdeva, S. (1983). Production, packaging and preservation of paneer. Ph.D. thesis. Kuruskhetra. Univ., Kurukshetra.

Sachdeva, S. and Singh, S. (1988). Optimisation of processing parameters in the manufacture of paneer. J. Food Sci. Tech. 25 (3) : 142-145.

Sachdeva, S.; Prokopek, D. and Reuter, H. (1991). Technology of paneer from cow milk. Jap. J. Dairy Food Sci. 40 (2) :A85-A90.

Shukla, F.C.; Madhu, B. and Jain, S.C. (1984). Technology of processing and preservation of paneer. A report on ICARProject.

Srivastava, S. and Goyal, A.K. (2007). Preparation of paneer – a review. Indian J. Dairy Sci. 60 (6) : 377-388.

Sweta Rai (2004). Studies on extension of shelf life of paneer through MAP. M.Sc. Thesis. University of Allahabad.

Vishweshwaraiah, L. and Anantakrishnan, C.P. (1986). Production of paneer from cow milk. Indian J. Dairy Sci. 39 (4) : 484-485.

Yadav, J.S.; Grover, S. and Batish, V.K. (1993). Comprehensive Dairy Microbiology. Metro politan Book Co. Pvt. Ltd., New Delhi.

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Management of mango malformation through paclobutrazol

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Abstract

An experiment was carried out to study the effect of different cultivars, various doses of paclobutrazol and their interaction on the incidence of mango malformation and the results differed significantly. Among cultivars, significantly higher healthy panicles were recorded in cultivar Dashehari followed by Langra and Chausa during both the years. Significantly lowest malformed panicles were recorded in cultivar Dashehari followed by Langra and highest in Chausa. Minimum number of medium malformed panicles was recorded lower in Dashehari followed by Chausa while it was highest in Langra. Significantly lowest light malformed panicles were noted in Langra and Dashehari and highest in Dashehari and Chausa during both the years, respectively. With regard to various doses of paclobutrazol showed varied results for healthy panicles, malformed panicles (light, medium and heavy). Significantly the highest percentage of healthy panicles was found in 5.0 g paclobutrazol treatment. On the basis of foregoing results it can be concluded that 5.0 to 7.5 g paclobutrazol concentrations were effective to minimize all types of malformed panicle.

Introduction

Mango (*Mangifera indica* L.), the worlds most luscious fruit has been recognized as the 'king of fruits' in India long back. India ranks first in area and production of mango in the world (Shikamany and Sudha, 2004). Mango malformation is of two types vegetative and floral, the former being more common on the nursery seedlings and young plants and the later, on trees at the bearing stage. It is the floral malformation which directly affects the productivity. The disease is characterized in the growing plants by production of multiple shoots with rudimentary leaves from either at leaf and or at the base of the shoot, which gives an impression of bunchy top. These symptoms are very usually seen in vegetative malformation. In floral malformation because of short internodes length and thickened peduncle, the malformed peduncles give the appearance of compact mass of flowers which are mostly male (Majumdar and Sinha, 1972). The peduncles keep hanging on tree for many more months without any fruit set.

Materials and Methods

The experiment was conducted at the Main Experiment Station, Department of Horticulture, Institute of Agricultural Science, Banaras Hindu University, Varanasi during 2000-01 and 2001-02. The experiment was conducted on mango cultivars Dashehari, Langra and Chausa. Which are the most popular varieties among north Indian mango cultivars and exhibit malformation behavior.

Experiment was laid out in factorial randomized block design with three replications. Application of different doses of paclobutrazol *viz*., 2.5, 5.0 and 7.5g per canopy diameter along with control was done. Paclobutrazol was applied once in a year i.e. 15th September 2000 and 2001 in soil around the tree canopy spread and in the next year half dose was applied, in view that the paclobutrazol possesses 50 per cent residual effect after one year of its application in the soil/plant. The following observations were recorded on healthy panicles, malformed panicles, medium panicles and severe malformed panicles.

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Results and Discussion

The Results (pooled over two years) of the present study are presented in the Table 1. Among cultivars, significantly highest percentage of healthy panicle was recorded in cultivar Dashehari (84.43 and 86.01 %) followed by Langra (82.83 and 83.65 %) and lowest was in Chausa (79.97 and 81.49 %) during both the years. With regard to various doses of paclobutrazol, significantly highest percentage of healthy panicle was recorded in 5.0g paclobutrazol (86.50 and 88.04 %) both at par followed by 7.5g paclobutrazol (84.03, 85.26 %) in the second year. The lowest percentage of healthy panicle was recorded in control (75.46 and 77.40 %) during both the years. Interaction between cultivars and paclobutrazol was found to be non significant in healthy panicle during first and second year. Kumar (1999) reported that higher concentration is more effective than lower doses of paclobutrazol. Higher doses of paclobutrazol increased in per cent of healthy panicle compared to lower doses of paclobutrazol.

It is obvious from the data presented in Table 1 that among cultivars, malformed panicles were significantly lower in Dashehari (15.51 &13.39 %) followed by Langra (17.77 & 15.64 %) and higher in Chausa (19.58 and 18.29%) during both the years. Various doses of paclobutrazol differed significantly during both the years. Malformed panicles were less with 5.0g paclobutrazol (13.25 and 13.87 %) followed by 7.5g paclobutrazol (15.41 and 15.26 %) during both the years and highest numbers of malformed panicles were recorded in control (23.40 and 18.60 %). Interaction between cultivars and paclobutrazol was non-significant in malformed panicles during first year. Significantly lowest malformed panicles were noted in Dashehari x 5.0g paclobutrazol treatment, this was similar with Dashehari x 7.5g paclobutrazol, Langra x

Table 1: Effect of paclobutrazol treatment on incidence of malformation in mango cvs. Dashehari, Langra and Chausa (Pooled over two years)

Treatments	Healthy panicles (%)	Malformed panicles (%)	Partially Malformed panicles (%)	Light Malformed panicles (%)	Medium Malformed panicles (%)	Severe Malformed panicles (%)
Cultivar						
V1 (Dashehari)	85.22	14.45	1.83	3.205	3.425	4.45
V2 (Langra)	82.99	16.705	2.68	2.795	4.635	5.48
V3 (Chausa)	80.73	18.935	3.05	3.335	3.905	6.405
S.Em+	0.505	0.35	0.06	0.09	0.095	0.13
CD at 5%	1.495	1.03	0.17	0.28	0.27	0.385
Paclobutrazol Doses						
To (Control)	76.43	21	3.46	5.375	5.675	6.985
T1 (Paclobutrazol @ 2.5g/tree	83.57	16.895	2.39	2.555	3.54	5.15
T2 (Paclobutrazol @ 5g/tree	87.27	14.255	1.98	2.165	3.205	4.7
T3 (Paclobutrazol @ 7.5g/tree	84.645	14.64	2.25	2.35	3.435	4.935
S.Em±	0.585	0.405	0.07	0.105	0.105	0.145
CD at 5%	1.715	1.19	0.2	0.32	0.31	0.445
VXT Interaction						
V1xT0 (Dashehari x control)	80.01	18.59	2.18	6.02	4.35	5.665
V1xT1 (Dashehari x Paclobutrazol @ 2.5g/tree	85.665	14.78	1.82	2.365	3.28	4.155
V1xT2 (Dashehari x Paclobutrazol @ 5g/tree	88.245	11.465	1.62	2.15	2.96	3.93
V1xT3 (Dashehari x Paclobutrazol @ 7.5g/tree	86.865	12.96	1.7	2.29	3.1	4.04
V2xT0 (Langra x control)	77.37	21.365	3.89	4.375	6.92	7.55
V2xT1(Langra x Paclobutrazol @ 2.5g/tree	83.075	16.64	2.42	2.56	4.03	4.965
V2xT2 (Langra x Paclobutrazol @ 5g/tree	87.36	12.755	2.1	1.975	3.73	4.615
V2xT3 (Langra x Paclobutrazol @ 7.5g/tree	84.145	15.14	2.3	2.26	3.86	4.775
V3xT0 (Chausa x control))	71.91	23.045	4.32	4.38	5.75	7.73
V3xT1(Chausa x Paclobutrazol @ 2.5g/tree	81.965	18.35	2.92	2.75	3.61	6.335
V3xT2 (Chausa x Paclobutrazol @ 5g/tree	86.06	13.515	2.2	2.365	2.915	5.56
V3xT3 (Chausa x Paclobutrazol @ 7.5g/tree	82.73	15.81	2.76	2.505	3.345	5.99
S.Em±	NS	0.61	0.12	0.16	0.185	NS
CDat5%	NS	1.78	0.35	0.48	0.54	NS

5.0g paclobutrazol and Chausa x 5.0g paclobutrazol during second year. Malformed panicles were highly affected by the climatic condition and the results varied in both the years. Paclobutrazol appear to control malformation. The control of malformation may be because of antifungal nature of paclobutrazol (Fletcher, 1985 and Fletcher *et al*., 1986).

Among cultivars significantly lower number of light, medium and severe malformed panicles was recorded in cultivar Langra (2.88 and 2.59 %) followed by Chausa (3.59 and 2.71 %). Significant variations were also observed with various doses of paclobutrazol during both the years. Percentage of light, medium and heavy malformed panicles were lower with 5.0g paclobutrazol (2.26 and 2.07 %), which was similar with 7.5 and 2.5g paclobutrazol. The highest light, medium and severe malformed panicles were recorded in control (6.36 and 4.39 %) during both the years. Interaction between cultivars and paclobutrazol light malformed panicles showed differences, being lowest in Langra x 5.0g paclobutrazol followed by Langra x 7.5g paclobutrazol and was the highest in Dashehari x control during first year and non-significant effect was observed in the second year. Interaction effect on medium malformed panicles was recorded lower in Chausa x 5.0g paclobutrazol (3.0 and 2.83 %), which was similar with Dashehari x 2.5,5.0 and 7.5g paclobutrazol and Chausa x 7.5g paclobutrazol (3.40; 3.0; 3.20; 3.16; 2.92, 3.0% and 3.43, 3.26 respectively. The highest percentage was observed in Langra x control (7.48 and 6.36 %) during both the years. Interaction effects on heavy malformed panicles were found non-significant during both the years. Similar findings were also reported by Kumar (1999). However, Ram and Yadav (1999) reported that the malformation intensity was reduced along with malformis levels in high density Dashehari plantation and malformation was reduced to less than 0.1 % by shoot pruning after the crop harvest and with the use of paclobutrazol.

On the basis of foregoing results it can be concluded that 5.0 to 7.5 g paclobutrazol concentrations were effective to minimize all types of malformed panicle.

References

Fletcher, R.A.(1985). Plant growth regulating properties of sterol-inhibiting fungicides. In "Hormonal regulation of Plant growth and development" pp.103-113. (S.S. Purohit, ed.).Agra Botanical Publishers, Bikaner, India.

Fletcher, R. A., Hofstra, G. and Gao, J. (1986). Comparative fungitoxic and plant growth regulating properties of triazole derivatives. Plant cell Physio., 27: 367-371.

Kumar, A. (1999). Effect of paclobutrazol in growth, flowering, fruiting and yield of mango cultivars. Ph.D. Thesis. GB Pant University of Agriculture and Technology, Pantnagar.

Majumdar, P.K. and Sinha, G. C. (1972). Studies on the effect of malformation on growth, sex ratio, fruit set and yield of mango. Acta Hort. 24: 230.

Ram, Sant and Yadav, V.K. (1999). Mango malformation- a review. J. Applied Horti. 1 (1): 70-78.

Shikamany, S.D. and Sudha, M. (2004). Lucrative export possibilities. The Hindu Survey of Indian Agriculture. Pp. 122-125.

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Effect of ethrel (2-choloroethyl phosphonic acid) on germination, shoot and root length of Lycopesicon esculentum mill. (cv. Pusa ruby)

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Abstract

An experiment was conducted with seeds of tomato CV. Pusa Ruby to study the effect of ethrel at germination, shoot & root length. These are used give concentrations of ethrel such as 0,10,25,100 & 200 ppm. Maximum percentage of germination & better shoot length was observed at 25 ppm. Root length was decreasing as increasing the concentration of ethrel.

Introduction

Tomato is well known as protective food and therefore, its holds economicaly a most important position. Ethephon is a synthetic ethylene releasing bioregulant (Draber: 1977). The present commercial use of ethephon indicates the substantial contribution of ethylene production is making to agriculture productive. The importance of growth promoters as well as the retardants are widely worked about on the vegetative growth of tomato. But very few works on the tomato seed germination have been reported. Beneficial effect of ethrel application on increasing flowing, fruit size & fruit yield have also been reported in tomato (Att-Aly et al. 1999). This paper reportes the effect of ethrel on the germination, seedling growth of tomato.

Materials and Methods

The present study was carried out during April 2008 at Plant physiology lab, Hindu College, Moradabad (U.P.) at room temperature. The experiment was conducted with tomato seed CV. Pusa Ruby. First of all seeds are sterilized with 0.1% HgCl2 for 2 minutes & thoroughly washed 3-4 water to remove traces of HgCl2 . Ethrel solutions were prepared at 4.0 pH of the different concentrations (0,10,25,50,100 & 200 ppm.) seeds were soaked in beakers for 6 hours in respective concentrations. Each treatment was replicated thrice with 20 uniform size seeds. Seeds were allowed to germination on petriplates arranged iin a randomized block design & petriplates were sprinkled with distilled water daily to keep the sand moist. Germination were daily recorded & finally root & shoot separated by blade and length of both was recorded.

Results and Discussion

Germination:- Ethephon within the range of concentration applied, stimulated germination o tomato seeds. The lower two conc. (10,25 ppm) were highly stimulatory & they show 83.33% and 91.67% of germination respectively. These concentrations enhanced germination & took only 12 days to complete the maximum germinatioin. The higher three conc. 50,100 & 200 ppm were inhibitory & recorded 70,60 and 48.33% germination respectively.

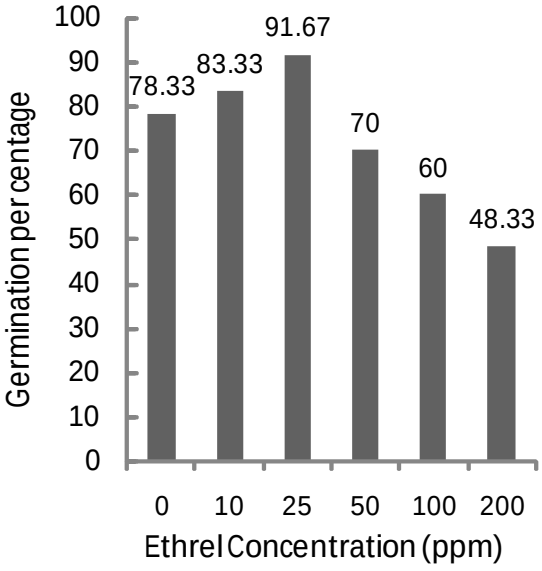

Fig. 1: Relationship between germination and ethrel concentration

After 12 days of showing, the lower concentration ethrel exhibited stimulatory effect while higher conc. inhibited the germination of tomato seeds. After 15 days, the present germination was recorded 78.33, 83.33, 91.67, 70, 60 and 48.33% at 0,10,25,50, 100 and 200 ppm of ethrel respectively. Highly significant effect of ethrel on the germination seed generally indicated stimulation (Fig. 1). The analysis of variance of the data revealed the effect of ethrel to be highly significant ($P<0.005$) establishing its highly stimulatory effect on

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seed germination of tomato. Low ethrel conc. Included seed germination of clover upto the extent of 80% (Eshai and Leopold, 1969). Bisaria and Paliwal (1981) observed better germination percentage due to ethrel presoaking of triticale seeds. Siska (1984) reported increased imbryo germination with exogenously applied ethrel in apple seeds.

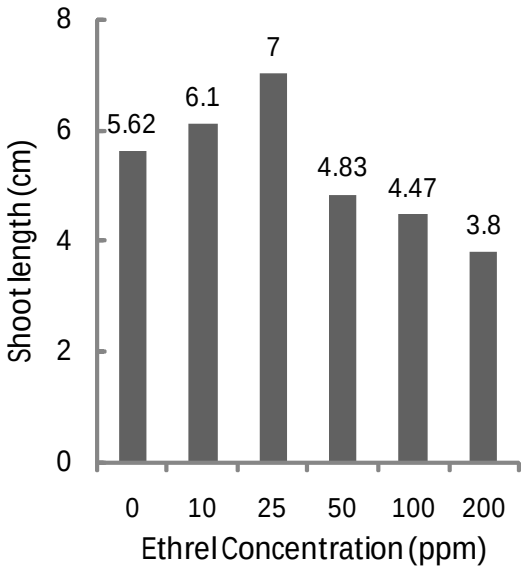

Fig.2 - Relationship between shoot length &ethrel concentration

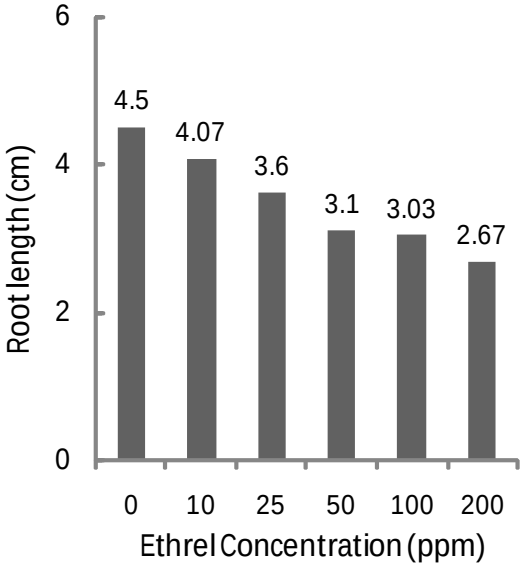

Fig.3.- Relationship between root length &ethrel concentration

Length of Shoot & Root: The shoot growth was promoted initially by the lower concentrations (10 and 25 ppm) and 15 days 10 & 25 ppm only remained as stimulatory while all other concentrations imparted inhibitory effect on shoot-length (Fig. II). All the concentrations had inhibitory effect in the root length of tomato seeds (Fig. III). Effect of ethrel on the growth of tea nursery seedlings had been reported by Wickremasighe et. Al (1974), who observed stimulation of shoot growth & inhibition of root length. The analysis of variance clearly indicated that ethrel at lower concentrations were stimulatory for shoot growth in the seedling while higher concentrations were inhibitory.

Seeds of orach pre soaked in ethrel solutions showed an increase in shoot length of seedlings (Saraswathamma 1979). In contrast, Shirigozaki and Takimoto (1983) reported that root length of the plants (Pharbities nil) treated with ethrel was longer than that of the plants treated with other growth regulators.

Conclusion

In conclusion it can be inferred that ethrel induced higher germination percentage and better percentage germination and better seedlings growth in tomato seeds.

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References

Att-Aly, M.A., riad, G.s. Cacheene, Z.El-s and Beltagy, A.S. (1999): Early application of ethrel extends tomato fruit cell division & increases fruit size and field with repparing delay. J. Plant growth. Regul 18.15-24

Bisaria, A.K. and Poliwal, N.K. (1981): Effect of ethrel on seed germinatioin, seedling growth & sugars in tritide Acta. Bot. indica., 9:148-150

Draber (1977): Natural & synthetic plant growth regulators. Agricola (4): 1-63

Esachi, Y. and Leopold, A.C. (1969): Dormancy regulation in subterranean clover seeds by ethylene, Plant physiol, 44: 1470-1472

Saraswathmma, D.N. (1979): The effect of pre-sowing harde thing and foliar application with growth regulators in orach (Atriplex hortensis L.) Curr. Sci, 48:357-359

Sinska, I (1984): Ethylene & the removal of emboyonal apple seed dormancy. Hort. Sci., 19:73-75.

Wickremassinghe. R.L., Perea, K.P.W.C. and Manusinghe, T.A. (1974): Effect of ehtephon, Pure tea seed saponin and partially purified tea root saponin on the growth of tea in the nursery and in the field. Tea Q. 44: 132-144.

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An analysis of constraints in production and marketing of lac in Jharkhand

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This paper is based on the analysis of survey data of 400 lac growers in Ranchi and West Singhbhum districts of Jharkhand during two years (2002-03 &2003-04). The analysis revealed that major constraints which is expressed by more than 50 per cent lac growers were shortage of fund for purchase of inputs especially broodlac, lack of demonstration on farmers field, lack of scientific knowledge, theft of lac, difficulty in cultivation operations due to host height, insect mortality due to environmental factors, non-availability of improved inputs in local markets, lack of grading facility in the market and long distance of market. There is need for extensive transfer of technology programme for scientific methods of lac cultivation, establishment of broodlac farm, dissemination of current price of lac, formation of self help groups, mechanization, strengthening of co-operative societies, Institutional intervention and value addition at village level for minimizing constraints in lac production at growers level.

Introduction

Lac is a natural resin secreted by an insect known as *Kerria lacca* (Kerr.) thriving on the tender twigs of specific host trees *viz. palas* (*Butea monosperma*), *ber* (*Zizyphus mauritiana*), *kusum* (*Schleichera oleosa*), *Ficus sp*. etc. Natural, renewable, non-toxic and eco-friendly products *i.e*. resin, dye and wax are derived form the lac. *Rangeeni* and *Kusmi* are the two strains of lac insect which are based on preference of the insect for specific host plants. It is an export oriented commodity cultivated by poor peasants, mostly forest and sub forest dwellers, in the states of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Orissa and parts of Maharashtra, Uttar Pradesh, Andhra Pradesh, Gujarat and NEH region. Majority of the households of the lac growing regions carry out lac cultivation as a subsidiary occupation to agriculture. It has high potential for generating employment for both men and women. The national production of lac was around 20,000 tons. About 75 per cent of lac produced in the country is exported to over 100 countries mainly in refined and semi refined forms. The export earning from lac and lac products during the year 2004-05 was around 165.0 crores (Anonymous, 2004-05).

A lot of schemes were announced and implemented for betterment of lac growers and lac production. But, due to various constraints operating at farm level, results were not encouraging. The information on production and marketing constraints in lac cultivation is meager except few studies (Kabra, 1983; Saha and Bhardwaj, 1986). Keeping in view the above facts, it is felt necessary to study the production and marketing constraints in lac. Accordingly, the study was undertaken with the objectives to study the production and marketing constraints faced by lac growers and to suggest measures for the efficient production and marketing at growers level.

Methodology

The present paper is based on the analysis of primary data. For collection of primary data, two major lac growing districts of Jharkhand under lac cultivation namely Ranchi and West Singhbhum were selected purposively in the year 2003-04 and 2004-05 for the study. Three stage stratified random sampling technique was adopted for selection of blocks, villages and farmers. Four blocks from each selected districts and five villages from each selected blocks were identified. Then ten lac growers from each identified village were selected randomly. Thus, the total sample size was 400 lac growers. Primary data were collected from the respondents using pre-tested interview schedule. Percentage analysis was used for the different values of constraints analysis of lac production and marketing.

Results and Discussion

Production and marketing of lac in Jharkhand

Lac cultivation is being carried out by all type of farmers *i.e.* marginal, small farmers and big farmers who possess lac host trees. Lac cultivation is mainly done on *palas*, *ber* and *kusum* trees which are available in plenty in agricultural field, bunds, unused land, degraded land and forest land of the lac growers. Mature or immature (*ari*) crop with branches are cut down and the lac incrustation is scraped by the cultivators. This scraped lac is known as 'sticklac'. Sticklac in small quantity (< 10 kg. lot) is generally sold in the *haats* by the lac growers. Ranchi, Palamau, Garhwa, Gumla,

Lohardaga, Latehar, Simdega, East Singhbhum and West Singhbhum are the major lac producing districts of Jharkhand.

Table 1: Field level constraints faced by lac growers in lac cultivation

Constraints	Lac growers (%)
Production constraints	
A. Financial constraints	
Shortage of funds for purchase of input (specially broodlac)	72
High cost of broodlac	48
B. Extension constraints	
Lack of demonstration on farmers field	82
Lack of scientific knowledge on lac cultivation	78
C. Labour constraints	
Unavailability of labour	44
Labour intensive crop	32
D. Social constraint	
Theft of lac	54
E. Operational constraints	
Difficulty in cultivation operation due to host height	64
Shortage of broodlac	50
Difficulty in management of large number of hosts	48
Scattered host plant	42
Distance of host plant from home	34
Scraping problem in case of *ber*	28
F. Other constraints	
Insect mortality due to environmental factors	72
Uncertainty in production	46
Lack of host (owning only one type of host)	24
Marketing constraints	
Non-availability of improved inputs in local market	90
Lack of grading facility in the market	53
Long distance of market	52
Lack of information on current price of lac	50
Broodlac marketing	38

The rural markets (*haat*) in Jharkhand operate once or twice a week. Farmers in these markets sell lac and other farm produce and purchase their daily requirement goods. Income from lac is used for purchase of household requirements. Lac growers, after harvesting sticklac sell it in the village itself or bring it to the nearest village market for sale to *paikars* (primary purchasers). Lac growers, nearer to lac processing units, also sell their produce directly to processing units. Prices of lac in the market depend upon the *Chouri* (seedlac) price in processing units. The *paikars* after collecting, whatever quantity they could in the course of the market day, sell it to the wholesaler in the same market or near by manufacturing centers in bigger lots. Simultaneously the wholesalers sell the produce to manufacturers at different lac processing centers. Lac processing units are situated in Ranchi (Khunti, Bundu and Murhu), West Singhbhum (Chakaradharpur), Garhwa, Latehar, Simdega (Kolebira) and Palamau (Daltonganj) districts of Jharkhand. Processing units in Jharkhand manufacture seedlac, shellac, button lac, bleached lac, aleuritic acid, lac dye etc. After processing, lac is sold for internal consumption within the country or exported by lac exporters.

Production and marketing constraints at growers level

Selected lac growers were contacted for analysis of field level constraints faced by them have been presented in Table 1. Shortage of funds for purchase of improved inputs and broodlac was expressed by 72 per cent lac growers. Since most of the lac growers were economically very poor, hence could not afford to by the improved inputs and broodlac used in lac cultivation. High cost of broodlac (seed for starting lac cultivation) as a constraints was expressed by 48 per cent lac grower. Presently the cost of *rangeeni* and *kusmi* broodlac is around Rs. 65 and Rs. 120 per kg respectively. Average requirement of broodlac for *palas*, *ber* and *kusum* is 0.50 kg, 2.0 kg and 8.0 kg per plant respectively. About 82 per cent lac growers expressed lack of demonstration on farmers field on scientific methods of lac cultivation. GOs and NGOs are involved in demonstration of scientific methods of lac cultivation on farmers field but their targeted area is limited. Lack of scientific knowledge on lac cultivation was expressed by 78 per cent lac growers. This constraint is due to their ignorance, nature of isolation and lack of initiatives. Unavailability of labour and labour intensive crop as constraints was expressed by 44 per cent and 32 per cent respectively. Some lac cultivation operations coincide with the other agricultural crops operations. At that time labour problem arises or labours available at higher rate than normal rate. Lac cultivation operations include pruning of host trees, inoculation, pesticide spray, harvesting of crop, scraping of lac from stick in which mechanization is very less, so it is a labour intensive crop. Lac is a high value crop, present rate of *rangeeni* and *kusmi* sticklac is Rs. 70 and Rs. 110 per kg. if it is cultivated at distant places from home, theft may occur which was reported by 54 per cent lac growers. Difficulty in cultivation operations due to host height has also been expressed by 64 per cent lac growers. This constraint was mainly faced in case of *kusum* as this host is large in size. About 50 percent lac growers expressed shortage of broodlac. During the period of crop failure,

lac growers face acute shortage of broodlac. About 48 per cent lac growers expressed difficulty in management of large number of hosts. This constraint is due to the labour intensive crop and shortage of broodlac. Scattered host plant and distance of host plants from home as constraints were expressed by 42 and 34 per cent lac growers. Generally lac host plants are available naturally in agricultural field, bunds, unused land and forest land. So, host plants are scattered and distance from home. This situation creates problem in cultivation operation, monitoring of crop and in safety. About 28 per cent lac growers expressed scraping problem in case of *ber*. Due to thorns in the branches of *ber*, scraping of lac from stick is difficult. About 72 per cent lac growers expressed insect mortality due to environmental factors and 46 per cent expressed uncertainty in production. This is due to the various biotic and abiotic factors causing adverse affect on lac insect and ultimately on lac production. Constraints in lac cultivation due to owning only one type of host were expressed by 24 per cent farmers. Due to this grower were unable to cultivate both type of lac *i.e. rangeeni* and *kusumi*. In this situation chances of occurring shortage of broodlac was more in case of crop failure.

Ninety per cent lac growers expressed non-availability of improved inputs in local market specially pesticides, synthetic net and cultivation tools which is essential in scientific method of lac cultivation. Since lac cultivation is generally done in remote areas where the improved inputs of lac cultivation are not easily available. About 53 per cent lac growers expressed lack of grading facility in the market. Long distance of market as a constraint in lac cultivation was reported by 52 per cent lac growers. This is due to the remote area of lac growing village. The local *haats* (markets) operating in the remote area once or twice a week. The catchments area of local *haats* is generally 5-15 km of periphery. Lack of information on current prices of lac were expressed by 50 per cent lac growers. This is due to the poor information system in remote areas and ignorance of lac growers. About 38 per cent lac growers expressed constraints in broodlac marketing. There is no systematic channel available for broodlac marketing. Broodlac can't be kept for longer period because of emergence of lac insect.

Suggestions for efficient production and marketing at growers level

1. There is need for extensive transfer of technology programme and motivational activities for lac growers to adopt scientific methods of lac cultivation.
2. Farmers should be encouraged to plant traditional as well as bush type of hosts for lac cultivation on waste land and bunds of agricultural field.
3. Dissemination of current prices of lac and support price fixed by JASCOLAMPF (a co-operative society in Jharkhand) through communication means *i.e.* radio, television and news paper.
4. Development of lac producer's organization in the form of co-operative society and self help groups (SHG) to protect the common interest and production and marketing of lac will be helpful for lac growers.
5. There is need to strengthen co-operative marketing societies for input and output marketing.
6. Needs to develop infrastructure and market support services in lac related primary and secondary markets.
7. NGOs and Institutional intervention can also be helpful for improvement of lac growers.
8. Needs to popularization of mechanization in lac cultivation operations.
9. Needs to establish broodlac farm in major lac growing areas.
10. For smooth broodlac marketing it is necessary for lac growers to advance estimation of quantity of broodlac for self use and sell. Advance negotiation for sell and purchase of broodlac is also necessary.

Value addition of lac at village level, standardization of weight in markets, credit facility etc. will be helpful to remove or minimize the constraints in lac production and marketing, which will certainly increase socio-economic condition of lac growers and the lac production.

References

Anonymous, (2004-05). 47th Annual Report, Shellac Export Promotion Council, Kolkata.

Kabra, K.N. (1983). Dependence and dominance, Indian Institute of Public Administration, New Delhi. pp.196

Saha, S.K. and Bhardwaj, S.P. (1986). Lac cultivation – A socio-economic study, Indian Shellac, 1&2 : 3-6.

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Genetic parameters for economic traits in White Leghorn

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Abstract

Data from 2277 pullets of 412 dams mated with Sires were utilized in this present study. The traits considered in this study as egg production upto 250 days of age, 20 week, 24 week and 34 week body weights, egg weight at 40 week of age at sexual maturity. The corresponding heritability estimates for above traits were 0.17±0.03, 0.68±0.05, 0.51±0.05, 0.37±0.05 and 0.16±0.03. the genetic phenotypic correlations among different economic traits were also estimated.

Introduction

The economic return from birds depends largely on traits like egg production, body weight, egg weight and egg at sexual maturity. A knowledge of genetic and phenotypic parameters for these traits is therefore essential to decide selection programme for overall improvement and hence the present investigation has been under taken to estimate the genetic parameters.

Material and Methods

Present study was under taken on the commercial strain of white leghorn maintained at poultry farm, College of Veterinary & Animal Science, Bikaner. The data of 2277 pullets produced by 58 sires with 412 dams. The chicks were hatched at weekly interval in month of march every year. The standard management practices were followed to rear the chicks. The traits measured for study were egg production up to 250 days to age, 20, 24 and 34 week body weights, egg weight at 40 week of age and age at sexual maturity. The heritability estimated, genetic and phenotypic correlations and their standard errors were estimated according to the method of Backner (1984) using the sire components of variance and covariance.

Results and Discussion

Heritability: Heritability estimate of all economic traits with their standard error have been presented in Table 1. The higher magnitude of heritability for 20 and 24 week body weights therefore, under study indicates that mass selection can be practiced for the improvement of these traits. The medium heritability observed for 34 week body weight shows that there is still sufficient genetic variability exist in the population for further improvement. The low magnitude of heritability for egg production up to 250 days of age and age at sexual maturity observed in the experiment could be due to several cycles of continuous selection for these traits, therefore, family selection or progeny testing may be more effective for the improvement of these traits our estimates for heritability value are similar to the reports of Nayak nad Mishra (1985), and Chatterjee et al. (1999).

Correlations: The phenotypic and genetic correlations among the traits are presented in Table 2. Phenotypic and genetically egg number had negative correlated with all traits expected 20 and 40 week body weights. In the fest of significance of the estimates of correlation it was observed that the relationship of egg number with different body weights was insignificant indicating the inheritance of egg number is almost independent of body weight. Most of the workers have observed positive and phenotypic correlation between par egg production and body weight at 20 week body weight. Johari et al., (1988). The corresponding estimates observed in the present investigation are concomitant with these reports. Egg number had a small non-significant positive correlation with body weight at 24 weeks. Similar egg number had insignificant positive association with body at 24 week. The part egg number had non-significant negative phenotypic and genetic association with body weight at 34 week. Johari et al., (1985), Johari et al., (1988) in selected group and Choudhary (1983) observed similar findings, therefore no valid inference can be drown on the bais of genetic association between egg number and different body weights estimated in the current study. However, the positive significant does indicate that increase in egg number might bring a gain in 20 and 24 week body weight with simultaneous decrease in body weight at 34 week.

Table 1: Heritability estimates with their standard error of different economic traits

S.No.	Traits	Heritability+S.E.
1.	Egg production uo tpo 250 days of age (No.)	0.17±0.03
2.	20 week body weight (g)	0.68±0.05
3.	24 week body weight (g)	0.63±0.05
4.	34 week body weight (g)	0.51±0.05
5.	Egg weight at 40 week of age	0.37±0.05
6.	age at sexual maturity (days)	0.16±0.03

The phenotypic and genetic correlation between egg number and egg weight was found to be negative but the magnitude was low(rp = 0.76 and rg = -0.206±1.22). almost similar results have been reported by Johari et al., (1983)

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Table 2: Phenotypic (P) and Genetic (G) correlation with their standard error

Traits		20 week body weight	24 week body weight	34 week body weight	Egg weight	Age at sexual maturity
Production	P	0.08	0.08	-0.04	-0.08	-0.46**
Egg	G	0.15±0.11	0.14±0.11	-0.09±0.11	-0.21±0.12	-0.88±0.20
20 week	P		0.73**	0.52**	0.10	-0.13
body weight	G		0.92±0.02	0.68±0.05	0.17±0.09	-0.29±0.11
24 week	P			0.68**	0.13	-0.06
body weight	G			0.83±0.03	0.30±0.08	-0.14±0.11
34 week	P				0.20*	0.07
body weight	G				0.49±0.08	0.17±0.14
Egg weight	P					0.06
	G					0.23±0.12

and Choudhary (1983). The correlation between egg number and age at sexual maturity were found to be negative and highly significant. These findings are similar to the results of Johari et al., (1985). This indicates that selection for increasing egg number results decrease in age at sexual maturity due to correlated response to selection.

The correlation of 20 week body weight with 24 and 34 week body weight was found to be positive and highly significant. It was also observed that the three body weights incorporated in this study were significant and genetically. These results also suggested that these are some common set of pleiotropic genes which govern these body weights. The correlation between 20 week body weight and egg weight were found to be 0.102 and 0.172 ± 0.087 phenotypic and genetically respectively, indicating a strong positive association between these two traits. Singh et al., (2000) also arrived at similar conclusions. The phenotypic and genetic association between body weight at 20 week and age at sexual maturity was observed to be -0.13 and 0.29 ± 0.11 respectively. Through, these correlations were not significant; the negative significant indicated that heavier birds at 20 week attain early sexual maturity. Similar findings were reported by, Thakur et al., (1989) and Choudhary (1983).

