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Assessing the Socio Economic Correlates for Analysing the Management Orientation of Cane and Bamboo Handicraft Entrepreneurs in Assam

M.M.ADHIKARY, K.PRADHAN[1] AND RIDIP SAHARIA
Department of Agricultural Extension, BCKV, Mohanpur, Nadia, WB-745412

Abstract

In the changed global perspective entrepreneurship development is a resilient concept today not only because of industrial growth and business ventures but also a solution for unemployment and for maintaining the sustainable livelihood status of the community. An entrepreneurship development process is a judicious blend of management and risk orientation process for profit maximization. The present study was conducted at Pub Nalbari Block of Nalbari District and Balipara Block of Sonitpur District under the state Assam with a view to assess the socio economic correlates for characterizing the management orientation of cane and bamboo handicraft entrepreneurs. The purposive as well as simple random sampling technique was adopted for the present study. The District and Blocks were purposively selected for the study. The District Nalbari and Sonitpur and the Blocks Pub Nalbari and Balipara were considered. Under Pub Nalbari Block out of ten gaon panchayats *two* gaon panchayats *and in case of Balipara Block out of eighteen* gaon panchayats *two* gaon panchayats *were randomly selected for the study. The hundred handicraft entrepreneurs were selected randomly as respondents from the selected* gaon panchayats *for the purpose of final data collection. The data were collected with the help of structured interview schedule prepared for the study. The selected data were subjected to the statistical tools like coefficients of correlation and multiple regressions for drawing conclusions. The study revealed that entrepreneurs are getting good returns from cane and bamboo enterprises due to the good management orientation of the entrepreneurs. The formal education of the entrepreneurs significantly contributes to the efficient use and management of existing resources in the enterprise with the help of low cost technological intervention for profit maximization. The partnership oriented organizational pattern indicated the better management orientation of the entrepreneurs. The nuclear family status helps in increasing the management orientation of the entrepreneurs for better profit from the enterprise. The involvements of capital for hiring better technology in case of own financial source is decreasing the management orientation of the handicraft entrepreneurs. The variables annual income and family type have recorded a significant regressional effect on the management orientation of the entr epreneurs in presence of other causal variables. In the study, the predictor variables put together 56.7% of the variations embedded in the predicted variables, management orientation has been explained.*

Introduction

The spirit of entrepreneurship development plays an important role in the development of people economically and helps in poverty eradication as a whole. It generates large-scale employment with relatively low capital, promotes more equitable distribution of national income, and makes use of untapped capital and human skills. The North Eastern region of India enjoys a pride of place in the country with heritage of artistic craftsmanship. The crafts of this region are almost entirely too locally available raw materials. The principal handicrafts of this region include basketwork, cane furniture, mats, woodcarvings, terra cotta, artistic textiles, artwork, brass metal craft, dolls and toys, embroidery. The northeastern states in view of their ethno-cultural diversity hold a vital place in Indian Handloom and Handicraft scenario. Survey reveals that eight north eastern states accounted for nearly eighty percent of total handicraft production employing twenty two percent of total artisans and every fourteenth person in the North Eastern region is dependent on handloom and handicraft products for livelihood. The craft or handicraft sector is the largest decentralized and unorganized sector of the Indian economy, and is among India's largest foreign exchange earners (Vijayagopalan, 1993). The number of new jobs created by craft industries was almost as large as the number created by the private and public sectors combined (Pye, 1988). As a socio economic group, artisans are amongst the poorest. Creation of

[1] Department of Agricultural Extension, UBKV, Pundibari, Coochbehar, WB-736165

employment through indigenous crafts tradition is believed to be a productive source of income (Harper, 2000). The current state of India's artisans is a matter of serious concern. Those producing the craft reap the fewest benefits from the lucrative market, and even the most talented often live in object poverty. All though most producers in India are highly skilled and many are true artisans, the vast majorities are poorly educated and have low social status. Moreover this sector in India firstly is lagging in efficient appropriation of its potentiality, and is struggling to reach the production and export possibility frontier. Secondly there is a dearth of information flow among the participants in the market of handicraft products. The state of Assam is traditionally known for its rich handloom and handicraft product, which has own reputation in the world market. People are now showing interest in taking various agro-based agro-unit, handloom and handicraft as an entrepreneurship which is proved to be lucrative for them in the rural areas. Presently, many youth, women and men are running various enterprises successfully in different parts of Assam and it is helping in upliftment of their socio-economic condition. Keeping above in view the present paper has assessed the socio-economic attributes to analyses the management orientation of the cane and bamboo entrepreneurs in Assam.

Methodology

The present study was conducted at Pub Nalbari Block of Nalbari District and Balipara Block of Sonitpur District under the state Assam. The purposive as well as simple random sampling technique was adopted for the present study. It is termed as multi stage random sampling procedure. The District and Blocks were purposively selected for the study. The District Nalbari and Sonitpur and the blocks Pub Nalbari and Balipara were considered. Under Pub Nalbari block out of ten *gaon panchayats* two *gaon panchayats* and in case of Balipara block out of eighteen *gaon panchayats* two *gaon panchayats* were randomly selected for the study. An exhaustive list of respondents was prepared with the help of block and panchayat officials from the selected four *gaon panchayats*. From the prepared list 100 respondents were selected randomly for the purpose of final data collection. A pilot study was conducted in the selected *gaon panchayats* before constructing the data collecting schedule. In course of this survey informal discussion was carried out with some rural entrepreneurs and extension agents of the localities. For the present study the variables, viz. age, education, organizational pattern, annual income, family type, experience, source of finance , source of labour, training exposure were considered as predictor variables and benefit-cost ratio, management orientation, risk orientation and performance of the enterprise were considered as predicted variables. The data were collected with the help of structured schedule prepared for the study after the pilot survey through the process of interview. The selected data were subjected to the statistical tools like coefficients of correlation and multiple regressions for drawing conclusion.

Results and discussion

Table 1 presents the coefficient of correlation of management orientation with the nine causal variables. The table reveals that the variables education (x_2), annual income (x_4), source of labour (x_8) are positively and significantly associated with the management orientation towards the enterprise. The variables organizational pattern (x3), family type (x_5), and source of finance (x_7) are negatively and significantly associated with the management orientation towards enterprise.

Table 1: Correlation coefficient of management orientation (Y) of the cane and bamboo handicraft entrepreneurs along with nine causal variables

Variables	Correlation coefficient (r)
Age (x_1)	-0.1167
Education (x_2)	0.2112
Organization pattern (x_3)	-0.2368 **
Annual income (x_4)	0.6199 **
Family type (x_5)	-0.4592 **
Experience (x_6)	0.0974
Source of finance(x_7)	-0.2327 **
Source of labour (x_8)	0.6117 **
Training exposure(x_9)	0.1220

* Significant at 5% level of significance

** Significant at 1% level of significance

The variable education plays an important role for effective decision making process. The analysis reveals that higher education helps in better management of the enterprise. Higher education improves the knowledge of an individual, more cosmopolite ness and sharing of knowledge and information is more, which helps in utilizing the different resources in his enterprise in an efficient manner. As a result variable education is positively and significantly correlated with the management orientation towards the enterprise.

There are several evidences that the increased annual income can give an impetus to manage the enterprise in an effective manner. Good management is possible if the annual income is higher because he can effectively invest the money for utilization of different resources, recruitment of skill labour for increase the production level of his enterprise. As a result, annual income is significantly and positively associated with management orientation towards the enterprise.

In the study the variable source of labour is divided into hired and not hired. From the analysis it is found that majority of the entrepreneurs use hired labour in comparison to own labour. It reveals that efficient

management of different operation in an enterprise is has been found in case of skill hired labour because they have experienced and knowledge regarding the activity of the particular enterprise. As a result the variable source of labour is positively and significantly associated with management orientation towards the enterprise.

The organizational pattern has been classified into five categories like Proprietorship, Partnership, Private Company, Public Company and Co-operation with other companies. The highest score has been assigned to proprietorship organizational pattern. Actually two types of organizational pattern have been found in the study area *viz*. proprietorship and partnership organizational pattern.

The study reveals that the partnership oriented organizational pattern indicates the better management orientation of the enterprise as because the experience sharing and involvement of capital in case of partnership oriented enterprise is better for delineating management orientation rather than proprietorship organizational pattern. The decision making ability in any enterprise is much higher when several partners involved in an enterprise which ultimately leads to better management orientation towards the enterprise. That is why organizational pattern negatively and significantly associated with the management orientation.

Family type is such a variable which reflects the nuclear and joint family in our society. The higher score has been assigned in case of joint family. The conflict within the joint family is much higher in case of decision making and managing an enterprise rather than nuclear family. That is why the variable family type is negatively and significantly associated with the management orientation.

The variable source of finance has been classified into several financial sources but the higher score is assigned to own source of finance for enterprise. The involvements of capital for hiring better technology in case of own financial source is not abundant for managing an enterprise. That is why source of finance is negatively and significantly associated with the management orientation.

The table 2 presents the multiple regression analysis of management orientation towards the enterprise with the nine causal variables and the result reveals that annual income and source of labour of the entrepreneur have recorded a significant regressional effect on the management orientation in presence of other causal variables. The annual income has contributed the highest direct effect in delineating the management orientation of the enterprise followed by the variable source of labour of the enterprise. The annual income of the entrepreneur indicates that higher risk taking ability, technological intervention, capital investment, involvement of skill hired labour to maximize the profit of the enterprise. That is why this variable has been found wielding substantive effect in the management orientation. The source of labour of the entrepreneur has also recorded a significant substantive impact on the management orientation of the enterprise. The source of labour mainly concentrated to hire and non hired and involvement of skill hired labour leads to better management of the enterprise, minimize risk and achieve quality product. That is why this variable has been found a significant regressional effect in characterizing the management orientation of the enterprise in presence of other predictor variables.

The family represents the classification of family according to the number of family members. The categories of family type are nuclear and joint. The study reveals that the variable family type has substantive significant regressional effect in characterizing the variable management orientation but the effect is negative. It means that joint family is negatively

Table 2: Multiple regression analysis of management orientation (Y) of the cane and bamboo handicraft entrepreneurs along with nine predictor variables

Variables	Standardized Regression Coefficient (β)	β×R	Regression Coefficient (b)	Standard error of 'b'	't' value
Age (x_1)	.007	.005	.0023	.038	0.061
Education (x_2)	-.024	-.018	-.092	.422	-0.220
Organization pattern (x_3)	-.074	-.055	-.704	.747	-0.943
Annual income (x_4)	.408	.307	.00007	.000	4.129**
Family type (x_5)	-.204	-.153	-1.384	.538	-2.575**
Experience (x_6)	-.041	-.030	-.028	.079	-0.360
Source of finance(x_7)	-.159	-.119	-.633	.377	-1.678*
Source of labour (x_8)	.284	.213	2.012	.705	2.853**
Training exposure(x_9)	.016	.012	.0123	.061	0.207

$R^2 = 0.567$ Adjusted $R^2 = 0.524$

* Significant at 5% level of significance * * Significant at 1% level of significance

contributing towards management orientation. In case of joint family there is conflict in between the family member for making the decision in managing their enterprise which is negatively effecting the management orientation towards the enterprise.

The capital invested in case of managing the enterprise is very less where an individual invests the capital but if the individual has taken the loan from different sources of finance then the optimum capital has been invested in case of borrowing the improve technology, skilled manpower etc. which ultimately leads to the better management of the entrepreneurs. That is why the variable source of finance has contributed significantly but negatively in case of characterizing the management orientation.

The R^2 value being 0.567 means the predictor variables put together 56.7% of the variations embedded in the predicted variable, management orientation has been explained and the 43.3% of variation in predicted variable still has been left unexplained. On the basis of the result this should further suggest that inclusion of more relevant and contextual variables can explain more variation in predicted variable.

Conclusion

For the growth of the concept entrepreneurship development efficient management plays a key role in small enterprise. This management includes planning, production and market management. The study revealed that majority of the handicraft entrepreneurs efficiently managing their enterprise for profit maximization and education, annual income and source of labour attributes help in effective management of an enterprise. Education helps in effective decision making process and higher education helps in better management of the enterprise. Higher education improves the knowledge of an individual, more cosmopolite ness and sharing of knowledge and information is more, which helps in utilizing the different resources in his enterprise in an efficient manner. The increased annual income can give an impetus to manage the enterprise in an effective manner. Good management is possible if the annual income is higher because he can effectively invest the money for utilization of different resources, recruitment of skill labour for increase the production level of his enterprise. On the other hand source of labour especially skill hired labour leads to efficient management of different operation in an enterprise because they have experienced and knowledge regarding the activity of the particular enterprise. As a whole these attributes have contributed to construct the whole behavioral complex of entrepreneurship management and performance of the enterprise holistically.

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Economics of milk production (cow) in Faizabad Distt. Of Eastern U.P.

RAMESH KUMAR, RAM ASHRAY SINGH, K.K. SINGH AND RAKESH PAL SINGH
Deptt. of Agricultural Economics, N.D. University of Agri. & Tech, Kumarganj, Faizabad, U.P.

Abstract

The present study was based on 100 respondent of cow milk producers scattered in Faizabad Distt. of eastern U.P. India ranks first in milk production followed by USA in the world. During 2007-08 with milk production of 104.80 million tones. India accounts for a significant share of world's livestock recourses with nearly 16.5% of world's cows population as reported by FAO. The milk production in district Faizabad was 12.20 tones during year 2005-06. The overall average input-output ratio returns per milch animal per day was 1:1.82, 1:1.76 and 1:1.84 in the winter season, summer season and rainy season, respectively.

Introduction

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

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 milk production, with USA on second rank in the world. In the year 2007-08 milk production was 104.80 million tones 53.5 million tones eggs, 44 million kg. wool and 2.6 million tones in India. (Singh *et al.* 2009). India accounts for a significant share of world's livestock resources with nearly 60% of world's buffaloes, 16.5% of cow and 16.20% of goats (FAO, 2004).

Livestock sector plays a key role in Indian rural economy through self-employment, income and food security. This sector provides 15-40 per cent income to nearly 70 per cent of rural households. It employs two third female work force. Livestock is also important for saving and investment for the poor households and in providing them security. The small, marginal and landless households together control 75 per 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 31.70 per cent GDP of agriculture and allied activities. The IIth five year plant envisages an overall growth of 6-7 per cent per annum in the livestock sector.