The phenotypic and genetic association between 24 week and 34 week body weight was found to be 0.83 +0.03 respectively; both the values were positive and highly significant. This indicates that pullets which are heavier around sexual maturity (24 weeks) tend to be higher weight at peak production (34 weeks) and vice versa. Likewise, the phenotypic and genetic correlation of 24 week body weight and egg weight were 0.13 and 0.30 ± 0.084 respectively. Through the association was not significant, the positive significance gives an indication that heavier birds at 24 week tend to lay heavier eggs and vice versa. These results are an agreement with the findings of Krishna and Choudhary (1987). The correlation of 24 weeks body weight and age at sexual maturity were -0.06 and -0.14 ± 0.11 respectively. Both were insignificant, indicate a nearly genetic independency between these two traits. The higly significant positive correlation almost 20, 24 and 34 week body weight indicated that selection on the basis of early body weight might be effective in increasing the mature body weights.

The correlation between 34 week body weight and egg weight were found to be 0.20 and 0.49 ± 0.08, respectively. These estimated indicated significant and positive relationship between these traits Choudhary (1983) also found similar results. These results indicate that selection for body weight at 34 week will be effective in increasing egg weight/egg size also. The correlation between 34 week body weight and age at sexual maturity were low and non-significant.

The association between egg weight and age at sexual maturity were positive low and non-significant. These results are akin to the finding of Choudhary (1983).

References

Backer, W.A. (1984). Manual of quantitative genetic. Forth Edn. Academic enterprise Pullman, Washington.

Chatterjee, R.N.; Mishra, B.S. and Singh, H.N. (1999). Indian J. Poultry Sci. 34(1):29-33.

Choudhary, R.S. (1983). Study on selection indices for improving production efficiency in white Leghorn, Ph.D. Thesis Rajasthan Agriculture University, Bikaner.

Choudhary, M.L.; Brah, D.S. and Sandhu, J.S. (1988). Indian J. Poultry Sci. 23:332-335.

Johary, D.C.; Das, P. Ayyagari, V. and Thiyagas undaram, J.S. (1985). Indian J. Poultry Sci.20:132-134.

Johary, D.C.; Day, B.R.; Kataria, M.C. Ayyagari, V. and Mohanpatra S.C.; and Ram Gopal (1988). Indian J. Poultry Sci. 23:40-46.

Kataria, S.T. and Choudhary, R.P. (1972). Indian Vet. J. 49:79-80.

Krishna, S.T. and Choudhary, R.P. (1987). Heritability of age and body weight and sexual maturity and their relationship with egg production traits in random breed white leghorn. Indian J. Animal Sci. 57:559-561.

Nayak, S.K. and Mishra, S.C. (1985). Indian J. Poultry Sci. 20:212-214.

Singh, B.; Chickara, B.S.; Dalal, D.S. and Kalic, C.P. (2000). Indian J. Poultry Sci. 36(2):163-168.

Thakur, Y.P.; Singh, B.P. and Singh, H.N. (1989). Indian J. Poultry Sci. 24:148-152.

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An economic analysis of buffalo milk production in faizabad district of eastern U.P.

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Abstract

India ranks first in the world milk production. During 2006-07, the milk production in India was 100.90 million tonnes. India accounts for a significant share of world's livestock resources with nearly 60% of world's buffaloes as reported by FAO. The attempt was made to have an economic analysis of buffalo milk production in Faizabad district of eastern Uttar Pradesh, where the milk production was 1220 tonnes during 2005-06. The study was conducted in Haringtaganj block of Faizabad district selected purposively for the study with a sample size of 100 households. The overall average returns per milch animal per day was 1:1.81 (winter season), 1:1.63 (summer season) and 1:1.93 (rainy season) respectively.

Introduction

Role of livestock in the rural economy of India could hardly be over emphasized. The contribution of livestock to the national economy is estimated to be 6%, which is around 25% of the total agricultural output (Kadirvel, 2002). Global milk production has been increasing moderately over the past 15 years and is estimated at 615 million tones in 2006-07. India ranks first in the world milk production, while USA stands second rank in the world. In the year 2006-07, milk production was 100.90 million tones in India. India accounts for a significant share of world's livestock resources with nearly 60% of world's buffaloes, 16/5% of cow, 16.20% of goats (FAO, 2004).

Though, the contribution of agriculture and allied sectors to the national gross domestic product (GDP) has declined during the last few decades. Livestock sector has been among the few high-growth sectors in rural India. The milk production was 987 litre per lactation in India as compared to the world average of 2038 litres per lactation (livestock Census 2003). Per capita milk availability per day was 246 gram during 2006-07, which may be due to the success of operation flood programme. It amounted to 16.41% share of India in the global milk production and holding large number of milch animals (Anonymous, 2006-07).

The milk production cost in India is one of the lowest in the world, only next to New Zealand. India is developing country. So, the small land holding and large percentage of population have no land. About the milch animal population, it is 284 million (187.38 cow and 92.62 million buffalo) in India. The milch animal population was 45.72 million (25.63 cow and 20.86 million buffalo) and milk production was recorded 12 million tones in Uttar Pradesh. In Faizabad district of eastern U.P., the milk production was 1220 tonnes during 2005-06 (Parag dairy, Faizabad). The specific objectives of the study were:

1. To study the costs and returns in buffalo milk production
2. to find out the break-even point of dairy enterprise
3. to identify the constraints associated with buffalo milk production and to suggest suitable remedies.

Research Methodology

A multistage stratified, purposive-cum random sampling technique was used for the selction of district, block, villages and sample of households in the ultimate stage of study. Faizabad district was selected purposively because of convenience of the investigator. Out of nine blocks in district Faizabad, one block I.e. Haringtanganj was selected randomly for the study. A list of all the villages of selected block was prepared and arranged in descending order on the basis of number of milch animals. Five villages from top having higher number of milch animals were selected for this study.

A list of all the milk producers from the five selected villages was prepared. The households/milk producers were divided in to five categories on the basis of land holdings i.e. landless (No land), marginal (below 1 ha), small (to 2 ha), medium (2 to 3 ha) and large household (3 ha and above). A predetermined sample of 100 households from all the five villages (20 from each village selected randomly) was drawn for detailed investigation. The number of milk producer/household in each category of households was in proportion to their population in each village.

Collection of data

The primary data was collected in the year 2006-07 from sample household by survey method on total

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milk produced. The other secondary data were collected from official records of district (Statistical Bulletin and Parag dairy) block head quarters, tehsil and other agencies of the district.

Tabular analysis was employed to the production by different categories of households and further costs and returns of milk. The tabular analysis were done as given below.

The weighted average of the variable X has been calculated by using following formulae.

$$WA = \frac{WiXi}{Wi}$$

Where,

WA = Weighted average

Wi = Weight of variable

Xi = Value of the variable

Break-even analysis was employed to work out break-even output for milch animals (Cow and buffalo) on different categories of household,

$$BEP = \frac{TFC}{ASP - AVC}$$

Where,

BEP = Break-even point in litres of milk

TFC = Total fixed cost per milch animal in rupees

ASP = Average selling price per litre of milk (Rs.)

AVC = Average variable cost per litre of milk (Rs.)

Results and Discussion

Cost and returns in buffalo milk production

The different items considered in the production and maintenance costs are given in Table 1. the overall average cost, Rs. 70.02 in the case of buffalo in winter season. The overall average cost Rs. 72.17 in the case of buffalo in summer season has been furnished in Table 2. the results revealed that the overall average cost observed Rs. 70.76 in the case of buffalo in rainy season (Table 3). The major items of cost for milch animals were the cost on fodder, concentrates, labour charges, miscellaneous cost and fixed cost. The overall average cost on major items as shown in Table 3 were 32.69, 40.60, 14.20, 2.83 and 9.71 per cent in case of buffaloes correspondingly on the total cost is based on rainy season. The per litre cost of milk production shown in Table 4 on landless, marginal, small, medium and large size group were estimated to be Rs. 8.73, 9.52, 8.36, 8.15 and 7.76, respectively. On an average input-output ratio in milch buffalo was highest on large (1:2.01) followed by medium (1:1.95), small (1:1.84), landless (1:1.68) and marginal (1:1.59) size groups households in winter season in the Table 5. on an average input-output ratio in milch buffalo was higher on large (1:1.77) followed by medium (1:1.75), small (1:1.60), landless (1:1.62) and marginal (1:1.40) size groups households in summer season in the Table 6. on an average input-output ratio in milch buffalo was highest on large (1:2.10) followed by medium (1:2.00), small (1:1.97), landless (1:1.75) and marginal (1:1.73) size groups households in rainy season shown in Table 7.

The net profit and input-output ratio per milch animal per day was maximum in rainy season followed by winter season and summer season on all the categories of milch animals.

Table 1: Production and maintenance cost per milch buffalo per day in winter season (Rs.)

Particulars		Category of milch animal					
		Landless	Marginal	Small	Medium	Large	Overall
Fodder	Dry fodder	12.98(20.27)	13.53(19.29)	13.52(19.35)	14.10(19.19)	14.49(20.23)	13.92(19.88)
	Green fodder	7.71(12.04)	9.21(13.14)	9.32(13.34)	9.18(12.49)	9.23(12.88)	8.93(12.75)
	Total	20.69(32.31)	22.4(32.43)	22.84(32.69)	23.28(31.68)	23.72(33.11)	22.85(32.63)
Concentrate	Grain	14.62(22.83)	14.90(21.24)	13.97(19.99)	5.03(20.45)	14.38(20.07)	14.58(20.82)
	Khali	5.00(4.20)	4.20(5.98)	4.35(6.22)	4.79(6.51)	3.49(4.87)	4.37(6.24)
	Mineral material	4.76(7.43)	6.47(9.22)	6.20(8.87)	5.70(7.75)	6.06(8.46)	5.84(8.34)
	Chunni/choker	2.81(4.38)	3.03(4.32)	3.47(4.96)	5.66(7.70)	4.28(5.97)	3.85(5.50)
	Total	27.19(42.46)	28.60(40.78)	27.99(40.06)	31.18(42.43)	28.21(39.38)	28.64(40.90)
	Labour charge	8.90(13.89)	9.30(13.26)	9.85(14.09)	10.10(13.74)	10.16(14.18)	9.66(13.80)
	Miscellaneous	2.00(3.12)	2.00(2.85)	2.00(2.86)	2.00(2.72)	2.00(2.79)	2.00(2.86)
	Fixed cost	5.25(8.19)	7.48(10.66)	7.18(10.27)	6.91(9.40)	7.53(10.51)	6.87(9.81)
	Grand Total	64.03(100.0)	70.12(100.0)	69.86(100.0)	73.47(100.0)	71.62(100.0)	70.02(100.0)

( ) Figures in parenthesis indicate percentage to total cost

Fixed cost=Housing expenditure+Depreciation on machinary+Depreciation on milch animal value+Interest on animal value

Miscellaneous, included veterinary charge etc.

Table 2: Production and maintenance cost per milch buffalo per day in summer season (Rs.)

Particulars		Category of milch animal					
		Landless	Marginal	Small	Medium	Large	Overall
Fodder	Dry fodder	12.80(19.62)	13.22(18.28)	13.77(18.96)	13.55(17.63)	13.71(18.05)	13.41(18.58)
	Green fodder	7.71(11.81)	9.25(12.79)	9.27(12.76)	9.23(12.01)	9.27(12.20)	8.95(12.40)
	Total	20.51(31.44)	22.47(31.08)	23.04(31.73)	22.78(29.64)	22.98(30.26)	22.36(30.98)
Concentrate	Grain	11.52(17.66)	13.70(18.95)	14.02(19.31)	1.98(19.49)	15.20(20.01)	13.88(10.23)
	Khali	5.09(7.80)	4.35(6.01)	4.30(5.92)	4.87(6.33)	3.59(4.72)	4.44(6.15)
	Mineral material	4.71(7.22)	6.58(9.10)	6.30(8.67)	5.74(7.47)	5.04(6.63)	5.27(7.30)
	Chunni/choker	3.00(4.49)	3.30(4.56)	3.56(4.90)	5.55(7.22)	4.40(5.79)	3.96(5.49)
	Total	24.32(37.28)	27.93(38.64)	28.18(38.81)	31.14(40.53)	28.23(37.17)	27.55(38.17)
	Labour charge	13.15(20.15)	12.40(17.5)	12.20(16.80)	14.00(18.22)	15.20(20.01)	13.39(18.55)
	Miscellaneous	2.00(3.06)	2.00(2.76)	2.00(2.75)	2.00(2.60)	2.00(2.63)	2.00(2.77)
	Fixed cost	5.25(8.04)	7.48(10.34)	7.18(9.88)	6.91(8.91)	7.53(9.91)	6.87(9.52)
	Grand Total	65.23(100.0)	72.28(100.0)	72.60(100.0)	76.83(100.0)	75.94(100.0)	72.17(100.0)

( ) Figures in parenthesis indicate percentage to total cost

Fixed cost=Housing expenditure+Depreciation on machinary+Depreciation on milch animal value+Interest on animal value

Miscellaneous, included veterinary charge etc.

Table 3: Production and maintenance cost per milch buffalo per day in rainy season (Rs.)

Particulars		Category of milch animal					
		Landless	Marginal	Small	Medium	Large	Overall
Fodder	Dry fodder	15.56(22.03)	13.87(19.60)	13.84(19.86)	14.08(19.13)	13.86(19.48)	14.24(20.12)
	Green fodder	8.38(11.86)	8.40(11.87)	9.24(13.26)	9.27(12.60)	9.17(12.88)	8.89(12.56)
	Total	23.94(33.89)	22.27(31.44)	23.08(33.12)	23.35(31.73)	23.03(32.38)	23.13(32.69)
Concentrate	Grain	15.90(22.51)	14.03(19.83)	14.03(20.13)	15.04(20.44)	15.32(21.54)	14.86(21.00)
	Khali	4.98(7.05)	4.74(6.70)	4.32(6.20)	4.90(6.66)	3.56(5.00)	4.50(6.36)
	Mineral material	4.81(6.81)	6.85(9.68)	6.10(8.75)	5.48(7.45)	5.06(7.11)	5.26(7.43)
	Chunni/choker	3.05(4.32)	3.89(5.50)	3.37(6.84)	5.70(7.75)	4.38(6.16)	4.09(5.78)
	Total	28.74(40.69)	29.51(41.70)	27.82(39.92)	31.12(42.29)	28.32(39.81)	28.71(40.60)
	Labour charge	10.70(15.15)	9.50(13.42)	9.60(13.78)	10.20(13.86)	10.25(14.41)	10.05(14.20)
	Miscellaneous	2.00(2.83)	2.00(2.83)	2.00(2.87)	2.00(2.72)	2.00(2.81)	2.00(2.83)
	Fixed cost	5.25(7.43)	7.48(10.57)	7.18(10.30)	6.91(9.39)	7.53(10.59)	6.87(9.71)
	Grand Total	70.63(100.0)	70.76(100.0)	69.68(100.0)	73.58(100.0)	71.13(100.0)	70.76(100.0)

( ) Figures in parenthesis indicate percentage to total cost

Fixed cost=Housing expenditure+Depreciation on machinary+Depreciation on milch animal value+Interest on animal value

Miscellaneous, included veterinary charge etc.

Table 4: Cost of milk production(per litre) in buffalo milk on different category (Rs./milch animal)

Particulars	Categories of milch animal buffalo					
	Landless	Marginal	Small	Medium	Large	Overall
Total cost/lactation (Rs.)	18.656.40	19894.93	19799.74	20895.34	19851.06	19791.33
Total milk production/ lactation (litre)	2136.40	2088.80	2368.80	2564.80	2559.20	2343.60
Cost of milk production/ per litre (Rs.)	8.73	9.52	8.36	8.15	7.76	8.44

Table 5: Input-output ratio in per milch buffalo per day (winter season)

Particulars	Categories of milch animal					
	Landless	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs)	64.03	70.12	69.86	73.43	71.62	70.02
Milk yield (litre)	7.33	7.53	8.59	9.35	9.37	8.43
Price milk (Rs/litre)	13.85	13.95	14.20	14.60	14.60	14.24
value of young stock (Rs/day)	4.25	4.37	4.60	4.90	5.20	4.66
Value of dung(Rs/day)	1.90	1.98	1.95	2.00	1.99	1.96
Gross return(Rs)	107.67	111.39	128.53	143.41	143.99	126.66
Net profit (Rs)	43.64	41.27	58.67	69.98	73.37	56.64
Cost benefit ratio	1.68	1.59	1.84	1.95	2.01	1.81

Gross return, included value of dung and young stock

Table 6: Input-output ratio in per milch buffalo per day (summer season)

Particulars	Categories of milch animal					
	Landless	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs)	65.23	72.28	72.60	76.83	74.94	72.17
Milk yield (litre)	7.00	6.47	7.45	8.33	8.15	7.48
Price milk (Rs/litre)	14.20	14.60	14.80	15.40	15.40	14.88
value of young stock (Rs/day)	4.25	4.37	4.60	4.90	5.20	4.66
Value of dung(Rs/day)	1.90	1.95	1.95	2.00	1.99	1.96
Gross return(Rs)	105.55	100.78	116.81	135.18	132.70	117.92
Net profit (Rs)	40.32	28.50	44.21	58.35	57.76	45.75
Cost benefit ratio	1.62	1.40	1.60	1.75	1.77	1.63

Gross return, included value of dung and young stock

Table 7: Input-output ratio in per milch buffalo per day (rainy season)

Particulars	Categories of milch animal					
	Landless	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs)	70.63	70.76	69.68	73.58	71.13	70.76
Milk yield (litre)	8.57	8.37	9.35	9.79	9.91	9.20
Price milk (Rs/litre)	13.75	13.90	14.00	14.40	14.40	14.17
value of young stock (Rs/day)	4.25	4.37	4.60	4.90	5.20	4.66
Value of dung(Rs/day)	1.90	1.95	1.95	2.00	1.99	1.96
Gross return(Rs)	123.99	122.66	137.45	147.88	149.89	136.98
Net profit (Rs)	53.36	51.90	67.77	74.30	78.76	66.22
Cost benefit ratio	1.75	1.73	1.97	2.00	2.10	1.93

Gross return, included value of dung and young stock

Table 8: Break-even point (BEP) for milch buffalo on different categories

Particulars	Category of household					
	Landless	Marginal	Small	Medium	Large	Overall
Milk yield per animal (litre)	2136.40	2088.80	2368.80	2564.80	2559.20	2343.60
Fixed cost per animal (Rs)	1470.00	2094.40	2010.40	1934.80	2108.40	1839.60
Variable cost per animal(Rs)	17186.40	17800.53	17789.34	18960.67	17742.66	17951.73
Total cost per animal (Rs)	18656.40	19894.93	19799.74	20895.34	19851.06	19791.33
Variable cost/litre of milk (Rs)	8.04	8.52	7.51	7.39	6.93	7.66
Price/litre of milk (Rs)	13.93	14.15	14.33	14.80	14.80	14.40
Break-even point (litre)	249.57	372.01	294.78	261.11	267.90	272.94
Percentage of BEP to total output	11.68	17.81	12.44	10.18	10.47	11.65

Table 9: Ranking the constraints faced by buffalo milk producers

S.No. Constraints	No. of households	Intensity constraints	Ranks
1. Technical constraints	(55.00)	55.00	III
(i) Lack of scientific knowledge	53	53.00	
(ii) Lack of technical guidance	57	57.00	
2. Production constraints	(54.25)	54.25	IV
(i) Low productivity of milch animal	58	58.00	
(ii) Poor quality of bulls at village	62	62.00	
(iii) Inadequate knowledge about balanced feeding	50	50.00	
(iv) Storage of green fodder	47	47.00	
3. Financial constraints	(67.40)	67.40	I
(i) High cost of concentrates	65	65.00	
(ii) Non remunerative price of milk	80	8.00	
(iii) high cost of mineral mixture	63	63.00	
(iv) Poor economic condition	57	57.00	
(v) High cost of feed and fodder	72	72.00	
4. Infrastructure constraints	(48.60)	48.60	V
(i) Lack of machinery	49	49.00	
(ii) Lack of credit facilities	46	46.00	
(iii) Lack of transport facilities	57	57.00	
(iv) Lacks of skilled person	44	44.00	
(v) Lack of trained person	47	47.00	
5. Marketing constraints	(57.50)	57.50	II
(i) Lack of organized market	58	58.00	
(ii) Low price of milk	60	60.00	
(iii) Lack of milk storage facilities	63	63.00	
(iv) Processing	49	49.00	
Total	100	100.00	

Break-even point analysis for buffalo

The break-even point analysis was done to estimate the maximum quantity of milk to be produced to cover the total cost on all the size groups of household for buffalo are given in Table 8.the break-even output worked out in case of buffalo milk was 11.68, 17.81, 12.44, 10.18 and 10.47 per cent of the total milk yield on landless, marginal, small, medium and large size groups, respectively. On an overall average, the break-even output was found to be 11.65 per cent of buffalo to the total milk yield.

Constraints Analysis

In the Table 9 response of the sample households about the constraints faced were viz., the average financial constraints 67.40%, marketing constraints 57.50%, technical constraints 55.00%, production constraints 54.25% and infrastructural constraints 48.60% and its corresponding ranks were observed I, II, III, IV and V, respectively.

Conclusion

It is observed that the total overall average production and maintenance cost for buffalo per day was Rs. 70.02 during winter season, Rs. 72.17 during summer season and Rs. 70.76 during rainy season. Thus, it can be concluded that the break-even output was found maximum in marginal size group of milch buffaloes. The overall average returns per milch animal per day was 1:1.81 during winter seasons, 1:1,63 in summer season, 1:1.93 in rainy season for buffaloes, respectively.

References

Anonymous (2006-07). Statistical Database. Department Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India.

Hymajyothi, S. Umamaheswara; Reddy, S. and Raju, V.T. (2003). Economics of buffalo milk production in west Godavary district of Andhra Pradesh-A case study. Indian J. of Dairy Science. 56(4):258-260.

Shah, Deepak and Sharma, K.N.S. (1994). Economics of milk production in bulandshahar district of Uttar Pradeshdian J. of Dairy Science, 47(11):937-944.

Singh, G.B.; Gupta, B.K.; Prasad, R.N. and Chauhan, Y.S. (1999). Market led production planning of milk producers in district Kanpur. Indian J. of Agril. Marketing, Conference special, 13(2):43.

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Economic utility Evaluation of Improved Technologies in Indian mustard: an analysis of Frontline Demonstrations

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Abstract

Rapeseed-Mustard group of crops is one of the major oilseed crops of India. Under the All India Coordinated Research Project on Rapeseed-Mustard (AICRPRM), the technologies developed through research activities are demonstrated under actual field conditions of the farmers through Frontline Demonstrations. From these demonstrations an understanding of the economic potential of each of the selected improved technology is possible. This paper attempts to study the economic performance of individual component technologies recommended for Indian mustard. The data on Frontline Demonstrations (FLDs) conducted under AICRPRM is used in the study. Percentage Yield Increase over Farmers Practice (%YIOFP), Additional Net Monetary returns (ANMR) and Incremental Benefit Cost Ratio (IBCR) are used for comparison between technologies. The results show that Integrated Pest Management Technology recommended for Indian mustard has shown the highest average increase in yield over farmer's practice (23.7%). The highest average increase in ANMR is obtained by the adoption of sulphur application. The IBCR values range from 13.4 in case of sulphur application to 2.4 for IPM strategy. The study shows that there is wide variation between the technologies with regard to their economic potentials. This calls for judicious deliberations in selection of technologies for popularization.

Introduction

Rapeseed-Mustard group of crops is one of the major oilseed crops of India. The Indian contribution to total rapeseed-mustard acreage and production in world is 25.5 and 14.7 per cent, respectively. In India, these crops during 2006-07 were grown on 6.33 m ha and recorded a yield level of 1057 Kg/ ha. Rapeseed-mustard group of crops contributed 24.1% and 27.1% to the oilseeds acreage and production, respectively during the period from 2001-02 to 2005-06. This crop commodity is the major source of income especially even to the marginal and small farmers in rainfed areas. Rajasthan, UP, MP, Gujarat and Haryana are the major rapeseed-mustard producing states .The technology mission on oilseeds (TMO), established in 1986 was aimed at attaining self reliance in oilseeds.

The benefits accrued from TMO were further strengthened through the ad hoc project on "Frontline Demonstrations in Oilseed Crops" launched from *Kharif* 1990-91 sponsored by Department of Agriculture and cooperation, Government of India. Under the All India Coordinated Research Project on Rapeseed Mustard, the technologies developed through research activities are demonstrated under actual field conditions of the farmers through Frontline Demonstrations. The results of the frontline demonstrations revealed that still nearly 40-50% realizable yield potential exists.

A targeted and focused approach in spreading the awareness about the improved technologies shall increase the rate of adoption and raise the productivity of the crop. For this an understanding of the economic potential of each of the selected improved technology is necessary. Vast yield gaps still persist between potential yield recorded at Research Station and the frontline demonstrations / on-farm trials. Further, untapped yield reservoir exists between yield obtained in frontline demonstrations and the State / National yield. With the available technologies, it is possible to further increase the rapeseed-mustard production. This paper attempts to study the economic performance of individual component technologies recommended for Indian mustard using the data from Frontline Demonstrations conducted during 2002-2007.

Methodology

The data on Frontline Demonstrations (FLDs) conducted under All India Coordinated Research Project (Rapeseed- Mustard) (AICRPRM)and published in the Annual Progress Reports of AICRP (RM) for the selected years were used for the study.

The bulk of the Frontline Demonstrations are conducted on Indian mustard which is the major species of oilseed brassica grown in India. For the present study

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data from only those frontline Demonstrations involving demonstration of component technologies in Indian mustard were taken. The Percentage Yield Improvement over Farmers' Practice (%YIOFP) obtained in demonstration plots across the regions for each component was calculated for each of the cropping season during 2002 to 2007 (Five Cropping seasons).The weighed average value for the five year period was then worked out using the number of demonstrations in each year as weights .One of the assumption while taking the average values was that the error due to change in locations of the trials over different years will be nullified as the number of trials and locations of the trials were fairly large . The Additional Net Monetary Returns (ANMR) for each of the trials is available in the annual progress report and the average values for each component were calculated for each year. The weighed average ANMR for the five year period were also worked out. The ANMR represents the net additional monetary returns received by the farmer who adopts the improved technology as compared to the farmer's traditional practice. To determine the benefits per additional rupee invested on improved technology, Incremental benefit cost Ratio (IBCR) has been calculated as per the following formula

$$IBCR = \frac{\text{Additional Gross Return from Demonstrated Technology}}{\text{Additional Cost Involved in Demonstrated Technology}}$$

From the above calculation ,it is clear that IBCR can be calculated only where the cost and the gross returns from the improved technology was more than the cost and gross return from the farmers' practice respectively (AICRP-RM, Annual Progress Report,2005).

Results and Discussion

a. Extend of Frontline Demonstrations

The number of frontline Demonstrations conducted can be broadly classified into whole package demonstrations where the entire recommended package of practices for the crop is demonstrated against the prevailing farmers' practice and the component technology demonstrations where the advantage of each component of the package is demonstrated. Table 1 shows the total number of FLDs conducted under AICRP(RM) for the five seasons . The percentage of FLDs on Indian mustard is consistently above 65% of the total demonstrations conducted. This shows the importance of Indian mustard under the AICRP project on Rapeseed-mustard. The number of FLDs has more than doubled during the last season. The FLDs on Indian mustard were 421 during 2006-07 as compared to 187 demonstrations during the previous season(2005-06).The number of component technology demonstrations have also shown a proportional jump from 92 to 207 demonstrations during the same period.

b. Yield and Monetary advantage of Technology Components

A comparison between different technology components in terms of their yield advantage over farmers' practise clearly brings out the potential of spread of technology in improving the yield levels. The absolute values of improvement in yield expressed in percentage increase over farmers' practice and the additional net monetary returns obtained by adoption of different component technologies are presented in table 2. The weighed average of percentage yield increase over farmers practice and ANMR for the five year period is presented in table 3.A joint reading of table 2 and 3 will clearly bring out the difference in potential of the various technology components. It can be seen that among the technologies Integrated Pest management technology recommended for Indian mustard has shown the highest average increase in yield over farmers practise (23.7%).This was followed by weed control strategies(19.1%) and adoption of recommended dose of fertilizers(16.6%).The high impact of weed control demonstration over farmers' practise might be due to the general apathy among farmers to go for weeding practises in view of high cost and non availability of labour. The lack of visible yield loss due to weed infestation unlike in the case of pest and diseases also work against the adoption of weed control measures by the farmers. The yield advantage of integrated pest management strategies gives the clear indication that an ecologically viable option does not necessarily compromise on the yield attributes of the cropping enterprise.

Table 1: Year Wise Break Up Of FLDs in Indian mustard

Year	FLDs Conducetd in Indian	Whole package FLDs	Component technology FLDs*	Total No of FLDs under AICRP-RM	2 as % of 5
2002-03	198	118	80	299	66
2003-04	344	240	104	485	71
2004-05	242	78	164	364	67
2005-06	187	95	92	301	62
2006-07	421	214	207	615	69

* Component technology includes the varietal demonstrations also

Source: Various Annual Progress reports –AICRP (RM)

The highest average increase in ANMR/ ha is obtained by the adoption of sulphur application. The average ANMR is Rs 4331/ha for demonstrations involving application of Sulphur nutrient. This is followed by IPM technology with an ANMR of Rs 4060/ha which is comparable to the ANMR/ha for sulphur application. Weed control gives an average ANMR of Rs 3676/ha

Table 2: Comparison of Yield Improvement and Additional Monetary Returns for Technologies

Technology	2002-03		2003-04		2004-05		2005-06		2006-07	
	YIOFP (%)	ANMR (Rs/ha)	YIOFP (%)	ANMR (Rs/ha)	YIOFP (%)	ANMR (Rs/ha)	YIOFP (%)	ANMR (Rs/ha)	YIOFP (%)	ANMR (Rs/ha)
Plant Protection	11.2	1319	15.7	2336	15.0	1551	10.9	2529	9.5	1879
Thinning	17.2	3203	12.6	2435	14.7	2243	11.8	1758	9.9	1248
Sulphur Application	33.3	8025	13.7	2386	9.7	6948	15.9	3057	10.7	2364
IPM	13.3	-95	13.4	474	45.1	4159	18.7	1964	21.8	3972
Weed Control	10.6	1825	11.6	3747	22.5	3378	22.3	3362	20.8	4552
Recommended Fertilizer Dose	17.1	3262	12.5	2640	17.3	3904	17.5	1100	18.2	4641
Thiourea	*	*	*	*	11.2	2147	12.0	2709	6.4	1195

* Thiourea demonstration trials were not conducted during 2002-03 and 2003-04

over farmers' practice. A noteworthy feature is that the ANMR for IPM, which gave the highest percentage increase in yield over farmers practise, is high when compared to that of other technologies like plant protection and thiourea application. This points to a lower cost of adoption for IPM strategy compared to other technological components. Improvement in methods of IPM which reduce the cost of adoption can be attractive option for the farmers to harness the full benefits of yield advantage and monetary benefits offered by the adoption of IPM strategy.

Table 3: Component wise Average Yield and Monetary advantage over Farmers' Practice (2002-03 to 2006-07)

Technology	Weighed Average YIOFP(%)	Weighed Average ANMR(Rs /ha)
Plant Protection	13.9	2044
Thinning	13.3	2182
Sulphur Application	12.0	4331
IPM	23.7	4060
Weed Control	19.1	3676
Recommended Fertilizer Dose	16.6	2327
Thiourea	10.2	2101

The advantage in terms of yield in the case of Sulphur application (%YOFP = 12.0%)is relatively low(Only thiourea application has a lesser yield advantage). Read along with the highest ANMR for the same technology, it means that the additional cost of adoption of Sulphur application technology is significantly lower. The application of Sulphur has been recommended through such mixed fertilizers which supply Sulphur nutrient along with the basic nutrients like Nitrogen and Phosphorus. This involves only changes in fertilizer composition and does not involve additional labour cost for fertilizer application or other associated incidental costs.

The lowest ANMR was recorded by Plant protection technology. This may be reflective of the higher cost of plant protection chemicals used in the crop. In this context, development of cost effective plant protection technologies assume significance.

c. Returns to investment in component technologies

The returns to investment determine the profitability and ultimately the extent of adoption of a technology. The Incremental Benefit cost ratio for the component technologies is presented in table 4. The IBCR values range from 13.4 in case of Sulphur application to 2.4 for IPM strategy. The fact that all the component technologies have an average IBCR value of above one shows that the technologies transferred to the farmers are economically viable . But large differences in IBCR values between technologies may cause differential rate of adoption between technologies. Based on the IBCR values it can be seen that Sulphur application has got significant economic benefit. A perusal of Table 4 reveals that there is a lot of variation in IBCR value between years for most of the technologies. This points to a lack of stabilisation of technologies and the location specific nature of the technologies. The fact that the technologies may not be location independent has got implications in the selection of the appropriate technology for each agro climatic location. Though the data on thiourea application technology is available only for three years, it can be seen from the IBCR values that this technology has got good potential to be a viable technology in the farmer's fields. The low returns to additional investment in adopting IPM strategies(IBCR=2.4) fails to account for other non economic benefits that may accrue through lower environmental pollution and benefits to ecological balance. Even then efforts should be taken to make IPM adoption more lucrative in the monetary sense so that

Table 4: Incremental Benefit cost ratio of component technologies in Indian mustard

Technology	2002-03	2003-04	2004-05	2005-06	2006-07	Weighed Average IBCR
Plant Protection	3.6	3.2	3.6	3.3	3.0	3.3
Thinning	9.5	3.2	2.6	2.0	6.3	4.5
Sulphur Application	108.0	47.7	9.9	6.2	3.7	13.4
IPM	0.9	1.3	2.4	1.7	3.3	2.4
Weed Control	4.3	5.1	7.4	5.6	9.3	6.9
Recommended Fertilizer Dose	3.3	3.7	5.2	1.3	10.5	5.8
Thiourea Application	-	-	4.2	8.1	3.0	5.4

the adoption rates can be increased.

Conclusion

The analysis of the economic efficiency of technologies released for use by the farmers is very important to determine the usefulness of the technology. It performs the role of an audit with respect to the usefulness and adaptability of the technologies. The analysis of yield increase and additional monetary returns by the adoption of particular technology components of Indian mustard was done with this need in mind. The study shows that there is wide variation between the technologies with regard to their economic potentials. This calls for informed deliberations in selection of technologies for popularisation. The use of IBCR as a measure of returns on additional investment does not fully capture the yield advantage due to the adoption of technology hence an integrative method involving the use of all the three parameters used in this study i.e., Percentage Yield Increase Over Farmers Practice, Additional Net Monetary Returns and Incremental Benefit Cost Ratio should be used in the selection of the ideal combination of technology for the farmer. By this we can also take into account the resource availability with the farmer and the agro climatic parameters under which the farming enterprise is done. The study of the different technology components in Indian mustard showed that the technologies like IPM strategies and weed control gave excellent yield advantage when compared to other technologies .Based on IBCR values Sulphur application was followed by weed control in terms of profitability of additional investment.

The Frontline Demonstrations in rapeseed mustard provide useful information regarding the scope and economic viability of the technologies developed for the crop. To supplement the extension efforts, selection of appropriate technology using economic parameters will be of significant help. The integration of the different economic criteria into a comprehensive selection criterion need to be explored for better utilisation of these criteria.

References

All India Coordinated Research Project on Rapeseed Mustard Annual Progress Reports (2002-2007). National research Centre on Rapeseed Mustard., Bharatpur, India.

G.V. Ramanjaneyulu.; S.V. Ramana Rao and D.M Hegde., A decade of Frontline Demonstrations in Oilseeds- An Overview(1988-89 to 1997-98) Directorate of Oilseeds Research,Hyderabad, India 53 p.