The milk production cost in India of lowest in the world, only next to Newzealand. 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 million cow and 92.62 million buffalo) in India. In the Uttar Pradesh milch animal population was 45.72 million (25.63 cow and 20.86 million buffalo) and milk production was recorded 12 million tones, in Faizabad district of eastern U.P., the milk production was 1220 tones during 2005-06. (Parag dairy, Faizabad). The specific objectives of the study are:

1. To study the costs and returns of cow milk production.
2. To find out the break-even point analysis of dairy enterprises.
3. To work out problem faced by milk producer associated with cow milk production and to suggest suitable remedial measures.

Research methodology:

A multistage stratified, purposive-cum random sampling technique was used for the selection 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 village 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 were 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 (1 to 2 ha.), medium (2 to 3 ha.) and large households (3 ha. & above). A 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 were collected in the year 2006-

07 from sample households by survey method on total 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 study 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.

$$WA = \frac{\sum W_i X_i}{\sum W_i}$$

Where,

WA = Weighted average
W_i = Weight of variable
X_i = Value of the variable

Break-even analysis was employed to work out break-even output for milch animals (cow) 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 rupee.
ASP = Average selling price per litre of milk (Rs.)
AVC = Average variable cost per litre of milk (Rs.)

Results of Discussion

Costs and returns in cow milk production:

The milk production analysis is different items considered in the production and maintenance costs are given in Table 1, the overall average cost, per animal per day was Rs. 48.53 in the case of cow in winter season. The overall average cost Rs. 50.18 in the case of cow in summer season (Table 2). The results revealed that the overall average cost was observed Rs. 49.39 in the case of cow 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 shown in Table 3 were 33.37, 38.85, 18.12, 3.04, 6.20 per cent, 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. 6.69, 6.88, 6.67, 6.77 and 6.79, respectively.

On an average input-output ratio in milch cow was highest on medium (1:1.86) followed by small (1:1.86), large (1:1.84), landless (1:1.80) and marginal (1:1.75) size groups households in winter season in the Table 5. On an average input-output ratio in milch cow was highest on small (1:1.83) followed by landless (1:1.78), medium and large (1:1.75), and marginal (1:1.71) size groups households in summer season in the Table 6. On an average input-output ratio in milch cow was highest on large (1:1.94) followed by medium (1:1.88), small (1:1.83), marginal (1:1.78) and landless (1:1.74) 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 cows.

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

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Fodder						
Dry fodder	11.01(24.19)	12.27(25.36)	12.16(25.04)	11.80(23.87)	12.36(24.34)	11.92(24.56)
Green fodder	4.40(0.10)	4.37(9.03)	4.30(11.29)	4.25(8.59)	4.30(8.46)	4.32(8.90)
Total	15.41(33.86)	16.64(34.39)	16.46(33.90)	16.05(32.47)	16.66(32.81)	16.24(33.46)
Concentrates						
Grain	10.50(23.07)	10.70(22.11)	10.40(21.42)	10.40(21.03)	11.20(22.06)	10.64(21.92)
Khali	3.00(6.59)	3.40(7.02)	3.20(6.59)	3.25(6.57)	3.30(6.49)	3.23(6.65)
Mineral material	2.60(5.71)	2.70(5.58)	2.70(5.56)	2.90(5.86)	2.70(5.31)	2.58(5.32)
Chunni/ choker	1.97(4.32)	2.10(4.34)	2.10(4.32)	2.30(4.65)	2.52(4.96)	2.20(4.53)
Total	18.7(39.71)	18.90(39.06)	18.40(37.89)	18.85(38.13)	19.72(38.84)	18.78(38.70)
Labour charge	8.33(18.30)	8.37(17.30)	8.75(18.02)	9.13(18.47)	9.05(17.82)	8.73(17.99)
Miscellaneous	1.50(3.29)	1.50(3.10)	1.50(3.08)	1.50(3.03)	1.50(2.95)	1.50(3.09)
Fixed cost	2.19(4.81)	2.97(6.13)	3.44(7.08)	3.90(7.88)	3.84(7.56)	3.27(6.74)
Grand total	45.50(100.0)	48.38(100.0)	48.55(100.0)	49.43(100.0)	50.77(100.0)	48.53(100.0)

Figures in parenthesis indicates percentage to total cost.
Fixed cost = Housing expenditure + Depreciation on machinery + Depreciation on milch animal value + Interest on animal value.
Miscellaneous, included veterinary charges

Table 2: Production and maintenance cost of per milch cow per day in summer season.

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Fodder						
Dry fodder	10.96(23.91)	11.73(23.76)	11.46(23.11)	11.40(21.68)	12.06(22.52)	11.52(22.96)
Green fodder	4.20(9.16)	4.25(8.61)	4.50(9.07)	4.20(7.98)	4.18(7.80)	4.27(8.51)
Total	15.16(33.07)	15.98(32.38)	15.96(32.19)	15.60(29.67)	16.24(30.32)	15.79(31.46)
Concentrates						
Grain	9.30(20.29)	9.90(20.06)	10.20(20.57)	10.90(20.73)	10.70(19.98)	10.20(20.33)
Khali	3.07(6.69)	3.35(6.78)	3.40(6.85)	3.30(6.27)	3.17(5.91)	3.26(6.50)
Mineral material	2.52(5.49)	2.90(5.87)	2.40(4.84)	2.45(4.66)	2.42(4.51)	2.54(5.06)
Chunni/ choker	2.00(4.36)	2.40(4.86)	2.50(5.04)	2.52(4.79)	2.60(4.85)	2.40(4.76)
Total	16.89(36.85)	18.55(37.58)	18.50(37.32)	19.17(36.46)	18.89(35.27)	18.40(36.67)
Labour charge	10.09(22.01)	10.35(20.97)	10.17(20.51)	12.40(23.58)	13.08(24.42)	11.22(22.36)
Miscellaneous	1.50(3.27)	1.50(3.03)	1.50(3.02)	1.50(2.85)	1.50(2.80)	1.50(2.99)
Fixed cost	2.19(4.77)	2.97(6.01)	3.44(6.93)	3.90(7.41)	3.84(7.17)	3.27(6.52)
Grand total	45.83(100.0)	49.35(100.0)	49.57(100.0)	52.57(100.0)	53.55(100.0)	50.18(100.0)

Figures in parenthesis indicates percentage to total cost.

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

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Fodder						
Dry fodder	12.21(25.13)	12.40(25.02)	12.21(25.16)	12.00(23.82)	12.26(24.55)	12.21(24.72)
Green fodder	4.70(9.74)	3.98(8.03)	4.15(8.55)	4.30(8.54)	4.20(8.41)	4.27(8.64)
Total	16.91(34.81)	16.38(33.06)	16.36(33.72)	16.30(32.36)	16.46(32.96)	16.48(33.37)
Concentrates						
Grain	10.90(22.44)	10.95(22.10)	10.55(21.74)	11.20(22.23)	10.40(20.82)	10.80(21.87)
Khali	2.99(6.15)	3.60(7.26)	2.99(6.16)	3.17(6.29)	3.24(6.49)	3.20(6.47)
Mineral material	2.62(5.39)	2.85(5.75)	2.80(5.77)	2.70(5.36)	2.90(5.81)	2.77(5.61)
Chunni/ choker	2.07(4.26)	2.50(5.04)	2.58(5.32)	2.50(4.96)	2.45(4.90)	2.42(8.90)
Total	18.58(38.25)	19.90(40.16)	18.92(38.99)	19.57(38.85)	18.99(38.02)	19.19(38.85)
Labour charge	9.40(19.35)	8.80(17.76)	8.30(17.11)	9.10(18.07)	9.15(18.32)	8.95(18.12)
Miscellaneous	1.50(3.09)	1.50(3.02)	1.50(3.09)	1.50(2.98)	1.50(3.00)	1.50(3.04)
Fixed cost	2.19(4.51)	2.97(5.99)	3.44(7.09)	3.90(7.74)	3.84(7.69)	3.27(6.20)
Grand total	48.58(100.0)	49.55(100.0)	48.52(100.0)	50.37(100.0)	49.94(100.0)	49.39(100.0)

Figures in parenthesis indicates percentage to total cost.

Table 4: Cost of milk production (per litre) in different milch cow per lactation(Rs./ Milch animal)

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Total cost (Rs.)	12125.53	12764.27	12708.80	13205.40	13369.20	12834.47
Total milk production (Litre)	1812.20	1853.80	1905.80	1950.00	1968.20	1898.00
Cost of Milk production/ litre (Rs.)	6.69	6.88	6.67	6.77	6.79	6.76

Break-even point analysis for cow:

The break-even point analysis was done to estimate the minimum quantity of milk to be produced to cover the total cost on all the size groups of household for cow are given in Table 8. The break-even output worked out in case of cow milk, was 6.25, 8.23, 8.42, 9.28 and 8.93 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 8.31 per cent of cow to the total milk yield.

Constraints analysis:

In the Table 9 response of the sample

Table 5: Input-output ratio per milch cow per day (winter season).

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs.)	45.50	48.38	48.55	49.43	50.77	48.53
Milk yield (litre)	7.00	7.25	7.50	7.60	7.60	7.39
Price of milk (Rs/ litre)	11.20	11.20	11.50	11.56	11.70	11.44
Value of Young (Rs. /day)	2.20	2.35	2.60	2.90	3.00	2.61
Value of dung (Rs./ day)	1.30	1.37	1.35	1.40	1.38	1.36
Gross return (Rs.)	81.90	84.92	90.20	92.16	93.30	88.51
Net profit (Rs.)	36.40	36.54	41.65	42.73	42.53	39.98
Cost Benefit ratio	1.80	1.75	1.86	1.86	1.84	1.82

· Gross return, included value of young and dung stock.

Table 6: Input-output ratio per milch cow per day (winter season).

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs.)	45.83	49.35	49.57	52.57	53.55	50.18
Milk yield (litre)	6.50	6.60	6.90	7.00	7.10	6.82
Price of milk (Rs/ litre)	12.00	12.20	12.60	12.50	12.60	12.38
Value of Young (Rs. /day)	2.20	2.35	2.60	2.90	3.00	2.61
Value of dung (Rs./ day)	1.30	1.37	1.35	1.40	1.38	1.37
Gross return (Rs.)	81.50	84.24	90.89	91.80	93.84	88.41
Net profit (Rs.)	35.67	34.89	41.32	39.23	40.29	38.23
Cost Benefit ratio	1.78	1.71	1.83	1.75	1.75	1.76

· Gross return, included value of young and dung stock.

Table 7: Input-output ratio per milch cow per day (Rainy season).

Particulars	Categories of milch animal					
	Land less	Marginal	Small	Medium	Large	Overall
Total cost of production (Rs.)	48.58	49.55	48.52	50.37	49.94	49.39
Milk yield (litre)	7.40	7.55	7.60	7.90	8.00	7.69
Price of milk (Rs/ litre)	11.00	11.20	11.20	11.50	11.60	11.30
Value of Young (Rs. /day)	2.20	2.35	2.60	2.90	3.00	2.61
Value of dung (Rs./ day)	1.30	1.37	1.35	1.40	1.38	1.36
Gross return (Rs.)	84.90	88.25	89.07	95.15	97.18	90.87
Net profit (Rs.)	36.32	38.70	40.55	44.78	47.24	41.48
Cost Benefit ratio	1.74	1.78	1.83	1.88	1.94	1.84

· Gross return, included value of young and dung stock.

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

Particulars	Categories of households					
	Land less	Marginal	Small	Medium	Large	Overall
Milk yield per animal (litre)	1812.20	1853.80	1905.80	1950.00	1968.20	1898.00
Fixed cost per animal (Rs.)	569.40	772.20	894.40	1014.00	993.40	850.20
Variable cost per animal (Rs.)	11556.13	11992.07	11814.40	12191.40	12370.80	11984.27
Total cost per animal (Rs.)	12125.53	12764.27	12708.80	13205.40	13369.20	12834.47
Variable cost per litre of milk (Rs.)	6.37	6.47	6.20	6.25	6.28	6.31
Price per litre of milk (Rs.)	11.40	11.53	11.77	11.85	11.96	11.70
Break-even Point (litre)	113.20	152.61	160.57	181.07	175.71	157.74
Percentage of BEP to total output	6.25	8.23	8.42	9.28	8.93	8.31

Table 9: Ranking the constraints faced by cow milk producer.

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 milk productivity of milch animals	58	58.00	
(ii) Poor quality of bulls at village	62	62.00	
(iii) Inadequate knowledge about balanced feeding	50	50.00	
(iv) Shortage 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 for milk	80	80.00	
(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. Infrastructural 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**	

Figures in parenthesis indicate average to respective constraints.

households about the constraints faced by the average financial constraints were 67.40 per cent, marketing constraints 57.50 per cent, technical constraints 55.00 per cent, production constraints 54.25 per cent and infrastructural constraints 48.60 per and its corresponding ranks were observed I, II, III, IV and V, respectively.

Conclusion

It is observed from this study that the total overall average production and maintenance cost for per milch cow per day was Rs. 48.53 during winter season, Rs. 50.18 during summer season and Rs. 49.39 during rainy season. The break-even output was found maximum on medium size group of milch cows. The overall average input-output ratio was per milch animal per day was 1:1.82 during winter season, 1:1.76 in summer season, 1:1.84 rainy season for cow, respectively.

Suggestions:

As per analysis and discussions during the field study with the opining of the household beneficiaries, following suggestions for improvement in dairying were offered:

1. There is need to evolve a comprehensive livestock development policy for the state to record the milestone of livestock and dairy development in the state.
2. The state government agencies must work out a feasible arrangement to grow fodder crops by enhancing the area under green fodder.
3. Some infrastructure development like road communication is needed for transportation of fodder, feed concentrates, veterinary services and medicines and transportation of milk to the consuming centers.
4. There is urgent necessity of genetic upgradation of animals on a massive scale to improve the milk production in the state.
5. There is need to educate and assist the dairy farmers/ households in respect of breeding, feeding, management technique and marketing of milk.
6. Efforts should be made for intensive epidemiological studies on livestock diseases and infection. Efforts may be undertaken for control and eradication of such diseases.
7. The conductive environment and confidence in the minds of dairy households should be created to make a break through in dairy farming in back ward areas.