Kiresur.V.R.; S.V. Ramana Rao and D.M Hegde,(2001). Improved Technologies in Oilseeds Production – An Assessment of their Economic Potentials in India. Agricultural Economics Research Review, 14(2):95-108

Mruthyunjaya et al., (2005). Efficiency in Indian Edible Oilseed Sector : Analysis and Implications Agricultural Economics Research Review., Vol. 18: 95-108

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Communication Pattern of Rural Poors for Rural Development Programmes

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Abstract

The present study was conducted in Rampur district of Uttar Pradesh to analyze communication pattern of rural poors for rural development programmes in terms of their awareness of the programmes, knowledge about target people/goal/'benefits of the programme as well as manner of acquiring information about programmes and processing them. Besides above, rural poors participation and dissemination of such information to others were also studied. A sample of 275 rural poors (living below poverty line) was selected for the study. Rural poors are mostly aware about Indira Awas Yojana followed by Rural Water Schemes and Ambedkar Gram Vikas Yojana. However, in general majority have only partial knowledge about rural development programmes implying there by that details are really not forth coming. Ignorance of rural poors about details also hinder in effective utilization of benefits. Rural poors discuss with Fellow Farmers and Beneficiaries to get clarity on the procedures of programmes, benefits, target people etc. They do contact Other Farmers/Poors after availing benefits. Thus, the pattern of communication shows over dependence on localite sources and incomplete knowledge there by indicating need for planning strategy of communication.

Introduction

Rural development is the most important challenge before the developing nations. In India, development of rural areas has been the focus of planners and policy makers ever since pre-independence. There have been a multitude of rural development programmes of different nature which includes multipurpose programmes, target and area specific programmes and mono purpose rural development programmes. However, an over view of various developmental efforts revealed various missing links in their planning and implementation. Despite the series of development programmes, the much desired change among rural people did not happen in the country. The problems facing the rural people are many. Rural development, today focuses not only to economic development but stands for series of quantitative and qualitative changes both in living conditions of rural people. This also includes the notion of larger and deeper social transformation. Rural development, usually involves a planned and serious attempts to introduce and diffuse new technologies and innovation among rural people as rapidly and efficiently as possible. Thus, the present study was conducted in Rampur District of Uttar Pradesh to analyse communication pattern of rural poors for rural development programmes in terms of their awareness of the programmes, knowledge about target people/goal/benefits of the programme as well as manner of acquiring information about programmes and processing them. Besides above, rural poors participation and dissemination of such information to others were also studied.

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Methods

The study was carried out in Rampur District of Uttar Pradesh. Rampur District of U.P. was selected purposively. There are six development blocks in Rampur District out of which three least developed blocks namely Shahabad, Milak & Suar were purposively selected on the basis of selected parameters such as weaker persons population, low level of literacy and un conducive means of transportation and communication. The entire block area was divided in four segments and from each segment one average Village Panchyat was elected. Thus, a total of twelve Village Panchayats were included in the present study for selecting the respondents. Census was conducted in each selected village panchayat i.e. house hold wise lists were prepared in each Village Panchayat. Further from the list thus prepared weaker persons (living below poverty line) were identified and arranged according to the occupation and from each occupational group 30 per cent house holds were selected randomly. Hence, a sample of 275 respondents was selected for the study. The respondents were interviewed with the help of pre tested structured interview schedule developed for the purpose of study.

Results

Awareness about Rural Development Programmes

Table 1 reveals that majority of respondents are aware about Indira Awas Yojana (55.27%) followed by Rural Water Schemes (48%), Ambedkar Gram Vikas Yojana. (35.27%), Sunishchit Rozgar Yojana (30.18%), Swarnajayanti Gram Swarozgar Yojana (25.09%), Jawahar Gram Samridhi Yojana (20.00%) and National Bio-gas Develop--ment Programme (7.27%). Thus, it can be say that Indira Awas Yojana (IAY) is quite popular in the area under study.

Table 1 : Respondents Awareness of Rural Development Programmes N = 275

Rural Development Programmes	Frequency	Percentage
Swarnajayanti Gram Swarozgar Yojana (SGSY)	69	25.09
Jawahar Gram- Sam r-idhi Yojana (JGSY)	55	20.00
Sunishchit Rozgar Yojana (SRI)	83	30.18
Indira Awas Yojana (IAY)	152	55.27
Rural Water Schemes (RWS)	132	48.00
National Bio-gas Development Programme (NBDP)	20	7.27
Ambedkar Gram Vikas Yojana (AGVY)	97	35.27

Knowledge about Rural Development Programmes

An attempt was made to find out if the respondents knew, about goals, target group of beneficiaries and benefits to be occurred from the programmes. Rural poors had been asked through open-ended questions on each of these items and their responses were classified as 'completely known' (in case of totally correct answer) and 'Partially Known' (in case of some correct answer) as depicted in Table 2.

The Table 2 revealed that majority of respondents knew about goals of IAY (30.54%) followed by goals of RWS (25.09%), SGSY (15.27%), JGSY (9.82%), SRY (7.64%). AGVY (7.27%) and NBDP (1.45%). However, most of the respondents had only partial knowledge in each case. As far as poor peoples' knowledge regarding target people of different rural development programmes was concerned, majority of respondents knew about IAY (31.27%) followed by RWS (28.00%), SGSY (16.73%), JGSY (10.91%), SRY (7.64%), AGVY (6.18%) and NBDP (1.09%). Most of these respondents had partial knowledge about the target people. Complete Knowledge about the target people of the programmes was possessed by only 17.09 per cent respondents in case of IAY followed by RWS (7.27%) and SGSY (6.18%).

As for as poor peoples' knowledge of benefits available in various rural development programmes was concerned, majority of the respondents had knowledge of IAY and RWS 25.45% each) followed by SGSY (13.82%),JGSY (8.00%), SRY and AGVY (6.18% each) and NBDP (1.09%). However, majority of the respondents were in the category of partially known in case of IAY (17.09%) followed by RWS (16.00%), SGSY (9.82%), JGSY (5.09%), AGVY (4.00%), SRY (3.64%) and NBDP (0.73%). About 9.45 per cent respondents had complete knowledge about benefits of RWS followed by IAY (8.36%) and SGSY (4.00%). In Case of rest other programmes less than three per cent respondents had complete knowledge. Thus, it can be said that majority of respondents had knowledge about RWS and IAY. However, they knew only partially about most programmes, complete knowledge was found in case of RWS by 9.45 per cent respondents.

Acquisition

One of the queries about communication behaviour has been the way rural poors acquires, process and store information. An attempt has been made to analyze and report the acquisition behaviour of rural poors in terms of efforts made by respondents, as well as the information sources used for rural development programmes.

Efforts Made by Respondents

Table 3 revealed that respondents had made contact with Fellow Farmers as well as Extension Personnel for acquisition of information about rural development programmes. Majority of respondents had made contacts with Fellow farmers in case of IAY (31.27%) followed by RWS (25.45%) SGSY (16.73%), JGSY (10.91%), SRY (7.64%), AGVY (7.27%) and NBDP (1.45%). In terms of number of contacts made, majority of respondents made five to ten contacts with Fellow Farmers in case of IAY (16.72%) and RWS (12.00%). For the other rural development programmes viz SGSY, JGSY, SRY, AGVY and NBDP. majority of

Table 2 : Distribution of Respondents According to their Level of Knowledge Regarding Rural Development Programmes

Rural Development Programmes	Goal			Target People			Benefits		
	Completely Known	Partially Known	Total	Completely Known	Partially Known	Total	Completely Known	Partially Known	Total
SGSY	18(6.55)	24(8.73)	42(15.27)	17(6.18)	29(10.55)	46(16.73)	1 1(4.00)	27(9.82)	38(13.82)
JGSY	06(2.18)	21(7.64)	27(9.82)	12(4.36)	18(6.55)	30(10.91)	08(2.91)	14(5.09)	22(8.00)
SRY	06(2.18)	15(5.45)	21(7.64)	04 (1.45)	17(6.18)	21(7.64)	07(2.55)	10(3.64)	17(6.18)
IAY	21(7.64)	63(22.91)	84(30.54)	47(17.09)	39(14.18)	86(31.27)	23(8.36)	47(17.09)	70(25.45)
RWS	30(10.91)	39(14.18)	6(25.09)	20(7.27)	57(20.73)	77(28.00)	26(9.45)	44(16.0)	70(25.45)
NBDP	01(0.36)	03(1.09)	04(1.45)	01(0.36)	02(0.73)	03(1.09)	01(0.36)	02(0.73)	03(1.09)
AGVY	06(2.18)	14(5.09)	20(7.27)	06(2.18)	11(4.00)	17(6.18)	06(2.18)	11(4.00)	17(6J8)

Figures in Parenthesis indicate Percentage.

Table 3 : Efforts Made by Respondents for Acquisition of Information Regarding Rural Development Programmes

Rural Development Programmes	Number of Contacts with Fellow Farmers				Number of Contacts with Extension Personnel			
	< 5	5-10	>10	Total	<5	5-10	>10	Total
SGSY	23 (8.36)	17 (6.18)	06 (218)	46(16.73)	28 (10.18)	09 (3.27)	0 (0.36)	38(13.82)
JGSY	17(6.18)	08 (2.91)	05 (1.82)	30 (10.91)	18 (6.55)	10 (3.64)	0	08 (10.18)
SRY	12 (4.36)	06 (2.18)	03(1.09)	21 (7.64)	15 (5.45)	05 (1.82)	0	20 (7.27)
IAY	30(10.91)	46(16.72)	10 (3.64)	86(31.27)	61 (22.18)	18 (6.55)	01 (0.36)	80 (29.09)
RWS	28 (10.18)	33 (12.00)	09 (3.27)	70 (25.45)	54 (19.64)	10 (3.64)	0	64 (23.27)
NBDP	03(1.09)	01 (0.36)	0	04 (1.45)	04 (1.45)	0	0	04 (1.45)
AGVY	12(4.36)	08 (2.91)	0	20 (7.27)	12 (4.36)	07(2. 55)	0	19 (6.91)

Table 4 : Dsitribution of Respondents According to their First Information Source for Rural Development Programmes

Information Sources	Rural Development Programmes							Cumulative Scores	Rank
	SGSY	JGSY	SRY	IAY	RWS	NBDP	AGVY		
Friends/Relatives	6 (2.18)	8 (2.91)	15*(5.45)*	22 (8.00)	0	2 (0.73)	0	53 (19.27)	V
Fellow Farmers	8 (2.91)	6 (2.18)	4 (1.45)	13 (4.73)	44 (16.00)	0	31 (11.27)	106 (38.55)	II
Local Leader	0	7 (2.55)	4 (1.45)	17 (6.18)	16 (5.82)	0	07 (2.55)	51 (18.55)	VI
Extension Personnel	10 (3.64)	10 (3.64)	4 (1.45)	47 (17.09)	35 (12.73)	1 (0.36)	21 (7.64)	128 (46.55)	I
Radio	2 (0.73)	5 (1.82)	19 (6.91)	10 (3.64)	5 (1.82)	0	7 (2.55)	4S (17.45)	VII
TV	1 (0.36)	1(0.36)	2 (0.73)	5 (1.82)	2 (0.73)	0	0	11 (4.00)	VIII
Newspaper	3 (1 .09)	10 (3.64)	19 (6.91)	17 (6.18)	15 (5.45)	0	31 (11.27)	95 (34.55)	IV
Poster	1 (0 .36)	1(0.36)	1 (0.36)	3 (1.09)	0	0	0	6 (2.18)	X
Meeting	0	7(2.55)	0	1 (0.36)	0	0	0	8 (2.91)	IX
Beneficiaries	37(13.45)	0	15 (5.45)	17 (6.18)	15 (5.45)	17 (6.18)	0	101 (36.73)	III
Bank	1(0.36)	0	0	0	0	0	0	1 (0.36)	XI

the respondents made less than five contacts with Fellow farmers. Respondents had more than ten contacts with Fellow Farmers in case of IAY (3.64%), RWS (3.27%). SGSY (2.18%), JGSY (1.82%) and SRY (1.09%).

As for as respondents contact with extension personnel for acquisition of information was concerned highest frequency was in case of IAY (29.09%) followed by RWS (23.27%), SGSY (13.82%), JGSY (10.18%). SRY (7.27%), AGVY (6.91%) and NBDP (1.45%). Further, majority of the respondents made less than five contacts with Extension personnel in case of IAY (22.18%), followed by RWS (19.64%), SGSY (10.18%), JGSY (6.55%). SRY (5.45%), AGVY (4.36%) and NBDP (1.45%). In the category of five to ten contacts with Extension personnel, highest frequency was in case of IAY only 6.55 per cent followed by RWS and JGSY (3.64% each), SGSY (3.27%), AGVY (2.55%) and SRY (1.82%).

However, only one respondent had made contact with Extension personnel numbering more than ten in the case of SGSY and IAY each and putting blank in case of the other rural development programmes. Thus, respondents made contacts mostly with Fellow farmers followed by Extension personnel in order to acquire information about rural development programmes. Maximum number of contacts with Fellow farmers made by the majority was five to ten contacts in case of IAY where as less than five contacts was made by majority with Extension personnel.

First Information Sources among Respondents

The table 4 clearly indicated that Extension personnel (46.55%) were at the top in use hierarchy followed by Fellow farmers (38.55%), Beneficiaries (36.73%), Newspaper (34.55%), Friends/Relatives (19.27%), Local Leader (18.55%), Radio (17.45%). TV (4.00%), Meeting (2.91%), Poster (2.18%) and Bank (0.36%). Further, Beneficiary was the first information source for the majority of the respondents in case of SGSY (13.45%) and NBDP (6.18%). Extension personnel and Newspaper (3.64% each) were the first information source for JGSY. Extension personnel were also mentioned as first source of information by majority of respondents in case of IAY (17.09%). Radio and Newspaper (6.91% each) were the first information source for SRY. Newspaper and Fellow farmers (11.27% each) were the first information sources for AGVY. In case of RWS, Fellow farmers (16.11%) were the first information source for majority of respondents.

Table 5 : Utilization of Sources for Detailed Information Regarding Rural Development Programmes.

Information Sources	Rural Development Programmes							Comulative Scores	Rank
	SGSY	JGSY	SRY	IAY	RWS	NBDP	AGVY		
Friends/Relatives	15(5.45)	13(4.73)	04(1.45)	27(9.82)	10(3.64)	0	8(2.91)	77(28.00)	IV
Fellow Farmers	22(8.00)	8(2.91)	06(2.18)	32(11.64)	12(4.36)	3(1.09)	14(5.09)	97(35.27)	III
Shopkeeper	7(2.55)	2(0.73)	0	02(0.73)	0	0	0	11(4.00)	*X*
Local Leader	18(6.55)	14(5.09)	2(0.73)	33(12.00)	24(8.73)	0	7(2.55)	98(35.64)	11
Extension Personnel	25(9.09)	12(4.36)	14(5.09)	45(16.36)	24(8.73)	7(2.55)	11(4.00)	138(50.18)	1
Radio	15(5.45)	13(4.73)	7(2.55)	9(3.27)	0	4(1.45)	10(3.64)	58(21.09)	VIII
TV	0	3(1.09)	2(0.73)	0	1(0.36)	0	0	6(2.18)	XI
Newspaper	11(4.00)	9(3.27)	12(4.36)	12(4.36)	0	7(2.55)	8(2.91)	59(21.45)	VII
Pamphlet	2(0.73)	1(0.36)	0	0	2(0.73)	0	0	5(1.82)	XII
Poster	0	1(0.36)	0	3(1.09)	0	0	0	4(1.45)	XIII
Meeting	8(2.91)	7(2.55)	0	0	0	0	0	15(5.45)	IX
Beneficiaries	30(10.91)	1(0.36)	8(2.91)	19(6.91)	5(1.82)	0	0	63(22.91)	V
Bank	21(7.64)	3(1 .09)	14(5.09)	12(4.36)	10(3.64)	0	0	60(21.82)	VI

Table 6 : Respondents Perception of Useful Information Sources for Rural Development Programmes

Information Sources	Rural Development Programmes							Comulative Scores	Rank
	SGSY	JGSY	SRY	IAY	RWS	NBDP	AGVY		
Friends/Relatives	5(1.82)	0	4(1.45)	16(5.82)	3(1.09)	0	0	28(10.18)	VII
Fellow Farmers	9(3.27)	6(2.18)	4(1.45)	10(3.64)	3(1.09)	1(0.36)	5(1.82)	38(13.82)	III
Shopkeeper	3(1.09)	2(0.7.i)	2(0.73)	0	0	0	0	7(2.55)	X
Local Leader	0	8(2.91)	2(0.73)	18(6.55)	6(2.18)	0	2(0.73)	36(13.09)	IV
Extension Personnel	18(6.55)	12(4.36)	32(11.6)	47(17.09)	15(5.45)	6(2.18)	5(1.82)	1.35(.49.09)	I
Radio	3(1.09)	3(1 .09)	6(2.18)	2(0.73)	1(0.36)	.0	0	15(5.45)	IX
TV	0	1(0.36)	1(0.36)	0	0	0	0	2(0.73)	XII
Newspaper	5(1.82)	9(3.27)	13(4.73)	10(3.64)	0	5(1.82)	5(1.82)	47(17.09)	II
Pamphlet	2(0.73)	1(0.36)	0	0	1(0.36)	0	0	4(1.45)	XI
Poster	8(2.91)	7(2.55)	0	1(0.36)	0	0	0	16(5.82)	VIII
Meeting	8(2.91)	0	10(3.64)	13(4.73)	4(1.45)	0	0	35(12.73)	V
Beneficiaries	8(2.91)	2(0.73)	9(3.27)	12(4.36)	0	0	0	31.(11.27)	VI

Table 7 : Suggested information Sources for Rural Development Programmes

Information Sources	Rural Development Programmes							Comulative Scores	Rank
	SGSY	JGSY	SRY	IAY	RWS	NBDP	AGVY		
Fellow Farmers	5 (1.82)	16(5.82)	8 (2.91)	13 (4.73)	0	2 (0.73)	4 (1.45)	48(17.45)	VI
Shopkeeper	0	3 (1.09)	0	0	2 (0.73)	0	0	5 (1.82)	XIII
Local Leader	4(1.45)	4 (1.45)	10 (3.64)	9 (3.27)	10(3.64)	2 (0.73)	3 (1.09)	42 (15.27)	VIII
Extension Personnel	4 (1.45)	2 (0.73)	5(1.82)	21(7.64)	8 (2.91)	3 (1.09)	4(1.45)	47(17.09)	VII
Radio	9 (3.27)	8 (2.91)	10 (3.64)	55 (20.0)	28(10.18)	3 (1.09)	7 (2.55)	120(43.64)	II
TV	1 (0.36)	2 (0.73)	1 (0.36)	23 (8.36)	9(3.27)	1 (0.36)	4 (1.45)	41 (14.91)	IX
Video	0	3(1.09)	0	4 (1.45)	0	0	4(1.45)	11(4.00)	XII
Newspaper	3 (1.09)	4 (1.45)	9(3.27)	5 (1.82)	7 (2.55)	2 (0.73)	0	30 (10.91)	X
Pamphlet	1 (0.36)	4(1.45)	9(3.27)	27(9.82)	20(7.27)	5 (1.82)	7(2.55)	73(26.55)	III
Poster	3 (1.09)	4(1.45)	4 (1.45)	33 (12.0)	18 (6.55)	3 (1 .09)	6 (2.18)	71(25.82)	IV
Meeting	6 (2.18)	6 (2.18)	21(7.64)	44 (16.0)	35 (12.7)	4 (1.45)	8 (2.91)	124(45.09)	I
Beneficiaries	4 (1.45)	0	2 (0.73)	39(14.18)	0	3 (1.09)	7(2.55)	55(20.00)	V
Bank	14(5.09)	6(2.18)	0	4 (1.45)	0	0	0	24 (8.73)	XI

Thus, Extension personnel, Fellow farmers and Beneficiaries were most sought source of information.

Source used for Detailed Information

Data pertaining to other information sources used by respondents for acquisition of information related to rural development programmes have been presented in Table 5. Table 5, clearly revealed that Extension personnel (50.18%) were the most used source ranked at the top followed by Local leader (35.64%) and Fellow farmers (35.27%) at the second and third ranks, respectively. The other sources were Friend/Relatives (28.00%), Beneficiaries (22.91%), Bank (21.28%), Newspaper (21.45%), Radio (21.09%), Meeting (5.45%) and Shopkeeper (4.00%), respectively. The sources at the bottom three places were TV (2.18%), Pumphlet (1.82%) and Poster (1.45%) with eleventh, twelfth and thirteenth places, respectively.

Further, Beneficiaries were the most used source for SGSY (10.19%). Extension personnel were most used source in case of IAY (16.36%). However, Local leader was the most used source for JGSY (5.09%). Banks and Extension personnel (5.09% each) were the most used source for SRY . Local leader and Extension Personnel (8.73% each) were most used source for detailed information in case of RWS. Extension personnel and Newspaper (2.55% each) were the most used source for NBDP. Fellow Farmers were most used source in case of AGVY (5.09%). Thus, Extension personnel were used most for detailed information about rural development programmes followd by Local Leaders.

Useful Information Sources

An attempt was made to gauge rural peoples' perception of useful information sources for rural development programmes, as presented in Table 6. It is clear from the table that Extension personnel (49.09%) were perceived as most useful source followed by Newspaper (17.09%) and Fellow farmers (13.82%), respectively. Local leader. (13.09%), Beneficiaries (12.73%), Bank (11.27%) and Friends/Relatives (10.18%) were the other sources placed in the descending order of their usefulness. However, sources at bottom five places were Meeting (5.82%), Radio (5.45%), Shopkeeper (2.55%), Pamphlet (1.45%) and TV (0.73%).

Further, it was revealed that Extension personnel were perceived as useful source by majority of respondents for most of the rural development programmes viz. SGSY (6.55%), JGSY (4.36%), SRY (11.6%), IAY (17.09%), RWS (5.45%) AND NBDP (2.18%).However, in case of AGVY-Extension personnel, Newspaper and Fellow farmers (1.82% each) were perceived as useful source by majority of respondents.

Suggested Information Sources

Table 7 revealed that meeting (45.09%) was the source suggested by majority of respondents at the first place followed by Radio (43.64%) and Pamphlet (26.55%). The other suggested sources in the hierarchy were Poster (25.82%), Beneficiaries (20.00%), Fellow farmers (17.45%), Extension Personnel (17.09%), Local leader (15.27%), TV (14.91%), Newspaper (10.91%), Bank (8.73%), Video (4.00%) and Shopkeepers (1.82%).

Programme-wise, Bank (5.09%) was suggested as desirable source for SGSY by a large majority. Meeting was the suggested source by majority in case of SGSY (2.18%), JGSY (2.18%), SRY (7.64%), IAY (16.00%), RWS (12.73%), NBDP (1.45%) and AGVY (2.91%) Radio had been suggested as desirable source for SGSY (3.27%), JGSY (2.91%). SRY (3.64%), IAY (20.00%), RWS (10.18%), NBDP (1.09%) and AGVY (2.55%). In case of JGSY, Fellow farmers had been suggested by 5.82 per cent respondents. Beneficiaries were suggested as desirable source for I AY by 14.18 per cent respondents.

Processing

After acquisition of information about rural development programmes poor peoples do process information and store for future use. Table 8 revealed that for the processing of rural development information, discussion with Fellow farmers (40.00%) was the most used method among respondents followed by discussion with Beneficiaries (37.09%). However, about 35.27 per cent respondents had discussion with Extension personnel. The other used methods for processing of information were discussion with Friends / Relatives (26.91%), discussion with Local leader (14.18%) and others (16.00%) like bank, visit at sites, reference materials etc.

Further, it is also clear that methods of processing do differ for various rural development programmes. Programme-wise, discussion with Beneficiaries was the most used source for SGSY (10.91%) and SRY (4.36%). Discussion with Local Leader used most in case of JGSY (4.36%). Discussion with Fellow farmers used most in case of IAY (14.18%) and AGVY (5.45%). Discussion with Friend/Relatives in case of IAY (11.27%) and RWS (8.00%) followed by discussion with Extension personnel for SRY (4.36%) and NBDP (2.55%).

Storage of Information

Table 9 revealed that majority of the respondents (60.00%) had not stored information regarding rural development programmes and were in the category of 'Just known' followed by 30.55 per cent respondents who memorized the informations. The other used methods for storage of information among respondents were making notes (12.73%), preserved papers (8.00%) and collected materials (6.18%). On the basis of analysis inference could be drawn that majority of the respondents were in the category of 'Just Known' for all the rural

Table 8 : Distribution of Respondents According to Procedure used for Processing of Information Related to Rural Development Programmes.

Rural Development Programmes	Processing of Information					
	Discussed with Friends/Relatives	Discussed with Farmers	Discussed with Beneficiaries	Discussed with Local Leaders	Discussed with Extension Personnel	Others
SGSY	10 (3.64)	26(9.45)	30(10.91)	0	16(5.82)	11(4.00)
JGSY	6(2.18)	8(2.91)	4(1.45)	12(4.36)	10(3.64)	0
SRY	0	6(2.18)	12(4.36)	0	12(4.36)	9(3.27)
IAY	31(11.27)	39(14.18)	30(10.91)	20(7.27)	30(10.91)	16(5.82)
RWS	22(8.00)	13(4.73)	20(7.27)	0	14(5.09)	6(2.18)
NBDP	3(1.09)	03(109)	6(2.18)	0	7(2.55)	0
AGVY	2(0.73)	15(5.45)	0	7(2.55)	8(2.91)	2(0.73)
TOTAL	74(26.91)	110(40.00)	102(37.09)	39(14.18)	97(35.27)	44(16.00)

Table 9 : Distribution of Respondents According to Methods Used for Storage of Information Regarding Rural Development Programmes

Rural Development Programmes	Methods of Storage				
	Just Known	Memorized	Noted	Collected Material	Preserved Papers
SGSY	31(11.27)	16(5.82)	5(1.82)	2(0.73)	9(3.27)
JGSY	16(5.82)	3(1 .09)	0	0	0
SRY	14(5.09)	3(1.09)	11(4.00)	2(0.73)	0
IAY	49(17.82)	25(9.09)	13(4.73)	11(4.00)	13(4.73)
RWS	34(12.36)	24(8.73)	6(2.18)	0	0
NBDP	4(1.45)	2(0.73)	0	0	0
AGVY	17(6.18)	11(4.00)	0	2(0.73)	0
TOTAL	165(60.00)	84(30.55)	35(12.73)	17(6.18)	22(8.00)

Table 10 : Distribution of Respondents According to their Participation in Rural Development Programmes.

Rural Development Programmes	Duration (years)				Participation Needed
	<5	5-10	>10	Total	
SGSY	14(5.09)	0	0	14(5.09)	50(18.18)
JGSY	0	0	0	0	26(9.45)
SRY	10(3.64)	0	0	10(3.64)	25(9.09)
IAY	38(13.82)	10(3.64)	1(0.36)	49(17.82)	55(20.00)
RWS	18(6.55)	10(3.64)	0	28(10.18)	8(2.91)
NBDP	0	0	0	0	6(2.18)
AGVY	0	0	0	0	48(17.45)

development programmes.

Participation

Table 10 containing data regarding participation of poor peoples in rural development programmes indicated that respondents had participated in only four major rural development programmes. However, the frequency of participation was higher in IAY (17.82%) followed by RWS (10.18%) and SGSY (5.09%). Only 3.64 per cent respondents had indicated their participation in SRY. In rest of the rural development programmes viz JGSY, NBDP and AGVY, there was' no participation at all.

Further, data regarding duration-wise participation indicated that majority of the respondents had participated during last five years in case of IAY (13.82%) followed by RWS (6.55%), SGSY (5.09%) and SRY (3.64%). In IAY and RWS both 3.64 per cent respondents were participated for 5-10 years duration. Incase of IAY, 0.36 per cent respondents had participated

Table 11 : Distribution of Respondents According to their Post Programme Contact (Dissemination of Information) Made with Others.

Rural Development Programmes	Number of Contacts with Fellow Farmers				Number of Contacts with Extension Personnel			
	<5	5-10	>10	Total	<5	5-10	>10	Total
SGSY	22 (8.00)	19(6.91)	6 (2.18)	47(17.09)	25(90.9)	11(4.00)	0	30(13.09)
JGSY	10 (3.64)	11 (4.00)	12(4.36)	33(12.00)	18(6.55)	3(1 09)	01(0.36)	22(8.00)
SRY	12(4.36)	10(3.64)	3(1 09)	25(9.09)	14(5.09)	9(3.27)	2(0.73)	25(9.09)
IAY	33(12.00)	20 (7.28)	17(6.18)	70(25.45)	32(11.64)	18(6.55)	5(1.82)	55(20.00)
RWS	26(9.45)	19(6.91)	16(5.82)	61(22.18)	25(9.09)	13(4.73)	0	38(13.82)
NBDP	2(0.73)	1 (0.36)	0	3(1.09)	2(0.73)	0	0	2(0.73)
AGVY	9(3.27)	12(4.36)	3(1.09)	24(8.73)	10(3.64)	3(1.09)	0	13(4.73)
TOTAL	114	92	57	263	126	57	08	191

for more than ten years duration.

When respondents were asked for their willingness to participate in the various rural development programmes highest frequency of respondents indicated preference for IAY (20.00%) followed by SGSY (18.18%), AGVY (17.45%), JGSY (9.45%), SRY (9.09%) RWS (2.91%) and NBDP (2.18%).

Dissemination

Rural poors do contact Fellow Farmers and Extension Personnel in order to get clear about the programmes and remove contradiction.

With Farmers

Table 11 revealed that highest frequency of respondents i.e. about 25.45 per cent had their post programme contact with other farmers in case of IAY followed by RWS (22.18%), SGSY (17.09%), JGSY (12.00%), SRY (9.09° o) , AGVY (8.73%) and NBDP (1.09%). Further, according to the number of contracts, majority of the respondents were in the category of less than five contact followed by contacts ranging between five to ten. In comparison to other rural development programmes, IAY had highest frequency in all the categories viz. less then five and between five to ten and above ten contacts.

With Extension Personnel

Table 11 revealed that 20.00 per cent respondents had made contact with Extension personnel in case of IAY followed by RWS (13.82%), SGSY (13.09%), SRY (9.09%)JGSY (8.00%), AGVY (4.73%) and NBDP (0.73%). Further, in the category of less than 5 contacts, the highest frequency was in case of IAY (11.64%) followed by RWS and SGSY (9.09% each), JGSY (6.55%), SRY (5.09%), AGVY (3.64%) and NBDP (0.73%). In case of 5 to 10 contacts with Extension personnel, IAY (11.64%) was again at top. However, only less than 2 per cent respondents were in the category of more than 10 contacts for IAY, SRY and JGSY.

Discussion

Rural poors in general had awareness about Indira Awas Yojana and Rural Water Schemes. However, they did not have complete information. This fact has earlier been reported (1,2,3, & 4). Thus, rural development programmes require sustained efforts to create awareness among rural poors at large.

Majority of rural poors had contacted Fellow farmers followed by Extension personnel in order to know about the programmes. Extension personnel were also the first source as well as source for detailed information for most rural poors. Besides, Extension personnel were also perceived as useful source for knowing about rural development programmes. This fact has earlier been reported (5,6 & 7). Now that Indira Awas yojana has been around for more than one and half decades people have seen the benefits in the community. Thus, they seek Extension personnel who visit or are available at Village Panchayat or Block head quarters for getting detailed information.

Meetings in the villages and Radio were suggested as effective source for knowing about rural development programmes. This fact has earlier been reported (8). However, rural poors tried to know more and clarify doubts by discussion with Fellow Farmers and Beneficiaries of rural development programmes. Rural poors evaluate pros and cons of information through discussion with Fellow Farmers arid Beneficiaries of rural development programmes to decide on further action. They have trust in the fellow beings and experiences of Beneficiaries are valued. This reflects the pattern of communication of the rural poor which follow a horizontal route due to cultural similarity. Majority had just known about the programmes and not done anything to store information. Only about less than one third of respondents had memorized information. This indicates that reason why precious details regarding programmes are not known to the rural poors when

needed. Any attempt to help in effective use of development messages, must include ways and means of preserving useful details in some permanent form.

Conclusion and Implication

Rural poors are mostly aware about Indira Avas Yojana followed by Rural water schemes and Ambedkar Gram Vikas Yojana. Information regarding rural development programmes are mostly sought through Extension Personnel, Fellow formers and Local leaders. Extension personnel are perceived as useful source by majority. Rural Poors discuss with these sources to get clarity on the programme. Extension personnel are both used and considered to be effective. However, in general majority have only partial knowledge about rural development programme implying thereby that details are really not forthcoming. Ignorance of rural poors about details also hinder in effective utilization of benefits. Rural poors discuss with Fellow farmers and beneficiaries to get clarity on the procedures of programme, benefits, target people etc. They do contact other farmers/Poors after availing benefits. Thus, the pattern of communication shows over dependence on localite sources of information and incomplete knowledge thereby indicating need for planning strategy of communication.

References

Mukhopadhyay, A.K.; Mohanrao, M.J. and Jena, A.C. (1984). Flow of credit and subsidy under IRDP in Uttar Pradesh. Journal of Rural Development. 3(5) : 405.

Balkrishna, S.; Rangacharyaula, S.V. and Reddy, B.S. (1984). Monitoring of IRDP-A Study in Vardhannapet block of Waranngal district, A.P. Journal of Rural Development 3 (1) : 15.

Paramahanasa, V.R.K. (1984). Dissemination of development information-Role of Information and Public Relation Department. Journal of Rural Development. 3(6):596.

Nayan, S. (1991). Impact of IRDP on Socio -economic status of the beneficiaries -with special reference to Rudrapur block in Nainital district. Unpublished M.Sc. (Ag.) Thesis, Department of Agril. Communication, G.B. Pant Univ. of Agri. and Tech., Pantnagar.

Singh, N.K. and Manaral. P.S. (1981). Communication and development-A study of two blocks in Ballia District (U.P.), Department of Communication Research, Indian Institute of Mass Communication, New Delhi.

Tripathi, R.N., Maithani, B.P. and Paradhan, F.M. (1984). Flow of credit and subsidy under IRDP-A Study in Bihar. Journal of Rural Development, 3 (5) 388.

Pandey, R.K. (1997). Information sources and communication pattern of farmers for rural development programmes: A Study in U.P. Unpublished Ph.D. Thesis, Department of Agril. Communication, G.B. Pant Univ. of Agri. Tech., Pantnagar.

Rangacharyaula,, S.V. (I984). Beneficiaries Meeting-A monitoring mechanism for IRDP. Journal of Rural Development. 3 (6) : 632.

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Production and consumption of milk and milk products in Agra district of U.P.

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Abstract

The study investigated the production and consumption of milk and milk products in Agra district of Uttar Pradesh. Production as well as marketed surplus was higher in member class compared to non member class of the district. The quantity of milk retained at home increased form summer to rainy and form rainy to winter season. The proportion of milk used for ghee production was observed to decrease with the increase in the herd size category, while a reverse trend was observed in the case of proportion of milk used for curd production. The percentage sale of ghee to the total production was the highest in member class than non member class. The per capita consumption of fluid milk was observed to be higher in member class. Winter season showed the maximum per capita per day consumption of fluid milk and ghee for all the categories in the study area. Further, the proportion of curd consumption was observed to increase with the increase in the herd size group in both classes.

Introduction

Increase in milk production would be more beneficial form the consumer's point of view, if it is followed by proportionate increase in the marketed surplus of milk. It has been observed that lack of marketing facilities may account for differences in the marketable surplus and actual quantities of milk marketed during a given period and result in increased self consumption of fluid milk or conversion of milk into products like curd, ghee etc. Conversion of milk into ghee may be further split into ghee used for home consumption and a part used for sale in the market. The literature is very scanty on the subject, though some location specific references are available (Ram et,al., 1973, Tyagi et, al. 1977; Bahadure et,al., 1981; Balister et,al., 1982; Gupta and Patel, 1988; Singh and Chattarj, 1989; Shah and Sharma, 1994). In view of these facts, an attempt was made in the present investigation to ascertain the production and consumption of milk and milk products by different categories of household during different seasons in Agra district of Uttar Pradesh which is one of the progressive dairying districts of the state.

Materials and Methods

The data used in the present study was taken form the survey conducted during the period March, 2007 to February, 2008. The sampling producers adopted for the selection of villages and milk producers for the study was multistage random sampling. The district is comprised of 15 development block, namely Akola, Achnera, Baroli Aheer, Bichpuri, Baah, Etmadpure, Fatehpur Sikri, Fatehabad, Jagner, Jaitpur Kala, Khandauli, Kheeragerh, Pinahat, Saiya and Shamsabad.