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Milk production function for different herd size groups of buffalo in Agra district of U.P.

SATYENDRA PAL SINGH, R.P. SINGH[1] SANJEEV SINGH[2] AND BHUMI RAJ SINGH[3]
Scientist, R. B. S. College, Krishi Vigyan Kendra, Bichpuri (Agra)-283105

Abstract

The study examines the input-output relationship in the use of resources for milk production for different herd size groups of buffalo in the members Village Dairy Cooperative (VDC) and non-members of VDC in Agra district of Uttar Pradesh for the year 2009-10. The result of the Cobb-Douglas production function revealed that concentrate was the single most significant factor effecting the milk production of all the herd size groups of buffaloes and both classes. Green fodder was the next important significant factor in all herd size groups in member class and single one herd size group in non-members class. The regression coefficients of dry fodder input were non-significant in most of the groups. The marginal value product of concentrate should that in almost all the groups it was used efficiently. On the other hand, the MVP of green fodder was efficiently in some herd size groups and dry fodder showed inefficient use of the inputs in the study areas and thus, warranted a reduction in their use.

Introduction

The milch animal is only a biological machine, which converts roughages and crude protein into milk, which is a source of animal protein for the human beings. The full genetic potential of the animals could be tapped only under adequate and balanced feeding. It has been observed that proper feeding along could increase the milk production by 50 per cent. In the economics of milk production, feed account for more than two thirds of the milk (Tripathi et. al. 1986; Rao et. al. 1991). Among the variable feeds, the cost of concentrates constitutes more than one-third of the feed cost (Goswami and Rao, 1992, Kumar and Balishter, 1996). Grains constitute one of the important constituents of the concentrate feed. There is, therefore, a stiff competition for grains for human consumption as well as for milk production. This puts grater reliance on the judicious use of scarcer sources for milk production. Shah and Singh (1994) advocated an increase in the use of green fodder and concentrate for higher milk production and profits. Gupta and Kumar (1988), Sharma and Rajpali (1989) and Shah et. al. (1995) conducted numerous surveys to identify the factors effecting milk production.

The present study was, therefore, designed to examine the input-output relationship for milk production for different herd size groups of buffaloes owned by members and non-members of VDC under different market infrastructure in Agra district of Uttar Pradesh.

Materials and Methods

Agra district was purposively selected for the study as it is the higher concentration of buffalo population indicated the commercial nature of dairy enterprise in the district.

The sampling design adopted for the study was multistage stratified random sampling. Agra district comprises of 15-development block. The Etmadpur block was selected at random. The district also comes under the preview of PCDF (PARAG) dairy federation. Since than, 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 list of VDC (PCDF) villages in the selected block was obtained and ten villages were selected randomly. First of all, the list of producers of milk was prepared in the 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 herd size groups as Ist group (1 milch buffalo), IInd group (2 milch buffaloes) and IIIrd group (3 or more milch buffaloes) by using cumulative square root method of stratification. A sample of households was selected from each groups using probability proportion to size technique. Thus, the number of households selected in Ist, IInd and IIIrd herd size groups in member class were 25, 31 and 19 respectively. Similar figures for non-member class were 39, 25 and

[1]P. C., K. V. K., Hastinapur, SVPUA & T, Meerut (U. P.)
[2]Scientist, Animal Biotechnology Center, MPPCVV, Jabalpur (M.P.)-482004.
[3]C.S.R. Centre (ICAR), R.B.S. College, Bichpuri, (Agra)

11. Thus, the study covered 150 households.

The data for the study was collected on a pre-tested questionnaire in three different seasons, viz. summer (March-June), rainy (July-October) and winter (November-February) for the year 2009-10. The information was collected on variables like quantity of green fodder, dry fodder and concentrates fed per buffalo along with their prices. Milk yield and the price realized on the previous day by visit, for different herd size groups of buffaloes, viz. Ist, IInd and IIIrd maintained by the sample households.

To study the input-output relationship between the value of milk production and the various explanatory variables, Linear, Cobb-Douglas and semi-long forms of production function were fitted. Cobb-Douglas production function was found to be the best fit to the data satisfying both economic and statistical criteria. The mathematical module of selected production function is given as follows:

$$Y = a\ X_1^{b1} X_2^{b2} X_3^{b3}$$

Where,

Y = Value of milk production per buffalo in rupees.

X_1 = Expenditure on green fodder fed per buffalo in rupees.

X_2 = Expenditure on dry fodder fed per buffalo in rupees.

X_3 = Expenditure on concentrate fed per buffalo in rupees.

In addition to the 'a' is the constant term and b_1, b_2, b_3 are partial regression coefficients of Y with respect to X_1, X_2, and X_3 variables, respectively.

The marginal value product (MVP) or three herd size groups of milch buffaloes for major input like green fodder, dry fodder and concentrate were worked out at their geometric mean levels to judge the degree of disequilibrium in the resource use and suggest the direction of resource use (Sharma and Singh, 1993).

The formula for ascertaining MVP for major inputs is given below:

$$MVPx_1 = b_1 \frac{Y}{X_1}$$

Where,

B = Elasticity coefficient of it input in production function.

X_1 = Geometric mean of it input.

Y = Actual levels of returns when all the inputs are at geometric mean levels.

R^2 = Coefficient of multiple determination.

Results and Discussion

Milk Production Functions:

The elasticity of production along with standard errors of regression coefficients and coefficient of multiple determinations of the milk production functions for Ist, IInd and IIIrd herd size groups of buffaloes maintained by members and non-members milk producers are provided in Table 1.

Ist Herd Size Group:

The results of regression analysis for Ist herd size group are presented in Table 1. The variables included in the production surfaces explained 60 to 81 per cent variation in milk yield.

Among the, expenditure on green fodder in member class and for concentrate in non-member class was found to be significant (P<0.01). On an average, one per cent increase in the expenditure on green fodder in members resulted in an increase of 0.56 per cent in the returns for milk and non-members increase in the one per cent expenditure on concentrate resulted in an increase of 0.83 per cent in the returns for milk.

Though the response of dry fodder on milk production was statistically non significant in both classes. This suggests that the producers in the study area might be feeding dry fodder at optimum level or there might not be much variation in the expenditure on dry fodder among members and non-members households.

The sum of elasticity in case of members comes out to be 0.92 which shows decreasing returns to scale. For non-members the sum of elasticity comes to be 1.08, which indicates increasing returns to scale.

IInd Herd Size Group:

Above Table presents the results of Cobb-Douglas production function for IInd herd size group in the study area for members and-members household.

The explanatory variables included in the production functions explained 76 to 88 per cent variation in the value of milk output in the study area.

Concentrate appeared to be the single most important variable influencing IInd herd size group milk production. Its coefficient was positive throughout and statistically significant (P<0.01) in members and non-members. On an average, one per cent increase in the expenditure on concentrate resulted in an increase of 0.91 per cent and 0.87 per cent in returns from milk in member class and non-member class.

It indicates that there was possibility of increasing the expenditure on concentrate to increase the production of milk in members and non-members.

The expenditure on green fodder emerged to be the most important variable significantly (P<0.01) influencing the returns from milk in the member class and non-member class was found to be non significant. On an average, one per cent increase in expenditure on green fodder increased 0.24 per cent returns

from milk in member class.

The estimates of elasticity with respect to expenditure on dry fodder were positive in both classes. The sum of elasticity in members was 1.38 and non-members were 1.14 which indicates increasing returns to scale.

IIIrd Herd Size Group:

Milk production function in the IIIrd herd size group were also fitted for members and non-members classes. The results of the regression analysis are also exhibited in Table 1. The production functions for both classes of households explained 66 to 87 per cent of total variation in returns from milk production.

The expenditure on concentrate was found to be highly significant ($P<0.01$) in member class whereas it was just significant ($P<0.05$) in non-member class. On an average, one per cent increase in the expenditure on concentrate resulted an increase in value of milk output by 0.65 per cent in member class and 0.36% in non-member class. In the reverse trend of the expenditure on green fodder was found to be highly significant ($P<0.01$) in non-member class. Whereas it was just significant ($P<0.05$) in member class. On an average, one per cent increase in the expenditure on green fodder resulted an increase in value of milk output in non-members and members by 0.46 and 0.30 per cent.

Though the expenditure on dry fodder was found to be non significant in member class and it was significant ($P<0.05$) in non-member class. The IIIrd herd size group might be getting optimum levels of dry fodder in member class, while there was a possibility of increasing expenditure on dry fodder in non-member class.

The sum of elasticity in case of members comes out to be 1.04 which shows' decreasing returns to scale and non-members comes out to be 1.64 which indicates increasing returns to scale.

Additional returns from milk per rupee additional expenditure on different herd size groups of feed was calculated and it was observed that in the IInd and IIIrd herd size groups, in member class and Ist and IInd herd size groups in non-member class, a rupee additional investment on concentrate resulted in more than on rupee additional returns for milk. The member class Ist and IInd herd size groups and non-member class only IIIrd herd size groups consistently gave more than one rupee returns from milk for every one rupee additional increase in the expenditure on green fodder. Dry fodder did not show any higher returns in all the groups of buffaloes though they were found to have significant influence on returns from milk.

The above analysis clearly indicated the importance of concentrate and green fodder input in particular for higher milk production and profits for different herd size groups of milch buffaloes. The regression coefficient of concentrate and green fodder input was found to be positive and highly significant for all the herd size groups of milch buffaloes. Thus, an increase in the level of this input demonstrated an increase in the production. The, results are comparable to the earlier studies under field conditions (Chikara and Gangwar, 1975; Pandey et. al.

Table 1 : Milk production for different herd size groups of buffaloes

Herd Size groups	Number of cases	Constant 'a'	Regression Coefficients			Sum of elasticity	R^2X100
			Value of green fodder (X_1)	Value of dry fodder (X_2)	Value of concentrate fodder (X_3)		
MEMBERS							
Ist group	25	16.75	0.56288**	0.05389	0.29824	0.91501	81,43
		(0.11525)	(0.18132)	(0.16772)			
IInd group	62	0.46	0.23763**	0.14660	0.90845**	1.29268	75.75
		(0.07652)	(0.14186)	(0.11100)			
IIIrd group	65	3.95	0.29770*	0.08366	0.65482**	1.03618	65.76
		(0.12478)	(0.15065)	(0.13850)			
Overall	152	2.37	0.23475**	0.10127	0.75703**	1.09305	70.07
		(0.05531)	(0.08065)	(0.07356)			
NON-MEMBERS							
Ist group	39	1.41	0.01855	0.22374	0.83395**	1.07624	59.50
		(0.02403)	(0.31359)	(0.12808)			
IInd group	50	1.04	0.03499	0.23366	0.87156**	1.14021	88.38
		(0.01324)	(0.20573)	(0.05945)			
IIIrd group	33	0.08	0.46466**	0.72466*	0.36322*	1.55254	87.22
		(0.15270)	(0.34064)	(0.14214)			
Overall	122	1.18	0.03559	0.30554	0.77730**	1.11843	71.74
		(0.01380)	(0.17864)	(0.05272)			

Figurers in parentheses indicate standard error of regression coefficients

* Significant at 5 per cent level ** Significant at 1 per cent level

1980; Sharma and Singh, 1993; Shah et. al. 1995)

Resource use Efficiency:

The MVP was, therefore, tested whether it was significantly different from unity or not with the help of 't' test. The marginal value products of three herd size groups of buffaloes were worked out and are presented in Table 2.

Table 2 : Marginal value products of inputs

Herd Size groups	Green Fodder	Dry Fodder	Concentrate
MEMBERS			
Ist group	8.34**	0.34	1.14
IInd group	2.28**	1.08	3.29**
IIIrd group	2.90*	0.81	2.42**
Overall	2.43**	0.82	2.79**
NON-MEMBERS			
Ist group	0.22	0.62	1.98**
IInd group	0.40	0.77	2.42**
IIIrd group	3.74**	2.17*	1.06*
Overall	0.37	0.98	2.08**

Significantly different from unit at *P <0.05, ** P <0.01

The marginal value product of green fodder in case of member class observed to be efficient in all the herd size group and non-member class also among IIIrd herd size group. The MVP of green fodder was observed to be significantly (P<0.01) greater than unity in Ist and IInd herd size groups in member class and IIIrd herd size group in non-member class. There was an indication that the green fodder was used efficiently for milk production in member class.

The allocation of dry fodder in the case of member class herd size groups, in general, was observed to be not efficient. While in the case of non-member class the MVP was significantly (P<0.05) greater than IIIrd herd size group indicating the possibility of increasing the allocation of dry fodder.

In the case of IInd and IIIrd herd size group in member class and IST and IInd herd size groups in non-member class, the use of concentrate were observed to be efficient. The MVP of concentrate was observed to be significantly (PO<0.01) greater than IInd and IIIrd herd size groups in member class and Ist & IInd herd size groups in non-member class. The efficiency of concentrate was, therefore low in non-member class and was just efficient in case of member class.

Conclusion

A comparison of the milk production surfaces of Ist, IInd and IIIrd herd size groups in member and non-member class revealed that the expenditure on concentrate was the single most significant factor affecting returns from milk. However, it was observed that one rupee additional investment resulted in more than one rupee additional returns from milk in the case of IInd and IIIrd herd size groups in member class and Ist and IInd herd size groups in non-member class. Green fodder also show significant response in all herd size groups in member class and only IIIrd herd size group in non-member class.

Dry fodder did not show any significant response in all the herd size groups of both classes. A critical examination of the marginal value product derived from production functions revealed that dry fodder was used inefficiently to produce milk in the study area. The use of concentrate was observed to be efficient in some of the groups it also indicated that an increased returns through milk. There is, therefore, a possibility of increasing returns form milk by increasing expenditure on concentrate in general in the both classes and green fodder particularly in all herd size groups in member class and IIIrd herd size group in non-member class.