The district also comes under the preview of Pradesik Co-operative Dairy Federation (PCDF) "PARAG" dairy federation. Since then, there is a well established market for milk production in the district through PCDF. The Village Dairy Co-operatives (VDC) is functioning in the Villages adopted by PCDF in all the blocks of district Agra. The Etmadpure block was selected at random. The list of VDC villages in the selected block was obtained and ten villages were selected randomly. First of all, the list of producers of milk was prepared for selected villages. Then the whole list was divided into member and non-member of PCDF. The milk producers in the selected villages were categorized on the basis of their hard size group as Ist group (1 milch buffalo), IInd group (2 milch buffalo) and III group (3 or more milch buffalo) using cumulative frequency square root technique. The sample sizes were selected randomly 75 members and 75 non-members households in study area. A sample of households were selected form each groups using probability proportion to size technique. Thus, the numbers of households selected in member class were 25 in Ist herd size group, 31 in IInd herd size group and 19 in IIIrd herd size group. In non-member class, the numbers of households selected in the respective groups were 39, 25 and 11. Thus, the study covered 150 households.

The data form the sample households were collected with the help of well structured pre-tested schedule by personal interview method. The data on the total milk production, quantity sold, quantity consumed as fluid milk and quantity converted into products on the previous day of visit to the households in each of the

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three seasons, namely summer (March-June), rainy (July-October) and winter (November-February) were collected. On the basis of this data, seasonal production, consumption and sale of milk were estimated. In addition to this, data on production and sale of milk products produced and sold during the previous season of visit were also collected. Tabular analysis was used as an empirical tool in the present study.

Results and Discussion

The presentation of the results in made under than three sub-sections:

(a) Production and utilization of milk,

(b) Production and sale of milk products, and

(c) Per capita consumption of milk and milk products.

(a) Production and utilization of milk:

The average milk production per household in the case of Ist group was 1115.72 liters, out of which 473.19 liters was sold representing marketed surplus of 42.41 per cent (Table1). In case of IInd group production was 2479.62 liters, marketed surplus was 1266.34 liters and percentage contribution to sale was 51.07 per cent. In IIIrd group, production was 4280.35 liters, marketed surplus was 2352.37 liters and percentage sale was 54.96 percent. The production as well as absolute marketed surplus increased with the group. The percentage sale of production was also increase in the increased with the group.

Both production and marketed surplus of milk in member class was found to be higher compared to non-member class. Seasonal fluctuations were observed in the production, marketed surplus and quantity of milk retained at home. The production and marketed surplus was the lowest in summer season followed by rainy and winter seasons.

Out of the milk retained at home, about 64 per cent was consumed as fluid milk in Ist group of household, 60 per cent in IInd group of household. These percentage were of the same order in both member and non-member class. The percentage consumption was decrease with the percentage of milk converted in to products, increased with the increase in the household category, while IIIrd group it was slightly higher in comparison to IInd group. It was consumption of fluid milk to the slightly less in the converted into product in both classes. However, quantum of milk consumed as fluid milk per household increased with the increase in herd size group.

(b) Production and sale of milk products:

Milk, unlike most other farm products, is highly perishable and as such requires quick disposal or conversion into milk products. The production and sale of milk products by different categories of households during different seasons are presented in Table 2 and 3.

On an average, 1.7 per cent of the milk retained at home for products was converted into curd by Ist group households, 18.7 per cent by IInd group households and 24.8 per cent by III group households in member class (Table-2) These percentage in non-member class were 10.6, 23.1 and 28.4 per cent in Ist, IInd and IIIrd group of households. Both the quantity and percentages diverted to non-member class. Though the quantity of milk diverted to curd production increased with the increase in the herd size, the proportion diverted to curd production were also increased with the increase in herd size.

The households manufactured only two products, namely curd and ghee. The milk diverted for ghee making was, therefore, the complement of proportion used for curd making. On an average, 98 per cent of milk was diverted to ghee making in Ist group, 81 per cent in IInd group and 75 per cent in IIIrd group household in member class. It was of the order of 89 per cent, 76 per cent and 71 per cent, respectively in non-member class. Both the quantity and percentages diverted to ghee production were slightly less in non-member class compared to member class. The proportion diverted to ghee production decreased with the increase in herd size.

Table3 gives the quantity of ghee produced, sold and retained at home in three different household group and two classes. On an average, about 5 kg. of ghee was produced per season per household in Ist group, 8 kg. in IInd group and 11 kg. in IIIrd group of households. IInd group of member class and Ist group of non-member class households provided larger share in the marketed surplus of ghee. About 35 per cent of ghee was sold by Ist group, 38 per cent by IInd group and 41 per cent by IIIrd group of milk produces out of the total production with in each groups. The rest of was consumed at home. The proportion of ghee production increased progressively from summer to rainy and rainy to winter season in all the groups in both the classes.

(c) Per capita consumption of milk and milk products:

Per capita per day consumption of fluid milk, curd and ghee was worked out taking into consideration the quantity consumed fluid milk, curd and ghee per day and the family size. The average size of family was 5.08 in Ist group, 6.55 in IInd group and 10.79 in IIIrd group of households in member class while similar figures for non-member are were 6.54, 9.28 and 10.73 respectively. The per capita per day consumption of fluid milk, curd and ghee are presented in Table-4.

The per capita per day consumption of fluid milk was higher in member class compared to non-member class. It increased with the increase in herd size group.

Sharma et,al. (1977), Shah and Sharma (1994) also made similar observation. It was observed that the per capita per day consumption was higher than the minimum nutritional standard of 250gm per capita per day, recommended by Indian Council of Medical Research, in all the household groups in member class

Table 1: seasonwise per household production and utilization of milk (in lit.)

Season	Ist Group					IInd Group					III group				
	Total Production	Quantity Sold	Quantity retained	Quantity consumed as fluid milk	Quantity converted into product	Total Production	Quantity Sold	Quantity retained	Quantity consumed as fluid milk	Quantity converted into product	Total Production	Quantity Sold	Quantity retained	Quantity consumed as fluid milk	Quantity converted into product
Members															
Summer	264.60	132.60	132.00	90.90	41.10	434.55	248.57	185.98	125.63	60.35	998.84	578.74	420.10	270.21	149.89
		(50.11)	(49.89)	(68.86)	(31.14)		(57.20)	(42.80)	(67.55)	(32.45)		(57.94)	(42.06)	(64.32)	(35.68)
Rainy	512.40	262.40	250.00	171.70	78.30	1299.03	788.71	510.32	310.09	200.23	2146.32	1346.42	799.90	509.58	290.32
		(51.21)	(48.79)	(68.68)	(31.32)		(60.72)	(39.28)	(60.76)	(39.24)		(62.73)	(37.27)	(63.71)	(36.29)
Winter	646.20	33.80	308.40	204.88	103.52	1354.65	809.92	544.73	337.29	207.44	2750.53	1779.58	970.95	613.82	357.13
		(52.27)	(47.73)	(66.43)	(33.57)		(59.79)	(40.21)	(61.92)	(38.08)		(64.70)	(35.30)	(63.22)	(36.78)
Total	1423.20	732.80	690.40	467.48	222.92	2088.23	1847.20	1241.03	773.02	468.01	5895.69	3704.74	2190.95	1393.61	797.34
		(51.49)	(48.51)	(67.71)	(32.29)		(59.81)	(40.19)	(62.29)	(37.71)		(62.84	(37.16)	(63.61)	(36.39)
Non-members															
Summer	84.36	23.84	60.52	38.96	21.56	172.60	64.50	108.10	65.24	42.86	360.45	102.73	257.72	159.45	98.27
		(28.26)	(71.74)	(64.38)	(35.62)		(37.37)	(62.63)	(60.35)	(39.65)		(28.50)	(71.50)	(61.87)	(38.13)
Rainy	341.16	97.85	243.31	141.99	101.32	748.80	277.80	471.00	270.68	200.32	973.64	340.00	633.64	369.55	264.09
		(28.68)	(71.32)	(58.36)	(41.64)		(37.10)	(62.90)	(57.47)	(42.53)		(34.92)	(65.08)	(58.32)	(41.68)
Winter	382.72	91.88	290.84	178.08	112.79	949.60	343.18	606.42	347.72	258.70	1330.91	557.27	773.64	452.91	320.73
		(24.01)	(75.99)	(61.22)	(38.78)		(36.14)	(63.86)	(57.34)	(42.66)		(41.87)	(58.13)	(58.54)	(41.46)
Total	808.24	213.57	594.67	359.04	235.63	1871.00	685.48	1185.52	683.64	501.88	2665.00	1000.00	1665.00	981.91	683.09
		(26.42)	(73.58)	(60.38)	(39.62)		(36.64)	(63.36)	(57.67)	(42.33)		(37.52)	(62.48)	(58.97)	(41.03)
Average	1115.72	473.19	642.54	413.26	229.28	2479.62	1266.34	1212.28	728.33	484.95	4280.35	2352.7	1927.98	1187.76	740.22
		(42.41)	(57.59)	(64.32)	(35.68)		(51.07)	(48.93)	(60.03)	(39.97)		(54.96)	(45.04)	(61.61)	(38.39)

Figures in parenthesis indicate percentage to the total milk production
Figures in parenthesis indicate percentage to the total quatity of milk retained

Table 2: Seasonwise average quantity of milk diverted to different milk products (in lit.)

Season	Ist group			IInd group			IIIrd group		
	Total quantity retained at home	Quantity diverted for curd	Quantity diverted for ghee	Total quantity retained at home	Quantity diverted for curd	Quantity diverted for ghee	Total quantity retained at home	Quantity diverted for curd	Quantity diverted for ghee
Members									
Summer	41.10	-	41.10 (100)	63.35	12.80 (21.21)	47.55 (78.79)	149.89	41.74 (27.85)	108.15 (72.15)
Rainy	78.30	3.72 (4.75)	74.58 (95.25)	200.23	43.81 (21.88)	456.42 (78.12)	290.32	76.48 (26.34)	213.84 (73.66)
Winter	103.52	-	103.52 (100)	207.44	30.96 (14.92)	176.48 (85.08)	357.13	79.21 (22.18)	277.92 (77.82)
Total	222.92	3.72 (1.67)	219.20 (98.33)	468.02	87.57 (18.71)	380.45 (81.29)	797.34	197.43 (24.76)	599.91 (75.24)
Non-members									
Summer	21.56	3.11 (14.42)	18.45 (85.58)	42.86	11.06 (25.80)	31.80 (74.20)	98.27	35.57 (36.20)	62.70 (63.80)
Rainy	101.32	9.91 (9.78)	91.41 (90.22)	200.32	48.52 (24.22)	151.80 (75.78)	264.09	61.63 (23.34)	202.46 (76.66)
Winter	112.79	11.99 (10.63)	100.80 (89.37)	258.70	56.46 (21.82)	202.24 (78.18)	320.73	96.73 (30.16)	224.00 (69.84)
Total	235.67	25.01 (10.61)	210.66 (89.39)	501.88	116.04 (23.12)	385.84 (76.88)	683.09	193.93 (28.39)	489.16 (71.61)

Figures in parenthesis indicate percentage to the total quantity of milk retained at home

Table 3: Seasonwise production and sale of ghee (in kg)

Season	Ist group			IInd group			IIIrd group		
	Total quantity of ghee produced	Quantity of ghee sold	Quantity consumed at home	Total quantity of ghee produced	Quantity of ghee sold	Quantity consumed at home	Total quantity of ghee produced	Quantity of ghee sold	Quantity consumed at home
Members									
Summer	2.72	0.88 (32.35)	1.84 (67.65)	3.17	1.17 (36.91)	2.00 (63.09)	7.20	2.05 (28.47)	5.15 (71.53)
Rainy	4.52	1.16 (25.66)	3.36 (74.34)	9.48	5.06 (53.38)	4.42 (46.62)	12.96	6.22 (47.99)	6.74 (52.01)
Winter	6.84	2.00 (29.24)	4.84 (70.76)	11.03	5.87 (53.22)	5.16 (46.78)	17.37	8.26 (47.55)	9.11 (52.45)
Total	14.08	4.04 (28.69)	10.04 (71.31)	23.68	12.10 (51.10)	11.58 (48.90)	37.53	16.53 (44.04)	21.00 (55.96)
Non-members									
Summer	1.23	0.51 (41.46)	0.72 (58.54)	2.12	0.36 (16.98)	1.76 (83.02)	4.18	1.18 (28.23)	3.00 (71.77)
Rainy	5.54	2.47 (44.58)	3.07 (55.42)	9.20	2.60 (28.26)	6.60 (71.74)	12.27	5.27 (42.95)	7.00 (57.05)
Winter	6.30	2.36 (37.46)	3.94 (62.54)	12.64	2.88 (22.78)	9.76 (77.22)	14.00	4.82 (34.43)	9.18 (65.57)
Total	13.07	5.34 (40.86)	7.73 (59.14)	23.96	5.84 (24.37)	18.12 (75.63)	30.45	11.27 (37.01)	19.18 (62.99)

Figures in parenthesis indicate percentage to the total quantity of ghee produced

Table 4: percapita per day consumption of fluid milk, curd and ghee

Season	Ist group			IInd group			IIIrd group		
	Fluid milk (ml)	Curd (ml)	Ghee (gm)	Fluid milk (ml)	Curd (ml)	Ghee (gm)	Fluid milk (ml)	Curd (ml)	Ghee (gm)
Member									
Summer	147	-	3	157	16	3	205	32	4
Rainy	277	6	5	388	55	6	387	58	5
Winter	331	-	8	422	39	7	466	60	7
Total	252	6	5	322	37	5	353	50	5
Non-members									
Summer	49	4	1	58	10	2	122	27	2
Rainy	178	12	4	239	43	6	282	47	5
Winter	223	15	5	307	50	9	346	74	7
Total	153	10	3	201	34	8	250	49	5

than non-member class consumption was slightly less in minimum nutritional standard in Ist and IInd group.

The quantum of curd production is generally equivalent to the quantum of milk used to prepared curd. It was observed that the entire curd produced was consumed with in the household. The per capita per day consumption of curd was higher in Ist and II group in member class compared to non-member class. The per capita per day consumption decreased with the decrease in herd size group. On an average, the consumption of curd was 8 ml of Ist group, 36 ml in Iind group and 50 ml per capita per day in IIIrd group of household.

The per capita per day consumption of ghee was of the order of 4 gm in Ist group, 6.5 gm in IInd group and 5gm in IIIrd group. The per capita per day consumption was not marginal difference in both classes and in all the groups. The per capita per day consumption was the highest in winter season followed by rainy and summer seasons. The larger production and consumption of ghee in winter season was due to higher production of milk and thereby, higher diversion of milk to ghee production, due to lower price as well as demand of milk.

Conclusion

Substantially higher production and consumption of milk and milk products in member class clearly indicated the positive impact of dairy co-operative in the study area. Since the milk producers in the study area observed to manufacture only two products, namely curd and ghee, the proportion of milk used for curd production was complement to the proportion used for ghee production. The proportion of milk used for curd production was observed to be higher in non-member class for all the groups of milk producers.

The per capita per day consumption of milk in member class was much higher than the minimum nutritional standard of 250 gm per capita per day as recommended by Indian Council of Medical Research and it was particularly so in the member class. This further strengthens the conclusion the dairy co-operatives are contributing positively in the district.

References

Bahadure, J.Z., Singh, C.B. and Patel, R.K. (1981). Milk production. Consumption and marketed surplus in some villages around Karnal. Agril. Marketing, 24(3):19-20.

Balishter, Singh, R.P. and Singh, Bhikam (1982). Milk production, consumption and marketed surplus in Agra district- A case study, Dairy Gudie, 4(9): 33-35.

Gupta, J.N. and Patel, R.K. (1988), Marketed surplus of milk in rural Karnal. Asian J.Dairy Res., 7(2):97-107.

Ram, Kuber, Singh, K. and Patel, R.K. (1973). Marketed surplus of milk- A pilot survey. Indian Dairyman, 25(8): 297-300.

Shah, Deepak and Sharma, K.N.S. (1994). Production, consumption and disposal of milk and milk products in Bulandshahar district (U.P.). Indian J. Dairy Sci., 47(10): 829-834.

Sharma, K.N.S., Agarwal, S.B. and Patel, R.K. (1977). Milk production and its utilization in relation to farm size around Karnal. Indian J. Anim. Sci., 47(8): 45-49.

Singh, Lotan and Chattaraj, J. (1989). Impact of dairy co-operatives on production, consumption and marketed surpluse of milk. Indian Dairyman, 41(2): 57- 64.

Tyagi, K.C., Kumar, P. and Sohal, T.S. (1977). Marketable surplus of milk of bred cow in ICDP, Karnal (Haryana). Indian, Dairyman, 29(9): 591-593.

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Infrastructural facilities available at Krishi Vigyan Kendra S.K.D., K.V.K. Hastinapur, Meerut

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Introduction

The main objective of KVKs lies on imparting vocational training to the farmers, farm women and rural youths. They impart skill training through work experience based on the principle of learning by doing. The main objectives of the KVKs are to indentify training needs and accordingly plan and conduct production oriented, need based short and long duration training courses on the campus as well as in the villages.

To make training programme a success, it is necessary to provide all essential infrastructural and laboratory facilities, audio-visual aids and equipments, hostel and library facilities, etc. This investigation was carried out to find out the existing infrastructural and other facilities available at KVKs of Hastinapur, Meerut (U.P.).

Methodology

Ten chief training organizers (KVK incharges or the heads of KVKs) and twenty women training officers (10 assistant professors and 10 demonstrators, Home Science) of all the KVKs of Hastinapur, Meerut (U.P.) state were tile respondents for the study. Data was collected through a specially designed mailed questionnaire to know the availability of audio-visual aids and equipments, infrastructural facilities and tools and equipments in home science laboratories of KVKs. Frequency and percentage were calculated for the analysis of data.

Results and Discussion

Infrastructure available at KVKs

It is evident from Table 1 that all ten KVKs had office, vehicles combined for men and women and telephone facility available to them. Eighty per cent KVKs had classroom and staff room available for teaching and for staff, respectively. Eighty per cent of KVKs had scooter and 70 per cent KVKs had jeep as a vehicle available to them, but these vehicles were combined for men and women, not separately for women trainers and trainees Ingle and Kude (1995) also suggested that vehicles should be provided to trainers for four and journey. Eighty per cent of KVKs has hostel combined for men and women. Ingle and Kude (1995) suggested that on campus residential quarters should be provided for the trainers. Sixty per cent of the KVKs had Home science laboratory but it should be available at all KVKs for the efficient functioning of women training programmes. Only 30 per cent KVKs had audio visual laboratory. Kaur (1992) also suggested that laboratory facilities should be provided to the satisfaction of the trainees.

Table 1: distribution of KVKs according to availability of infrastructural facilities

Infrastructural facilities	f	%
KVK office	10	100
Class room	8	80
Staff room	8	80
Combined hostel for men & women	8	80
Residential quarters	6	60
Audio-visual laboratory	3	30
Library	7	70
Home science laboratory	6	60
Vehicle combined for men & women	10	100
Car	2	20
Jeep/gypsi	7	70
Van	1	10
Motor cycle	6	60
Scooter	8	80
Telephone facility	10	100

Tool and equipment available in home science laboratory of KVKs

For the effective on-campus trainings in home science, it is very essential to have sufficient tools and equipment available in home science laboratory. It is shown in table 2 that for the trainings in food and nutrition, most of the essential tools and equipments were available at all the KVKs. Most of the KVKs lacked special purpose tools and equipments and the labour saving devices like thermas, fry pan, sauce pan, 2 –way grater and chipper and papad making machine.

For the training in clothing and textile all the KVKs had sewing machine, scissors, fabric colors and painting brushes but other things were very few. As most of the trainings were on cutting and stitching of garments and

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fabric paintings, they had the materials related to that but none of the KVKs had laundry equipments and only 10 per cent had laundry materials, embroidery machine, and ironing board which are essential for the advanced trainings in home science.

Table 2: Distribution and KVKs according to the availability of tools and equipments in home science laboratory

Tools & equipments available in the field of home science	f	%
I. Food and nutrition		
Gas stove, gas cylinder, oven	10	100
Refrigerator	9	90
Mixer grider, jucer, knives, grater	10	100
Weighting balance	10	100
Measuring spoon	7	70
Measuring katories	2	20
Beater, strainer, toaster	8	80
Pressure cooker and utensils	10	100
Tharmas	1	10
Fry pan, sauce pan, 2-way grater and chipper	3	30
Sieves	9	90
Peeler, lemon squeezer	5	50
Papad making machine	2	20
II. Clothing & textile		
Sewing machine, sinssor	10	100
Measuring tape	9	90
Iron	6	60
Ironing board	1	10
Dyes	2	20
Fabric colors & painting brushes	10	100
Fabric	8	80
Laundry materials	1	10
Detergents	2	20
Embroidery machine	1	10
Fashion maker	2	20
III. Humen development		
Soft toy material	4	40
Different games	3	30
Tri color strips	1	10
Weighing balance & measuring scale	3	30
IV. Storage bins	6	60
Solar cooker	5	50
Smokeless chulha	3	30
Material for decorative articles and for pot decoration	8	80
Lavour saving device	7	70
Solar dryer	1	10
Potato masher, tomato slicer, chop-n-churn	5	50
Chopping board	4	40
Chilly cuttur, Nut cutter	3	30

For the trainings in human development, most of the KVKs lacked essential tools and equipments. For the trainings in family resource management most of the KVKs has materials for pot decoration, decorative articles, flower arrangement and labour saving devices. Most of the trainings were conducted on interior decoration and materials for these courses were available at KVKs but for the fuel energy management courses the equipments available were very few. Thus, it can be concluded that most of the tools and equipments available in home science laboratory of most of the KVKs were related to general trainings in food & nutrition and clothing & textile. The tools and equipments for advanced training were lacking in most of the KVKs which affected the training in home science, so more tools and equipments should be provided in all the KVKs. Kaur (1992) also suggested that laboratory facility should be provided to the satisfaction of the trainees.

Table 3: Distribution of KVKs according to the availability of audio visual aids and equipments at KVKs

Audio visual aids and equipments	f	%
Sets of flash card	2	20
Sets of slides	8	80
Audio cassettes	6	60
Video cassettes	6	60
Charts	2	20
Photographs	1	10
Transparencies	1	10
Fil strips	-	-
Film 8 mm	-	-
Film 16 mm	-	-
Slide projector	8	80
Film projector	3	30
Tap recorder	9	80
Epidiascope	3	30
Overhead projector	8	80
Camera	7	70
Video camera	2	20
Radio	1	10
VCR	10	100
Television	10	100
Public address system	8	80

Audio-visual aids and equipment available at KVKs should have sufficient number of audio-visual aids and equipments. It is obvious from Table 3 that most of the KVKs had modern audio-visual aids and equipments but they lacked some essential and commonly used audio-visual aids like charts, flash cards, photographs, video camera, films, filmstrips etc. Thus there is a need of prepare the essential and commonly used audio-visual aids and equipments on different topics of training. Kaur (1992) also suggested that the training

Table 4: Additional facilities required by the trainers of the KVKs

Additional facilities required	CTO* n1 = 9		AP** n2 = 7		Demonstrator n3 = 9		Total n = 25	
	f	%	f	%	f	%	f	%
1. Equipments								
Clothing and Textile								
Zig-zag embroidery machine	2	22.2	2	28.6	2	22.2	6	24
knitting machine	3	33.3	3	42.8	3	33.3	9	36
2. Food and Nutrition								
Partially mechanized equipment for fruit and vegetable preservation	1	11.1	2	28.6	1	11.1	45	16
Cooking range	2	22.2	2	28.6	2	22.2	6	24
3. Family Resource Management								
Solar cooker	3	33.3	3	42.8	3	33.3	9	36
4. Agriculture related courses								
Mushroom and bee keeping unit	2	22.2	2	28.6	1	11.1	5	20
5. Others								
Vehicle facilities for trainees from distance	6	66.7	7	100	6	66.7	19	76

in classes should be supplemented with frequent use of visual aids, audio and visual equipments like charts, slides and films.

Additional facilities required

Among the additional facilities needed for the effective and efficient training, 36 per cent trainers expressed need for solar cocker and knitting machine, while 24 per cent trainers expressed for zig-zag embroidery machine and cooking range. Twenty per centtrainers needed mushroom and bee keeping unit, 16 per cent needed partially mechanized equipments for fruits and vegetable preservation and 78 per cent, vehicle facility for bringing trainees from distance (Table 4).

Conclusion

It can be concluded that KVKs had most of the basic infrastructural facilities available but most of them lacked hostel separately for women and audio-visual labaoratory. They lacked tools and equipments in home science laboratory like special purpose tolls, labour-saving devices, equipments for feul energy management. In audio-visual labaoratory most of the KVKs had modern audio-visual aids and equipments but they lacked some essential and commonly used audio-visual aids like charts, flash cards, phographs, video camera etc. the KVKs needed modern and advanced equipments like knitting machine, solar cocker, zig-zg embroidery machine etc. For advanced trainings and vehicle facility for trainees from the distance. In nutshell, it can be said that infrastructure and other facilities specially for women training were lacking.

References

Deepshikha (1989). As perusal of training programme for rural women in Krishi Vigyan Kendra (KVK). Farm Science Centre. M.Sc. Thesis, Rajasthan Agricultural University, Udaipur.

Ingle, O. and Kude, N.R. (1965). Evaluation of KVK programmes. Agri. Ext. Review. 7:3-8.

Kaur, S. (1992). Relative effectiveness of home science practices through institutional training course for farm women in KVK, Gurdaspur. Ph.D. Thesis, Punjab Agricultural University, Ludhiana.

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Role of women in dairy income on the farms in Agra district of western U.P.

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Abstract

The present study was conducted in Agra district of western U.P. out of 15 blocks, two blocks viz. Jaitpur kalan and Bah were covered under the study. The study covered 150 cases viz. 24, 45 and 78 in I, II and III herd size groups respectively. The study shows that women played a significant role in dairying in the rural area. The contribution of women in dairy in came highest in case of scheduled caste (48.00 per cent) followed by backward caste (37.50 per cent) and general caste (35.7 per cent).

Introduction

It is now widely known that rural women, as well as men, throughout the world are engaged in a range of productive activities essential to household welfare, agricultural productivity and economic growth. Yet women's substantial contribution continues to be systematically marginalized and undervalued in conventional agricultural and economic analysis and policies, while men's contribution remains the central, often the sole focus of attention. Women are typically, and wrongly, still characterized as "economically inactive" in statistical surveys of agriculture, a result that tells us more about survey methodology than about reality (Janelid, 1975). Agricultural extension services still do not attach much importance to reaching women farmers or women on the farm. Policy makers and administrators typically still assume (in the face of the empirical data) that men are the farmers and women play only a "supportive role" as farmers' wife (Samanta, 1994). But now women are playing a great role in rural farm economy.

Livestock are not only a source of employment; income and food but are also critical to strong socio-cultural linkage in countries like India. The animals were given a place of importance by the society in recognition of their contribution to human welfare. Evidence of this importance is noted by references in ancient scriptures, by their place of prominence among the official seals of the Harappan civilization dating 4000 BC and by the special festivals dedicated to livestock. The involvement of women with livestock is much more than just with crops. This involvement is probably indicative of the same socio-cultural linkage. While most of us are aware that livestock management is considered the traditional responsibility of women and that women shoulder most of the work load, the subject has been neglected too long by researchers and development planners (Swaminathan, 1988, 1990). Dairy farming has been considered a supplementary and complementary enterprise to crop farming as it provides gainful employment around the year, income and nutritional security to the millions of farm families. Men, women and children in the rural areas, perform farming operations but women play a dominant role in performing various livestock operations. Women own the UNDP report indicates that while women do 67% of the world's work, only 10% of global income is earned by women and a mere 1% of global property. Thus it is essential to know the contribution of women in dairying.

Objectives:

In order to make the present study more scientific and systematic, following objectives were framed-

1. To examine the proportion of women labour in total labour used in dairying under different herd size groups of families.
2. To estimate the income generated through dairying and the share of women in dairy income.

Methodology

The present study was conducted in Agra district. Out of 15 blocks of Agra district, two blocks viz. Jaitpur Kalan and Bah were selected purposely since these blocks were supplying maximum quantity of milk to P.C.D.F. (Provincial Dairy Co-operative federation). Five villages from each block were selected randomly. The list of all the households keeping milch animals categorized according to caste viz. general, backward and schedule caste than each caste group was divided into different size groups viz. I herd size (one animal keepers), II herd size (two milch animal keepers) and III herd size (keeping three and more animals). A sample of 150 cases was drawn from different herd size groups in proportion to its size. Thus in general caste 49 cases, (8, 19 and 22 in I, II and III herd size groups respectively), in case of backward caste 65 cases, viz. 11, 16 and 38 in I, II and III herd size groups respectively while in scheduled caste 36 cases viz. 8, 10 and 18 cases were selected randomly. In all 150 cases were studied i.e. 27, 45 and 78 in I, II and III herd size groups respectively. The data were collected through survey method.

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Results and Discussion

A close perusal of Table 2 under observation reveals that overall per household total investment in dairy was about Rs. 20857, Rs. 22790 and Rs. 17180 in case of general, backward and scheduled caste respectively.

Table 1: Investment on dairy assets per household of different socio-economic categories (Rs.)

Particulars	Herd size groups			
	I	II	III	Overall
General caste				
Milch animal	4685.0	10465.0	20413.5	13988.0
	74.96	*69.11*	*65.63*	*67.07*
Cattle shed	1340.0	4115.0	3909.3	5994.1
	21.44	*27.18*	*29.93*	*28.74*
Dairy equipment	225.0	562.5	1381.5	875.1
	3.60	*3.71*	*4.44*	*4.20*
Total	6250.0	15142.5	31104.2	20857.2
	100.00	*100.00*	*100.00*	*100.00*
Backward cast				
Milch animal	4581.82	10331.2	20785.0	15469.7
	74.67	*71.31*	*66.82*	*67.88*
Cattle shed	1336.4	3631.2	8890.7	6317.6
	21.78	*25.06*	*28.58*	*27.72*
Dairy equipment	218.2	525.0	1431.3	1002.9
	3.56	*3.62*	*4.60*	*4.40*
Total	6136.4	14487.5	31107.0	22790.3
	100.00	*100.00*	*100.00*	*100.00*
Scheduled caste				
Milch animal	4037.5	9760.0	17286.1	12251.4
	73.76	*73.39*	*70.44*	*71.31*
Cattle shed	1237.5	3128.0	6416.7	4352.2
	22.61	*23.52*	*26.15*	*25.33*
Dairy equipment	198.7	411.0	836.1	576.4
	3.63	*3.09*	*3.41*	*3.36*
Total	5473.7	13299.0	24538.9	17180.0
	100.00	*100.00*	*100.00*	*100.00*

(Figures in italics indicate percentage)

Source - Survey

Out of total investment maximum share occupied by the value of milch animal i.e. 60.23, 67.88 and 71.31 per cent in the respective categories which varies inversely with the increase in number of milch animals in all the caste groups. On the other hand the proportionate expenditure on cattle shed to the total investment in dairy goes on increasing with the size of herd in all the castes. To overall per household investment on dairy equipments accounted for 3.77, 4.40 and 3.36 per cent of the total investment in case of general, backward and scheduled caste categories respectively.

Maintenance cost of dairy animals

It is essential to know the cost of production of milk from the point of view to assess the dairy income the following Table 2 shows the maintenance cost of dairy animal in the farms.

Maintenance cost of animals in different socio-economic groups

Among the various items of variable cost, maximum share to the total cost is occupied by the cost of green fodder followed by value of concentrates and cost of human labour in general and backward caste. In scheduled caste the maximum share is occupied by human labour followed by green fodder and concentrates. Within the various herd size groups proportionate expenditures of variable cost is the highest in group I.

The Table 2 further indicates that the proportionate expenditure on human labour varies directly with the herd size while on the other hand share of other items of variable cost to the total maintenance cost were found to be the highest in case of households having only one animal. Inclusion of hired labour in the maintenance of animals is the reason for higher share of labour cost to the total maintenance cost on the households of II and III herd size groups.

Production of milk

Milk yield is function of many factors like proper breeding, balanced feeding and scientific management of milch animals and its major determinants.

A part from these entire factors, the milk yield also varies in one season to another. Average yield of milk of milch animals maintained by different socio-economic categories of sample households per annum has been estimated and is presented in the Table 3.

The results enumerated in the Table 3 reveal that the over all per household yearly production of the milk in case of general, backward and scheduled caste respondents was about 5246, 5254 and 4075 litres respectively. Among all the herd size groups, per household yearly milk production was the highest in case of general caste followed by backward and scheduled caste households. This depicts that the respondents of higher caste take more care of breed, feed and maintenance of their animals and consequently get good production of milk.

Gross and net income from milk production

The overall per household gross income from milk on general, backward and scheduled caste households was estimated to be Rs. 70823, Rs. 70942 and 55017 respectively. As the different herd size are concerned per household gross income from milk was the highest in case of general caste respondents in the entire herd size groups followed by backward and scheduled caste households and depend on the number of animals maintained.

The net income from dairy enterprises has been worked out by subtracting net maintenance cost from the gross income. The per household net income have been estimated from each herd size group and caste and is presented in Table 4.

It can be clearly observed from the Table 4 that the overall per household highest net income per annum from dairying was earned by the respondents of general caste (Rs. 44459.07) followed by backward (Rs. 42878.58) and scheduled caste (Rs. 34526.97) households.

Table 2: Per household maintenance cost of milch animals on different herd size groups in case of general caste, backward caste and scheduled caste (Rs.)

Items	General caste Herd size group				Backward caste herd size group				Scheduled caste Herd size group			
	I	II	III	Overall	I	II	III	Overall	I	II	III	Overall
Green fodder	2448.1	52.54.2	10850.6	7308.7	2394.0	5118.3	11088.3	8147.4	1948.1	3962.4	7279.2	5173.1
	28.09	*26.95*	*27.28*	*27.23*	*28.50*	*27.85*	*28.58*	*28.46*	*25.35*	*24.46*	*24.70*	*24.70*
Dry fodder	1001.3	2050.4	4313.7	2895.3	976.1	1957.9	3939.9	2950.5	965.2	1954.9	3458.1	2486.5
	11.49	*10.52*	*10.84*	*10.79*	*11.62*	*10.65*	*10.15*	*10.31*	*12.56*	*12.07*	*11.73*	*11.87*
Concentrates	1758.1	4452.3	8688.1	5914.2	1643.8	3907.3	8638.7	6290.3	1610.6	3312.7	6055.1	4305.7
	20.17	*22.83*	*21.84*	*22.03*	*19.57*	*21.26*	*22.27*	*21.98*	*20.95*	*20.45*	*20.54*	*20.56*
Humen labour	2003.2	4262.3	8867.8	5871.4	1917.8	4152.1	8397.3	6255.8	1890.4	3990.0	7296.9	5176.9
	22.98	*21.86*	*21.79*	*21.87*	*22.83*	*22.59*	*21.64*	*21.85*	*24.60*	*24.63*	*24.76*	*24.72*
Vet. expenses	194.7	351.5	653.6	461.5	191.3	304.7	574.1	443.0	123.5	248.6	436.6	314.8
	2.23	*1.80*	*1.64*	*1.72*	*2.28*	*1.66*	*1.48*	*1.55*	*1.61*	*1.53*	*1.48*	*1.50*
Misc. expenses	139.1	254.3	462.6	329.0	128.5	246.7	455.0	348.5	125.3	248.6	401.6	297.7
	1.60	*1.30*	*1.16*	*1.23*	*1.53*	*1.34*	*1.17*	*1.22*	*1.63*	*1.53*	*1.36*	*1.42*
A. Variable cost	7544.5	16624.9	33636.3	22780.2	7251.5	15687.1	33093.3	24435.5	6663.2	13717.2	24927.5	17754.8
	86.56	*85.26*	*84.55*	*84.86*	*86.32*	*85.36*	*85.30*	*85.36*	*86.69*	*84.67*	*84.58*	*84.77*
Dep. on fixed	546.7	1280.4	2575.9	1742.3	535.9	1240.9	2594.6	1913.0	475.6	1152.9	2091.2	1471.6
assets	*6.27*	*66.57*	*6.48*	*6.49*	*6.38*	*6.75*	*6.69*	*6.68*	*6.19*	*7.12*	*7.10*	*7.03*
Interest of fixed	625.0	1594.2	3568.8	2322.5	613.6	1448.7	3110.7	2279.0	547.4	1329.9	2453.9	1718.0
assets	*7.17*	*8.18*	*8.97*	*8.65*	*7.30*	*7.88*	*8.02*	*7.96*	*7.12*	*8.21*	*8.33*	*8.20*
B. Fixed cost	1171.7	2874.6	6144.7	4064.8	1149.5	2689.7	5705.3	4192.0	1022.9	2482.8	4545.1	3189.6
	100.00	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Dung value	168.0	355.2	703.2	480.9	153.7	374.0	762.2	563.7	157.6	354.0	642.0	454.4
	1.93	*1.82*	*1.77*	*1.79*	*1.83*	*2.04*	*1.96*	*1.97*				
Net maintenance	8548.2	19144.3	39077.8	26364.1	8247.3	18002.8	38036.4	28063.8	7528.6	15846.1	28830.6	20490.0
cost	*98.07*	*98.18*	*98.23*	*98.21*	*98.17*	*97.96*	*98.04*	*98.03*				

(figures in italics indicate percentage)

Table 3: Per household production of milk in different socio-economic groups (litres per year)

Herd size groups	General Caste	Backward Caste	Scheduled Caste
I	1794.05	1656.25	1499.90
II	3842.50	3471.50	3036.90
III	7713.73	7047.68	5796.88
Over all	5246.16	5254.99	4075.33

Table 4: Per household income from dairy in different socio-economic groups (Rs./year)

Herd size groups	Gross income	Net maintenance cost	Net income
General caste			
I	24219.68	8548.21	15671.47
II	51873.75	19144.35	32729.41
III	104135.30	39077.85	65057.46
Over all	70823.17	26364.10	44459.07
Backward caste			
I	22359.38	8247.30	14112.08
II	40998.15	15846.07	25152.08
III	95143.61	38036.36	57107.26
Over all	70942.38	28063.79	42878.58
Scheduled caste			
I	20248.65	7528.57	12720.08
II	40998.15	15846.07	25152.08
III	78257.81	28830.62	49427.19
Overall	55016.98	20490.01	34526.97

The same trend was observed within the different herd size groups. As the income depends upon the number of milch animals maintained therefore the net income varies directly with the herd size in all the caste groups.