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Effect of brine treatment on sensory, chemical and microbiological quality of paneer

Y.N.YADAV, C. SINGH[1] AND M.P. GUPTA
Department of Dairy Science, U.P. Pt. D.D. Upadhyay Veterinary University, Mathura-281001 (U.P.)

Abstract

The shelf life of paneer prepared from buffalo milk (6% fat and 9% MSNF), using three different coagulants, viz. citric acid, lactic acid and tartaric acid and 80°C coagulation temperature, and dipped in brine solution, was assessed by monitoring changes in sensory, chemical and microbiological parameters at different storage intervals. While, paneer made with 1 and 2% citric acid and lactic acid elicited better sensory attributes and higher total solids, protein and fat contents as compared to product made with lactic acid, the storage related changes in sensory, chemical and microbiology qualities at different storage periods followed almost similar pattern. Based on these parameters, it was suggested that the shelf life of paneer could be extended for 21 days by the brine treatment of the product.

Introduction

Paneer is a popular indigenous variety of soft cheese, which is obtained by acid coagulation of milk at high temperature. Paneer provides one of the best methods of preserving and conserving milk solids in highly concentrated form. Good quality paneer is characterised by its mild acidic flavour with slightly sweet taste, firm and compact body and close-knit smooth texture. The flavour and composition of paneer are controlled primarily by the composition of milk from which it is prepared.

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 meats (Srivastava and Goyal, 2007). Nutritionally, paneer is of great value in diet, because it is rich source of high quality proteins, fats, essential fatty acids, amino acids, vitamins and minerals. With its low sugar content, it is recommended to diabetic persons. Conventionally, the raw material for manufacture of paneer is buffalo milk or blends of cow and buffalo milk (Yadav *et al.,* 2009).

The shelf life of paneer is about 7 days under refrigeration, though its freshness is lost within 4 days. At room temperature, paneer does not keep good for more than a day (Dharam Pal and Agrawala, 2007). It is, therefore, imperative to extend the shelf life of paneer to facilitate long distance transportation and convenience disposal. The present study was undertaken to enhance the shelf life of paneer at refrigeration temperature by treating it with brine solution, which is inexpensive and convenient to use.

Materials and Methods

Preparation of paneer: The method used for paneer manufacture was as suggested by Bhattacharya *et al.,* (1971) and subsequently modified by Sachdeva (1983). The standardized buffalo milk (6% fat and 9% MSNF) was heated to 100°C for 5 minutes and then cooled to 80°C. Various coagulants, *viz.* citric acid, lactic acid and tartaric acid at one and two per cent concentration each were added slowly with continuous agitation till clear whey separated out. The curd was then left for 10 minutes in the whey and then drained though muslin cloth and pressed in a hoof at 2 kg/cm^2 pressure. The paneer block was dipped in chilled water for 2 hour to get firm body. It was then cut into 200 g pieces and dipped in 5% brine solution 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 also determined at regular intervals (0, 7, 14 and 21 days) by methods prescribed in BIS (1962).

Results and Discussion

The shelf life of paneer prepared from buffalo milk (6% fat and 9% MSNF) was assessed at different storage periods by monitoring changes in sensory, chemical and microbiological parameters.

Sensory attributes: The results on changes in sensory attributes, *viz.* appearance, flavour, body and texture and overall acceptability have been compiled in Table 1. These results indicated that the samples of paneer made using 1% citric acid at 80°C coagulation temperature elicited maximum score (8.50) for

[1]Professor & Head (Retd.), Deptt. of Animal Husbandry & Dairying, C.S.A. Univ. of Agric.& Tech., Kanpur (U.P.)

Table 1. Effect of brine treatment on sensory attributes of paneer

	B_1	B_2	B_3	B_4	B_5	**B_6**
			Appearance			
D_1	8.50	8.40	8.40	8.20	7.90	7.80
D_2	8.00	7.90	7.90	7.70	7.50	7.40
D_3	7.40	7.30	7.30	7.10	6.90	6.70
D_4	6.50	6.40	6.40	6.20	6.00	5.80
			Flavour			
D_1	8.40	8.30	8.20	8.10	7.90	7.70
D_2	7.30	7.20	7.70	7.60	7.40	7.30
D_3	6.90	6.80	7.10	7.00	6.80	6.60
D_4	6.40	6.30	6.20	6.10	5.90	5.70
			Body and Texture			
D_1	8.30	8.20	8.20	8.00	7.80	7.60
D_2	7.80	7.70	7.70	7.50	7.30	7.20
D_3	7.20	7.10	7.10	6.90	6.70	6.50
D_4	6.30	6.20	6.30	6.0	5.90	5.85
			Overall acceptability			
D_1	8.40	8.30	8.20	8.01	7.90	7.70
D_2	7.60	7.50	7.70	7.60	7.40	7.30
D_3	7.00	6.90	7.10	7.00	6.80	6.60
D_4	6.40	6.30	6.30	6.10	5.90	5.72

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%.

Storage period: D_1 0 day (Fresh), D_2 7 days, D_3 14 days, D_4 21 days.

appearance, followed by paneer prepared with 2% citric acid. Lactic acid also yielded good quality paneer at 1% (8.40) and 2% (8.20) concentration. The tartaric acid, however, produced inferior quality product. During storage after 7 days, the score for appearance declined slightly. After 14 days of storage, the score further declined but it was over 7, except for tartaric acid paneer, which indicated that the quality of paneer in respect to appearance was still good. At 21 days of storage, the product scored above 6 score (except for tartaric acid) which suggested that the appearance was acceptable.

The flavour, which is the most important attribute, was also found best (8.40) in paneer made with 1% citric acid, followed by 2% citric acid, lactic acid and tartaric acid. The body and texture also followed similar trend as the flavour. The changes in flavour, body and texture of the product at different storage intervals followed almost a similar pattern as the appearance score. The overall acceptability was also highest (8.40) in case of fresh paneer prepared with 1% citric acid. The overall acceptability declined as the period of storage elapsed. After 14 days, the overall acceptability score was around 7 indicating that the product was still of good quality. At 21 days, however, the overall acceptability score further declined but it was above 6 (except for tartaric acid) which suggested that the product still remained of acceptable quality, as adjudged by sensory evaluation.

Table 2. Effect of brine treatment on chemical quality of paneer

	B_1	B_2	B_3	B_4	B_5	**B_6**
			Moisture content (%)			
D_1	53.80	53.10	54.30	53.60	55.80	55.20
D_2	53.50	52.80	54.00	53.30	55.50	54.80
D_3	53.08	52.38	53.58	52.88	55.08	54.30
D_4	53.00	52.00	53.20	52.50	54.07	54.00
			Total solids (%)			
D_1	46.20	46.90	45.70	46.40	44.20	44.80
D_2	46.50	47.20	46.00	46.70	44.50	45.20
D_3	46.92	47.62	46.42	47.12	44.92	45.70
D_4	47.00	48.00	46.80	47.50	45.93	46.00
			Protein content (%)			
D_1	14.80	15.30	14.60	15.10	14.40	15.40
D_2	14.90	15.40	14.70	15.20	14.50	15.50
D_3	15.02	15.52	14.82	15.32	14.62	15.62
D_4	15.10	15.60	14.92	15.40	14.70	15.70
			Fat content (%)			
D_1	27.30	27.50	27.00	27.20	25.70	25.80
D_2	27.50	27.70	27.20	27.40	25.90	26.10
D_3	27.80	28.00	27.50	27.70	26.20	26.40
D_4	28.00	28.20	27.70	27.90	26.40	26.60
			Ash content (%)			
D_1	2.10	2.10	2.10	2.10	2.10	2.10
D_2	2.10	2.10	2.10	2.10	2.11	2.12
D_3	2.10	2.10	2.10	2.12	2.12	2.12
D_4	2.20	2.20	2.20	2.15	2.14	2.15

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%.

Storage period: D_1 0 day (Fresh), D_2 7 days, D_3 14 days, D_4 21 days.

Chemical quality: The total solids, protein and fat contents of paneer were slightly influenced by the concentration of coagulant (Table 2). In general, the contents of these solids, were higher in fresh products (D_1) prepared with 2% concentration, while 1% concentration of coagulants caused more retention of moisture contents. As the period of storage of paneer advanced, there was a gradual decline in moisture contents in all paneer samples with concomitant increase in total solids, protein and fat content. The ash content was, however, little affected by storage periods. After 7 days (D_2) storage, there was little loss of moisture with proportionate increase in total solids which accentuated after storage for 14 days (D_3) and 21 days (D_4). All paneer samples elicited almost similar trends irrespective of the concentration and type of coagulants used. It was further noted that all the samples of paneer whether fresh or stored for varying periods of time met with the PFA specification.

The quality of paneer depends on quality of raw milk used. Buffalo milk is considered more suitable for making good quality paneer with desirable attributes (Yadav *et al.*, 2009). Best quality paneer could be prepared by using buffalo milk having 6% fat. The type of coagulant, its strength and temperature of coagulation affect the yield, sensory quality as well as chemical composition of paneer (Ramasamya *et al.*, 1999). Bhattacharya *et al.*, (1971) and Sachdeva and Singh (1988) suggested 1% citric acid as optimum for making good quality paneer from buffalo milk. The data on chemical quality of paneer are also fully supported (Bhattacharya *et al.*, 1971; Sweta Rai, 2004; Divya Srivastava, 2004). Over results on changes in chemical quality of paneer during storage are also substantiated by data of Yadav and Gupta (2009).

Microbiological quality of paneer: The results on changes in standard plate count (SPC), coliform count and yeast and mould counts in paneer during storage are presented in Table 3, which indicated that fresh samples, of paneer contained a small number of viable organisms (31 to 38 cfu/g) coliform organisms were completely absent in the product, as strict hygienic measures were observed in the preparation of product. No yeast and moulds were found in the product. However, during storage, the total viable counts (SPC) and yeast and moulds increased as the storage period elapsed. The growth of these organisms, however, occurred at a slow pace due to the brine treatment of the product. Even after 21 days of storage (D_4), the SPC and yeast and moulds counts of paneer were well within the prescribed limits (BIS, IS:10484-1983). The absence of coliform organisms in the product indicated the strict sanitary conditions maintained during storage.

These results suggested that the shelf life of paneer could be extended for 21 days by the brine treatment of the product. Such results are supported by the observations of Sachdeva (1983) who reported that paneer dipped in 5% brine solution lasted for nearly 20 days as against control that kept well for 7 days at 5-7°C. The sensory attributes were rated higher for salted samples, since, paneer is mostly salted and spiced before consumption. Besides salting (brine treatment), various other methods *viz.* use of preservative, freezing, heat sterilization, vacuum packaging and hurdle technology have also been attempted to enhance the shelf life of paneer (Dharam Pal and Agrawala, 2007).

Table 3. Effect of brine treatment on microbiological quality of paneer

	B_1	B_2	B_3	B_4	B_5	**B_6**
			Standard plate count (cfu/g)			
D_1	33.60	31.90	35.20	33.80	38.00	35.70
D_2	44.90	42.80	47.10	45.00	49.60	47.20
D_3	61.50	59.50	53.70	61.30	62.00	63.90
D_4	87.30	85.70	90.00	88.00	92.10	90.70
			Coliform count			
D_1						
D_2						
D_3			NIL			
D_4						
			Yeast and mould count (cfu/g)			
D_1	0.0	0.0	0.0	0.0	0.0	0.0
D_2	61.0	59.0	63.0	60.0	65.0	62.0
D_3	83.0	81.0	9.50	93.0	95.0	95.0
D_4	139.0	137.0	142.0	139.0	144.0	144.0

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%.

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Standardization of methods for manufacture of paneer spread

BAL RAM DWIVEDI[1], HARI SINGH[2] AND M.P.GUPTA
Department of Dairy Science, U.P. Pt. D.D.Upadhyay Veterinary University, Mathura-281001 (U.P.)

Abstract

Paneer was prepared from standardized buffalo milk containing 6% fat and 9% MSNF using one per cent citric acid as coagulant at 80°C coagulation temperature. Such paneer was used for preparation of paneer spread by blending it with 10% whey and varying concentration (1.0, 1.5 and 2.0%) of salt and preservatives (0.2% sodium benzoate or potassium metabisulphite) into a smooth paste consistency. The product was evaluated for sensory attributes and chemical and micro- biological qualities. The product prepared with 1.5% added salt and pot. metabisulphite as preservative elicited highest sensory score. The chemical quality of paneer spread was influenced by the levels of added salt and preservatives. The micro-biological quality of the product was excellent as only a few viable organisms were observed. No coliform organisms or yeast and mould were found in the product.

Introduction

The health-oriented foods are generally referred to as functional foods, designer foods, pharma foods or nutraceuticals. However, dairy foods constitute a family of natural functional foods due to their established health related benefits. Nutritive value of paneer is fairly high, as it contains almost all the proteins and fats present in milk besides being a rich source of minerals and vitamins. It possesses a nutty flavour with slightly sour and sweet taste, which makes it palatable to Indian palate. Variety of culinary dishes and snacks are prepared from paneer in addition to its direct consumption. Although, the buffalo milk is best suited for paneer manufacture but good quality of paneer has also been made from cow or mixed milk with suitable treatments and/or modifications (Dharam Pal and Agrawala, 2007; Yadav *et al.*, 2009 and Dwivedi *et al.* (2010).

Recently, a spread has been developed from paneer, which has pleasant taste and liked very much over other spread on account of its nutty flavour. Presently, mainly two types of spread are available in market, namely butter and cheese spread, which are used alongwith bread in the breakfast. Butter spread is not preferred by obese persons or those suffering from coronary heart diseases. Cheese spread is suitable for consumers of all age groups but it is highly expensive. Contrarily, the paneer spread would be cheaper but equally nutritious. The present study was, therefore, undertaken to optimize technological parameters for manufacture of paneer spread from buffalo milk.

[1]Lecturer, Deptt. of Animal Husbandry & Dairying, Nehru P.G. College, Lalitpur (U.P.)

[2]Head, Deptt. of Animal Husbandry & Dairying, Brahma Nand Mahavidyalaya, Rath, Distt. Hamirpur (U.P.).

Materials and Methods

Standardization of milk: The buffalo milk was standardized to 6.0 per cent fat and 9.0% MSNF.

Preparation of paneer: The paneer was made 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 then cooled to 80°C. Citric acid (1%) was added to milk at 80°C. The curd was left for 5-10 minutes in the whey without agitation. The whey was then drained through muslin cloth and the coagulated mass was pressed in a hoof by applying presence of 2 kg/cm^2. It was then dipped in chilled water for 2 hour and packaged in LDPE packs and stored at 5°C.

Preparation of paneer spread: The paneer prepared from standardized buffalo milk containing 6.0% fat and 9% SNF using citric acid (1%) as coagulant at 80°C coagulation temperature was adjudged as the best quality paneer from the stand-point of sensory attributes and chemical and microbiological qualities (Dwivedi *et al.*, 2009; Dwivedi *et al.*, 2010). Hence, paneer made as above was only used for preparation of paneer spread.

The paneer blocks were sliced into small pieces and blended with 10% of whey water. Salt (1.0, 1.5, 2.0%) and preservative (sodium benzoate or pot. metabisulphite, 0.2% each) were added to the paneer mass and blended thoroughly into a smooth paste like consistency. The product (paneer spread) was packaged in polystyrene cups and stored at 5°C.

Sensory evaluation of paneer spread: A 9-point hedonic scale was used to evaluate the flavour, body and texture, appearance and overall acceptability of the product by a selected panel of five experienced

judges as per BIS (1971).

Chemical and microbiological quality of paneer spread: The total solids, fat, protein and ash contents in the product as well as its acidity were determined by methods described in BIS (1961) and BIS (1964), while the microbiological quality of the product in respect to standard plate count (SPC), coliform organisms, yeast and moulds counts were ascertained according to BIS (1962).

Results and Discussion

The quality of paneer spread prepared from buffalo milk paneer using one per cent citric acid at 80°C coagulation temperature was assessed for its sensory attributes, chemical and micro-biological qualities.

Sensory attributes: The results on sensory profile of fresh paneer spread have been laid down in Table 1. These results indicated that the product prepared with 1.5% added salt and pot metabisulphite as preservative obtained the highest sensory score (8.80) than the product prepared using sodium benzoate preservative (8.60). At one and two per cent levels of added salt, the sensory scores were somewhat lower in the products prepared using sodium benzoate or pot metabisulphite preservatives. The preservative metabisulphite, however, elicited slightly better sensory scores than the sodium benzoate at all levels of added salt. The body and texture of the product as well as its colour and appearance followed a similar pattern as the flavour of the product. The scores for these attributes were highest in paneer spread made with 1.5% added salt and using pot. metabisulphite as preservative. The sodium benzoate was next best at this level of added salt.

Table 1: Sensory attributes of fresh paneer spread

	Flavour	Body & Texture	Appearance	Overall acceptability
X_1Y_1	8.20	8.00	8.10	8.10
Y_2	8.40	8.20	8.30	8.30
X_2Y_1	8.60	8.40	8.50	8.50
Y_2	8.80	8.60	8.70	8.70
X_3Y_1	8.00	7.80	7.90	7.90
Y_2	8.20	8.00	8.10	8.10

Salt added: X_1-1%, X_2-1.5%, X_3-2%

Preservative: Y_1-Sod. benzoate, Y_2-Pot.metabisulphite

Based on sensory attributes, the overall acceptability of the product was also maximum in case of paneer spread made with 1.5% added salt and pot. metabisulphite (8.70) or sodium benzoate (8.50) as preservative as compared to other levels of added salt. Two per cent levels of added salt produced slightly inferior quality product than one per cent level, irrespective of the preservatives used. Pot. metabisulphite, however, produced better product than sodium benzoate at all levels of added salt.

Chemical quality: Results on total solids, fat, protein and ash contents as well as acidity of fresh paneer spread are presented in Table 2.

These results revealed that the total solids content of paneer spread increased with the level of added salts in the product. The total solids content was around 38.30% in product with 1% added salt, which increased to 39.40% and 40.30% in 1.5% and 2% added salt product. Thus, it was highest in product with 2% added salt. Contrary to it, the fat content decreased with increase in the level of added salt in paneer spread. The protein content followed same trend as the fat content. Thus, the fat and protein contents were highest in one per cent salted product and lowest in 2% added salt product. The ash content of paneer spread; however, increased as the level of added salt increased in the product. The type of preservative added had little effect on the chemical constituents of the product. The acidity of the product was also slightly influenced by the concentration of added salt. The type of preservative had, however, negligible effect.

Table 2: Chemical quality of fresh paneer spread

	Total solids (%)	Fat (%)	Protein (%)	Ash (%)	Acidity (%)
X_1Y_1	38.20	21.20	12.40	2.62	0.48
Y_2	38.30	21.30	12.40	2.70	0.46
X_2Y_1	39.30	20.90	12.10	3.32	0.45
Y_2	39.40	21.00	12.10	3.32	0.45
X_3Y_1	40.30	20.60	11.80	3.75	0.43
Y_2	40.20	20.70	11.80	3.75	0.43

Salt added: X_1-1%, X_2-1.5%, X_3-2%

Preservative: Y_1-Sod. benzoate, Y_2-Pot.metabisulphite

Tewari and Sachdeva (1991) appear to be the only authors who have worked on chhana/paneer spread. Their results support the present findings on sensory scores and general acceptability of the product. Over results on total solids, fat, protein and ash contents, however, differ from those of Tewari and Sachdeva (1991). This was primarily due to the difference in the composition of milk and paneer used in preparation of paneer spread. The reported data on acidity of paneer are lacking to collate the results of present investigation.

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

These results indicated that the fresh samples

of paneer had a very small number (9.20 to 10.0 cfu/g) of total viable organisms. The salt concentration and preservatives used had little effect on the number of viable organisms in the fresh product. Preservatives exert their antibacterial effect as the period of storage of the product progresses. The fresh product had only inherent organisms that survived processing. No coliform organisms were detected in the product, as the strict hygienic measures were adopted in the manufacture of the product. Similarly, no yeast and moulds were encountered in the fresh product.

Table 3: Microbiological quality of fresh paneer spread

	Standard plate count/g	Coliform count	Yeast and mould count
X_1Y_1	10.00	NIL	NIL
Y_2	9.80		
X_2Y_1	10.00	NIL	NIL
Y_2	9.70		
X_3Y_1	9.20		
Y_2	9.20	NIL	NIL

Salt added: X_1-1%, X_2-1.5%, X_3-2%

Preservative: Y_1-Sod. benzoate, Y_2-Pot.metabisulphite

There is paucity of published literature on microbiological quality of paneer spread, whereas adequate literature is available on similar aspects of paneer. The fresh samples prepared under hygienic conditions contain only a few organisms. The coliforms and yeasts and moulds are completely destroyed during heating of milk at 80°C for 5 minutes, but these micro organisms reappear in the product in the absence of strict sanitary conditions (Vishweshwaraiah and Anantakrishnan, 1985). The absence of coliform organisms or yeast and mould in samples of paneer spread in the present study reaffirm hygienic conditions maintained during manufacture and subsequent handling.

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Effect of row spacings and weed control methods on yield attributes of maize (*Zea mays L.*) under tilled and untilled conditions

P.S. SHEKHAWAT, R.C. GAUTAM[1] AND PRAMENDRA SINGH
ARS, Rajasthan Agri. University, Beechwal, Bikaner (Rajasthan)

Abstract

*A field experiment was conducted at Crop Research Centre, Pantnagar during 1999 and 2000 to study the "Effect of row spacings and weed control methods on yield and yield attributes of maize (*Zea mays L.*) under tilled and untilled conditions". Tillage methods and row spacings did not cause any significant effect on yield and yield attributes of maize during both the years except total number of grains per cob during 1999. However, slightly higher cob length, number of grains per row, number of grain rows per cob, total number of grains per cob, 1000 grain weight, grain and stover yield kg per hectare and harvest index were recorded under narrow row spacing and filled condition as compared to wider row spacing and untilled condition. In contrary, higher cob diameter was recorded under untilled condition as compared to tilled condition during both the years. All the weed control treatments increased the yield and yield attributes significantly over the weedy check during both the years. The highest cob length, cob diameter, number of grains per row, number of grain rows per cob, total number of grains per cob, 1000 grain weight, grain and stover yield kg per hectare and harvest index were recorded under weed free condition followed by either atrazine at 1.0 kg ai/ha or two hand weeding at 20 and 40 DAS during both the years.*

Introduction

Maize (*Zea mays L.*) is the world's second largest cereal after wheat. In India, maize occupies 6.31 million hectares area and produces 10.85 million tones of grain (Anon, 1999). Though maize is being grown in almost all the states of India but UP, MP, Rajasthan, and Bihar accounts for 60 percent of the total production (Choudhary and Choudhary, 1996). In early period the growing of maize under good tilth condition was pre-requisite for better production and one of the primary benefits or soil tillage in crop production over the years has been weed control. But with the evolution of weed control technology and development of new herbicides, there is less and less need for primary tillage (Lewis and Worsham, 1989). Tillage is an energy intensive activity and use as much as 11 percent of the energy used on an average farm (Frye, 1984), besides this soil that are routinely tilled lose their structure and cohesiveness along with their surface cover resulting reduction in infiltration capacity and rise in wind and water erosion. Forcella et al. (1992) found that narrow row corn competed well enough weeds to effectively eliminate the need for cultivation and two third of the normally applied herbicide rate.

Materials and Methods

A filed experiment was conducted during Kharif 1999 and 2000 at Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar to study the effect of row spacings and weed control methods on yield and yield attributes of maize (*Zea mays L.*) under tilled and untilled conditions. All the twenty four treatment combinations were tested in split plot design with three replications, keeping tillage and row spacing in main plots and weed control methods in sub plots, with using same seed rate under both the row spacing treatments. The soil of the experimental site was clay loam in texture, medium in organic carbon, total nitrogen and available phosphorus and high in available potash.

Results and Discussion

Effect of tillage on maize

Date indicated that tillage methods did not cause significant effect on cob length, cob diameter, number of grain rows per cob, number of grains per row, total number of grains per cob, 1000 grain weight, grain and stover yield and harvest index during both the years, except total number of grains per cob during 1999 (Table 1). Clay et al (1998) and Mehdi et al (1999) also reported that grain yield did not differ significantly due to tillage methods. Nildar and Ronald (1996) advocated that omitting tillage did not reduce yield but proper weed management with herbicide becomes critical.

Effect of row spacing on maize

Variation in cob length, cob-diameter, number of grain rows per cob, number of grains per row, total

[1]Department of Agronomy, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar (Uttaranchal) 263145

Table 1: Effect of row spacing and weed control methods on yield and yield parameters of maize under tilled and tilled conditions

S.No.	Treatments	Cob Length (cm)		Cob diameter (cm)		No. of grains/ row		No. of rows/ cob		Total no.of grains/ cob		1000 grain weight (g)		Grain yield (Kg/ha)		Stover yield (Kg/ha)		Harvest index (%)	
		1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
	Main Plot																		
a.	Tillage methods																		
i.	Tilled	13.88	13.76	3.80	3.84	27.92	25.78	13.26	13.20	375.38	340.46	204.6	195.4	4290.1	3928.3	5432.1	5264.0	40.12	38.64
ii.	Untilled	13.62	13.59	3.83	3.86	27.08	25.72	12.86	13.00	350.29	341.61	204.1	194.0	4185.5	3904.3	5246.9	5193.7	39.91	38.61
	SEm ±	0.10	0.06	0.07	0.03	0.55	0.34	0.19	0.24	6.07	5.76	1.83	0.44	103.4	57.58	55.15	54.20	0.19	0.18
	CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	20.96	NS	NS	NS	NS	NS	NS	NS	NS	NS
b.	Row spacings																		
i.	45 Cm.	13.79	13.75	3.75	3.84	27.48	25.98	13.14	13.33	365.55	345.59	204.8	194.8	4247.4	3948.9	5346.4	5265.7	40.04	38.77
ii.	60 Cm.	13.72	13.61	3.88	3.86	27.53	26.04	12.97	12.88	360.12	336.49	203.9	194.6	4227.3	3883.7	5332.6	5192.0	39.99	38.48
	SEm ±	0.10	0.06	0.07	0.03	0.55	0.34	0.19	0.24	6.07	5.76	1.83	0.44	103.4	57.58	55.15	54.20	0.19	0.18
	CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Sub Plots																		
	Weed control methods																		
	Atrazine @ 0.5 kg. ai/ha	14.12	13.49	3.87	3.81	26.86	25.37	13.10	13.19	352.48	335.14	210.7	185.8	3838.2	3420.8	3947.5	4933.1	39.31	37.56
	Atrazine @ 1.0 kg ai/ha	15.19	14.23	4.02	3.98	30.78	28.38	13.73	13.57	422.84	376.73	213.0	200.0	4990.7	4611.1	6075.1	5992.5	40.70	39.34
	One HW at 20 DAS	12.68	13.83	3.80	3.92	26.89	25.52	12.43	13.17	338.09	335.97	195.9	190.7	3930.03	894.0	4928.0	5401.2	40.29	38.35
	Two HW at 20 and 40 DAS	14.52	14.60	4.05	3.99	29.89	28.47	13.73	13.70	413.98	388.6	208.2	200.90	4913.6	4742.8	6059.7	6008.20	40.82	39.87
	Weed Free	15.72	15.43	4.12	4.15	30.99	30.29	14.32	14.33	438.00	418.47	221.9	208.5	5131.70	4591.4	6322.0	6239.7	41.36	40.30
	Weedy check	10.26	10.49	3.03	3.22	19.60	17.95	11.04	10.65	215.64	191.28	186.3	182.3	2644.04	1877.6	3744.9	2798.4	37.60	36.35
	SEm ±	0.22	0.40	0.20	0.16	0.69	0.70	0.30	0.44	6.63	10.56	2.72	2.22	177.01	164.4	174.4	195.1	0.26	0.68
	CD at 5%	0.63	1.16	0.58	0.45	1.98	2.00	0.86	1.25	18.94	30.17	7.78	6.34	505.29	470.0	498.4	557.5	0.74	1.85

number of grains per cob, 1000 grain weight, grain and stover yield and harvest index due to row spacings was found non significant during both the years (Table 1). Although, slightly higher cob length,number of grain rows per cob, total number of grains per cob, 1000 grain weight, grain and stover yield kg per hectare and harvest index were recorded under narrow row spacing than the wider row spacing during both the years. The reason for increase yield and yield attributes in narrow row system may be the decrease competition between plants due to more equidistant spatial arrangement of plants (Bullock et al, 1988).