Contribution of women in dairy income

The total family days spent in the upkeep of animals were separated out than the total net income of the family from dairying apportioned among the male, female and children according to their work participation. The contribution of female in the dairying has been presented in the Table 5 in terms of women's share in the net income from dairying.

It is clear from the Table 5 that out of total per household net income from dairy, the overall contribution of male, female and children was about 52, 36 and 13 per cent respectively in case of general caste households. The respective figures in case of backward and scheduled caste household were 47, 38, 16 and 37, 48 16 per cent. The overall contribution of women in per household net

Table 5: Contribution of women in house hold income from dairy

Category	Work days used per year				Net income	Contribution (Rs.)		
	Male	Female	Children	Total		Male	Female	Children
General caste								
I	36.96	33.15	9.13	79.24	156871.47	7309.6	6556.2	1805.7
						46.6	*41.8*	*11.5*
II	70.26	57.18	20.68	148.12	32729.41	15525.0	12634.8	4569.6
						47.4	*38.6*	*13.9*
III	134.20	82.43	29.20	245.83	65057.46	3515.2	21814.6	7727.6
						54.5	*33.5*	*11.8*
Over all	93.53	64.59	22.62	180.74	44459.07	23006.8	15888.1	5564.2
						51.7	*35.7*	*12.5*
Backward caste								
I	31.48	32.55	13.08	77.11	14112.08	5761.2	5957.1	2393.8
						40.8	*42.2*	*16.9*
II	78.93	58.40	19.77	157.10	28862.45	14501.0	10729.3	3632.2
						50.2	*37.2*	*12.6*
III	146.46	117.10	50.80	314.36	57107.26	26606.2	21272.6	9228.4
						46.9	*37.2*	*16.2*
Over all	110.38	88.34	36.78	235.50	42878.58	20097.4	16084.5	6696.7
						46.9	*37.5*	*15.7*
Scheduled caste								
I	22.81	27.68	17.95	68.44	12720.08	4239.4	5144.5	3336.1
						33.3	*40.4*	*26.2*
II	67.98	68.13	20.38	156.49	25152.08	10926.2	10950.3	3275.6
						43.4	*43.5*	*13.1*
III	92.16	133.83	39.85	265.84	49427.19	17135.2	24882.8	7409.2
						34.7	*50.3*	*14.9*
Over all	70.03	91.99	29.58	191.60	34526.97	12619.6	16576.9	5330.4
						36.6	*48.0*	*15.4*

(figures in italics indicate percentage)

income came to Rs. 15888.1, Rs. 16084.5 and Rs. 16576.9 respectively in case of general, backward and scheduled caste households, which shows that contribution of women in the family net income increase as the social status of the family decreases. The proportionate contribution of women in the family net income was the highest in scheduled caste households followed by backward caste and general caste households.

As the different herd size groups are concerned, the contribution of the women in net income from dairy decreases with the increase in herd size in case of general and backward caste while the reverse trend was observed in case of scheduled caste households.

Conclusion

Thus, it can be generalized that women belong to scheduled caste contributed more in the family income than general and backward caste, as in higher caste either due to their sound economic condition or due to tradition; participation of women in farm activities is not much common.

References

Smith et al. (1991). Insight from women dairy farmers in India: what do they gain from participation. Indian Social Action, Vol. 4 No. 4, 416-427.

Sulaiman, F. (1999). The impacts of agricultural development project on women: a case study of the Eastern Islands small folder farming systems and live-stock development project (EISFSLUP). J. of Ago-ecol-ogy (Indonesia, 17(2):59-79.

Goyal, G. and Kaur (2001). Loan associated constraints of integrated rural development programme-women beneficiaries. J. of Research, Punjab Agri. Univ. 38(304):301-307.

Ponghal, S. Kumar, A.; and Singh, S.I. (1986). Comparative working efficiency of men and women labour in different operation in Haryana- A case study of Rohtak district. Indian J. of Agricultural Research, 48(2):32-35.

Singh, R.P.; Badal, P.S. and Bashist, A.P. (1986). Composition of family female force in agriculture. Agricultural Situation in India, 34(10):719-722.

Bhati, J.P. and Singh, D.V. (1987). Contribution of farm women in farm income and employment in Himanchal Pradesh. Research Report, AERC, H.P. University, Simla.

Janelid, I. (1975). The role of women in Nigerian agriculture. Rome: FAO.

Samanta, R.K. (1994). They reap less than they sow. The Hindu (Aril), No. 7. Madras, India.

Shiva, V. (1991). Most farmers in India are women, New Delhi, FAO.

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Food security in changing scenario

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Abstract

Food security continues to be one of the important policy objectives of most of the developing countries like India. And in theory, international trade imparts a great deal of flexibility in the matter of food security of developing countries. The study paper deals loopholes and actual practice of international trade in agriculture. Its shows that food security of India has been affected in last phase of 20th Century in terms of availability, stability and accessibility.

Introduction

One of the millennium development goals of the United Nations Halfling the proportion of people living in extreme poverty by years 2015, about 1.3 billion of world population live in severe poverty. Nearly 800 million people suffer from malnutrition. So food security continues to be one of the important policy objectives of the developing countries in the world, especially country like India.

As food security and is defined by the FAO as "a situation in which all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". This definition has 3 implicit dimensions, namely; availability, stability and success where as adequate food availability means that, as average, sufficient food supplies should be available to meet consumption needs, stability means that sufficient food would be available to meet food requirements even in difficult years or seasons, finally, access means that people have sufficient purchasing power to buy adequate amount of food.

As it has been argued that international trade and globalization imparts a great deal of flexibility in the matter of food security of developing countries through augmenting domestic supplies and reducing supply variability. At the global level, food production has exceeded the population growth rate during the last 40 years there by resulting in increasing average per capita food availability. But despite this food insecurity persists in many countries

In theory, it looks quite comfortable that international trade leads to food security, in developing countries. But there are few caveats need to address. First, greater reliance on trade for ensuring food security creates two important risks namely the uncertainty of supplies and instability of world prices. In this context, two elements become important for the developing countries. The first is import capacity and the second is reliability of the world market as a source of affordable food supplies. The import capacity of the most of the developing countries has increased because of relative decline in real price on food and some increase in income. Relative share of developing countries expenditure on food import has declined substantially despite increase in absolute term. For example for South and Southeast Asia as a whole, the share declined from 16% in 1970 to 6% in 1991 and in Latin America, it fell from 11 to 10% (FAO). The expected boost in food production in developing countries is also likely to bring about greater liquidity in the grain markets and greater choice suppliers thereby further increasing the reliability world market as a source of food import. In short run, however, the withdrawal of subsidies is likely to reduce production and raise food prices and increase the import bill of food deficit countries. So the capital scarce developing countries cannot afford in the long term basis. Recently, it has been seen that many developed countries despite the guidelines of AoA, have placed export restrictions or 'embargoes' for a variety of reason. Secondly, due to large subsidies to agriculture by the developed countries have tendency to depress the price of agriculture commodities, which led to increased dependence but also become a major disincentive for increasing domestic production. Sometimes the prices fell to a level where many developing country farmers could not make a living.

It is argued that trade liberalization would lead to more stable prices in the longer run after markets fully adjust to new trading environment. However, the post WTO period so far is marked by increased instability in prices. The price and income risks of excessive dependence on world trade could be dependence on world trade could be quite serious for large countries like China and India where consumption of basic food commodities is too large and dwarf world trade in these commodities (Parikh 1998).

Food security in the post liberalization period:

Food management in India is credited with having increased both the physical and economic access to food

and enhanced the level of food security in the country in general and in deficit areas in particular. The physical access to food grains increased because of increased productivity, and output of food grains. The economic access to food increased both because of rising income in agriculture and also because (up to the beginning of the nineties) the real price of food had declined over time and the proportion of per capita income required by food had also declined significantly (Tyagi 1990).

With the initiation of economic liberalization in India in June 1991, the country embarked on a policy of comprehensive economic reforms with the purpose of liberalizing the economy and integrating it with the world economy. Now that the policy has been in operation for more than a decade it is worthwhile to evaluate its impact on food security in the country in terms of three main determinants of food security namely, food availability in relation to demand, stability in availability and adequate income for purchase of food grains i.e. entitlement to food.

Food availability in relation to demand:

Taking the demand side first, there is a slowdown in the growth rate of direct demand for food grains for two reasons. First, the growth rate of population has decelerated to 1.95 per cent pa during 1991 to 2001 compared with 2.15 per cent pa during the earlier decade. Second, with rise in per capita income, the food basket in India is getting rapidly diversified. With diversification of consumption, the income elasticity of demand for food grains has declined perceptibly. On the other hand, per capita expenditure on superior foods, animal husbandry products and edible oils is increasing at a rapid rate (Table 1). The results are that the expenditure on food grains constitutes only 40 per cent of total expenditure on food. Data shows that the food diversification groups including the poorest households, although the poorest households still spend a major part of their income on food grains.

Multiplying these with population, the estimated demand for food grains in 1990-2000 works out to be 156.24 million tones. The demand for animal husbandry products namely like milk and milk products and for meat, eggs and fish, work out to be 56.8 million tones and 5.52 million tones, respectively. Since the feed demand for producing animal husbandry products is quite high in the total demand for food grains in India and is estimated to increase rapidly at about 2% pa by 2020 (Bhalla, Hazell and Karr, 1999). Adding the estimated demand for feed, the total direct and indirect demand for food grains is likely to be around 170 mn tones in 2004 as against an estimated food production of 183.2 mn tones in 2003-04.

Now taking the supply situation, the growth rate of food grains production which was 2.95 per cent pa during 198-81 to 1990-91. Decelerated significantly to only 1.66 per cent during the post liberalization period 1990-91 to 2000-01 (Table 2). This growth rate was even lower than the population growth rate of 1.95 per cent pa during this period. This had adverse consequences for the availability of food grains. The official data indicate that the per capita availability of food grains in the country came down from 481 kg per capita during the TE 1993 to 445 kg per capita during the TE 2001 (Economic Survey, 2003-04).

Stability:

Stability of supplies is the second feature of food security. Indian food production is characterized by large year-to-year fluctuations. For example, food grains output which had increased from 199.4 mn tones in 1996-07 to a peak level of 212 mn tones in 2001-02 is estimated to fall down to 183.2 mn tones during 2002-03. In India, stability of food supplies and prices is brought about

Table 1: changes in food consumption pattern in rural and urban India, 1977-99 (Quantity in kg/person per annum)

Year	Rural				Urban			
	1977	1987	1993	1997	1977	1987	1993	1997
Rice	86.5	88.1	85.4	81.0	67.6	68.1	64.2	62.5
wheat	49.2	61.6	53.5	53.9	64.6	60.4	57.4	55.4
Course cereals	56.7	29.8	24.1	17.7	14.8	10.6	7.7	7.1
T. cereals	192.6	179.5	163.0	152.6	14.7	139.1	129.3	125.0
Pulses	8.7	11.5	9.2	10.1	11.7	12.2	10.5	12.0
Milk & M.P.	24.6	58.0	51.4	50.5	39.7	64.9	68.3	72.4
Edible oils	2.7	4.3	4.6	6.0	4.8	6.8	6.3	8.6
Vegetables	24.7	50.8	53.2	66.0	39.7	66.4	63.1	70.0
Fruits	2.6	10.3	9.8	17.0	5.9	18.8	20.1	19.0
Meat, Egg & Fish	2.7	3.3	4.1	5.0	4.8	4.9	6.8	6.8
Sugar & Gur	13.5	11.0	9.2	10.1	17.1	12.3	11.8	12.0

Source: NSSO Consumer Expenditure Survey, Variuos Rounds.

through stocks maintained for this purpose and imports (Economic Survey, 2003-04).

Table 2: Growth rates of production of major crops

(% per annum)

Crops	1980-81/1999-91	1991-91/2000-01
Rice	3.56	1.74
Wheat	3.57	3.27
Coarse cereals	0.40	-0.54
T. cereals	3.03	1.86
T. pulses	1.52	-0.04
Food grains	3.77	2.41
All crops	3.19	1.96

India was able to maintain a satisfactory level of stability of food supplies and Indian prices could be effectively insulated from very high volatility in international prices of wheat and rice and other agricultural commodities because of a policy of buffer stoking. Stocks had to be sometimes supplemented by imports. For example, during the early 90's and again in 1998 India entered into contract for imports of wheat to overcome domestic shortage. However, recently the existence of very large stocks far above quantities needed for stabilization and PDS distribution have resulted in undue increase in food subsidy.

Access:

Economic access to food is the third important component of food security. An important development during the post reform period was that both the GDP and per capita income recorded a significant acceleration during 1990-91 to 2000-01 as compared with all the earlier decade of the eighties (Table 3). Given favorable income distribution, rapid growth of per capita income should mean that the economic access of the population to food has certainly increased, on an average.

Table 3: Growth rates of GDP and per capita income

(at 1980-81 and 1993-94 prices)

	At 1980-81 Prices		At 1993-94 Prices	
	1980/81-1990/91	1990/91-1998/99	1980/81-1990/91	1990/91-1998/99
GDP	5.46	6.23	5.51	6.10
GDP Agr.	3.94	1.95	3.13	3.13
Per capita income	3.01	4.30	3.13	4.11

Source: GoL, National Account Statistics, Various Issues

But no definitive conclusion can be arrived at regard in the growth of agricultural GDP, which effects a very large production of population in India. While the GDP in agriculture recorded a significant decline compared with the 1990's at constant 1980-81 prices, there was no change in its growth rate at 1993-94 prices. The higher growth of agricultural GDP at 1993-94 prices in mainly because of the contribution of fruits and vegetables, since the growth rate of crop production registered a significant decline. The statistical commission of India has expressed serious doubts the validity of data on fruits and vegetables (Gol, Statistical Commission of India Report, 2002).

The impact of growth on the economic access of the poor could be obtained from the changes in the incidence of poverty. According to official data, the incidence of poverty has declined perceptibly from 36.0 per cent in 1993-94 to 26.1 per cent in 1999-2000. But the data on poverty has been seriously questioned because of mix up of recall periods of 7 days and 30 days (sen, 2002). In any case the official data also brings out nearly 260 mn people are still below the poverty line in India. Hence although nothing conclusive can be said about decline in poverty, the number of poor in India that have inadequate access to food continues to be quite high.

On the other hand, increase in prices of food grains has reduced the economic access of the poor to food grains. One of the serious consequences of hafty rise in administered price during the nineties was that consumption of the poor declined and many of them were priced out in terms of demand for food grains (Bhalla, 2001).

There is a pressure on all developing countries to wean away from the policy of food self-sufficiency, the overall objectives of agricultural policies so far. The widespread move towards globalization on the one hand and the secular decline in food prices on the other, are advanced as arguments to forsake food security and organize production on the basis of comparative costs. But such proposition is flawed on any counts. Firstly, the notion of comparative advantages often represented by border prices is at best a static concept. It does not take into account the dynamic role of technological and institutional measures. It also assumes quick and frequent changes in cropping pattern by domestic producers to adjust to year to year changes in international prices. Secondly, wide swings in inter-year and inter-year fluctuations in international prices, greater in magnitude than the domestic prices, enhance risk and uncertainty for the domestic producers as well as the consumers. Advocacy of unrestricted exposure to international markets ignores the fact of the dependence of a large majority of domestic producers on food grains production as their main source of livelihood; it overestimates the resilience of the system to compensate these producers from heavy and sudden dislocations. These assumptions are not borne out by facts, not the least in large and poor country like India (Tyagi 1990, Nayar and Sen 1994, Vyas, 2002). While recognizing that trade liberalization has given much more flexibility in

management of food society, it needs to be emphasized that large countries like India cannot entirely depend on food imports and will have to produce a major part of their food requirements domestically.

Conclusion

At last, it can be said that trade does provide new opportunities for specialization and exchange, but the extent to which poor household in particular, the small and marginal farmers and the landless labour take advantage of them depends on their access to resources and the supportive role provide by the state. Thus for enhancing positive benefits of trade opportunities at macro level, the need is to undertake sectoral policies like strengthening institutional mechanisms, access to credit, education and extension services, proper guidance, and market access by the poor farmers.

References

Chand, Ramesh (2002). Trade Liberalization, WTO and Indian Agriculture, Mittal Publication, New Delhi.

Parikh, K.S. (1998). Food security:Individual and National, in Ed., I.J. Ahlubalia and I.M.D. Little India's Economic Development: Essays for Man Mohan Singh, Oxford, Delhi.

Government of India (GoL) (2002). Annual Report (1998-99), new Delhi Department of Agriculture and cooperation, Ministry of Agriculture.

Government of India (GoL) (2002). Economic survey: 2003-04., Ministry of Finance.

Gulati, A. and Bathla, S. (2001). Capital formation in Indian Agriculture.

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Adoption of plant protection and weedicides technology to improve wheat productivity

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Abstract

The present study was undertaken to ascertain the level of adoption of recommended plant protection and weedicide practices of wheat growers in Aligarh district of Uttar Pradesh. The study indicated that the wheat growers having medium size of holding, better SES and medium contact with extension personnel. The data of 300 respondents revealed that the majority respondents were adopted only 25.00 per cent extent of adoption of plant protection and weedicide technology. There was highly significant and positive relationship of income, farm power and socio-economic status of the small farmers with recommended plant protection and weedicide practices. Based on the findings, it may be recommended that the extension personnel should strengthen their efforts to educate and convince the wheat growers to adopt recommended plant protection and weedicide practices with demonstration, exhibitions, field trips, distribution of literature in local area and other extension communication methods.

Introduction

Agriculture development depends largely on the extent of new technologies used by the farmers. Theoretically, it is assumed that the use of plant protection and weedicide technologies by the farmers would be more on irrigated areas than dry farming areas and would also induced social & economical changes depending on the extent of use of new technologies. The extent of technology use refers to adoption of recommended practices in respect of all the important crops grown by farmers. Low adoption of plant protection and weedicide technologies depend upon many factors like social, economic, physical, cultural and lack of knowledge about them. Therefore, the study was undertaken to study the adoption of plant protection and weedicide technologies and socio-economic factors relationship in adoption.

Materials and methods

The present study was conducting in Dhanipur, Akrawad, Gangari blocks of Aligarh district of U.P. Out of 17 blocks of Aligarh district, Dhanipur, Akrawad and Gangiri were selected randomly. Out of ten randomly selected villages, 30 respondents were selected from each villages on randomly basis, thus the total 300 respondents were selected for this study. The data were collected with the help of presented structured schedule by personally interviewing the respondents. The data was analysed using appropriate statistical methods.

Results and discussion

It is evident from Table 1 that a very high majority i.e. 84.00 per cent respondents have adopted the plant protection measures in the range of upto 25 per cent level. Those who have adopted the same practice in the

Table 1: Extent of adoption of plant protection and weedicide technology

S.No.	Extent of adoption (%)	packages of practice related to plant protection technology			
		Plant protection chemical		Weedicides chemicals	
		No. of respondents	%	No. of respondents	%
1.	Up to 25	252	84.00	260	86.67
2.	26-50	19	6.33	22	7.33
3.	51-75	17	5.67	12	4.00
4.	76-100	12	4.00	6	2.00
	Total	300	100.00	300	100.00

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range of 76-100 per cent level are only 4.0. The percentages of farmers who have adopted the weedicide practice are 86.67 per cent. Only 13.33 per cent of the farmers have adopted weedicides practices in the high and very high level i.e. 50 to 100 per cent (Srivastava and Singh, 1989 and Soni, 2002). Table 2 also reveals that majority of the small farmers i.e. 86.00 per cent have low adoption level in term of plant protection technology, on the other hand 7.33 per cent,6.66 per cent have the high and medium adoption. The Table 2 also indicates that 88.33 per cent small farmers have low adoption in term of weedicides chemicals, 7.66 per cent of the small farmers have the medium adoption and only 4.00 per cent respondents have the high adoption in term of weed technology (Saraswat, 1991).

Table 2: Overall adoption of plant protection and weedicide technology

S. No.	Adoption level	Plant protection Chemicals		Weedicides	
		No. of respondents	%	No. of respondents	%
1.	Low adoption	258	86.00	265	88.33
2.	Medium adoption	20	6.66	23	7.66
3.	High adoption	22	7.33	12	4.00
	Total	300	100.00	300	100.00

Table 3: Correlation between socio-economic variables and adoption behaviour of Small farmers

S.No.	Socio-economic variables	Adoption of new technology Plant protection	Weedicides
1.	Age	-0.011 NS	-0.055 NS
2.	Caste	9.275 NS	10.523 NS
3.	Education	11.359 NS	16.252 NS
4.	Family type	4.142 NS	5.568 NS
5.	Family size	2.876 NS	4.668 NS
6.	Income	0.712 **	0.254 **
7.	Size of holding	0.089 NS	0.020 NS
8.	Farm power	0.324 **	0.347 **
9.	Change agent linkage	26.724 **	27.768 **
10.	Social participation	0.82 NS	1.98 NS
11.	Urban contact	-0.666 NS	-0.085 NS
12.	Socio-economic status	0.489 **	0.422 **

** Significant at 1% level

NS - Non-Significant

There has a very high significant and positive correlation between income, farm power, change agent linkage and socio-economic status with the adoption of plant protection as well as weedicides technology of wheat crop in Table 3, that some variables like age, caste, education, family type, family size, size of holding, social participation and urban contact are found non significant relationship with plant protection and weedicides technology. Latoria *et al*., 2003.

Conclusion

On the basis of this study, it was concluded that very high majority i.e.86.00 and 88.33 per cent respondents had adopted the weedicides and plant protection chemicals to be very low extent of adoption, out of twelve socio-economic variables only four variables namely income, farm power, change agent linkage and socio-economic status had significant association with adoption technology.

References

Latoria, S. K. and Jaulkar, A. M. (2003). Adoption behaviour of sugarcane growers. Ind. Res. J. ext. edu. 3 (2): 53-55.

Saraswat (1991). A critical study in technological gap of pulses and oilseed crops with special reference to small, medium and large farmers of C.D. Block Bichpuri, Agra Ph.D. Thesis, Agra University Agra (UP).

Shrivastva, R. B., Singh, D. P. and Rizvi, A. H. (1989). Pulses production technology, adoption and cultivation in Bihar. Agril. Situation in India, Nov.1981, P 641-642.

Soni, S. N. (2002). Perception analysis of adoption of improved gram production technologies. Madhya Jour. of Ext. edu. 4 (3) 65-67.

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An socio-economic survey of farmers in North Western Indian Himalayas:An empirical study of J & K

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The hill and mountain areas have a unique feature in respect to topography, climate and production techniques. The undulated topography, rugged terrain, cold climate and lack of production and marketing infrastructure have made the area poor in terms of higher production and productivity of crops. Most of the hill farmers have small and scattered land holdings, low investment capacity and little technical know-how about improved crop production. The crop production in these areas is still based on the use of traditional varieties and characterized by uneconomic production system. The high yielding varieties of rice, maize and wheat suitable for hill have, indeed, yet to make a dent in the hill farming conditions throughout the mountain region. Similarly much remains to be achieved so far as the adoption of balanced and recommended doses measures in concerned. All these factors have made farming in gills a non-viable proposition.

A socio economic survey of the farmers provides basic information to the planners, policy makers and scientist engaged in agricultural development and agro-biological researches. The results of research in any field can be assessed effectively if the socio-economic survey in the fields is conducted adequately. Such surveys are crucial as they serve as benchmarks for policy planning. These types of surveys provide basic information regarding the existing availability of resources and their uses apart from providing information on input efficiency and also the extent and levels of household income. The paper presents an insight about the socio-economic survey of farmers in North Western Indian Himalayas especially the state of J & K.

Methodology

For the present study all six districts of Kasmir valley viz. Anantnag, Baramulla, Budgam, Kupwara, Pulwama and Srinagar were selected. The survey was based on an intensive enquiry of about 250 households spread in 24 villages which fall in two agro climatic zones. Twelve villages fall in low altitude zone (LAZ) with paddy based cropping system and twelve villages fall in high altitude zone (HAZ) with maize based cropping system. In all 250 respondents were selected and contacted with a minimum of 10 respondents from each village. Selection of villages was done by random sampling technique. Detailed household survey schedule was prepared to collect the data. The respondents/

Table 1: Issues related to category on different sample household farms

S.No.	Issues	Reasons	Small (%)	Large (%)
I	Deoforestation	1. Increase in population	75	80
		2. Exploitation by contractor	20	20
		3. Developmental works e.g. roads	5	-
II	Soil erosion/land slides	1. Deforestation	80	90
		2. Faulty methods of cultivation	15	5
		3. Devepomental works	5	5
III	Decline in fertility of soil	1. Exessive use of chemical fertilizers	30	40
		2. Over utilization of land	-	-
		3. Decline in the use of F.Y.M.	50	50
		4. Change in cropping pattern	20	10
IV	Drying up of water resources	1. Deforestation	70	75
		2. Decrease in rainfall	30	25
		3. Non-maintenance	-	-
		4. Natural calamity	-	-

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households were categorized in small and large farmers by cube root method. Detailed household survey schedule were prepared to collect the data gave the following results.

Results and Discussion

Table 1 gives the results about the ecology issues such as deforestation, soil erosion, decline in fertility of soil and drying up of water resources and indicate the similarity of opinion among the respondents having small and large household farms. More than seventy per cent of population view increase in population as the main cause of deforestation and more than eighty per cent view deforestation as the main cause of soil erosion. Decline in the use of F.Y.M. and excessive use of chemical fertilizers are the reasons for decline in the fertility of soil. Three-forth respondents view deforestation as the reason of drying up of water resources while as one-forth cited decrease in the rainfall as its main reason.

Table 2 gives the information about the education levels of the household population of sampled farms. 45 per cent in small and 55 per cent in large farm households are illiterate whereas 10 per cent in small and 5 per cent in large farm households have completed their education. 10 per cent in small and 20 per cent in large farm households have some literacy level but are not going to school. The results suggest that those households have large farms have low literacy rate as compared to those households having small farms.

Table 2: Literacy status of household population of sampled farms

S.No.	Education level	Small (%)	Large (%)
I	Non-school going	10	20
II	School going		
	a) Primary	15	10
	b) High school	-	-
	c) Senior secondary	15	10
	d) Graduation & above	5	-
III	Completed education	10	5
IV	Illiterate	45	55

Table 3 provides an insight on the percentage consumption pattern of small and large sampled household farms. There are almost insignificant differences as the way the households having small and large farmers spend their incomes on food, clothing, health, education, lighting etc. About 40 per cent of income is spent on food while as 30 per cent is spent on clothing. 12 per cent of income by small farm households is spent on education whereas it is mere 10 per cent in case of large farm households. Small farm household farms spend 16 per cent of their income on travel/ transport whereas the same is 12 per cent in large farm households.

Table 3: Percentage consumption pattern of sampled household farms

S.No.	Items	Small (%)	Large (%)
I	Food	40.60	39.20
II	Clothing	13.76	13.25
III	Health	10.32	11.32
IV	Education	12.12	10.15
V	Lighting	2.00	1.37
VI	Travel/transport	15.76	12.15
VII	Micsellaneous	5.44	12.56

The main occupation of the sampled households was found to be agriculture. In low altitude zone (LAZ) the main cultivated crop was paddy and in high altitude zone (HAZ), the main cultivated crop was maize. In LAZ, issues related to food security on different households were found out to be sufficient and they also use to sell some produce. But, in high altitude zone (HAZ) food security was insufficient and they use to meet the gap by purchasing it from market. The society was found to be male dominated, as there was little participation by women in day-to –day decision-making. However major decisions were taken jointly in the households. It was also found out the that women on an average were spending 6 hours a day on household chores. It was also observed that there was no shortage of fodder for livestock and livestock husbandry was well developed of sampled households. Most of the households were having local cows and there was much scope to adopt crossbred livestock. Marketing infrastructure was found out to be poor in sampled villages. There were no cold storage facilities in fruit belt areas and farmers were compelled to sell the produce as soon as possible to avoid rotting with the result they could not fetch good price of the produce.

Conclusion

it can be conluded that both zones lack in infrastructure facilities. thus there is need to develop such facilities for rural development.

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Women right and rural development

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Abstract

The study was conducted on 100 rural women of 50 families belonging to five villages of Farah Block, district Mathura in U.P. The data were collected pertaining to education, awareness, area of employment and general profile. The study revealed that 75% rural women were having no knowledge about their rights and different small scale work to uplift the socio-economic status of their family.

Introduction

Father of the nation Mathura Ghandhi had said that actual India lies in the villages as about 76% of our population lives in the rural areas. So a large part of women folk lives in rural areas. If they do not fully participate in national building process, India will not be able to attain the required development. Women have crucial role in the family development and the household economy. It is true that illiteracy and poverty marginalize the participation of women in gainful employment. They key to better employment is the participation of women in gainful employment.

Women should acquaint with the required skills and equip themselves with training in new trades for gainful employment. Such initiations from women have produced positive result, which are visible in their day to day life in the term of confidence, strength, courage and determination. Economic independence for rural women is the foundation of their right's, freedom and dignity. According to ILO Report (1999) out of 1800 million workers in the world, 600 million are women constituting one-third of global work force. The study was initiated with two specific objectives, viz.

(i) To study the socio-economic profile of rural women's
(ii) To know the level of education, knowledge and awareness of rural women regarding women's rights and rural employment.

Materials and Methods

Mathura district of U.P. was selected for the purpose of present study. Out of 10 blocks in Mathura district only one block i.e. Farah was selected. Five villages in this block namely- Makhdoom, Nagla Bangara, Salimpur, Fatiha and Gadhaya were selected following the basic criteria i.e.

(i) Village should be approachable to conduct the research study.
(ii) Heterogenic nature of population existing different categories of economic status and
(iii) Willingness of the villagers to provide all necessary information.

A list of women was procured from the Gram Panchayat record registered with the help of Gram Pradhan of the selected villages. A well structured interview-cum-questionnaire method was employed after its pretesting.

Survey was conducted during November and December, 2006 for collecting information regarding awareness among women about their rights, Government policies, level of education and knowledge about self-employment etc. The work participation rate for females were collected from respondents using 24 hours' recalls method.

Results and Discussion

Table 1 clearly reveals that majority of the women from the villages of the Farah block belonged to 20-40 years age group, majority of respondents i.e. 49% belong to the income group of Rs. 1000/- per month, majority i.e. 67% of respondents were orthodox and conservative in the nature, 46% respondents having large family size, majority i.e. 68% respondents engaged themselves and perform the work ranging from 5-10 hrs. Vishwanathan (1994) and Seikis (1994) have observed the similar findings.

Table 2 clearly indicate that 25% women respondents were literate or educated upto middle, majority i.e. 75% women respondents were illiterate, majority i.e. 85% of respondents do not have any knowledge about their rights and directive principles of state policies. They were majority i.e. 64% respondents aware about fundamental rights and rural employment.

Extent of awareness and access to education are prime determination of rural women status and role in the process of development. Limited awareness not only restricts economic options but affects their physical and social well being. Lack of education and skill are important constraints of rural women to work spheres characterized by low scale and low pay. The findings are in conformity woth those of reddy and Sumangla (1998) and Vereghere (1991).

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Table 1: General socio-personal and economic profile of rural women of Mathura district

Socio-personal and Economic characteristics	No. of respondents	Percentage
Age		
Up to 20 years	36	36.0
20-40 years	64	64.0
Occupation		
House wife	29	29.0
House wife + farm women or farm labour	65	65.0
House wife engaged in other self-employment	06	6.0
Duration of work hour or work participation rate		
2-4 hours	38	38.0
5-10 hours	62	62.0
Monthly income		
Up to Rs. 1000	49	49.0
Rs. 1000-2000	40	40.0
Rs. 200-3000	11	11.0
Type of House		
Kachcha	32	32.0
Partially Pakka	68	68.0
Size of the family		
Small (Up to 3 members)	16	16.0
Medium (4-5 members)	38	38.0
Large (above 5 members)	46	46.0
Nature of the family		
Orthodox and conservative	67	67.0
Live in present	33	33.0

Table 2: Level of education, knowledge and awareness regarding women rights and rural employment

Level of education, knowledge and awareness	No. of respondents	Percentage
Education		
Literate	25	25.0
Illiterate	75	75.0
Total	100	100.0
Knowledge		
Having knowledge about policies started by the Government for their welfare	15	15.0
Do not have any knowledge of different policies	85	85.0
Total	100	100.0
Awareness		
Awareness about fundamental rights and rural employment	64	64.0
Do not aware about fundamental rights and rural employment	36	36.0
Total	100	100.0

Conclusion

Majority i.e. 64% respondents belonged to 20-40 year age group, while 49% respondents have the income of Rs. 1000/- and majority i.e. 67% respondents were orthodox and conservatives in the nature.

Majority i.e. 75% respondents were illiterate while 85% respondents do not have any knowledge about their rights and directive principles of the state policies. They were not aware about fundamental right and rural employment.

References

Seiki's P.D. (1986). India Rural Women, Miyyal Publication Delhi, pp. 28-30.

Vishwanathan, M. (1994). Women in Agriculture Rural Development, Printwell Jaipur Rajasthan, pp. 125-127.

Vereghera, N.V. (1991). Women and work an examination of female marginalization. Thesis in the Indian Context. The Indian Journal of Labour Economics, 84(3):274-275.

Government o India, Seventh Five Year Plan Document, pp. 89-95.

Reddy, P.R. and Sumangla, P. (1998). Women in development, 1& 2 B.R. Publishing Corporation, pp. 305-306.

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Technological studies on low fat yoghurt from filled milk

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Abstract

Buffalo milk could be replaced with 75 per cent filled milk prepared with palm oil and upto 50 per cent filled milk prepared with safflower oil for preparation of acceptable quality low fat yoghurt. The yoghurt culture (3 per cent) in 1:2 ratio of Streptococcus thermophilus and lactobacillus delbruckii sub sp. bulgaricus were found more suitable in producing desired acid development, firm consistency and yoghurt flavour. To enhance the acceptability of filled milk yoghurt, different flavouring compounds were tried. The pine apple emulsion and cardamom imparted attractive aroma and taste to yoghurt and enhanced its acceptability. Among various additives, corn flour, gelatin and sodium alginate produced a firm body and desired flavour to the yoghurt prepared from filled milk at 0.2 to 0.3 per cent concentration. Starch was not found suitable. Storage studies revealed that the biochemical changes occurring in control and filled milk yoghurt were not pronounced and in no way did affect the quality of the product.

Introduction

Yoghurt, a fermented milk product, is known globally as an important dairy product due to its higher nutritional and therapeutic values. New and innovative types of yoghurts and yoghurt products are being marketed world-wide resulting in spectacular increase in yoghurt consumption. Yoghurt is generally prepared from milk by lactic acid fermentation through the symbiotic action of *Lactobacillus delbruckii* sub sp. *bulgaricus* and *Streptococcus thermophilus*. Recently, yoghurt has become a popular vehicle for incorporating probiotic cultures like *Bifidobacterium bifidum* and *Lactobacillus acidophilus* (Sarkar and Misra, 2006), with the object of implanting these organisms in the gastro-intestinal tract to provide numerous health benefits.

The composition of yoghurt is almost same as that of milk used for its preparation. The demand for low fat yoghurt has increased during the past decade due to cholesterol content in high milk fat yoghurt. Although, abundant literature has accumulated on preparation of yoghurt, the technique regarding use of vegetable oil/fat to replace milk fat needs standardization. In the present study, attempts have been made to replace milk fat by use of palm oil and safflower oil in preparation of yoghurt from buffalo milk and to assess its effect on sensory attributes and physico-chemical quality of yoghurt.

Materials and Methods

Milk: Buffalo milk was obtained from the farm dairy. Skim milk was separated in a Alfa-laval cream separator and used in preparation of filled milk for yoghurt production.

Refined palm oil, safflower oil, sugar and other materials, were purchased from the local market.

Culture: The culture of *Streptococcus thermophilus* and *Lactobacillus delbruckii* sub sp. *bulgaricus* were obtained from the National Dairy Research Institute, for the preparation of yoghurt.

Preparation of filled milk: The palm oil and safflower oil were added slowly at the rate of 3 per cent to buffalo skim milk and the per cent of total solids in milk was raised to 14.0 by adding skim milk powder. The mixture was heated to 65°C and homogenized at 175 Mpa and 35 Mpa pressures in a two-stage homogenizer. The filled milk thus prepared was cooled to room temperature.

Preparation of yoghurt: The homogenized filled milk was added to buffalo milk (with 3 per cent fat and 14 per cent total solids) at 50, 75 and 100 (v/v) level. The milk samples containing varying proportions of filled milk in buffalo milk and pure filled milk samples were heated to 85°C for 20 minutes and cooled to 40°C. The mixed cultures of *Streptococcus thermophilus* (ST) and *Lactobcillus bulgaricus* (LB) were added in different proportions (1:1, 1:2 and 1:3) at the rate of 3 per cent and incubated at 40±2°C for 4 hours. The samples were then stored at 4°C overnight before subjecting it to sensory evaluation and biochemical analysis.

Influence of additives, flavour and colour on the quality of yoghurt: Glyceryl monostearate was added at the rate of 0.1 per cent to filled milk as an emulsifier. Various additives, viz. starch, corn flavour and sodium alginate were added in different concentrations to assess

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its effect on body, texture, flavour and other characteristics of yoghurt. The influence of added colour and flavours, viz. cardamom, orange emulsion, rose with saffron and pine apple emulsion, added at the rate of 0.3 ml/litre, was ascertained. All samples were homogenized and heat treated, as above, for preparation of yoghurt.

Examination and analysis of yoghurt: Sensory evaluation of yoghurt was done by a panel of five judges, who were well-versed in evaluation of dairy products, using a score card of 100 points distributed over different attributes, viz. firmness (30), whey separation (10), body and texture (20), aroma (20) and taste (20).

Fat and total solids in milk samples and acidity in yoghurt samples were determined by IS:1479-Part I(BIS, 1960). The pH in yoghurt samples was measured in Elico pH meter. Proteolysis in yoghurt was determined by method of Hull (1947) and lypolysis according to Frankel and Tarassuk (1955).

Results and Discussion

The results relating to effect of varying the proportion of yoghurt cultures (ST:LB) on quality of product prepared from palm oil and safflower oil filled milk (Tables 1 and 2) indicated that the maximum acid development was 0.92and 1.10 per cent at the end of 4 hour in yoghurt made from palm oil and safflower oil, respectively. When 1:3 ratio of ST:LB was used. The corresponding pH values were noted to be 3.80 and 3.75. The body and texture of the product were found to be unacceptable because of formation of excess of whey. Wheying off was also found in yoghurt samples made with 1:1 combination of ST:LB and the flavour was only mild. The use of 1:2 ratio of yoghurt culture produced a firm body and texture with only slight whey formation. It was due to proper acid development which varied from 0.88 to 0.90 with corresponding pH values from 3.98 to 3.85.

These results indicated that yoghurt cultures in 1:2 (ST:LB) ratio were found more suitable in producing desired acid development, a firm body and desired yoghurt flavour. The level of filled milk upto 75 per cent was found suitable, as 100 per cent replacement produced objectionable flavour. These results are in agreement with those of Laxminarayana (1970) and Madan Lal *et al*. (1978) who observed that *Str. Thermophilus* and *L. bulgaricus* used in 1:2 ratio caused production of high acid and a firm coagulation.. Malik *et al.,* (1998) have reported that the most prolific metabolite in yoghurt is lactic acid, which is the main substance responsible for inhibition of spoilage bacteria in the intestines. It has also been reported that if yoghurt is consumed continuously for several days, the lactose intolerant persons are able to digest lactose properly (Teuber, 1995).

Sensory attributes of yoghurt: The yoghurt samples made using 3 per cent culture (ST:LB) in 1:2 ratio with varying levels of filled and buffalo milk were evaluated by panel of judges. The results in Table 3 indicated that the body and texture in all the samples was firm irrespective of the nature and proportion of vegetable oils used in yoghurt production. The separation of whey was minimum. However, the flavour of respectable oils (palm oil/ safflower oil) became increasingly evident as the proportion of filled milk increased in Yoghurt samples. But the oily flavours were masked by the delicate yoghurt flavour when 75 per cent of filled milk prepared by using

Table 1: Changes in acidity and pH of yoghurt from filled milk using palm oil during 4 h incubation at 40±2°C®

Culture combination RatioST:LB	Milk sample FM:BM	Acidity Oh	1h	2h	3h	4h	pH Oh	1h	2h	3h	4h	At the end of 4 h Firmness	Wheying	Flavour
1:1	0:100	0.16	0.20	0.50	0.72	0.82	6.46	6.02	4.82	4.23	4.00	good	+ve	Mild
	50:50	0.16	0.21	0.50	0.71	0.86	6.51	6.06	4.89	4.20	4.00	good	+ve	Mild
	75:25	0.17	0.26	0.64	0.80	0.82	6.43	6.60	4.73	4.53	4.31	good	+ve	Mild
	100:00	0.15	0.20	0.55	0.70	0.81	6.47	6.00	4.90	4.33	4.11	good	+ve	Oily
1:2	0:100	0.15	0.20	0.60	0.78	0.88	6.46	6.02	4.80	4.23	3.98	good	-ve	Good
	50:50	0.16	0.21	0.62	0.79	0.89	6.56	6.06	4.73	4.15	3.90	good	-ve	Good
	75:25	0.15	0.22	0.65	0.81	0.90	6.56	6.01	4.63	4.05	3.85	good	-ve	Good
	100:00	0.15	0.21	0.62	0.77	0.90	6.46	6.07	4.79	4.15	3.90	good	-ve	Oily
1:3	0:100	0.15	0.22	0.69	0.82	0.90	6.55	6.02	4.61	4.10	3.81	lumpy	++	Acidic
	50:50	0.15	0.23	0.69	0.81	0.90	6.57	6.07	4.60	3.90	3.85	lumpy	+++	Acidic
	75:25	0.15	0.23	0.71	0.82	0.91	6.57	6.01	4.50	3.88	3.82	lumpy	+++	Acidic
	100:00	0.16	0.23	0.71	0.82	0.92	6.50	6.00	4.10	3.86	3.80	lumpy	++++	Oily

®Average of 5 trials FM: Filled palm oil milk BM: Buffalo milk

Table 2: Changes in acidity and pH of yoghurt from filled milk using safflower oil during 4 h of incubation at 40±2°C®

Culture combination RatioST:LB	Milk sample FM:BM	Acidity Oh	1h	2h	3h	4h	pH Oh	1h	2h	3h	4h	At the end of 4 h Firmness	Wheying	Flavour
1:1	0:100	0.15	0.22	0.54	0.72	0.82	6.46	6.02	4.82	4.23	4.00	good	+ve	mild
	50:50	0.15	0.21	0.50	0.70	0.86	6.51	6.06	4.89	4.25	4.00	good	+ve	Mild
	75:25	0.17	0.17	0.24	0.58	0.72	6.43	5.60	4.73	4.53	4.31	good	+ve	mild
	100:00	0.16	0.23	0.49	0.70	0.94	6.33	6.00	4.87	4.26	3.78	good	+ve	Oily
1:2	0:100	0.15	0.24	0.56	0.79	0.88	6.46	6.02	4.72	4.01	3.90	good	-ve	good
	50:50	0.15	0.21	0.55	0.72	0.89	6.51	6.06	4.80	4.05	3.91	good	-ve	good
	75:25	0.17	0.26	0.47	0.69	0.89	6.51	6.06	4.83	4.12	3.95	good	-ve	good
	100:00	0.15	0.29	0.49	0.70	0.90	6.46	6.02	4.78	4.22	3.78	good	-ve	Oily
1:3	0:100	0.15	0.23	0.55	0.81	0.90	6.46	6.02	4.65	3.90	3.90	lumpy	++	acidic
	50:50	0.15	0.23	0.55	0.90	0.93	6.41	6.07	4.80	3.95	3.90	lumpy	+++	acidic
	75:25	0.15	0.26	0.57	0.97	1.07	6.40	6.08	5.10	3.95	3.80	lumpy	+++	acidic
	100:00	0.15	0.24	0.60	0.99	1.10	6.50	6.01	4.90	3.82	3.75	lumpy	++++	Oily

®Average of 5 trials FM: Filled safflower oil milk BM: Buffalo milk

Table 3: Sensory evaluation scores of filled milk yoghurt prepared from different proportions of buffalo milk and filled milk.

Treatment	Sample Ratio FM:BM	Firmness (30)	Whey Seprn. (10)	Body & Texture (20)	Aroma (20)	Taste (20)	Total Score (100)
Filled	0:100	28.25	9.50	16.50	17.50	18.00	89.75
milk	50:50	28.50	9.00	17.00	14.00	16.50	85.00
yoghurt	75:25	28.75	9.25	17.50	14.00	14.00	83.50
from palm oil	100:00	26.25	8.50	16.75	16.50	14.00	81.25
Filled	0:100	28.25	9.25	16.75	18.00	15.25	87.50
milk	50:50	27.00	9.00	16.75	15.75	15.50	84.00
yoghurt from	75:25	28.70	9.25	17.00	12.75	14.25	82.00
safflower oil	100:00	26.00	9.00	15.50	14.75	13.20	78.45

palm oil and 50 per cent prepared by using safflower oil were used in yoghurt preparation. In other samples prepared using higher levels of these oils, the respective vegetable oil flavours dominated over typical yoghurt flavour and consequently such yoghurt samples were not acceptable.

These results suggested that acceptable quality of yoghurt could be made upto 75 per cent replacement with palm oil and upto 50 per cent substitution with safflower oil filled milk in case of plain yoghurt.

Influence of added flavour and colour on quality of yoghurt: In order lto enhance the acceptability of yoghurt, the influence of different flavour and colour on quality of filled yoghurt made using palm oil and safflower oil filled milks, was ascertained.

The results (Table 4) showed that the acidity of product varied from 0.78 to 0.91 per cent after incubation period of four hours with the same level of inoculum (3% in 1:2 ratio of ST:LB) added to all flavours. Pine apple emulsion gave a product with attractive aroma and taste. Hundred per cent replacement of buffalo milk with palm oil filled yoghurt was of acceptable quality in case of pine apple. The next best of filled yoghurt was from cardamom. The product with cardamom was acceptable upto 75 per cent replacement with palm oil, whereas in case of safflower oil filled yoghurt, the pine apple flavour could be used upto 75 per cent replacement of buffalo milk with safflower oil. Such yoghurt could also be prepared with cardamom flavour upto 75 per cent replacement of buffalo milk.

Effect of additives on filled yoghurt: Effect of various additives, viz. starch, corn flour, gelatin and sodium alginate on flavour, body and texture of filled yoghurt (Table 5) indicated that the higher levels of additives

Table 4: Influence of added flavour and colour on the quality of filled yoghurt

Flavour Used	Milk ratio FM:BM	Appearance PO	Appearance SO	Wheying off PO	Wheying off SO	Taste PO	Taste SO	Flavour PO	Flavour SO	Acidity (% lactic acid) PO	Acidity (% lactic acid) SO
Cardamom	0:100	-good-		-nil-		-good-		-pleasing-		0.80	0.80
	50:50	-good-		-nil-		-good-		-pleasing-		0.82	0.81
	75:25	-good-		-nil-		-good-		-acceptable-		0.90	0.81
Orange emulsion	100:00	-fair-		-nil-		-oily-		-fair-		0.85	0.80
	0:100	-strong-		-slight-		-fair-		-slight-		0.81	0.81
	50:50	-strong-		-slight-		-fair-		-fair-		0.82	0.81
	75:25	-strong-		-slight-		-poor-		-fair-		0.86	0.80
	100:00	-strong-		-more-		-poor-		-poor-		0.90	0.80
Rose with saffron	0:100	-good-		-nil-		-fair-		-good-		0.78	0.78
	50:50	-mild-		-nil-		-fair-		-fair-		0.91	0.79
	75:25	-mild-		-nil-		-poor-		-acceptable		0.81	0.80
	100:00	-fair-		-nil-		-poor-		-poor-		0.89	0.81
Pineapple emulsion	0:100	-attractive-		-nil-		-good-		-pleasing-		0.79	0.79
	50:50	-good-		-nil-		-good-		-pleasing-		0.85	0.80
	75:25	-good-		-nil-		-good-		-good-		0.83	0.81
	100:00	-acceptable-		-slight-		-good-		-good-		0.86	0.82

FM=Filled milk; BM=Buffalo milk PO=Palm oil: SO = Safflower oil

Table 5: Effect of additive on the body and texture and flavour of filled yoghurt

Additive	Additive(%)	Acidity(% lactic acid) PO	Acidity(% lactic acid) SO	pH PO	pH SO	Body & texture PO	Body & texture SO	Flavour PO	Flavour SO
Control		0.81	0.81	4.30	4.30	Firm	firm	good	Good
Starch	0.2	0.79	0.78	4.60	4.35	Good	good	fair	fair
	0.3	0.75	0.75	4.75	4.40	lumpy	lumpy	fair	fair
	0.4	0.76	0.71	4.65	4.45	Lumpy	Lumpy	fair	fair
	0.5	0.74	0.9	4.75	4.50	lumpy	lumpy	fair	fair
Corm flour	0.2	0.80	0.84	4.45	4.40	Good	good	good	good
	0.3	0.81	0.80	4.45	4.41	Good	good	good	good
	0.4	0.78	0.78	4.40	4.45	Good	good	good	good
	0.5	0.75	0.70	4.00	4.50	Good	lumpy	good	fair
Gelitin	0.2	0.74	0.82	4.10	4.40	Good	good	acceptable	good
	0.3	0.74	0.77	4.15	4.45	Good	good	acceptable	food
	0.4	0.74	0.74	4.05	4.45	Good	good	fair	fair
	0.5	0.76	0.70	4.00	4.45	Good	lumpy	fair	fair
Sodium alginate	0.2	0.80	0.60	4.50	4.40	Good	good	acceptable	good
	0.3	0.79	0.78	4.96	4.45	Firm	firm	acceptable	good
	0.4	0.76	0.75	4.66	4.50	Loose	good	fair	good
	0.5	0.75	0.73	4.75	4.50	Loose	lumpy	fair	acceptable

PO=Palm oil, SO = Safflower Inoculum 3%

used diminished the acidity of the product. Corn flour, gelatin and sodium alginate were found suitable at 0.2 to 0.3 per cent level in imparting a firm body and desired flavour in yoghurt made from filled milk using palm oil and safflower oil with 100% and 75% replacement, respectively. These additives also minimized the wheying off. The starch was, however, found unsuitable.

Biochemical changes during storage: The results on bio-chemical changes in respect to breakdown of carbohydrates, protein and fat during three days storage at room temperature (30°C) were monitored. The data in Table 6 indicated that the proteolytic changes in

Table 6 : Biochemical changes in filled milk yoghurt during storage®

Type of Yoghurt	Acidtiy (% lactic acid)	pH	Proteolysis (mg Tyrosine liberated/g sample)	Lipolysis (Milliomoles of FFA/ 10 g of sample)	Body	Flavour
Buffalo milk yoghurt						
24 hours	0.68	4.44	0.21	0.007	Loose	Acidic
48 hours	0.85	4.25	026	0.010	Good	Yoghurt flavour
72 hours	1.20	4.15	0.29	0.090	Firm	Highly acidic
Yoghurt with palm oil (75:25):						
24 hours	0.70	4.20	0.21	0.008	Loose	Acidic
48 hours	0.87	4.15	0.27	0.087	Good	Yoghurt flavour
72 hours	1.25	4.05	0.33	0.091	Good	Highly acidic
Yoghurt with safflower oil (75:25):						
24 hours	0.76	4.60	0.18	0.002	Firm	Desirable
48 hours	0.99	4.32	0.24	0.007	Firm	Slightly acidic
72 hours	1.32	4.01	0.27	0.012	Firm	Highly acidic

®Average of 5 trails ST:LB ratio 1:2 (3% concentration)

yoghurt made from filled milk with fat sources from palm soil and safflower oil were similar to those in yoghurt prepared from buffalo milk (control samples). The lipolytic changes were also similar in yoghurt from buffalo milk and palm oil but different in safflower filled yoghurt. The latter appeared to be less prone to lipolysis. The body and texture of the product were not substantially influenced by the storage period but the product imparted highly acidic flavour at end of 72 hours of storage due to high acid development. However, the results suggested that the biochemical changes occurring in yoghurt, both in control and filled milk were not pronounced and did not affect the quality of the product adversely.

The beneficial effects of yoghurt consumption are attributed mainly to the biochemical changes brought about during the fermentation process.

References

BIS (1960). Methods of test for dairy industry, IS: 1479-Part I. Rapid Examination of milk. Bureau of Indian Standards, Manak Bhavan, New Delhli.

Frankel, C.N. and Tarassuk, N.P. (1955). An extraction method of free fatty acids in rancid cream. *J. Dairy Sci*. 38 : 751.

Hull, M.E. (1947). Studies on milk protein by calorimetric determination of partial hydrolysis of protein. *J. Dairy Sci*. 30 : 881.

Lxminarayana, H. (1970). Use of genetic variants for the preparation of improved cultured milk. PL-480 Project, ICAR, NDRI. 60.

Madan Lal; Sachdeva, Meena; Gandhi, D.N. and Nambudripad, V.K.N. (1978). Studies on selection of starter culture for manufacture of yoghurt. *J. Food Sci. Tech.* 15 : 20.

Malik, R.K.; Rao, K.V.S.S.; Rao, K.N.; Mathur, B.N. and Sahai, D. (1998). Yoghurt: role of live micro organisms in human nutrition and health. *Indian Dairyman* 50 (9) : 37-46.

Sarkar, S. and Misra, A.K. (2006). Potential of goat milk for yoghurt manufacture- a review. *Indian J. Dairy Sci*. 59 (5) : 271-280.

Teuber, M. (1995). The influence of fermentation on the nutritional quality of dairy products-facts and fictions. The Word of Ingredients. Jan.-Feb. 1995.pp. 43-46.

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Changes in Nutrients Composition of Vegetables Grown in Sewage Water Irrigated Area

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Introduction

Utilization of sewage water for vegetable production in peri-urban areas has become a common practice, as the availability of fresh water for irrigation is getting reduced day by day in arid and semi-arid areas. Water resources are limited and a large gap exists between fresh water supply and amount required for irrigation therefore, municipal sewage water can be used as a source of plant nutrients and water (Bhatia *et al* 2001). Continuous use of sewage water in irrigation results in high yields undoubtly but quality of crop produce some time is not up to the mark. Although sewage water supplies an appreciable amount of macro and micro nutrients but necessary caution needs to be exercised in its use with regard to metal content. Sewage water irrigation paves the way for safe disposal of sewage through land treatment and avoids potential environmental hazards. Soil is most effective sink due to higher metabolic rates to transform waste material into useful products to plant and soil (Velayutham and Bhardwaj 1994). Apart from various factors which are responsible for change in composition and quality of vegetables crops, irrigation water seems to be an important. Source and quality of irrigation water determines the make up of crops grown. There is growing interest in sewage water recycling for irrigation in urban areas. The Varanasi city is one of the appropriate examples where sewage water is being used by vegetable growers for irrigating their crops. Presents work attempts to study the changes in nutrients composition of vegetables grown under sewage irrigation practices in Bhagwanpur area of varanasi.

Methods and Materials

Some important Rabi and Zaid season vegetable crops were collected for study from selected sewage irrigated sites during 2005-06 from Bhagwanpur area and tube well irrigated vegetables were also collected for making comparison. Common vegetables of winter season namely cauliflower (*Brassica oleracea* var. botrytis), cabbage (*Brassica oleracea* var. capitata), Brinjal (*Solenum melongina*), tomato (*Lycopersicon esculentum*), spinach (*Spinacia oleracea*) and radish (*Rahanus sativus*) were collected from sewage irrigated and tube well irrigated areas for study. Cucumber (*Cucumis sativus*), pumpkin (*Cucurbita moschata*), sponge gourd (*Luffa cylindrica*), bottle gourd (*Lagenaria siceraria*), bitter gourd (*Momordica charantia*), cowpea (*Vigna sinensi*), okra (*Abelmoschus esculentus*), fenugreek (*Fenugreek arvensis*) and onion (*Allium cepa*) vegetables were collected in summer season. Vegetable crop samples were collected from four sites (10 samples of each crop from each sites and made composite) and composite samples from tube well irrigated area were also collected for comparative study.

The collected vegetables samples were washed successively with tap water and de-ionized water. Washed samples were dried in oven at 65^0c and then ground. For N estimation representative samples were taken in 125 ml digestion tubes, 5gm digestion mixture and 10 ml H_2SO_4 was added to digestion tube and was allowed to react over night. Next day samples were digested and distillation of samples was done over Kel Plus N analyzer. For Phosphorus, Potassium and micro nutrients (viz. Fe, Cu, Mn, Zn) determination, plant samples were digested with di-acid (HNO_3: $HClO_4$, 9:4). Phosphorus and Potassium readings were taken on Spectrophotometer (Olsen *et al* 1954) and Flame photometer (Jackson M.L. 1973) and micro nutrients were analyzed by using Atomic Absorption Spectrophotometer (AAS) as per methods given by Lindsay and Norvell (1978).

Results and discussion

Nutrients Composition of Rabi Season Vegetables

Data regarding N, P and K concentration in winter season vegetables viz cauliflower (*Brassica oleracea* var. botrytis), cabbage (*Brassica oleracea* var. capitata), brinjal (*Solenum melongina*), tomato (*Lycopersicon esculentum*), spinach (*Spinacia oleracea*) and radish (*Raphanus sativus*) is given in Table 1. These vegetable crop samples were collected from sewage water irrigated as well as tube well water irrigated areas. The data pertaining to Nitrogen content in vegetables shows that nitrogen content varied from 35.4 to 56.7 g kg^{-1} being highest in spinach and lowest in radish in sewage water irrigated vegetables. Whereas in tube well water irrigated vegetables nitrogen ranged from 22.8 to 42.2 g kg^{-1} irrespective

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of vegetable types. Overall nitrogen content in different winter season vegetables of sewage water irrigated area is higher than tube well irrigated ones. This may be due to the fact that sewage water is supposed to be a good source of available N P K and these becomes readily available to plant thereby increasing their concentration in plants. In case of tube well water irrigated vegetables the same trend of N content was also observed Table 1.

Phosphorus content in various vegetables of sewage water and tube well water irrigated areas collected in winter season is given in Table 1. Phosphorus content in sewage water irrigated vegetables ranged from 4.7 to 11.0 g kg^{-1} irrespective of vegetable types, whereas in tube well irrigated vegetables it ranged from 2.9 to 7.8 g kg^{-1} Table 1. Data further shows that different vegetable crops have different phosphorus status which may be mentioned as cabbage > spinach > cauliflower > brinjal > tomato > radish in case of sewage water irrigated vegetables whereas in case of tube well water irrigated vegetables, phosphorus content may be arranged as cabbage > cauliflower > spinach > brinjal > radish > tomato Table 1.

The potassium element is known for luxury consumption by plant irrespective of type and species because it does not make bond inside the plant body. The vegetable samples collected from sewage irrigated areas accumulated higher potassium than those of collected from tube well irrigated areas. In all the vegetables, spinach had highest amount of potassium (i.e. 54.4 g kg^{-1}) and tomato (28.0 g kg^{-1}) had lowest potassium content. Overall the data showed that sewage water irrigated vegetables had higher amount of N, P and K in comparison to tube well water irrigated vegetables. Higher NPK contents in vegetables receiving treated sewage water have also been reported by Saraswat *et al* (2007).

The concentration of micronutrients (viz. Fe, Cu, Zn and Mn) in various vegetable crops viz. cauliflower (*Brassica oleracea* var. botrytis), cabbage (*Brassica oleracea* var. capitata), brinjal (*Solenum melongina*), tomato (*Lycopersicon esculentum*), spinach (*Spinacia oleracea*) and radish (*Raphanus sativus*) is given in Table 1. Data regarding micro nutrients contents showed that iron content in different vegetables ranged form 79 to 295 mg kg^{-1}. Further data indicates that sewage water irrigated vegetables contained higher amount of Fe in comparison to tube well irrigated vegetables. These higher amounts of Fe in vegetables may be due to higher availability of Fe in sewage water. Patel *et al* (2004) reported that different vegetable crops accumulate invariably higher amount of Fe irrespective of type of water indicating a fact of variable uptake as a function of crop species and selectivity of element. In sewage water irrigated vegetables Zn ranged from 26.4 to 95.0 mg kg^{-1} whereas in tube well irrigated vegetable it ranged from 20.8 to 88.0 mg kg^{-1} respectively Table 1. The concentration of Zn above the range of 150 – 250 mg kg^{-1} in dry matter of plant tissue is considered as toxic. In present study the Zn concentrations were below the prescribed toxic range but were well higher than the tube well irrigated range. Mitra and Gupta (1999) also reported that among the heavy metals present in consumable parts of the vegetables the concentrations of Fe and Zn were comparatively high. Lindsay (1979) had opinion that Zn becomes readily available to plants over a fairly wide range of soil condition.

The distribution of Cu in different vegetables of sewage water irrigated area varied 22.0 to 70.4 mg kg^{-1} being lowest in cabbage and highest in spinach whereas in tube well irrigated vegetables Cu ranged form 15.0 to 50.0 mg kg^{-1}. Data further shows that Cu contents in all vegetables were well in the range of critical limit of phytotoxicity (i.e. 20 – 100 mg kg^{-1}), but for most of the plant species, the optimum limit of this element is considered in the range of 4.0 to 15.0 mg kg^{-1} in dry matter (Alloway, 1968). The high concentrations of Cu

Table 1: Nutrient contents in Rabi season vegetable crops irrigated with sewage water (SW) and tube well (TW).

Crops	Nutrients in (g kg^{-1})						Micronutrients (mg kg^{-1})							
	N		P		K		Fe		Cu		Mn		Zn	
	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW
Cauliflower	42.0	35.5	9.0	6.2	33.7	22.8	200	180	25.0	15.0	12.2	9.7	95.0	88.0
Cabbage	41.2	34.0	11.0	7.8	29.3	23.9	210	170	22.0	16.0	11.8	7.8	92.0	85.4
Bringal	45.0	29.4	7.1	4.2	36.8	32.2	190	120	30.4	24.2	104.5	99	46.6	32.0
Tomato	49.0	41.5	5.0	2.9	28.0	20.8	190	95	49.6	27.2	95.0	53.0	45.6	36.2
Spanich	56.7	42.2	9.8	5.8	54.4	44.9	225	79	70.4	50.0	68.0	45.0	26.4	20.8
Radish	35.4	22.8	4.7	3.3	42.2	34.8	295	110	60.2	16.3	29.0	22.0	34.2	26.4
Critical Limits of phytotoxicity*	-		-		-		>500		20-100		>500		150-250	

* Mortvedt *et al* (1991) and Tondon (1995).

Cd, Pb, Ni and Cr were not detectable in triacid mixture digest of vegetables.

Table 2: Nutrient contents in Zaid season vegetable crops irrigated with sewage water (SW) and tube well (TW).

Crops	Nutrients in (g kg^{-1})						Micronutrients (mg kg^{-1})							
	N		P		K		Fe		Cu		Mn		Zn	
	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW	SW	TW
Cucumber	23.3	21.0	5.1	4.2	42.3	36.7	60	29	38	20	124	102	70	60
Pumpkin	37.2	34.2	4.2	3.8	29.2	22.9	30	20	33	18	130	96	66	52
Sponge gourd	31.7	26.4	3.7	3.1	32.3	28.4	42	18	36	25	240	190	50	42
Okra	35.1	30.2	4.3	3.5	22.2	20.1	36	23	48	28	205	176	76	61
Fenugreek	25.7	23.2	5.2	4.2	29.4	26.7	42	21	30	21	170	152	95	73
Cow pea	31.2	29.4	4.7	4.3	30.1	28.2	44	20	29	18	250	201	72	60
Bitter gourd	24.2	20.9	4.3	3.8	22.3	19.4	32	26	28	19	140	112	62	54
Onion	40.6	34.2	3.6	3.0	26.2	22.4	26	15	31	22	120	102	56	46
Bottle gourd	23.3	19.4	4.1	3.3	34.6	29.4	29.0	19	34	16	170	140	72	63

The heavy metals such as Pb, Ni, Cr, Cd were not detectable in triacid digest of vegetables.

in consumable parts of vegetables were also reported by Mitra and Gupta (1999) and Adhikari, *et al* (1998). Different vegetable crops accumulated different concentrations in their consumable parts. This may be due to the fact that crops species exercise differentially in accumulating metals in their tissues.

Distribution of Mn in different vegetables given in Table 1 reveals that it ranged from 7.8 to 104.5 mg kg^{-1} being lowest in cabbage and highest in brinjal respectively in sewage water irrigated as well as tube well irrigated vegetables. As far as critical phytotoxicity limits are concerned Mn concentrations were below the prescribed limit (i.e. > 500) of phytotoxicity. In cauliflower and cabbage the Mn concentration was less than the critical Mn deficiency level of 20 mg kg^{-1} dry weight. The low content of Mn in some vegetables may be attributed to antagonistic interactions of different heavy metals. Overall this may be summarized that vegetables collected from sewage water irrigated areas in winter season had higher plant nutrient contents than those collected from tube well irrigated areas in the same season.

Nutrients Composition of Zaid Vegetables

Macronutrient (N, P and K) and micronutrient (Fe, Cu, Mn and Zn) status of different summer vegetables viz. cucumber (*Cucumis sativus*), pumpkin (*Cucurbita moschata*), sponge gourd (*Luffa cylindrica*), bottle gourd (*Lagenaria siceraria*), bitter gourd (*Momordica charantia*), cowpea (*Vigna sinensi*), okra (*Abelmoschus esculentus*), fenugreek (*Fenugreek arvensis*) and onion (*Allium cepa*) collected from sewage water irrigated and tube well irrigated areas are given in Table 2.

The data regarding N, P and K distribution in different summer vegetables clearly indicate that onion, cucumber and bottle gourd respectively were higher and lower accumulator of nitrogen in sewage irrigated vegetables whereas in case of tube well irrigated vegetables pumpkin and onion both registered highest nitrogen content, bottle gourd being lowest in nitrogen content Table 2. Sewage water and tube well irrigated vegetables did not show any marked variation with regard to phosphorus distribution in them. But phosphorus contents were definitely higher in sewage water irrigated vegetables than those collected from tube well irrigated areas. The potassium concentration in various vegetables collected in summer season from sewage irrigated as well as tube well irrigated areas is given in Table 2. Data further indicate that cucumber accumulated highest amount of potassium in both sewage water and tube well water irrigated area. Okra accumulated lowest amount of K in sewage irrigated area and in case of tube well irrigated area bitter gourd accumulated lowest amount of potassium. A critical perusal of data shows that potassium content among all vegetables collected from sewage water irrigated areas ranged from 22.2 to 42.3 g kg^{-1} whereas in case of tube well irrigated vegetables potassium content varied form 19.4 to 36.7 g kg^{-1}. Results of study again confirmed that sewage water irrigated vegetables had higher amount of potassium in comparison to tube well irrigated vegetables.

Micronutrient (Fe, Cu, Mn and Zn) contents of different vegetables collected in summer season from sewage water and tube well irrigated area are given in Table 2. The copper content of sewage irrigated vegetables ranged form 26 to 60 mg kg^{-1} being lowest in onion and highest in cucumber. The tube well irrigated vegetables showed a copper variation from 15 to 29 mg kg^{-1} indicating the same trend as obtained from sewage irrigated vegetables. The sewage irrigated vegetables showed higher amount of copper than that of tube well irrigated vegetables. This is because of the fact that sewage water contains much more amount of copper (data not given) in comparison to tube well water. But the copper content of all vegetables collected from

sewage water and tube well irrigated area were well in the range of phytotoxicity limits (i.e. 20-100 mg kg^{-1}).

The concentration of zinc in consumable parts of all summer vegetables is given in Table 2. Data revealed that zinc had a variation from 16 to 48 mg kg^{-1} irrespectively of irrigation source and type of vegetables. But as far as sewage irrigated vegetables are concerned okra registered highest amount of zinc (48 mg kg^{-1}) and bitter gourd registered lowest (i.e. 28 mg kg^{-1}). In case of tube well irrigated vegetables bottle gourd and okra were lowest and highest accumulator of zinc in consumable parts respectively.

The iron distribution pattern given in Table 2 shows that onion accumulated lowest amount of iron (i.e. 120 mg kg^{-1}) and cowpea registered highest amount of iron (i.e. 250 mg kg^{-1}) in vegetables collected from sewage water irrigated vegetables. The content of iron in tube well irrigated vegetables ranged from 96 to 201 mg kg^{-1} being lowest in pumpkin and highest in cowpea. In present investigation the Fe & Zn contents were well within the prescribed phytotoxic limits. But their concentrations were higher than the rest of elements. This has been reported that among the micronutrients present in consumable parts of vegetables (Mitra and Gupta, 1999) the zinc and iron contents remain high comparatively.

The data regarding Mn distribution pattern given in Table 2 reveals that Mn varied from 50 to 95 mg kg^{-1} being lowest in sponge gourd and highest in fenugreek in vegetables collected from sewage water irrigated areas. In tube well irrigated vegetables sponge gourd and fenugreek were lowest and highest accumulator of Mn respectively in their consumable parts. As far as critical phytotoxicity limits of Mn in plants are concerned Mn contents were found to be in the range of prescribed limit (i.e.>500 mg kg^{-1}). On the basis of dry weight (Ohki, 1981) values less than 20 mg kg^{-1} are considered deficiency levels. In present investigation not a single vegetable showed deficiency levels of Mn in their consumable parts. On the basis of chemical analysis this can be summarized that vegetables collected from sewage water irrigated area in summer season contained higher amount of plant nutrients than those collected from tube well irrigated area in the same season.

Conclusion

Besides nutrient potential, sewage irrigation also has some problems of metal accumulation in soil and plant system. Present study confirmed that nutrient contents in sewage irrigated vegetables were obviously higher in comparison to tube well irrigated vegetables but by and large metal contents were within the generalized limits of phytotoxicity. Regular monitoring needs to be exercised in the use of sewage irrigation for vegetable production.