Effect of weed control methods on maize

Weed control methods caused significant variation in yield and yield attributes of maize during both the years (Table 1). All the weed control methods significantly increased the cob length, cob diameter, number of grain rows per cob, number of grains per row, total number of grains per cob, 1000 grain weight, grain and stover yield kg per hectare and harvest index over the weedy check during both the years. Maximum values of these yield and yield attributes were recorded under weed free plot treatment which was followed by either hand weeded twice at 20 and 40 DAS (days after sowing) or atrazine at 1.0 kg ai per hectare treated plot during both the years. Higher grain yield under weed control treatments was a cummulative effect of reduced crop weed competition and better growth and development of plants. These results are similar to those of Kalia and Singh (1993) and Dixit and Gautam (1996).

Conclusion

Tillage methods and row spacings did not cause significant differences in yield and yield attributes of maize during both the years. Whereas, weed control methods significantly increased the cob length, cob diameter, number of grain rows per cob, number of grains per row, total number of grains per cob, 1000 grain weight, grain and stover yield and harvest index during both the year. Maximum values of yield and yield attributes of maize were recorded under weed free condition during both the years.

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Involvement of rural women in job market and decision making-A case study of Bhagalpur, Bihar

SANJEEV KUMAR, A.K. JHA AND NUTAN VERMA[1]
C.C.S. Scheme, Deptt. of Ag. Econ., R.A.U. Pusa, Samastipur Bihar-848 125

Abstract

Women in rural India are involved in myriad activities, ranging from crop production, to the management of soil household resources. The study aims at with two principal objectives to examine the role of women in crop production and allied activities in rural Bihar as well as to quantify the involvement of women in the decision making process both within and outside the household and examine the extent to which such involvement varies between female-headed and male-handed households. Women contributing a significant share of the labour use in crop production, but also spend a considerable amount of time in livestock, food processing, sericulture and weaving activities. There is substantial gender-specificity to many agricultural operations, and unlike other parts of the country. Women agricultural workers continue to be paid less than their male counterparts and suffer greater seasonality in employment than do men. Despite their substantial labour contributions, women do not have a say in important decision within the household, especially as they relate to financial matters.

Introduction

Women in rural India are involved in myriad activities, ranging from crop production, to the management of household resources. Over time as technological change in agriculture has brought in substantial changes in labour use patterns in general the nature of work of rural women has also undergone a change. It is also important to keep in mind the fact that women also spend a substantial part of their time in the management of livestock, poultry etc. (Sisodia, 1985, Agarwal 1988 and Sethi 1989). The extent to which these activities are recognized and given their due depends on, among other factor, Socio-economic-ethnic status, customs and traditions, religion beliefs and education. However, there are still too few studies that attempt to capture the employment of rural women in both farm and off farm sectors especially in North-East India. Furthermore, it is widely acknowledged that despite substantial involvement of rural women in laboring activities they have little or no agency in decision-making processes except in some SC/ST communities (Sisodia 1985 and Giriappa (1988) and certain hill areas. Again similar studies for the North Eastern states are rare.

There are thus two principal objectives of this paper first we examine in greater detail the role of women in crop production and allied activities in rural Bihar. In doing so we pay particular attention to the many activities that are often not counted as commercially productive such as time spent in processing food and care off animals. Our second objectives is to attempt to qualify the involvement of women in the decision making process both within and outside the household and examine the extent to which such involvement varies between female-headed and male-headed households.

Methodology

The paper based on a primary survey in three villages of Bhagalpur district, Bihar namely Champanagar, Nathnagar and Chakhusain selected purposively from three different blocks. The selected villages are representative of rural Bihar in terms cropping pattern important of livestock and so on. The households in these villages were classified on the basis of operational holdings as marginal (below 1 ha.), small (1.01 to 2.00 ha), medium (2.01 to 3.00 ha) and large (above 3 ha). In each stratum, thirty per cent of the households with probability proportional to the number of households in each stratum were selected randomly. A total of 138 households were thus, selected in all comprising 57 marginal, 39 small, 27 medium and 15 large farmers.

For each of these households, we obtained detailed information on the disposition of labour time. Data was collected in term of the number of those spent in various activities and converted subsequently in to per (8 hour) day equivalents. In addition, we also attempted to quantify the extent of women's role in decision-making in various areas by categorizing responses as 'major', 'equal' or minor women were deemed to play a 'major' role if their decisions were accepted unconditionally, an 'equal' role if decisions were taken jointly with a male member and a 'minor' role if women were rarely consulted while taking a decision. For the purpose of this exercise we also categorized households as a being

[1]Department of plant breeding and genetics,
Birsa Agril. University, Kanke, Ranchi, Jharkhand

female-headed or male headed to examine whether there were systematic differences in the extent of women's say between the two sets of households.

Results and Discussion

Employment patterns in crop cultivation

Number of days worked

The work participation rate in our sample was 42 per cent for female and 47 per cent for males. Women's work participation declines distinctly with farm size from 44 per cent in marginal farms to 37% in large farms. As indicated in Table 1 on an average woman are employed in crop cultivation for 84 days a year almost half the corresponding figure of 158 days for men. The number of days worked in a year per worker is positively correlated with farm size for both men and women. This is as expected, given the expanded set of farm activities on larger farms, in terms of shares, relative to that of men. Women's labour time in crop production decreases with land size.

Disaggregated by crop, the evidence presented in Table 1 indicates that rice cultivation accounted for 67% for female and 70% for male employment in crop production. This is understandable given that rice is the major crop covering three-forth of gross cropped area. Next to rice in importance are vegetable and pulses, which each account for approximately 10% labour use in crop production for women and 9% for men. These percentages do not vary appreciably by size of land holding for pulses, but decline with size of holding in the case of vegetables.

Contract mix

Family labor accounts for much of total labour use in crop production. The terms of contract for hired labour are both permanent and casual in nature. However, only men are hired as permanent servants on contract for entire season, with wages being paid both in cash and kind (share of crop). Further, the cost of food for such labourers is borne by the farmers. Women are not hired as permanent workers. Both men and women are hired as casual labour, however, and are engaged for specific agricultural operations either on piece rate or daily wages basis.

Reliance on hired labour varies substantially by crop. For example, as indicated in Table 2, in rice cultivation, hired labour accounts for 37% of total labour of this, 26% is associated worth permanent servants and 74% with casual labour. Hired labour accounts for 38% of women workers in this crop all of whom are employed as casual labour. In correct, the proportion of hired labour employed in vegetable cultivation is 25%, nearly all such work casual in nature with a daily wage rate. Also, the bulk of hired labour use in this crop is found among commercial growers.

It may also be noted that reliance on hired labour increases with farm size. In marginal and small farms, family labour accounts for four-fifth of total labour use, while in medium and large farms it is approximately half.

Gender segregated activities

There is considerable specificity to the operations in which women participate. Women are engaged in sowing, transplanting, irrigation, hand weeding, harvesting and post harvest activities (Table 3). In fact, women perform over 80% of the transplanting and harvesting activities. They do not 'however' participate at all the preparation of land, spraying of insecticides/ pesticides, using tractor/power tiller, purchase of inputs etc. For the other operations, female labour accounts for between 10 to 30% of the labour used in the activity. This specificity appears to cut across all size classes of farms.

Unchanged work patterns

Interestingly, these activity patterns in agriculture have not changed over the year. For instance, the author conducted a study during 1990-91 in the same villages. The sample households were slightly differently fervently constructed than as medium and large farms were merged as a single category, and the definitions of marginal and small farmers being the same as in the

Table 1: Labour utilization by crop by size of farm

Person days (8 hours) per farm

Size group		Autumn Rice	Winter Rice	Oilseeds	Pulses	Sugarcane	Vegetable	Total
Marginal	Male	14.3	66.2	10.7	8.3	5.8	13.0	118.2
	Female	9.5	34.2	6.2	5.3	2.2	12.0	69.3
Small	Male	17.0	78.3	12.6	10.0	7.2	15.1	140.0
	Female	10.3	42.0	7.5	6.3	3.1	11.4	80.6
Medium	Male	18.0	111.7	15.0	12.5	5.2	13.2	175.6
	Female	12.1	50.1	7.6	8.3	2.2	7.2	87.3
Large	Male	19.0	123.6	18.7	14.3	7.7	15.3	198.5
	Female	14.6	54.4	10.9	9.3	4.5	6.8	100.4
All size	Male	17.1	93.8	14.2	11.3	7.7	14.1	158.1
	Female	11.6	45.2	8.0	7.3	3.0	9.4	84.4

Table 2: Contract mix by crop and size of farm

Person days (8 hours) per farm

Size group		Rice		Pulses		Oilseeds		Sugarcane		Vegetable	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Marginal	Family labour	78.8	44.7	11.8	7.6	16.9	10.2	6.6	4.3	32.6	16.5
	Permanently hired	3.0									
	Casual labour	19.2	14.9	2.6	0.9	3.0	1.5	0.9		5.3	6.0
	Total	101.0	59.6	14.4	8.5	19.9	11.7	7.2	4.3	37.9	22.4
Small	Family labour	80.7	53.1	12.7	8.4	15.3	10.2	6.2	5.4	28.9	22.2
	Permanently hired	4.9									
	Casual labour	13.0	14.1	1.6	1.3	3.0	1.9	1.9		9.6	3.6
	Total	98.6	67.2	14.3	9.6	17.9	12.0	8.1	5.4	38.6	25.8
Medium	Family labour	72.7	49.4	9.5	5.5	13.8	8.2	5.0	2.8	29.7	15.7
	Permanently hired	15.7								1.3	
	Casual labour	36.5	23.5	5.1	3.0	8.1	4.6	2.3	1.5	8.6	7.4
	Total	124.9	72.9	14.6	8.5	21.9	12.8	7.3	4.3	39.5	23.1
Large	Family labour	99.3	47.4	11.4	5.9	17.9	8.7	8.9	3.6	25.3	10.8
	Permanently hired	25.1		4.7		5.6				4.4	
	Casual labour	56.1	40.4	5.8	4.8	8.5	6.9	2.8	2.1	15.5	11.2
	Total	180.5	87.8	21.8	10.6	32.0	15.6	11.6	5.7	45.1	21.9
All size	Family labour	80.4	42.5	10.5	5.2	14.8	7.0	7.4	3.5	30.7	17.1
	Permanently hired	18.8		2.3		2.0				2.2	
	Casual labour	26.2	26.0	3.6	3.8	6.0	5.5	1.9	1.2	8.5	5.4
	Total	125.6	68.5	16.4	8.9	22.8	12.4	8.5	4.7	41.3	22.5

Table 3: Gender-specificity to crop operations by size of farm

Average person day (8 hours) per worker

	Marginal		Small		Medium		Large		All size	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Land preparation, ploughing etc.	25.6		31.0		38.5		42.6		34.4	
Irrigation	9.4	2.4	11.3	2.9	14.5	3.4	16.8	3.6	13.0	3.1
Fertilizers application	8.6	1.6	10.6	2.3	12.9	3.5	15.9	4.89	12.0	3.1
Sowing	8.8	2.5	12.8	3.4	15.9	3.5	17.2	4.2	13.7	3.4
Transplanting	4.7	24.5	5.8	29.6	6.4	32.8	8.9	35.5	6.4	30.6
Use of insecticides, pesticide	4.2		5.3		7.4		8.5		6.3	
Hand weeding	8.3	2.8	10.7	3.4	14.3	3.6	16.3	4.2	12.4	3.5
Use of weeder Herbicide	4.2		5.3		6.8		8.5		6.2	
Harvesting	6.0	26.5	7.0	30.4	8.1	32.0	10.2	36.4	7.8	31.3
Post harvest operations	38.7	9.0	40.5	8.7	51.0	8.9	53.5	11.7	45.9	9.5
All operations	118.2	69.3	140.0	80.6	175.6	87.3	198.5	100.4	158.1	84.4
Total working days	187.5		220.6		262.9		298.9		242.5	

current study. The sample also included 30 landless agricultural labour households. However, despite these differences, results relating to the work patterns of women remain largely the same. In 1990-91, female were engaged mainly in transplanting, harvesting and post harvest operations. Out of a total 91 annual working days, 34 days were spent in harvesting, 28 days in transplanting and 20 days in post harvest operations. Broadly speaking, these relative shares obtained in 1998-99 as well. This is an contrast to the experience elsewhere in India as noted earlier.

Seasonality in employment

It is well known agricultural production systems are characterized by seasonality, with peak periods associated with the necessity to complete specific farm operation within a definite time frame. An increase in cropping intensity and diversification of cropping patterns can, to a certain extent, reduce the extent of seasonality in employment. Cropping intensity in our study area was 121% (as against the state average of 128%), therefore seasonal variations in labour use are marked. Although both male and female employment exhibited seasonality its extent was far greater for women than men. As indicated in Table 4, while men are engaged in farm

Table 4: Seasonal variations in employment

Average number of working day (8 hours) per worker

	Marginal		Small		Medium		Large		All size	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
May	8.0	2.0	9.8	2.6	12.6	3.0	15.2	4.0	11.4	2.9
June	16.9	3.2	18.6	4.4	22.8	4.2	23.9	4.6	20.5	4.1
July	19.3	10.1	22.8	12.5	26.9	11.2	27.1	13.9	23.9	11.9
August	12.9	12.4	15.9	14.7	17.5	15.6	19.2	17.7	16.4	15.1
September	9.9	2.4	10.5	3.8	14.4	4.9	16.5	6.1	12.8	4.3
October	4.8	2.0	5.6	2.5	7.2	3.1	8.2	3.3	6.4	2.7
November	8.3	6.6	9.3	7.3	9.9	8.3	10.0	10.3	9.4	8.1
December	12.1	14.9	15.9	16.2	19.7	17.4	23.1	21.3	17.6	17.4
January	13.2	15.7	16.3	16.5	22.2	19.6	24.2	19.3	19.0	17.8
February	6.3		7.3		8.6		10.1		8.1	
March	3.2		4.1		6.2		9.2		5.7	
April	3.5		4.5		8.0		11.6		6.9	
Total	118.2	69.3	140.0	80.6	175.6	87.3	198.5	100.4	158.1	84.4

activities throughout the crop season this is not the case for women.