References

Adhikari, S; Mitra, A; Gupta, S.K. and Banarjee, S.K.(1998). Pollutant metal contents of vegetables irrigated with sewage water. Journal of the Indian Society of Soil Science 46: 153-155.

Alloway, W.H. (1968).Agronomic control over plant factors. Advances in Agronomy 20:235-238.

Bhatia, Arti., Pathak, H. and Joshi, H.C. (2001).Use of sewage as a source of plant nutrients. Fertilizer News March 2001, 463: 55-58 & 61-64.

Jackson, M.L. (1973). Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd. New Delhi.

Lindsay, W.L. and Norvell W.A. (1978). Development of a DTPA soil test for Zn, Fe, Mn and Cu. Soil Science Society of America Journal 42: 421-428.

Lindsay, D.G. (1979). Possible health hazards from the presence of persistent chemical residue in sewage sludge. In: Proceedings of water research conference. Water research centre, Stevenage Laboratory, Elder way, Stevenage Harfordshire, England.

Mitra, A. and Gupta, S.K. (1999). Effect of sewage water irrigation on essential plant nutrients and pollutant element status in a vegetable growing area around Calcutta. Journal of the Indian Society of Soil Science 47: 99-105.

Mortvedt J.J; Cox, F.R. Shuman, L.M and Welch, R, (1991). Micronutrients in Agriculture, II ED. Soil Science Society of Americ. Inc. Madison, USA. 332-333.

Olsen, S.R., Cole, C.V., Watnable, F.S. and Dean, L.A. (1954). Estimation of available phosphorus in soils by extraction with sodium bi carbonate. Circular of USDA. 939: US Govt. Printing Office Washington D.C.

Ohki, K. (1981). Effects of heavy metal pollution on plants. Journal Plant Nutrients 3: 271-274.

Patel, K.P., Pandya, R.R., Maliwal, G.L., Patel, K.C., Ramani, V.P. and George, V. (2004). Heavy metal contents in different effluent and their availability in soils irrigated with effluent water around major industrial cities of Gujrat. Journal of the Indian Society of Soil Science 52: 89-94.

Sara swat, P.K., Sanjay Kumar and Tiwari, R.C. (2007). Effects of treated sewage water irrigation on soil quality and composition of vegetable crops. Journal of Rural and Agricultural Research 7: 10-15.

Tandon, H.L.S. (1993). Methods of Analysis of Soils, Plants, Waters and Fertilizers. Fertilizer Development and Consultation Organization. (2004). A Bhanot Corner, 1-2, Pam posh Enclave New Delhi 110048.

Velayutham, M. and Bhardwaj, K.K.R. (1994). Soil and Agricultural waste disposal. Indian Farming 2: 39-41.

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Long Term Effects of Manure and Fertilizer Application on Physico-chemical Properties of Soil under Rain fed Conditions

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Introduction

Technological developments in field of agriculture have increased the production many fold, but they also have posed a pressure on soil. Management strategies and production have to match the capabilities of soil resource. There are many factors responsible for bringing out changes in physico-chemical and microbiological properties of soil. Among them, nutrition of soils in terms of fertilizer and manure and nature of crops grown there on seem very much close. A sound knowledge of soil with respect to characteristics and potential use is extremely important for optimizing their potential. Productivity of soil is a function of fertility and soil management practices e.g. Fertilizer and manure application and irrigation etc. Irrigation facility in India covers hardly 40 per cent of cultivated area and rest food grain production comes from Dry land and Rain fed agriculture. Rain-fed Agriculture in India extends over 97 M ha (67%) of the cultivated area and contributes 44 per cent to the national food basket.

In rain-fed area, cropping intensity and crop yield are generally low (Singh and Brar 1985) due to low organic matter content, poor water retention and course nature of soil.

Consequently, there is more interest in utilizing rain-fed soil of marginal productivity with judicious use of organic manures and chemical fertilizers for crop production. Organic manures have long been considered as a desirable soil amendment for improving and sustaining soil health (Terter, 1990). There is hardly any scope for increasing the area under cultivation, therefore, increasing and maintaining the production potential of rain fed soils remains as an alternative.

Having considered the comparative advantage of integrated plant nutrient management in rain fed soils for boosting the productivity of the same, a permanent field experiment on integrated nutrient management in paddy-lentil system was initiated in kharif season (1986) at Agricultural Research Farm of Banaras Hindu University, Varanasi. At the time of start of experimentation the grain and straw yield of rice was 31 and 37 Qh^{-1} respectively. After eighteen years of experimentation, soil and plant samples were collected and analyzed to gather the information on the changes occurred in due course of time as a result of long term fertilizer and manure application. The present study aims to assess the changes in soil parameters and yield, uptake and nutrient translocation pattern in paddy crop. Eight treatment combinations viz. T_1- Control (No use of fertilizers), T_2- 100% Recommended dose fertilizers (80:40:30::N:P_2O_5:K_2O), T_3- 50% Recommended dose of fertilizers (40:20:15::N:P_2O_5:K_2O) , T_4- 50% N through FYM (8 t ha^{-1}), T_5- 50% N through FYM+ 50% NPK fertilizers , T_6- 100% N through FYM (16 t ha^{-1}), T_7- 50% NPK fertilizers(40:20:15) + 50% N through two foliar dose and T_8- Farmer's Practices (20 kg N through urea) were laid in randomized block design with three replications. All the treatments were applied to paddy crop and lentil (Var. P-406) was grown on residual soil fertility. The sources of N, P and K were urea, single super phosphate and muriate of potash, respectively. The climate of the area is semi-arid and sub-humid with annual rainfall 1000 mm and soil belongs to the order Inceptisol (udic, ustechrept). The important characteristics of the soil at the beginning of experiment were: pH 7.4, EC 0.1dS m^{-1}, Bulk density 1.39 mg m^{-3}, Water holding capacity 36%, O.C. 4.3 g/kg, CEC 13.7 Cmol. (P+) kg^{-1}, available N 100.45 mg kg^{-1}, Olsen P mg kg^{-1}, NH_4OAC K 73.5 mg kg^{-1} and available S 10.7 mg kg^{-1}.

Bulk density: The bulk density of the soil at the beginning of the experiment was 1.39 m^{-3}. The data pertaining to BD of soil given in table 1 reveals that bulk density decreased significantly in FYM treated plot (T_6) and increased in fertilizer treated plots at both depths. FYM being purely organic source attributed to high amount of organic carbon and resulted in decreased BD of soil. The low level of BD obviously represents high organic matter content in soil. Use of fertilizers increased the bulk density of soil, which might be due to deterioration of soil structure by inorganic fertilizers (Bellakki and Badanur, 1997). Further reduction in bulk density, in FYM treated plots is expected due to positive impact of organic manure The organic sources like FYM are not only store house of plant nutrients but help considerably to improve physico – chemical properties of soil (Bandyopadhyay and Puste.1999).

Water holding capacity

Long term application of different treatment has greatly influenced the WHC of soil in plough layer and sub soil zone (Table 1). Data clearly reveals that soils of T_6 had highest WHC (40.23 and 38.0%) in

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Table 1 Effect of different treatments on pH, E.C, C.E.C, bulk density, and water holding capacity at different depth of soil.

Treatments	pH		EC (dSm^{-1})		CEC [cmol(p+)kg^{-1}]		BD (Mg M^{-3})		WHC (%)	
	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2
T_1 Control (no use of fertilizers)	7.1	7.2	0.095	0.09	12.5	2.8	1.41	1.45	33.12	30.0
$T_2$100% Recommended dose fertilizers(80:40:30: : N:P_2O_5: K_2O)	6.4	6.7	0.13	0.11	13.7	3.2	1.43	1.47	35.32	32.8
$T_3$50% Recommended dose fertilizers(40:20:15:: N:P_2O_5: K_2O)	6.5	6.8	0.12	0.10	13.0	3.0	1.42	1.45	33.18	32.0
$T_4$50% N through FYM (8 t h^{-1})	7.0	7.3	0.11	0.10	14.1	3.2	1.37	1.40	36.67	34.7
$T_5$50% N through FYM +50 % NPK fertilizers	6.9	7.2	0.14	0.12	14.7	4.0	1.33	1.37	38.57	35.5
$T_6$100% N through FYM (16 t ha^{-1})	7.0	7.2	0.12	0.11	15.3	4.3	1.30	1.34	40.23	38.0
$T_7$50% NPK fertilizers+ 50% N through two foliar dose	6.5	6.7	0.11	0.10	13.5	3.1	1.43	1.47	35.17	32.5
T_8 Farmer's Practices (20 kg N through urea)	6.1	6.2	0.12	0.11	11.7	2.80	1.45	1.49	32.00	29.4
SEM+-	0.08	0.09	0.01	0.01	0.48	0.08	0.002	0.03	0.08	0.89
LSD at 5%	0.17	0.19	0.02	0.02	1.02	0.18	0.048	0.56	1.78	1.90

D_1 = 0-15 cm D_2 = 15-30 cm

surface and sub surface layer respectively in comparison to others fields under study. Water holding capacity of soil increased significantly in surface and subsurface soil with the increase of FYM. Maximum water holding capacity was observed in T_6 followed by 50% NPK (T_5) treatment (Table 2). WHC of soil depends on its physical properties like depth, bulk density, aggregation etc. Here improvement in water holding capacity of soil might be attributed due to increase in organic matter and total porosity of soil, thereby improved soil structure. These results are in agreement with the finding of Bellakki and Babanur (1997) and Sharma *et al*., (2000).

Soil pH: Data given for soil pH shows slightly lower pH in treatments receiving inorganic fertilizers continuously in comparison to treatments receiving FYM either alone or in combination with 50% NPK fertilizers (Table 1). Increased removal of cations due to acidifying effects of inorganic fertilizers might have resulted in lowering of soil pH. FYM application maintained the soil reaction as it imparts buffering effect. Under present study soil pH got slightly increased, whereas EC went on decreasing with increase in soil depth and this may be due to increase in cation concentration in plough layer of soil (Sharma *et al*., 1988).

Cation exchange capacity: The CEC of soil before start of experiment was 13.7 cmol. (p^+) kg^{-1}. Data indicate that CEC ranged from 11.7 to 15.3 at 0-15 cm and 10.9 to 14.5 coml. (p^+) kg^{-1} at 15-30 cm depth respectively (Table 1). Maximum CEC was found in T6 plot followed by T_5. Increase in organic colloids and humus increases the CEC and more over kinds and nature of organic colloids also govern the CEC of soil. Addition of FYM along with inorganic N (i.e. T_4, T_5, and T_6) has influenced the CEC in surface and sub surface of soil (Table 1). Full dose of N through FYM registered a significant increase in CEC at both depths and in T_5 and T_4 plots CEC went on decreasing accordingly. These findings are in agreements with those of Bellakki and Badanur (1997). CEC of T_5 was higher in comparison to T_4. Additional supply of 50% NPK to T_5 stimulated the root and shoot growth resulting into higher CEC. The CEC of surface soil was more than that of the subsurface soil, due to high organic content in surface soil.

Organic carbon and Macronutrients status of soil: Data pertaining to OC, available NPK and S at different depth in soil is given in Table 2. Initial status of soil organic carbon was 4.3 g kg^{-1} in surface soil. After 18 years of cultivation, it ranged from 3.1 to 5.2 in surface and from 2.8 to 4.3 g kg^{-1} in subsurface soil respectively (Table 2). Incorporation of FYM alone and or in combination with chemical fertilizers (T_6 and T_5) as compared with recommended dose of fertilizers (T_2) increased soil OC significantly. Although T_4 also registered a slightly higher OC but it was non significant. This could be attributed to addition of higher quantity of FYM, higher production of biomass and somewhat resistant nature of FYM to microbial decomposition in soil (Kamimura *et al*. 1994 and Babhulkar *et al*., 2000).

Available N: Available N content of soil as influenced by different treatments is presented in table 2. Before the start of field experiment in 1986, the status of available N was 100.45-mg kg^{-1}. It is clear from the table that available N content of soil varied from 80.09 to 106.12 and from 67.0 to 90.5 mg kg^{-1} in surface and subsurface soil sample respectively. The highest available nitrogen was recorded in 100% FYM supplied field (T_6) followed by T_5 and T_2 at both depths of sampling. The increase in available nitrogen of FYM supplied treatment as compared to other may be ascribed as a function of

Table 2 Effect of different treatments on organic carbon (g kg^{-1}), available NPK and S (mg kg^{-1}) at different depth of soil.

Treatments	Organic carbon		Available N		Available P		Available K		Available S	
	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2
T_1 Control (no use of fertilizers)	3.2	2.8	80.1	67.0	3.9	2.5	53.7	68.0	8.0	6.5
$T_2$100% Recommended dose fertilizers(80:40:30: : N:P_2O_5: K_2O)	4.0	3.2	100.8	82.8	7.2	5.0	72.2	83.4	10.0	8.6
$T_3$50% Recommended dose fertilizers(40:20:15::N:P_2O_5: K_2O)	3.6	3.0	92.4	72.5	5.7	3.9	68.0	77.8	9.2	7.5
$T_4$50% N through FYM (8 t h^{-1})	4.1	3.2	95.7	80.6	5.4	3.7	59.2	70.5	8.5	7.8
$T_5$50% N through FYM +50 % NPK fertilizers	5.0	4.0	102.5	85.0	8.2	5.8	78.6	90.9	11.2	9.0
$T_6$100% N through FYM (16 t ha^{-1})	5.2	4.3	106.1	90.5	6.3	4.0	68.0	77.8	10.8	8.5
$T_7$50% NPK fertilizers+ 50% N through two foliar dose	3.8	3.1	95.0	82.5	5.3	4.0	66.6	76.2	9.0	7.8
T_8 Farmer's Practices (20 kg N through urea)	3.1	2.8	81.9	68.9	3.5	2.6	48.3	62.0	7.0	6.4
S.E m+LSD at 5%	0.01	0.08	2.67	1.98	0.35	0.34	1.69	3.33	0.33	0.21
	0.22	0.18	5.73	4.26	0.75	0.72	3.62	7.14	0.71	0.46

D_1 = 0-15 cm D_2 = 15-30 cm

greater multiplication of soil microbes, which could have converted organically found N to inorganic form. Similar results were also reported by Sarkar and Singh (2002) and Yaduvanshi (2001).

Available P: 50% NPK+ FYM (T_5) and 100% NPK application as fertilizer (T_2) registered a higher build up of available P in comparison to others, whereas T_6 showed lower content of available P (i.e. 6.3 mg kg^{-1}). Full supply of N through FYM (T_6) might have solubilized native P of soil through release of organic acid resulting into reduction in available P of soil. A significant reduction in available P content of soil was observed under farmer's practice (T_8) and control T_1 (Table 2) as result of higher crop removal in the absence of external source of P. These results are in agreement with that of Sarkar and Singh (2002).

Available K: Addition of 50% NPK+ 50% FYM showed significant higher availability of K than 100% NPK alone. The beneficial effect of FYM on K availability is due to additional K supply through FYM and release of K due to the interaction of organic matter with clay (Mathur, 1997). Solubility of K^+ ions and textural composition of soil have played a greater role in distribution of available K in soil layers. Comparatively higher concentration of K was recoded in sub surface layer (i.e. 15-30 cm) of soil as the high sand makes soils more prone to K^+ ions movement in lower layers.

Available S: The available sulphur content in soil increased significantly in all treatments. It may be due to addition of phosphorus through single super phosphate which in advertantly supplies sulphur. Increase in available S with addition of FYM alone or in combination with fertilizers may be due to improvement in organic carbon content of soil. There was a reduction in the content of available S at both the surfaces where the plots did not receive this nutrient either directly or through FYM (Table 3). These finding are agreement with those of Sharma *et al*, (2001) and Singh *et al*, (2001).

Yield and Nutrients Uptake by Paddy: The data pertaining to paddy and straw yield, uptake and translocation of NPKS to grain has been given in table 3. Among all the treatments, T_5 produced highest grain + straw yield followed by T_2, T_6, T_7, and T_3, T_4, and T_1 respectively. Data further showed that T_5 having 50% NPK +50% N through FYM could yield just equal to 100% recommend dose of fertilizer (i.e. T_2), thus indicating a saving of 50% dose of chemical fertilizer. Although yield data of T_6 was also approaching towards T_5 (Table 3). FYM being a direct source of macro and micro nutrients might have contributed towards yield enhancement. The similar findings with respect to integrated use of FYM and chemical fertilizer have also been reported by Bindia *et. al* (2005) and Debtanu and Das (2005) and both have concluded that application of FYM curtails the NPK requirements and play an important role in rice- wheat crop sequence. Data given for NPK uptake pattern further reveals that N, P and K uptake in crop plant were significantly higher in T_5 followed by T_6 and T_2 for N, T_2 and T_6 for P and K respectively (Table 3). Presence of FYM to meet out 50% requirement has made it possible for realizing the need of IPNM for correcting the imbalance of plant nutrients. Mukharjee *et. al.* (1995) also pointed out that integrated use of organic manure with chemical fertilizers has been more effective than that of chemical fertilizers alone in augmenting crop productivity.

Combined use of FYM and chemical fertilizers also augmented macro nutrient translocation to paddy grain.

Table 3: Effect of different treatments on yield, uptake and NPK and S translocation of paddy crop.

Treatments	Yield (Q/ha)		Uptake (Kg/ha)				Translocation (%)			
	Grain	Straw	N	P	K	S	N	P	K	S
T_1- Control (no use of fertilizers)	21.1	32.6	35.70	11.13	42.38	8.70	61.45	56.87	15.43	48.50
T_2- 100% Recommended dose fertilizers	38.3	46.20	63.38	26.35	74.69	20.53	66.17	59.65	19.50	50.41
T_3- 50% Recommended dose of fertilizers	31.2	40.90	54.61	19.52	62.23	14.53	63.98	57.82	17.03	49.31
T_4- 50% N through FYM (8 t ha^{-1})	30.3	38.5	51.49	16.65	57.75	12.92	64.86	58.37	17.33	49.30
T_5- 50% N through FYM+ 50% NPK fertilizers	38.90	46.3	71.61	27.86	78.48	20.47	66.39	60.12	20.34	54.48
T_6- 100% N through FYM (16 t ha^{-1})	37.20	45.5	64.69	22.95	70.8	18.85	65.5	58.34	18.38	49.33
T_7- 50% NPK fertilizers+50% N through two foliar dose	33.5	41.8	58.35	20.43	63.7	16.41	64.86	59.03	17.88	49.00
T_8- Farmer's Practices	26.8	38.3	46.17	14.42	52.62	11.36	62.68	57.56	16.3	49.47
S.E.m±	0.99	0.88	1.04	0.66	1.48	0.64				
L.S.D. at 5%	2.04	1.89	2.24	1.42	3.18	1.30				

Out of eight treatments T_5, T_2 and T_6 showed the same trend of nutrient translocation as observed for nutrient uptake. Nutrient translocation values were significantly higher in T_5 as compared to T_2 and T_6 (Table 3). Use of FYM along with fertilizers might have provided availability and additional supply of nutrients and prolific root system as a result of balanced nutrients availability thereby better absorption of nutrients.

Conclusion

Present study has assessed perspectives of IPNM followed for sufficient long time. The results revealed that IPNM has its incredible benefits with regards to soil health and crop productivity. Application of 50% N through FYM + 50% NPK fertilizers has achieved the same yield as has been obtained from 100% application of NPK fertilizer and maintained the soil in good condition.

References

Bandopadhyay, S and A.M. Puste (1999). Effects of INM on productivity and residual soil fertility status under different rice – pulse cropping system in rain fed laterite belt of West Bengal. Soil Science and Plant Nutrition 44, 139-144.

Debtanu, Maiti and Das, D.K. (2005). Influence of manures and fertilizers on yield and fertility build up of soil under rice-wheat irrigated ecosystem. Indian Journal of Agricultural Sciences 75, 343-345.

Bellakki, M.A. and Badanur, V.P. (1997). Long-term effect of integrated nutrient management on properties of vertisol under dryland agriculture. Journal of the Indian Society of Soil Science 45, 438-442.

Bindia, B.D. Kalia and B.S. Mankotia (2005). Effects of IPNM on growth and productivity of wheat crop. Agricultural Science Digest 25, 235-239.

Mathur, G.M. (1997). Effect of long-term application of fertilizers and manures on soil properties and yield under cotton-wheat rotation in north-east Rajasthan. Journal of the Indian Society of Soil Science 45, 288-292.

Mukharjee, D.; Chattopadhyay, M.K. and Chakravarty, A. (1995). some aspects of chemical changes as influenced by different organic additives in Entisols of Gangetic origin. Advances in Plant Science 8, 169-176.

Santhy, P., Muthuvl, P., Murugappan, V. and Selvi, D. (1998). Long-term effect of continuous cropping and fertilization on crop yield and soil fertility status. Journal of the Indian Society of Soil Science 46, 391-398.

Sarkar, A.K. and Singh, A.P. (2002). Importance of long-term fertilizer use for sustainable agriculture in Jharkhand. Fertilizer News 47, 107-111.

Sharma, M.P., Bali S.B. and Gupta D.K. (2000). Crop yield and productivity of inceptisol as influenced by residue management under rice- wheat cropping sequence. Journal of the Indian Society of Soil Science 48, 506-509.

Sharma, N., Srivastava, L.L., Mishra, B. and Srivastava, N.C. (1988). Changes in some physico- chemical properties of an acid- red soil as affected by long term use of fertilizer and amendments. Journal of the Indian Society of Soil Science 36, 688-692.

Singh, B and Brar, S.P.S (1985). Effect of K and FYM application on tuber yield and K, Ca and Mg concentration of potato leaves. J.of Potassium Res. 1, 174-178.

Singh, M., Singh, V.P. and Sammireddy, K. (2001). Effect of integrated use of fertilizer, nitrogen and farm yard manure or green manure on transformation of N, P, K and S and productivity of rice-wheat system on Vertisol. Journal of the Indian Society of Soil Science 49, 430-434.

Tester F. Cecil (1990). Organic amendment effect on physical and chemical properties of a sandy soil. Soil Science Society of America Journal 54, 827-831.

Yaduvanshi, N.P.S. (2001). Effect of five years of rice-wheat cropping and NPK fertilizer use with and without organic and green manure on soil properties and crop yields in a reclaimed sodic soil. Journal of the Indian Society of Soil Science 49, 714-718.

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Effect of herd size on milk production performance in member and non-member categories of PCDF in Agra district

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Abstract

The present study was undertaken to assess the role of dairying in general and the State Dairy Federation (PCDF) in particular in raising the employment and income generation through milk production in different herd size groups in case of members and non-members of dairy cooperative societies. PCDF collects milk from entire Agra district through various specified routes. One route (Pilthora) having adequate number of milk cooperatives and supplying maximum milk was selected. Seventy five member producers and 75 non-members were selected and categorised into I (upto 2 milch animals),II (3-4 milch animals) and III (5 or more milch animals) herd size groups. The land holding size and distribution of milch animals were also ascertained. The production trails of milch animals elicited that the lactation length and the corresponding milk yield of milch animals were greater in the category of members than in non-members. The milk producers, irrespective of category, preferred to rear more buffaloes than either the crossbreds or local cows.The net income from milk production was also much higher from buffalo rearing followed by crossbred cows and local cows The net income from milk production in various herd size groups was found to be greater in case of those milk producers who were members of dairy cooperative societies (PCDF) as against those who did not avail of such benefits as various inputs, veterinary services and extension services made available to members by the PCDF through respective dairy cooperative societies.

Introduction

The performance of agricultural sector significantly influences the Indian economy. Agriculture (including allied activities) accounted for 17.8 per cent of the GDP at constant prices. Although the share of this sector in GDP has been declining over the years, its role remains critical as it accounts for about 52 per cent of the employment in the country. Apart from being the provider of food and fodder, it provides raw material to the industry. Thus, the prosperity of rural economy is closely linked to agriculture and allied activities (Bhasin, 2009).

Livestock sector plays a key role in Indian rural economy through self-employment, income and food security. This sector provides between 15 to 40 per cent income to nearly 70 per cent of rural households. It employs two third female workforces. Livestock is also important for saving and investment for the poor households and in providing them security. The small and marginal farmers and landless labourers together control 75per cent of the livestock. Livestock is thus an important source of livelihood for these groups of households. The livestock sector contributed over 5.26 per cent to the total GDP during 2006-07 and accounted for 31.7 per cent GDP of agriculture and allied activities. The 11th Five Year Plan envisages an overall growth of 6-7 per cent per annum for this sector. In 2007-08, this sector contributed 104.8 million tonnes of milk, 53.5 million eggs, 44 million kg wool and 2.6 million tonnes of meat. Like all others, the livestock sector has also elicited deceleration during 2008-09 and its growth is expected to be 3.8 per cent only.

The Pradeshik Cooperative Dairy Federation (PCDF) in the state has been playing a pivotal role in augmenting milk production by assisting the member milk producers in various ways. The present study critically examines the comparative economics of milk production in different herd size groups of members and non-member milk producing households in Agra district.

Research Methodology

The present study was confined to Agra district of Uttar Pradesh, which as under the operation of Pradeshik Cooperative Dairy Federation (PCDF) of U.P., for procurement, processing and marketing of milk and milk products as well as for the development of dairying in the rural areas.

Selection of milk collection centres

PCDF collects milk from entire Agra district through various specific routes. One such route, viz. Pilthora, supplying maximum milk and having maximum numbers of milk cooperatives was selected purposely. Then 5 collection centres falling on this route were selected randomly.

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Selection of villages and cases

Two villages from each collection centre, thus, a total of ten villages were selected. The selection of households was the most important stage of sampling in the study. First, the list of all milk producing families was prepared from selected villages. The milk producers were then divided into two categories, viz. members and non-members of PCDF. Further, the members and non-members were categorised in three herd size groups, depending upon the number of milch animals possessed, viz. I Herd size (having upto 2 milch animals), II Herd size (having 3-4 milch animals) and III Herd size group (having 5 and more milch animals). A total of 150 cases (75 members and 75 non-members) were selected randomly.

Collection of data

The data collected for the present study pertained to the year 2006-2007 from both primary as well as secondary sources. The schedules and questionnaires were designed imaginatively in such way as would cover almost all aspects of rearing milch animals for milk production, viz. breeding, feeding, resource structure of selected cases, productivity of milch animals, capital investment, expenditure and income from milk production etc. The accuracy of data thus collected was ensured at each step by establishing a close rapport with the respondents, interviewed during the investigation.

The data thus collected were compiled and tabulated systematically. In most of the cases, simple tabular analysis was followed. Standard cost and income measures were used to work out the profitability of milk production.

Results and Discussion

The milk production performance is governed by a number of parameters, such as land holdings, economic status, milch animals and their production traits etc. These factors have also been taken into account in the present study which indicates resource endowment and its utilization.

Size of land holdings:

Land is the main resource base of the farmers in the production process which requires compatible use of other supplementary resources. Thus, economic and social progress of the households largely depends on the size of operational holdings. The land resources, viz. soil, water, natural vegetation, minerals etc. have been transported into economic goods and services with the help of labour and capital inputs. Hence, the size of farm is an important factor of production (crops, crop residences, fodder), which determines the requirement and use of inputs which ultimately results in enhancing income on the farm. Thus, the area of operational holdings in case of different farm size groups under study was estimated and presented in Table 1.

The data in Table 1 indicated that on an average, the non-member household, had relatively longer land holding per farm (3.04 ha) as compared to the member households operating with 1and holding of 2.14 ha only. Further, it was observed that 36 per cent of members and about 37 per cent of non-member of households did not possess any aerable land.

Distribution of total bovine

Livestock is an asset for the rural households and dairying being a subsidiary occupation contributes significantly to the socio-economic status of rural households due to uncertainity in crop production (major occupation). With increasing emphasis on farm mechanization and subsequent fragmentation of land, there has been a change in the pattern of rearing milch animals.

The strength of different types of milch animals owned by the selected households has been seen to be directly affecting the economy of milk producers. The data on distribution pattern of different categories of milch animals are presented in Table 2.

It is obvious from Table 2, that the number of milch animals per household varied with the herd size in both categories of milk producers (non-members and members of PCDF). It was observed that the number of buffaloes in the herd was more in both the categories of milk producers, about 64 per cent incase of members and 55 per cent in case of non-members, while the crossbred and local cows accounted for 16 and 21 per cent of total milch animals per farm in case of member milk producers. The corresponding data in case of non-member group were 13 and 32 per cent, respectively.

The number of local cows, with non-member milk producers was higher by about 52 per cent than member

Table 1: Size of land holding on different herd size categories

Herd size group	Members				Non-members			
	Samplesize	Having land	Total land (ha)	Per farm (ha)	Sample size	Having land	Total land (ha)	Per farm (ha)
I	45	25(55.56)	11.40	0.46	35	14(40.00)	12.74	0.91
II	20	15(75.00)	46.02	3.07	25	20(80.00)	57.40	2.87
III	10	8(80.00)	45.36	5.67	15	13(86.67)	72.93	5.61
Overall	75	48(64.00)	102.78	2.14	75	47(62.67)	143.07	3.04

Table 2: Distribution of total bovine

Herd size	Members				Non-members			
	Cross Breed	Local cow	Buffalo	Total	Cross Breed	Local cow	Buffalo	Total
				Milch animals				
I	0.31	0.40	0.80	1.51	0.14	0.49	0.80	1.43
	(20.59)	(26.47)	(52.94)	(100.00)	(10.00)	(34.00)	(56.00)	(100.00)
II	0.50	0.60	2.20	3.30	0.36	0.56	1.68	2.60
	(15.15)	(18.18)	(66.67)	(100.00)	(13.85)	(21.54)	(64.62)	(100.00)
III	0.60	1.00	4.20	5.80	0.80	2.00	2.40	5.20
	(10.34)	(17.24)	(72.41)	(100.00)	(15.38)	(38.46)	(46.15)	(100.00)
Overall	0.47	0.67	2.42	3.53	0.43	1.81	1.63	3.07
	(15.63)	(20.83)	(63.54)	(100.00)	(13.47)	(31.61)	(54.92)	(100.00)
				Young stock above 1 year				
I	0.11	0.04	0.20	0.35	0.03	0.14	0.34	0.51
	(31.75)	(12.70)	(57.14)	(100.00)	(5.56)	(27.78)	(66.67)	(100.00)
II	0.25	0.30	0.55	1.10	0.12	0.20	0.60	0.92
	(22.73)	(27.27)	(50.00)	(100.00)	(13.04)	(21.74)	(65.22)	(100.00)
III	0.40	0.40	1.30	2.10	0.27	0.20	0.67	1.14
	(19.05)	(19.05)	(61.90)	(100.00)	(23.39)	(17.54)	(58.48)	(100.00)
Overall	0.19	0.16	0.44	0.79	0.11	0.17	0.49	0.77
	(23.73)	(20.34)	(5.93)	(100.00)	(13.79)	(22.41)	(63.79)	(100.00)
				Young stock below 1 year				
I	0.16	0.04	0.20	0.40	0.11	0.14	0.31	0.57
	(38.89)	(11.11)	(50.00)	(100.00)	(20.00)	(25.00)	(55.00)	(100.00)
II	0.25	0.20	0.65	1.10	0.16	0.44	0.80	1.40
	(22.73)	(18.18)	(59.09)	(100.00)	(11.43)	(31.43)	(57.14)	(100.00)
III	0.50	0.30	1.50	2.30	0.27	0.47	0.87	1.61
	(21.74)	(13.04)	(65.22)	(100.00)	(16.56)	(28.99)	(53.83)	(100.00)
Overall	0.23	0.12	0.49	0.84	0.16	0.31	0.59	1.05
	(26.98)	(4.29)	(58.73)	(100.00)	(15.19)	(9.11)_	(55.70)	(100.00)
				Draft animals				
I	-	0.11	0.04	0.15	-	0.17	0.06	0.23
		(74.07)	(25.93)	(100.00)		(75.00)	(25.00)	(100.00)
II	-	0.30	0.15	0.45	-	0.24	0.08	0.32
		(66.67)	(33.33)	(100.00)	-	(75.00)	(25.00)	(100.00)
IIII	0.20	0.20	0.20	0.60	-	0.27	0.13	0.40
	(33.33)	(33.33)	(33.33)	(100.00)	-	(66.67)	(33.33)	(100.00)
Overall	0.03	0.17	0.09	0.29	-	0.21	0.08	0.29
	(9.09)	(59.09)	(31.82)	(100.00)	-	(72.73)	(27.27)	(100.00)

milk producers. Since, buffalo milk is the major dairy fluid in the country (Bhaskar *et al.*, 2007) and is particularly liked for conversion into milk products; there has been an increasing trend for buffalo upkeep.

Further, it was noted that the number of crossbreds cows along with young stock below and above one year was also higher with member milk producers.

So far as the draft animals are concerned, the number was very less in the herd in both categories of members and non-members of the cooperative society.

Production traits of milch animals

The production traits of dairy animals are, in fact, the economic indicators which reflect the overall productive performance and characteristics of a particular type of milch animals. The observations on productive traits of various milch animals reared by different categories of milk producers in the study area are compiled in Table 3.

It is evident from data in Tale 3 that the lactation length, which affects the total milk production and also the income from lactating animals varied in different types of milch animals reared by various categories of households. It was also influenced by the herd size. Although the lactation length and the corresponding lactation yield varied in milch animals reared by member

Table 3: Production traits of milch animals

Cattle & herd size	Member			Non-member		
	Lactation length	Dry period	Lactation yield (Lire)	Lactation length	Dry period	Lactation yield (Lire)
I group						
Cross Bred Cow	310	102	2100	321	112	1990
Local cow	268	187	980	252	196	910
Buffaloes	315	146	1922	337	158	1970
II group						
Cross Bred Cow	306	194	2220	314	115	2135
Local Cow	274	154	1050	280	202	1022
Buffaloes	331	115	2170	334	161	2087
III group						
Cross Bred Cow	305	115	2630	318	121	2530
Local Cow	271	179	1020	276	184	970
Buffaloes	327	157	2100	341	160	2090
Overall						
Cross Bred Cow	308	137	2317	317	117	2217
Local Cow	271	173	1017	270	197	967
Buffaloes	325	139	2064	337	160	2049

Table 4: Net income from milk production on different herd size groups of member and non-member milk producers (in Rs.)

Herd size	Members			Non-members		
	Cross bred cow	Local cow	Buffalo	Cross bred cow	Local cow	Buffalo
			Per farm			
I	4211.11	1941.86	12118.12	1542.03	1525.44	11306.21
II	7069.20	3217.18	36590.31	4162.65	2174.27	23110.43
III	10088.50	4763.60	66166.84	10938.34	6103.81	30425.31
Overall	7122.92	3307.55	38291.76	5547.67	3267.67	21614.12
			Per animal			
I	13500.14	4854.65	15147.65	10794.25	3180.01	14132.76
II	14138.40	5468.91	16631.96	11562.92	3965.01	13756.21
III	16814.17	4922.66	15754.01	13672.91	3178.74	12677.22
Overall	14817.31	5082.10	15844.54	12010.21	3441.34	13522.10

and non-member groups of households, the results suggested that the overall lactation yield (in litres) of crossbred cows (2317), local cows (1017) and buffaloes (2064) were higher in case of members than in case of non-member households (2217, 967 and 2049, respectively for cross bred cows, local cows and buffaloes). The dry periods in case of local cows and buffaloes were shorter in the category of members.

Income from milk production

The net income from dairy enterprise was worked out by subtracting net maintenance cost from the gross income. The results on per farm and per milch animal net income have been estimated for each type of milch animals reared by the sample households, and presented in Table 4.

It was observed (Table 4) that the overall per household net income of member herd size groups from crossbred cows, local cows and buffaloes, came to Rs. 7123, Rs.3307 and Rs.38291, respectively. While, the overall per household net income of non-members was about Rs.5548, Rs. 3268 and Rs. 21614 from crossbred cows, local cows and buffaloes respectively. The herd size had significant effect on net income, irrespective of the category of milk producers. The net income per household increased significantly with increase in herd size of milch animals and such income was much greater

in case of member households than in non-member category.

Further, the net income from milk production per milch animal was also higher in case of member producers than in non-member category, because of availability of inputs at subsidized prices from dairy cooperative societies. Various schemes regarding production enhancement have helped raise milk production and subsequently increased income therefrom in case of those who were members of cooperative dairy society (PCDF) as against those who did not avail of benefits of being members.

Shah *et al*. (1996) and Shah (1997) in their studies on milk production and marketing pattern of milk indicated that the households covered under the Dugdh Utpadak Sahkari Sangh (PCDF) benefited more than those not covered under PCDF.

It is, hence, suggested that the milk producers should be motivated to become members of PCDF so that they derive benefits of various inputs, extension and veterinary services alongwith technical guidance and support, which would help raise milk production, effective marketing and remunerative prices of the produce.

References

Bhasin, N.R. (2009). From the President's desk. *Indian Dairyman* 61 (7) : 4-5.

Bhaskar, M.L.; Gupta, M.P. and Singh, K.P. (2007). Effect of lactation number on milk production and quality of milk of crossbred cows and Murrah buffaloes. *Indian J. Dairy Sci*. 60 (6) : 426-431.

Shah, D. (1997). Cooperative dairying in Maharashtra: lessions to be learnt. Economic and Political Weekly. 32 : 125-135.

Shah, D.; Jain, D.K. and Sharma, K.N.S.(1996). Impact of dairy cooperatives on marketing pattern of milk in Bulandshahar district. *Indian Dairyman*. 48 (6) : 37-41.

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Influence of select preservatives in extending the shelf life of chhana

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Abstract

Chhana samples prepared from milk of Sahiwal cows were treated with seven different combinations of antimicrobial agents (preservatives) at two levels (full and half), with two modes of application, A1 - dry polythene pack and A2 - dipped in water containing preservatives and stored at 25^{0}C. The changes in sensory, physico-chemical and microbiological qualities of the product were assessed at one day interval. The protein, fat and total solids content of chhana underwent slight changes during storage. However, no appreciable difference was observed in these constituents in dry and wet application or full and half concentration of the preservatives during various storage periods. The changes in the microbial quality of the product as revealed by SPC, coliform, lipolytic and proteolytic counts as well as yeast and mold counts during storage periods were limited in preservative treated samples as compared to control samples. Yeast and molds were visible in control (untreated) samples on second day but in treated samples, these were observed in few numbers on fourth day. Full concentrations of preservatives were found more effective than half concentrations. Calcium propionate + oxytetracycline (P_7) and calcium propionate + pot. metabisulplite (P_8) were found more effective in inhibiting yeast and molds, which were major spoilage organisms.The sensory scores revealed that the control samples starting deteriorating after two days and were unaccepted on fourth day. Contrarily, the treated samples were highly acceptable on fourth day and remained acceptable upto 6 to 7 days at full concentration and 5-6 days with half concentration of the preservatives used in the present study

Introduction

In India, a large proportion of population is vegetarian, in whose diet milk and milk products assume a great significance, as they are the only source of animal proteins. However, the keeping quality of milk is poor and its economic disposal in fluid form presents difficulties during flush season. Surplus milk is usually converted into milk products that could be stored over longer periods and transported to distant places for sale at convenience.

Chhana, an acid-cum-heat coogulated milk product, has become very popular as it is used as a base for preparation of a variety of sweets, viz. Rasogolla, Rasmalai, Sandesh Chum-Chum etc. Thus, it offers an outlet for milk in surplus season.

Chhana is a highly nutritious product, as it contains almost entire milk cascin, part of denatured whey proteins, almost all fat, colloidal salts and soluble milk solids in proportion to the moisture content retained. The production of chhana has many advantage over other milk products because the technology of its manufacture is relatively sample and does not require specific equipments. However, its shelf-life is limited (3 days at 22^{0}C and one day at 37^{0}C) and is influenced by storage temperature and packaging material (De, 1980).

As the demand for chhana is increasing rapidly, especially in big towns and cities for conversion into sweets (Aneja *etal.*, 1982), it is imperative to extend the shelf-life of chhana to facilitate long-distance transportation and convenience disposal. But unlike paneer, only few attempts have been made to enhance the shelf life of chhana (Yadav *etal.*, 1985). Therefore, concerted efforts were made in the present study to assess the role of select preservatives on the sensory, chemical and microbiological quality of chhana with a view to extend its shelf-life at ambient temperatures.

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 slight 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 :

The chhana samples were treated with the preservatives in two ways: A1 - dry polythene pack, A2 - dipped in distilled water containing the preservatives. The control samples were dipped in distilled water and all the samples were stored at 25^{0}C. The changes in

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Preservatives	Concentrations	
	Full (C1)	Half (C2)
1.Calcium propionate + Sodium benzoate (P6)	(0.32%+0.1%)	(0.16%+0.05)
2.Calcium propionate + Oxytetracyline (P7)	(0.32%+7ppm)	(0.16%+3.5ppm)
3.Calcium propionate+Potassium metabisulphite (P8)	(0.32%+250ppm)	(0.16%+125ppm)
4.Calcium propionate + Sodium benzoate + Oxytetracycline (P9)	(0.32%+0.1%+7ppm)	(0.16%+0.05%+3.5ppm)
5.Calcium propionate + Sodium benzoate + Potassium metabisulphite (P10)	(0.32%+0.1%+250ppm)	(0.16%+0.05%+125ppm)
6.Calcium propionate + Oxytetra cycline + Potassium metabisulphite (P11)	(0.32%+7ppm+250ppm)	(0.16%+3.5ppm+125ppm)
7.Calcium propionate + Oxytetracycline + Potassium metabisulphite (P12)	(0.32%+0.1%+7ppm+ 250ppm)	(0.16%+0.05%+3.5ppm+125ppm)

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 the product was also recorded.

Results and Discussion

The milk of Sahiwal cows used for chhana making in the present study contained 4.40 $\pm$ 0.20 (4.10 - 4.70) % fat, 3.38 $\pm$ 0.31 (3.21 - 3.69) % protein and 14.18 $\pm$ 0.45 (13.83 - 14.42) % total solids (TS). The recovery of chhana ranged from 14.80 to 15.50 with an average of 15.18 $\pm$ 0.36 percent.

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 treated with seven different preservatives (P6 to P12) at two different concentrations (C1 and C2) with two modes of application (A1 and A2), as detailed previously, 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 Tables 1 (A1C1), 2(A1C2), 3(A2C1) and 4 (A2C2).

Results revealed that the protein, fat and total solids contents of chhana underwent slight changes during storage on first, second and third day. Changes were observed both at full (C1) and half (C2) concentrations of all the preservatives (P6 to P12) both in dry (A1) and wet (A2) applications. Changes in the concentrations of protein, fat and total solids content of chhana samples on third day in case of dry and wet applications were almost comparable indicating that dry application was as effective as wet application. Furthermore, appreciable differences were not observed between full and half concentrations of the preservatives. The analysis of variance of these data (Table-5) however, suggested that the application (A) and preservative (P) had significant effect on protein, fat and total solids content of chhana during storage, while the concentration (C) had only effect on protein content. Similarly, period of storage (D) and application x storage period (A x D) had significant effect on changes in various constitutents of chhana. Intraction of various other factors had either significant or non-significant effect (Table 5).

Changes in microbiological quality : Results on changes in toal viable count (SPC), coliform, lipolytic, proteolytic and yeast and mold count in various chhana samples, as influenced by treatment with various preservatives (P6 to P12), at two concentrations (C1 and C2) with two different methods of application (A1 and A2) and storage period (D0, D1, D2 and D3) are presented in Tables 3 and 4).

It is revealed from Table 6 and 7 (Dry Application) that the fresh samples had slightly higher SPC count (8.34cfu/g) than the treated samples (lowest 7.83cfu/g in P9 calcium propionate + sodium benzate + oxytetra cycline group). Coliform and yeast and molds were not detectable while the lypolytic and proteolytic organisms were obsrved in higher number (5.06 and 5.63) than in treated samples (lowest 4.37 in P10, calcium + propionate + sodium benzoate + potassium metabisulphite and 4.86 in P11, calcium propionate oxytetracycline + potassium metabisulphite treated). Such counts (SPC, lipolytic and proteolytic) were slightly higher in samples treated with half concentrations (C2) of the preservatives (Table 7). The SPC, lipolytic and proteolytic counts increased with increase in storage periods. On fourth day (D3), some coliform (5.51 cfu/g) and yeast and mold (6.70cfu/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 (3.08-3.27cfu/g) were noted but in much lesser number than in control samples.

The wet application (A2) of various preservatives in full (C1) and half (C2) concentrations appeared to exert greater effect on inhibition of various microorganisms (Table 8 and 9) during storage of various chhana samples. As in case of dry application, the SPC, lypolytic and proteolytic counts were lower in treated samples in wet application also than the control samples. Such counts were even lower than those observed in case of dry application of the preservatives. The magnitude of increase of these counts were further found to be lower with advancement in storage periods than those recorded in case of dry application (Table 6 and 7). 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 periods, 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). Calcium propionate + oxytetracycline (P7) and calcium propionate + potassium metabisulphite (P8) were found more effective in inhibiting yeast and molds, which 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 qualities.

It was observed that the control samples started deteriorating after two days of storage at 25^{0}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 below the maximum limit prescribed by BIS (1983). Although the changes in chemical and microbiological qualities (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. Incase of dry polythene packaging, surface growth of molds became visible on fourth day, however, such growth was

Table 1 (A1C1): Changes in protein, fat and total solids content (%) at 25^{0}C

Treatments	Days of storage											
	D0			D1			D2			D3		
	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS
A1C0	17.23	24.33	48.18	17.28	24.16	48.24	17.31	24.33	48.30	17.35	24.49	48.36
A1C1P6	17.37	24.99	47.92	17.43	24.65	48.02	17.48	23.99	48.09	17.52	23.33	48.16
A1C1P7	16.82	24.33	47.43	16.85	24.33	47.50	16.90	24.66	47.57	16.94	24.33	47.63
A1C1P8	17.36	24.66	48.95	17.43	23.66	48.70	17.47	24.66	49.12	17.52	24.33	49.20
A1C1P9	17.16	23.99	48.22	17.22	23.99	48.29	17.29	23.99	48.36	17.35	23.99	48.45
A1C1P10	17.68	24.99	49.06	17.73	24.32	49.12	17.75	24.65	49.18	17.79	24.66	49.22
A1C1P11	17.61	23.99	47.22	17.67	23.99	47.41	17.71	23.99	47.38	17.75	23.99	47.44
A1C1P12	17.13	23.99	48.16	17.22	23.99	48.20	17.14	23.99	48.26	17.15	23.99	48.29

C0 - Control, A1 - Dry application, C1 - Concentration (Full), P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

Table 2 (A1C2): Changes in protein, fat and total solids content (%) at 25^{0}C

Treatments	Days of storage											
	D0			D1			D2			D3		
	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS
A1C0	17.23	24.33	48.18	17.28	24.16	48.24	17.31	24.33	48.30	17.35	24.49	48.36
A1C2P6	17.31	24.66	47.86	17.37	23.99	47.96	17.42	23.66	48.04	17.48	23.66	48.10
A1C2P7	16.78	24.66	47.49	16.82	24.33	47.56	16.97	23.99	47.63	16.91	24.33	47.67
A1C2P8	17.29	24.33	48.90	17.35	23.99	49.01	17.40	23.99	49.10	17.47	23.99	49.17
A1C2P9	17.14	23.99	48.26	17.20	23.66	48.32	17.26	23.99	48.39	17.33	23.99	48.46
A1C2P10	17.62	23.99	49.05	17.70	24.32	49.08	17.12	24.66	49.14	17.76	24.99	49.25
A1C2P11	17.58	24.33	47.22	17.63	23.99	47.32	17.69	23.99	47.36	17.72	24.99	47.42
A1C2P12	17.16	23.99	48.11	17.14	23.65	48.19	17.04	23.99	48.23	16.99	24.33	48.27

C0 - Control, A1 - Dry application, C2 - Concentration (Half), P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

Table 3 (A1C1): Changes in microbilogycal quality of chhana at 25^{0}C (cfu/g)

Treatments	Days of storage																			
	D0					D1					D2					D3				
	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold
A1C0	8.34	0.00	5.06	5.63	0.00	8.89	0.00	5.52	5.98	3.32	9.32	0.00	5.90	6.27	4.55	9.67	5.51	6.14	6.57	6.70
A1C1P6	8.15	0.00	4.37	5.19	0.00	8.26	0.00	4.69	5.43	0.00	8.36	0.00	5.07	5.58	0.00	8.56	0.00	5.32	5.78	3.27
A1C1P7	7.84	0.00	4.58	5.13	0.00	8.00	0.00	4.80	5.43	0.00	8.19	0.00	5.04	5.66	0.00	8.32	0.00	5.20	5.88	3.08
A1C1P8	8.16	0.00	4.49	5.32	0.00	8.26	0.00	4.86	5.47	0.00	8.35	0.00	5.07	5.63	0.00	8.46	0.00	5.29	5.78	3.19
A1C1P9	7.83	0.00	4.60	4.73	0.00	8.04	0.00	4.93	5.12	0.00	8.23	0.00	5.22	5.45	0.00	8.34	0.00	5.46	5.73	3.21
A1C1P10	8.08	0.00	4.37	5.15	0.00	8.19	0.00	4.68	5.29	0.00	8.29	0.00	4.91	5.46	0.00	8.42	0.00	5.17	5.59	3.26
A1C1P11	8.19	0.00	4.48	4.86	0.00	8.35	0.00	4.77	5.15	0.00	8.49	0.00	5.10	5.46	0.00	8.65	0.00	5.34	5.63	3.23
A1C1P12	8.19	0.00	4.60	5.04	0.00	8.34	0.00	4.93	5.27	0.00	8.49	0.00	5.22	5.47	0.00	8.68	0.00	5.37	5.63	3.25

C0 - Control, A1 - Dry application, C1 - Concentration (Full), P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

Table 4 (A1C2): Changes in microbilogycal quality of chhana at 25^{0}C (cfu/g)

Treatments	Days of storage																			
	D0					D1					D2					D3				
	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold	SPC	Coliform	Lipolytic	Proteo-lytic	Yeat & Mold
A1C0	8.34	0.00	5.06	5.63	0.00	8.89	0.00	5.52	5.98	3.32	9.32	0.00	5.90	6.27	4.55	9.67	5.51	6.14	6.57	6.70
A1C2P6	8.23	0.00	4.69	5.36	0.00	8.36	0.00	4.94	5.54	0.00	8.51	0.00	5.22	5.73	0.00	8.66	0.00	5.34	5.92	3.47
A1C2P7	8.03	0.00	4.60	5.36	0.00	8.26	0.00	4.83	5.53	0.00	8.31	0.00	5.17	5.73	0.00	8.51	0.00	5.41	5.93	3.14
A1C2P8	8.24	0.00	4.78	5.45	0.00	8.36	0.00	5.02	5.63	0.00	8.48	0.00	5.29	5.80	0.00	8.59	0.00	5.56	5.95	3.26
A1C2P9	7.94	0.00	4.89	4.82	0.00	8.14	0.00	5.18	5.22	0.00	8.32	0.00	5.44	5.51	0.00	8.52	0.00	5.70	5.76	3.31
A1C2P10	8.16	0.00	4.60	5.27	0.00	8.26	0.00	4.91	5.46	0.00	8.37	0.00	5.13	5.63	0.00	8.53	0.00	5.39	5.72	3.39
A1C2P11	8.25	0.00	4.55	4.93	0.00	8.41	0.00	4.82	5.22	0.00	8.60	0.00	5.18	5.49	0.00	8.69	0.00	5.47	5.71	3.42
A1C2P12	8.22	0.00	4.86	5.09	0.00	8.40	0.00	5.15	5.37	0.00	8.60	0.00	5.36	5.58	0.00	8.73	0.00	5.61	5.77	3.37

C0 - Control, A1 - Dry application, C1 - Concentration (Half), P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

lower in wet application (A2) of the preservatives.

The changes in chemical quality during storage period were more marked in case of wet application of the treated samples than in case of dry application. These constituents tended to decline in greater proportion in the former than in latter because of greater activities of lypolytic and proteolytic organisms during storage.

The chemical quality of channa prepared from Sahiwal cows as reported in this study is in accordance with the reported data (Aneja *etal.*, 2002). However, published literature on changes in chemical constituents as influenced by treatments with preservatives during storage at ambient temperatures are meagre to support the result of present investigation. However, Yadav *etal.* (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, oxytetra cycline and its combination with other preservatives on changes in chemical constituents of chhana during storage, to corroborate our results.

Results on microbiological quality of chhana are also in agreement with Aneja *etal.* (2002). Published literature on microbiological quality of fresh and market paneer, which is a similar product, is abundant (Kumari and Kalimuddin, 2002; Divya Srivastava, 2004), which support the present microbiological quality of chhana. However, data on changes in bacteriological quality of chhana as affected by various preservatives during storage are scanty to support present data. Aneja *etal.* (2002) have reported that during storage, the product (chhana) develops a sour smell and butter taste at 25-37^{0}C, while its surface in sparsely covered with molds such as *Aspergillus, Mucor, Rhizopus, Fusarium etc.,* which are major spoilage organisms.

The preservatives used in present study are antibacterial in nature. Greater study has been carried out on nisin which is the most common bacteriocin. It inhibits a variety of Gram-positine bacteria and bacterial spores including *Listeria, Clostridium botulinum* and *Bacillus cereus.* Nisin functions by disrupting bacterial membranes. With spores, it prevents out growth by inhibiting the swelling process of germination. Bacteriocins, thus, can extend the shelf-life of dairy product, by arresting the growth of spoilage bacteria (Kumar and Anand, 2003). It appears that the various preservatives used in the present study, also function in same manner as nisin. Nisin and sorbic acid (and its salts). have, infact, been recommended (PFA act and BIS) for use in certain dairy products (various types of cheese) in order to prevent these products from spoilage (biochemical and microbial), so as to extend their shelf-life. Yadav *etal.* (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).

These reports substantiate the results of present investigation, which indicated that the shelf-life of chhana could be extended at ambient temperature by use of such preservatives as employed in the present study.

References

Aneja, R.P.; Mathur, BN.; Chandan, R.C. and Banerjee, A.K (2002). Technology of Indian milk products. A Dairy India Publication, A-25 Priyadarshini Vihar, Delhi-92.

Aneja, R.P.; Rajorhia, G.S. and Makkar, S.K. (1982). An improved process for continuous production of chhana. Asian J. Dairy Res. 1(1): 41-44.

BIS (1961). Methods of test for dairy industry. Part II : Chemical analysis of milk. IS : 1479, Bureau of Indian Standards, Manak Bhavan, New Delhi.

BIS (1962). Methods of test for dairy industry. Part III : Bacteriological analysis of milk. IS : 1479. Bureau of Indian Standards, Manak Bhavan, New Delhi.

BIS (1964). Specifications for hard cheese, processed cheese and processed cheese spread. IS : 2785. Bureau of Indian Standards, Manak Bhavan, New Delhi.

BIS (1983). Microbiological standards of paneer. IS : 10484. Bureau of Indian Standards, Manak Bhavan, New Delhi.

De, S. (1980). Outlines of Dairy Technology. Oxford University Press, New Delhi.

Divya Srivastava (2004). Studies on influence of modified atmosphere packaging (MAP) on the microbial population and shelf-life of panner. M.Sc. thesis, University of Allahabad, Allahabad.

EIRI (2006). Handbook of milk processing, dairy products and packaging technolgoy. Engineers India Research Institute. 4449, Nai Sarak, Main Road, Delhi, P-281.

Kumar, V.M. and Anand, S.K. (2003). Alternative techniques for extended shelf life (ESL) of milk. Indian Dairyman 55(5) : 68-73.

Kumari, A. and Kalimuddin, M. (2002). Bacteriological quality of khoa and panner samples from local and standard shops. J.Res.14(1): 135-139.

Kundu, S.S. and De, S. (1972). Chhana production from buffalo milk. Indian J.Dairy Sci. 25:159-163.

Yadav, B.L.; Kulshrestha, D.C.; Khan, B.L. and Srivastava, R.P. (1985). Use of some antimicrobial agents to increase shelf life of chhana. Asian J. Dairy Res. 4(3) : 161-166.

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Economics of vegetable crops cultivation on small and marginal farms

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Abstract

The net income of vegetable crops (carrot and cauliflower) came more on small farms as compared to marginal farms. And the overall input output ratio of vegetable crops (carrot and cauliflower) came to 1:5.18 and 1:4.63 respectively. Carrot crop return per rupee investment is more than cauliflower crop on both farms. Thus efforts be made grow vegetable crops for getting higher return on both farms.

Introduction

Poverty and large population are significant and persistent problems in India. These problems besides having close relationship with food, insecurity and also related to poor health and mal-nutrition. Food security in India is, therefore, an important national priority.

Two-third of the population of India depends on agriculture sector directly and indirectly. Self-sufficiency of food grain production has been the basic objective of India's policy on agriculture. With the growing population the man land ratio id declining and charges of bringing additional land under cultivation are remote, therefore, future increase in agricultural production has to come only by way of increasing the productivity of the land already under cultivation and adoption of scientific farming thus to achieve the crop production target additional land area will needed. The land area is fixed. The present per capita available land in India is only 0.16 hectare.

The vegetable crops like brinjal, carrot and cauliflower, which produce more dry matter, edible energy and edible protein per unit of land and time than many other major crops such as wheat, paddy and maize are the most potential land nutritionally superior crops for fighting hunger and malnutrition. Vegetable crops wide flexibility in its planting and harvesting are valuable trials that help in adjusting these crops putting pressure on scare resources such as land, water, fertilizers etc. These also generate larger returns per unit of land and time.

Brinjal and cauliflower are most important vegetable crops grown in India. These contributions about 8.2 and 5% respectively of the total production of vegetables.

The production and area of vegetable crops in India, Asia and world is given in following Table 1.

India's second position in production of v in the total production in world. In India only 32 per cent of the total cultivated land is possessed by cultivated by the rest 20 per cent farmers. It shows the uneven distribution of land area. It also shows that small and marginal farmer's number is more than the medium and large farmers. The cultivation of vegetable crops by small and marginal farmers may be useful for raising their employment and income.

Table 1: Showing area and production of vegetable crops in India, Asia and World.

Country	Area (Million ha)	Production (Metric tonns)	Yield (t/ha)
India	5.73	78.2	13.6
Asia	33.31	574.7	17.2
World	46.96	787.4	16.7

The brinjal, cauliflower and carrot because of their high production potential and superior nutritional quality would prove to be useful for small and marginal farmers in this locality. These crops are providing better income on the farms.

Objectives

The following objectives have studied are as below;

1. To know the cost of cultivation of vegetable crops on different farm size groups.
2. To examine the returns from vegetable crops
3. To know the input-output ration under vegetable crops

Methodology

The present study is confined to Bichpuri block of Agra district. The present study is based on the descriptive research design. First of all the name of villages growing vegetable in Bichpuri block were identified the name of such villages were 12 out of 36 villages in the block. Out of such list of vegetable growing village's three villages like Amarpura, Dehtora and Bilasganj were selected for study. At the second and final stage of sampling a list of all the rabi vegetable crops growers is selected villages was prepared. The total number of vegetable growers was 71. These cases of vegetable growers were divided in to marginal (<1

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ha) and small (1-2 ha). The number of small and marginal vegetable growers was 16 and 55 respectively. After doing so 50% cases were selected in each group. Thus 8 cases of small and 27 cases of marginal farmers were selected randomly.

Collection of data

The present study is based on primary and secondary data. The primary data were collected by survey method through personal interview method with the respondent while secondary data were collected through the record of B.D.O .The data were related to year 2003-2004.

Results and discussions

Size of holding on farm size

Land is the resource to a farmer indicates the quality of land available to him for growing farm crops and other uses.

Table 2: Average holding size on different farm size groups of the sample farms

Farm size group	No. of cases	Total area (ha)	Average size of holding (ha)
Small	8	10.64	1.33
Marginal	27	16.20	0.60
Overall	35	326.84	0.77

The Table 2 indicates that the average size of farm came to 0.77 hectare . It was 1.33 hectare in small and 0.60 hectare in marginal farm size group.

Cropping pattern:

Cropping pattern refers to the area of crops and crop combinations, which the cultivators follow within specific period of time. The type of crops grown on a particular farm play important role in its costs and income position. The table represents per farm area under various crops grown in the study area.

The Table 3 reveals that the vegetable crops in rabi season were carrot and cauliflower. The overall cropped area of carrot and cauliflower was 0.22 hectare and 0.15 hectare respectively. While in case of small farms 0.52 hectare and 0.18 hectare and in case of marginal farms it came 0.22 hectare and 0.14 hectare respectively.

Table 4 shows that the overall intensity of cropping is 227.27 per cent. It varied from 24.81 to 2.30 per cent.

Cost of cultivation of major rabi vegetable crops:

It is essential to know a profitability or comparative economy of the crops. The cost of cultivation includes the variable cost as well as fixed cost.

Table 5 indicate that the overall per farm total cost of carrot crop came to Rs.2698.356. It varies Rs.4643.38 and Rs.211..65 respectively on small and marginal farm size groups.

Table 3: per farm cropping pattern on different size of farms

Crops	Small	Marginal	Over all
Jowar	0.08	0.08	0.08
	(2.68)	(5.80)	(4.57)
Bajra	0.20	0.02	0.06
	(6.69)	(1.45)	(3.43)
Maize	0.00	0.04	0..03
	(0.00)	(2.90)	(1.71)
Brinjal	0.00	0.29	0.22
	(0.00)	(21.01)	(12.57)
Radish	0.64	0.08	0.21
	(24.40)	(5.80)	(12.00)
Total Kharif	0.92	0.51	0.60
	(30.77)	(36.96)	(34.29)
Carrot	0.52	0.22	0.29
	(17.39)	(15.94)	(16.57)
Cauliflower	0.18	0.14	.0.15
	(6.02)	(10.15)	(8.57)
Mustard	0.10	0.00	0.02
	(3.35)	(0.00)	(1.14)
Wheat	0.50	0.24	0.30
	(16.72)	(17.39)	(17.14)
Potato	0.03	0.00	0.01
	(1.00)	(0.00)	(0.57)
Total Rabi	1.33	0.50	0.77
	(44.48)	(43.48)	(4.00)
Cucurbits	0.54	0.21	0.29
	(18.06)	(15.21)	(16.57)
Palak	0.10	0.06	0.07
	(3.34)	(4.34)	(4.00)
Arbi	0.10	0.00	0.02
	(3.34)	(0.00)	(1.14)
Total Zaid	0.74	0.27	0.38
	(24.75)	(19.56)	(21.71)
Total cropped area	2.99	1.38	1.75
	(100.00)	(100.00)	(100.00)

Note: Figure in parentheses showed the percentage

Table 4: Per farm cropping intensity of different farm size groups

Farm size group	Total cultivated area (ha)	Total cropped area (ha)	Cropping intensity(%)
Small	1.33	2.09	224.81
Marginal	0.60	1.38	230.00
Overall	0.77	1.75	227.27

Table 6 reveals that the overall per hectare cropped area total cost of carrot crop came to Rs.9274.35 it varies Rs.8929.57 and Rs.9593.85 respectively on small and marginal farm size groups.

Table 5: Per farm item –wise cost of cultivation of carrot in different farm size crops (Rs.)

Item's cost	Size group		
	Small	Marginal	Overall
Family labor	384.74	188.78	233.57
	(8.29)	(8.94)	(8.68)
Hired labour	121.04	Nil	22.67
	(2.67)		(1.03)
Irrigation charges	1241.30	744.33	857.92
	(26.73)	(35.27)	(31.90)
Tractor etc.	483.57	205.83	269.31
	(10.41)	(9.75)	(10.01)
Seed value	458.66	192.50	253.34
	(9.88)	(9.12)	(9.42)
Fertilizers & mannure	1282.64	528.22	700.66
	(27.62)	(25.03)	(26.05)
Pesticides and insecticides	211.94	87.43	115.89
	(4.56)	(4.14)	(4.31)
Interest on working capital	167.36	77.88	98.33
	(3.60)	(3.69)	(3.66)
Others	185.14	49.87	80.79
	(3.99)	(2.36)	(3.00)
Total variable cost	4536.37	2074.84	2637.48
	(97.70)	(98.30)	(98.06)
Total fixed cost	107.01	35.81	52.08
	(2.30)	(1.70)	(1.94)
Total cost	4643.38	2110.65	2689.56
	(100.00)	(100.00)	(100.00)

Note: Figure in parenthesis showed the percentage

Table 6: Per hectare cropped area item-wise cost of cultivation of carrot on different farm size group (Rs.)

Item's cost	Size group		
	Small	Marginal	Overall
Family labor	7.39.88	858.09	805.41
	(8.29)	(8.94)	(8.68)
Hired labour	232.76	Nil	95.41
	(2.61)		(1.03)
Irrigation charges	2387.11	3383.33	2958.34
	(26.73)	(35.27)	(31.90)
Tractor etc.	929.94	935.57	928.66
	(10.41)	(9.75)	(10.01)
Seed value	882.03	875.00	873.59
	(9.88)	(9.12)	(9.42)
Fertilizers & mannure	2466.61	2401.00	2416.07
	(27.62)	(25.03)	(26.05)
Pesticides and insecticides	407.57	397.40	399.62
	(4.56)	(4.14)	(4.31)
Interest on working capital	321.84	354.02	339.07
	(3.60)	(3.69)	(3.66)
Others	356.04	226.67	278.59
	(3.99)	(2.36)	(3.00)
Total variable cost	8723.78	9431.08	9094.76
	(97.70)	(98.30)	(98.06)
Total fixed cost	205.79	162.77	179.59
	(2.30)	(1.70)	(1.94)
Total cost	8929.57	9593.85	9274.35
	(100.00)	(100.00)	(100.00)

Note: Figure in parentheses showed the percentage

Table 7: Per farm item –wise cost of cultivation of cauliflower in different farm size crops (Rs.)

Item's cost	Size group		
	Small	Marginal	Overall
Family labor	285.56	237.86	248.76
	(13.49)	(13.4)	(13.45)
Hired labour	25.31	Nil	5.79
	(1.20)		(0.31)
Irrigation charges	541.00	501.76	510.73
	(25.56)	(28.35)	(27.62)
Tractor etc.	196.78	176.17	180.88
	(9.30)	(9.95)	(9.78)
Seed value	226.39	186.24	195.42
	(10.69)	(10.52)	(10.57)
Fertilizers & mannure	613.62	513.13	536.10
	(28.99)	(28.99)	(28.99)
Pesticides and insecticides	74.44	43.41	50.50
	(3.52)	(3.75)	(3.74)
Interest on working capital	78.53	66.34	69.13
	(3.71)	93.75)	(3.74)
Others	44.12	30.79	33.84
	(2.08)	(1.74)	(1.83)
Total variable cost	2085.75	1755.71	1831.15
	(98.53)	(99.19)	(99.02)
Total fixed cost	31.09	14.40	18.21
	(1.47)	(0.81)	(0.98)
Total cost	2116.84	1770.11	1849.36
	(100.00)	(100.00)	(100.00)

Note: Figure in parentheses showed the percentage

Table 7 shows that the overall per farm total cost of cauliflower crop came to Rs.1849.36 . It varies Rs.2116.84 and Rs.1770.11 respectively on small and marginal farm size groups.

Table 8 indicates that the overall per hectare cropped area total cost of cauliflower came to Rs.1329.07. It varies Rs 11760.25 and Rs.12643.66. A small and marginal farm size group respectively.

Returns from vegetable crops (carrot and cauliflower)

The return of crop depends upon the production and the cost of production of the crops. The estimation is essential from the point of view of knowing the comparative economy of the crops grown in the farms.The table shows that per farm and per hectare production of the carrot and cauliflower crops on the different farms.

Table 8: Per hectare cropped area item –wise cost of cultivation of cauliflower in different farm size crops (Rs.)

Item's cost	Size group		
	Small	Marginal	Overall
Family labor	1586.47 (13.49)	1698.98 (13.4)	1658.40 (13.45)
Hired labour	140.60 (1.20)	Nil	34.60 (0.31)
Irrigation charges	300.5.56 (25.56)	3584.02 (28.35)	3404.87 (27.62)
Tractor etc.	1093.23 (9.30)	1258.36 (9.95)	1205.87 (9.78)
Seed value	1257.75 (10.69)	1330.29 (10.52)	1302.80 (10.57)
Fertilizers & mannure	3409.02 (28.99)	3665.24 (28.99)	3574.00 (28.99)
Pesticides and insecticides	413.53 (3.52)	310.09 (3.75)	336.67 (3.74)
Interest on working capital	436.25 (3.71)	473.88 93.75)	460.87 (3.74)
Others	245.11 (2.08)	219.91 (1.74)	225.60 (1.83)
Total variable cost	11587.52 (98.53)	12540.77 (99.19)	12207.67 (99.02)
Total fixed cost	172.73 (1.47)	102.89 (0.81)	121.40 (0.98)
Total cost	11760.25 (100.00)	12643.66 (100.00)	12329.07 (100.00)

Note: Figure in parentheses showed the percentage

Table 9: Per farm and per hectare production (quintals) of carrot and cauliflower on different farm size groups

Size group	Production of vegetable crops			
	Carrot		Cauliflower	
	Per farm	Per ha.	Per farm	Per ha.
Small	123.86	238.19	36.62	203.43
Marginal	54.38	247.17	29.07	207.61
Overall	71.08	245.12	31.00	206.65

Table reveals that the overall production of carrot and cauliflower per farm came to 71.08 quintals and 245.12 quintals and per hectare it came to 245.12 quintals and 206.65 quintals on carrot and cauliflower crops respectively.

Table 10 indicates that overall gross income per farm on carrot and cauliflower crop came to Rs.13941.83 and Rs.8560.43 and per hectare it came to Rs.48078.54 and Rs.5764.92 respectively.

The table 11 reveals that the per farm overall net income of the carrot crop came to Rs.11252.27. The net income of carrot crop on small and marginal farm income Rs.20128.62 and Rs.8493.145 respectively. In case of cauliflower crop the per farm overall net income came to Rs.6711.07. The net income of cauliflower crop on small and marginal farm came to Rs.8136.76 and Rs.6224.14 respectively.

Table 10: Per farm and per hectare gross income of carrot and cauliflower crops on the different farm size groups

Size group	Production of vegetable crops			
	Carrot		Cauliflower	
	Per farm	Per ha.	Per farm	Per ha.
Small	24772.00	47638.00	10253.60	56960.40
Marginal	10604.10	48198.15	7994.25	57064.92
Overall	13941.83	48078.54	8560.43	57064.92

Table 11: The per farm net income and input output ratio of vegetable crops (carrot and cauliflower) on different farm size groups.

Size group	Gross income	Total cost	Net income	Input-output ratio
		Carrot		
Small	24772.00	4643.38	20128.62	1:5.33
Marginal	10604.10	2110.65	8493.45	1:5.02
Overall	13941.83	2689.56	11252.27	1:5.18
		Cauliflower		
Small	10253.60	2116.84	8136.76	1:4.84
Marginal	7994.25	1770.11	6224.14	1:4.52
Overall	8560.43	1849.36	6711.07	1:4.63

The Table also indicates that the overall average input output ratio come to 1:5.18 and 1:1.463 respectively on carrot and cauliflower crops. The table further reveals that in case of carrot by investing Rs. 1.00 the return came Rs. 5.33 and Rs. 5.02 on small and marginal farms respectively and in case of cauliflower crop it came to Rs. 4.84 and Rs. 4.52 on small and marginal farms respectively.

It can be concluded that the net income of vegetable crops (carrot and cauliflower) came to small farms more as compared to marginal farms. It can further conclude that the return per rupee of investment was more on small farms as compared to marginal farms.

References

Dahiya, P.S. and Pandey, N.K. (1992). Seeds and farms Journal of the Indian Potato Association. Vol. 18 No. 1-3 pp 3-8

Dahiya, P.S. and Pandey, N.K. (1993). The economics of potato production and marketing. Journal of the Indian Potato Association. Vol. 20, No. 3-4 pp. 230-239.

Mathur, S.C. and Balister (1969). Economics of vegetable farming W.A.E. and R.S.A. Vol. 14 No. 4 pp. 888.

Minhas, S.C.; Patel, P.K. and Gadewar, A.V. (1988). Dangs a potential area for growing seed potatoes in Gujrat. Indian Farming. Vol. 38 No. 7. Pp. 33-37.