July-August and December-January are the busiest months as these correspond to the transplanting and harvesting activities for the major crops, during these months, women work in the farm for 8-9 hours per day. September through November are the lean months when they work only for 2-3 hours per day in the farm while from February to April women perform no farm activities whatsoever. Further the extent of dependence of hired labour is greater during the peak agricultural months work in allied activities and household industries tends to even this seasonality, with relatively greater time spent on these activities during the lean months. There is also some evidence that the coefficient of variation in employment is higher for large-sized farms, but it is weak.

Wage differentials

Wage differentials between male and female labourers are pervasive, far greater than differentials across the villages. Female wage rates are lower than those of males for similar type of work, in all villages. Wage rate are determined on several considerations such as-type of work, availability of labour, basis of payment i.e. piece rate of daily wage, and the prevailing wage-rate in the locality. The wage rates paid to casually hired labourers in villages are indicated in Table 5. Casual wage rates vary from Rs. 60 per day for men and 40 for women. Piece rates are common for land preparation where male labour is engaged at Rs. 150/80 per bigha for transplanting women are hired at Rs. 120 per bigha. In each case, women are paid less than men. The wages paid to permanently hired labourers vary from Rs. 500 per month in Champanagar village to Rs. 600 in Chakhussain village along with a share of the crop, the quantum of which is based on agreement between the labourers and the farmer. When the contract precludes kind payment in terms of a share of the crop, the monthly wage rate of permanently hired labour is between Rs. 900 to Rs. 1000. As noted earlier, women are not hired as permanent workers.

Table 5: Wage rates in the sample villages

Daily wage rate (Rs./day)

Village	Male	Female	
Champa Nagar	50-55	40-45	Plus mid day meal
Nath Nagar	50-55	40-45	Plus mid day meal
Chak Husain	50-60	40-45	Plus mid day meal

Piece rate (Rs./bigha)

Village activity	Champa Nagar		Nath Nagar		Chak Husain	
	Male	Female	Male	Female	Male	Female
Land preparation	150		150		180	
Transplanting		120		120		120
Harvesting	120	100	120	100	120	100

The importance of the non-crop sector

It is often recognized that considerable time is spent on economically productive off-farm activities. While some of these are recorded as such, it is more often the case that labour time spent on some of these activities is unaccounted for or termed as household work. The best example is provided by the time spent in care of animals. Most households did possess either livestock or poultry. On the average, each household had 2.54 cows/bullocks, 0.84 buffaloes, 0.56 goats, 0.25 pigs, 3.46 poultry/ducks. The care of livestock and other animals is a set of activities in which women spend a large number of hours. In fact, spent as much time in the care of livestock as in crop production activities, 168.3 (eight hour) days required for management of livestock/poultry,

Table 6: Number of day (8 hours) spent in livestock and poultry-related activities during the year by size of farm

	Marginal		Small		Medium		Large		All size	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Cleaning cattle/poultry shed	2.1	9.3	3.8	8.4	5.3	9.4	4.4	6.7	3.9	8.4
Collection of fodder/ preparation of feed	10.5	13.8	15.4	16.8	20.6	17.8	18.6	10.3	16.3	14.7
Feeding	3.2	10.0	4.9	11.6	6.9	13.1	4.6	12.4	4.9	11.8
Grazing cattle	14.5	6.0	18.6	6.3	19.8	3.9	18.1	0.8	17.7	4.2
Milking	2.7	10.5	5.8	16.3	7.8	17.1	8.6	25.1	6.2	17.3
Processing livestock product	2.9	4.3	4.6	5.3	5.3	4.7	6.9	6.2	4.9	5.1
Maintaing poultry ducks	9.3	16.6	16.5	20.6	26.8	23.4	26.8	25.0	19.9	21.4
Attending sick/pregnent animals	5.6	3.6	6.3	4.7	8.3	5.5	8.3	4.6	7.1	4.6
All activities	50.7	74.0	75.7	90.1	100.7	94.8	96.2	91.1	80.8	87.4
Total working days (Male+Female)	124.7		165.8		195.5		187.2		168.3	
Percent contributed by female	59.3		54.3		48.5		48.6		52.0	

women contribute 87.4 days (52%) of these, women spend a majority -66 days-in indoor activities such as cleaning and preparing feed, feeding, milking, processing livestock products, attending sick/pregnant animals (Table 6). In interpreting these numbers, it is important to recognize that unlike the case with farm operations, tending to livestock and poultry was undertaken both by elderly women (over 60 years of age) as well as young girls 10-14 years old. Outdoor activities related to care of livestock is undertaken by men. This includes both market-mediated activities such as purchase of fodder, and purchase and sale of animals, as well activities such as taking animals for grazing, or for artificial insemination. In the case of poultry/ducks, women account for a much greater (72%) share of the time involved in their care.

The share of women in livestock and poultry related activities are greater among small and marginal farms. Further, despite the considerable number of hours spent in caring for animals, since such work is frequently dubbed as household chores, no attention is paid to increasing efficiency or encouraging better management practice in these activities.

In addition to tending of livestock and poultry, raising Eri (Philosomia recini) and Muga (Antherea assam) are two important sericultural activities in which 25 and 8 households, respectively, are engaged in. Two to three batch of Eri/Muga are reared per year depending on availability of seed cocoons, host plants and family labour. Women are engaged in the entire gamut of activities including collecting leaves from host plants, feeding, ensuring that predators/birds/insects kept away, reeling, spinning and weaving. On average, women work 19 days for productions of cocoons. About 42% of the cocoons are sold; the remaining is used for weaving cloths within the households.

Food processing particularly varieties of rice products both for domestic consumption and sale, is done by women in all rural households and they spent about 17 days in such activities.

Also important among other non-farm activities, is handloom weaving in which practically every household is engaged, 86% of women report working at weaving. On an average, weaving occupied 34 days of time in a year, varying from 18 days in marginal, 25 days in small, 27 days in medium and 37 days in large farms. These activities are pursued primarily during the lean agricultural months. Although women are also engaged in tailoring and embroidery in many households, systematic data was not available and is hence not included in the analysis.

The totality of women's work

Taking into account all the activities in rural households, women's labour time exceeds 223 days in the year. Out of this 84 days were for spent in crop production, 87 days for animal care activities, 34 days for hand loom weaving and 17 days food processing. By most reckoning, only a little over one third of this-the 84 days spent in crop production-is visible and deemed as 'work'.

It is important to recongnise, however, there is under-utilization of female labour in all farms. With women especially in marginal and small farms seeking better employment opportunities. Women are less able to benefit from employment outside the home due to a variety of reasons, including time spent in household chores. Child care and socio-economic-cum-religious constraints. They remain, by and large, outside the purview of rural development programmes. This paper suggests that labour contributions of women in Assam extend well beyond the crop sector, a fact that is not given its due, especially by policy makers designing rural development programmes. Training facilities targeted exclusively at women may help redress this.

Involvement of women in decision-making

As noted in the methodology section, the role of

Table 7: Extent of participation in decision-making by women

Activities	Male headed households			Female headed households		
	Major	Equal	Minor	Major	Equal	Minor
A. Production activities						
1. Selection of farm enterprise	21.3	37.8	41.0	46.2	30.8	23.0
2. Crop to be grown	20.5	46.2	33.3	54.5	33.2	12.3
3. Selection of crop variety use of HYV	34.0	47.5	18.5	64.5	21.6	13.9
4. Use of fertilizers pesticide etc.	15.2	26.3	58.3	38.7	42.5	18.8
5. Engagement of hired labour	25.2	37.8	37.0	46.5	42.3	11.2
6. Use of tractor/improved farm implements	15.4	32.6	52.0	32.5	46.2	21.3
7. Selection of breeds for animals birds	22.4	41.3	36.3	56.2	34.8	9.0
B. Financial matters						
1. Purchase sale of land cattle poultry	23.0	32.4	44.6	46.2	35.0	18.8
2. Purchase of farm machinery	26.3	30.0	43.7	56.0	28.6	15.4
3. Sale of farm produce	25.4	47.3	27.3	62.5	27.0	10.5
4. Borrowing lending money	21.2	32.0	46.8	60.5	25.5	14.0
5. Education of children	15.2	26.5	58.3	35.6	42.8	21.6
C. House hold activities						
1. Marriage, social ceremonies etc.	57.3	35.2	7.5	76.2	20.3	3.5

women in decision making may categorized as 'major' 'equal' depending on the extent to which they were consulted. The tabulations presented in Table 7 suggest that the decision making process is quite different in male-headed (MHH) and female headed households (FHH). Higher proportion of women played a major role in all decisions in FHH than in MHH. Thus, in MHH, in production activities, women play a major role in 15 to 34% of cases, the corresponding range in FHH is 33 to 65%. The greatest involvement of women seems to be in selection of crop and use of HYV in both sets of households. Similarly, in financial matters the role of women is largely minor in MHH. In household activities like marriages and other ceremonies women play major role in both types of households although once again the proportion is larger among FHH. These trends are as one might expect. However, it is also interesting to note (although this not presented in Table 7) that in the case of households with educated women, those in service as well as in low economic-status households-representing opposite ends of the income spectrum-women typically have a major role in the decision-making process.

Conclusions

The principal contribution of this paper is to capture the totality of women's labour commitments in rural areas of Bihar. The survey indicates that women contribute a significant share of the labour use in crop production, but also spend a considerable amount of time in livestock, food processing, sericulture and weaving activities. These time commitment are in addition to the amount of time spent in household chores-almost invariably the responsibility of women. There is substantial gender-specificity to many agricultural operations, and unlike other parts of the country, there in no evidence that this has changed over time. Women agricultural workers continue to be paid less than their male counterparts, and suffer greater seasonality in employment than do men. Despite their substantial labour contributions, women do not often have a say in important decisions within the household, especially as they relate to financial matters. Although they do have a significant role in the choice of crop/variety to be cultivated. There is need for studies along similar lines, so that trends common to rural women all over the country are identified and delineated from those that are specific to certain regions. Only then can policy interventions targeted to women be effective.

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Constraints faced by members and non-members of dairy cooperatives in adoption of improved feeding and milking management practices in Jaipur district of Rajasthan

P.S TANWAR, YOGENDRA KUMAR[1] AND R.P. SINGH[2]
Programme coordinator, KVK, Sardarshahr, Churu

Abstract

The present study was carried out in Jaipur district of Rajasthan on total 240 household of weaker sections identified 120 from members and 120 from non-members of dairy co-operatives, where efforts had been made to identified certain constraints in adoption of improved feeding and milking management practices. The results of the study depicted that high cost of concentrate , lack of grazing facilities, lack of knowledge about balance feeding, non availability of HYV fodder seed, lack of green and dry fodder , poor irrigation facility, high cost of mineral mixture and farmer do not prefer silage and hay making were important constraints for adoption of improved feeding management practices. Lack of knowledge about scientific method of milking, ignorance about drying off animals before45-60 days of calving and lack of awareness about importance of clean milk production were main constraints regarding milking management practices.

Introduction

The India is predominantly an agrarian economy with more than 75 percent of population in villages depending on agriculture, animal husbandry and allied activities for their live hood. Among many livestock enterprises, dairying is the most ancient occupation established in rural setting of our country. Livestock forms one of the components of the backbone of the Indian economy and an important sub sector of agriculture, forming an integral part of crop farming.

Currently dairying provides 70-80 million farm families the triple benefit of nutritive food, supplementary income and productive employment, while setting right the seasonal imbalance in employment. Dairy animals, apart from their role in milk production and contribute huge quantity of organic manure

India is blessed with huge bovine population of 185.20 millions cattle and 97.90 millions buffalo accounting 16.24 percent and 56.90 percent, respectively in world bovine population and stand first in the world in number of bovine population. (Livestock census 2003. GOI).

Before independence milk production in India was below 20 million tones and the quality was also very poor, owing to the white revolution, India has emerged highest milk producer in the world i.e. 100.9 million tones with per capita availability of 246 gm/day (Dept. of A.H, Dairying and Fisheries, Ministry of agriculture, GOI, 2007). The state Rajasthan consists 108.53 lakh cattle and 104.46 lakh buffaloes contributing 6.07% and 11.17% in national population and stand at 6th and 3rd rank in cattle and buffalo population, respectively. The Jaipur district having 4.12 lakh cattle and 8.94 lakh buffaloes contributing 3.80% and 8.54% in the state population (Live stock census -2003). Rajasthan Stand at 3rd rank in the country with annual milk production 9.375 million tones and per capita availability is 408 gm. per day (Dept. of A.H. ,Dairying & Fisheries , Ministry of Agriculture, GOI, 2007).The rapid growth in India's milk production has been mainly because of increase in the number of animals rather than that of improved productivity. The low productivity of our dairy animals is of great concern and average productivity of Indian cow is only 987.0 kg/lactation as against the world average 2038 kg/lactation and average productivity of cross bred cattle, local cow and buffalo is 6.07 kg, 2.86 kg and 4.41 kg/day, respectively, in Rajasthan (Survey report, Department A.H, and Dairying, GOR, 2005). It well know facts that adoption of scientific feeding milking management practices not only increase the productivity of the dairy animals but reduces the re-productive and health problems also. Ultimately it helps in enhancing the return of dairy farming. There are a number of constrains responsible for not adoption of scientific feeding and milking management practices. Hence an attempt had been made to identified to the constraints in adoption of improved feeding and milking management practices

[1]Reader & Head, Deptt of Animal Husband & Dairying, Kisan P . G College, Shimbhaoli, Ghaziabad (UP)
[2]Associate Director Extension, KVK- Hastinapur, SVPUA&T, Meerut

Methodology

At present Rajasthan state having 19 milk unions, out of these Jaipur Zila Dugdh Utpadak Sahakari Sangh Ltd. Jaipur was selected purposely and the present study was confined in Jaipur district of Rajasthan. There are thirteen blocks in Jaipur district which are covered by the Jaipur Zila Dugdh Utpadak Sahakari Sangh Ltd. Out of these thirteen blocks, one block i.e. Govindgarh was selected purposely for present study. This block having maximum bovine population in the district than other blocks.

After selection of blocks a list of functional milk producing co-operative societies in the block working in different villages were prepared with the help of official staff of Jaipur Zila Dugdh Utpadak Sahakari Sangh Ltd. were selected randomly. After selection of milk producing co-operative societies, a separate list of milk producing members and non-members (keeping mich animals) of weaker section community was prepared for the selected co-operative societies.

Thus, 120 milk producers from members and 120 milk producers from non-member were selected for the purpose of comparison. The final selection of the cases of weaker section were made purely on random basis from different categories of members and non-members viz- landless (having no land), marginal (having up to one hectare of land), small farmers (having one to two hectare of land), based on proportion to its size.

The data were collected with the help of pre-prepared schedules and questionnaire by personal interview method within four-five meetings with the respondents. Thus, the survey method was used for the collection of data. The data obtained from different categories of members and non-members families were analyzed with the help of tabular analysis for drawing the results. However, percentage, standard error and chi-squire was calculated for interpretation of data.

Feeding constraints

The constraints regarding feeding management faced by members and non-members families were sought out and presented in table-1. In case of members families major constraints were high cost of concentrate ,lack of grazing facilities , lack of knowledge of balance feeding , non availability of HYVs fodder seed , lack of green and dry fodder , poor irrigation facilities, high cost of mineral mixture, and farmers do not prefer silage and hay making as expressed by 69.17, 68.33, , 49.17, 40.83, 40.0, 33.33, 33.33 and 30.0 percent members families , respectively.Table further reveals that in case of non- members families the constraints related to feeding practices were high cost of concentrates as reported by 90.83 percent farmers followed by lack of knowledge of balance feeding (80.0 percent) , lack of grazing facilities (77.50 percent) , lack of green and dry fodder (62,50 percent) , poor irrigation facilities (53.33 percent), non availability of HYVs fodder seed (49.17 percent) , farmers do not prefer silage and hay making (49.17) and high cost of mineral mixture (43.33 percent) were the major constraints .These findings are accordance to earlier workers Chug (1995), Malik (1997), Choudhary and Intodia (2000), Singh (2003), Meena and Fulzele (2004), Khan and Chauhan (2005), Sharma (2005), Suresh et al. (2007).

Milking consytraints

Milking constraints faced in different categories of members and non-members families indicated in table -2. In case of member's families milking constraints were ignorance about drying off animals before 45-60 days of calving as reported by 66.67 percent followed by lack knowledge about scientific method of milking (63.33 percent) and lack of awareness about clean milk production (49.17 percent).Table further reveals that in case of non-members constraints related to milking practices were lack knowledge about scientific method

Table 1: Constaints faced by members and non-members in adoption of improved Feeding Management practices

S.No.	Constraints	Members			Non-Members		
		Frequency	Percentage	Rank	Frequency	Percentage	Rank
1	High cost of cattle feed	83	69.17	I	101	90.83	I
2	Lack of grazing facilities	82	68.30	II	93	77.50	III
3	Lack of knowledge about balance feeding	59	49.17	III	96	80.00	II
4	Non arability of HYV^{S} fodder seed	49	40.83	IV	59	49.17	VI
5	Lack of green and dry fodder	48	40.00	V	75	62.50	IV
6	Poor irrigation facility	40	33.33	VI	64	53.33	V
7	High cost mineral mixture	40	33.33	VI	52	43.33	VII
8	Farmer do not preffer silage &hay making	36	30.00	VII	59	49.17	VI

Table 2: Constraints faced by members and non-members in adoption of improved milking management practices

S.No.	Constraints	Members			Non-Members		
		Frequency	Percentage	Rank	Frequency	Percentage	Rank
1	Lack of Knowledge about scientific method of milking	80	66.67	I	101	84.17	I
2	Ignorance about drying off animals before 45-60 days of calving	76	63.33	II	91	75.83	III
3	Lack of awareness about clean milk production	59	49.17	III	94	78.33	II

of milking, lack of awareness about clean milk production, ignorance about drying off animals before 45-60 days of calving as reported by 84.17, 78.33 and 75.83 percent respondents, respectively. These findings are accordance to Bairathi et al. (1997), Malik (1997), Chuodhary and Intodia (2000), Mathur (2001), Mohi and Bhatti (2006).

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An economic trends of pulse production in Bihar

AJAY KUMAR JHA, SANJEEV KUMAR AND NUTAN VERMA[1]
Department of Agri. Economics, Rajendra Agricultural University, Pusa (Samastipur) Bihar

Abstract

Among major crops of Bihar the decline in area was found substantial in case of barley and pulses and it was marginal in case of rice, maize and sugarcane during the period 1970-2005. The area was replaced mainly by wheat, mustard and to some extent by potato. Among major pulses the decline in area was found highest in case of khesari followed by gram, arhar, pea and the least decline was observed in lentil. The productivity of all the pulses except khesari, have increased during the period. The variability in area of total pulses in the state was comparatively lower followed by production and productivity. Among the total pulses the area under pea was found very unstable followed by arhar and lentil whereas area under khesari and gram was found quite stable. The results of Nerlovian Dynamic Adjustment Model fitted in time series data suggests with increase in rainfall during late kharif i.e. during October-November the area under pulses may likely to be increased particularly for lentil and khesari, whereas when rainfall in summer season occurs the area under arhar may likely to be declined. The results of logistic probability model suggests that good quality of land has negative, upland has positive and heavy texture has negative relationship with farmers' decision to grow pulses.

Introduction

Pulses are the cheapest source of protein for the poor and the vegetarian who constitute majority of Indian population. Pulse crops increase the soil fertility through the nitrogen fixing bacteria present in the root nodules. Due to the tap root system, these crops open up soil by which soil aeration improves. The heavy leaf-fall increases the organic matter in the soil. Being low input requirement for the pulse cultivation these crops are most suitable to the resource poor farmers. But unfortunately, despite immense importance, the per capita availability of pulses in India has been continuously decreasing. As a result of increasing population and stagnating pulse production, per capita pulse consumption has steadily decline from about 70 gm/day in the early 1960's to about 27 gm/day in 2001.

India has made rapid increase inn agricultural production since the ear of the green revolution. Food grain production increased from 108 million tonnes in 1970-71 to a record of 234.47 million tonnes in 2008-09. This rise has been mainly due to increase in production of wheat and rice. The production of pulses has shown a smaller increase during the period. There has been shift in acreage from pulses to other crops in most of the states during the recent years. A fall in the area under pulses has been especially observed in the state of Bihar.

In Bihar, the agricultural sector has experienced a considerable growth during the past three decades. The progress has been spectacular in 1980's when state recorded agricultural growth of 2.50 per cent which outpaced the population growth in the state (2.35%) during the period which could not be sustained during early nineties. Among the different crops, major cereals like rice and wheat achieved comparatively higher growth, and annual per capita production of food grains increased from 123 kg in 1970-71 to 180 kg in 1996-97. In the process of technological development inn agriculture, pulse crops got major set back and its area declined from 1626 thousand hectare in 1970-71 to 959 thousand hectare in the year 1995-96. The percentage area under pulses to gross cropped area has also declined with the increase in gross irrigated area (Chopra, 1982)

Area under pulses experienced not only declining trend but had been most instable during the last two and half decades. Pulses, no doubt, covers nearly 11 per cent of area put to food grain crops in the state but the pulse productivity is comparatively lower in the state (729 kg/ha) in comparison to major pulse growing states of the country. This phenomenon has threatened the nutrition security of vegetarian population, in general and poor population, in particular. The state share in area and production of pulses in India also declined from 7.4 per cent and 9.1 per cent in 1970-71 to 4.2 per cent and 5.2 per cent in 1995-96, respectively.

The proposed study would be an attempt to examine the various aspects pulse production in Bihar during post green revolution period. The specific objectives of the study are as follows. Keeping in view of above facts an attempt has been made in the present

[1]Department of plant breeding and genetics,
Birsa Agril. University, Kanke, Ranchi, Jharkhand

paper to analyse the trend of area, production and productivity of major pulses during the period 1970 to 2005 along with their stability analysis with the following objectives:

1. To examine the spatial and temporal growth in area, production and productivity of major pulses alongwith their stability in different agro-climatic zones of Bihar.
2. To analyse the area shift with respect to pulses alongwith factors affecting farmers decision making process.

Methodology

The study will be based on both primary and secondary data. The secondary data will be obtained from the records/publications of the Department of Statistics and Evaluation, Govt. of Bihar.

The secondary data will pertain to the post-green revolution period that is, 1970-71 to 1997-98 which will be used to find out the trend in area, production and productivity of major pulses grown in different agro-climatic zones of Bihar. These data will also be used for estimating stability in area, production and productivity of major pulses in Bihar.

i. Measurement of growth

The growth rate will be estimated with the help of exponential trend equations for that the following model will be used.

$$Y_t = AB^t$$

Where,

Y_t = Area/production/productivity of pulses

A = Intercept

t = Years

$$B = 1 + \frac{r}{100}$$

where "r" refers to the growth rate

The stability analysis will be undertaken to study the fluctuations in area and production of pulses from their trends. For this, annual percentage change in area and production of pulses and standard deviation in such annual changes will be estimated which may provide a measure of fluctuations around the trend line.

ii. Area response

To examine the area response of pulses to the price and non-price factors Nerlovian Dynamic Adjustment model of the following type will be used.

$$A_t = b_0 + b_1 A_{t-1} + b_2 P_{t-1} + b_3 R_{kt-1} + b_4 Y_{t-1} + b_5 R_{kt-} + b_6 R_{wt} + b_7 S_{pt-1} + b_8 S_{yt-1} + e_1$$

Where,

A_t = area under the pulse crop in year t (000'ha)

A_{t-1} = area under the pulse crop in year- t-1(000'ha)

P_{t-1} = harvest price of the main pulse production year t-1 (Rs/qt)

Y_{t-1} = yield of the pulse crop in year t-1 (kg/ha)

R_{kt} = kharif rainfall in year (mm)

R_{wt} = winter rainfall in year (mm)

S_{pt-1} = moving C.V. of price for triennium concluding in year t-1

S_{yt-1} = moving C.V. of yield for triennium concluding in year t-1

e_t = error term

b_0 = intercept

b_1 = regression co-efficient (i = 1, 2..... 8)

d = Durbin-Watson statistic used for serial correlation

Coefficient of adjustment (r) = (1-coefficient of lagged area)

iii. Factors affecting farmers' decision to grow pulses

To identify the factors affecting farmer's decision to grow pulses, the plot-wise analysis will be undertaken. It has been observed that the micro and macro-environment affect the decision making process. The decision on whether to grow pulse will be model using the logistic probability model (binomial logit model). The form of the model will be

Prob. $[Y_i = 1] = e \beta x_i (1 + e \beta x_i)$

Where,

Y_i = the qualitative dependent variable that takes on the value 1 for pulses growers, 0 otherwise.

X_i = a matrix of explanatory variables related to the decision taken by farmer 1 to grow pulse, and 0 otherwise

β = the parameters to be estimated

The decision to grow pulse will be modeled as a function of the following variables.

Land Elevation = Dummy variable for land elevation

Where, 1 = high land and

0 = medium land.

Soil Texture = Dummy variable for soil texture

Where, 1 = light texture (sandy loam, silt loam, silt)

0 = heavy texture (silty clay loam, silty clay)

Cultivated Area = Area cultivated by the farmer during the current cropping season.

Pulse Price = Average selling price of pulses reported by the farmer.

Wheat Price = Selling price reported by farmers.

Besides, the use of Nerlovian Dynamic Adjustment Model for area response and Binomial logit model to study farmers decision making to grow pulses (Plot wise analysis).

Finding and Discussion

Compound Growth Rate of Area, Production and Productivity of Major Pulses

It may be observed that among major crops which are grown in Bihar, area under wheat, potato and mustard have shown positive growth rate whereas area under rice barley, sugarcane, maize and the pulses have shown negative growth rate during the period 1970 to 2005 (Table 1). The decline in area under barley was observed to be highest 3.8551% followed by pulses 1.5365 % and are significant at 1% level. A marginal declined in area

was also observed in case of rice (0.3447%), maize (0.347%) both at 5% significance level and sugarcane (0.2901%) with non-significance. The increase in area was significant in case of wheat (0.5095%) and mustard (1.2774%). Thus it may be said that area under pulses particularly the rabi pulses, has been replaced mainly by wheat, mustard and potato, in Bihar.

Table 1 : Compound growth rate of area, production and productivity of major crops during 1970 to 2005 in Bihar

Crops	Area	Production	Productivity
Rice	-0.3447*	0.2062	0.5528**
Wheat	0.5095**	1.7198***	1.2042***
Maize	-0.3471*	0.5473**	0.8975***
Barley	-3.8551***	-3.2604***	0.6145***
Mustard	1.2774***	1.9822***	0.6959**
Sugarcane	-0.2901	-0.0211	0.2698
Potato	0.1839*	0.0059	-0.1776
Pulses (Total)	-1.5365***	-0.4484**	1.1050***

* : 10% significant level
** : 5% significant level
***: 1% significant level

So far as production of major crops in Bihar is concerned most of the crops except barley, sugarcane and pulses have shown positive growth rate during the study period. The decline in production of pulses (0.4484%) and barley (3.2604%) was found significant however, the decline in production was found less intense than that of decline in area mainly because of the fact that productivity of almost all crops have shown positive growth rate during the period under study.

Compound Growth Rate of Major Pulses

Major pulses grown in Bihar are arhar in Kharif season, pea, gram, lentil and khesari in Rabi season, therefore study of growth in area, production and productivity of only these pulses has been taken in the present paper. It may be observed that growth in area under total pulses has declined by 1.5365 per cent and that of production by 0.4448 per cent during the period 1970 to 2005. However, though the area and production of total pulses has declined, the productivity has increased by 1.1050 per cent during the same period (Table 2). Among the major pulses grown, khesari has shown highest decline i.e. 2.3072 per cent followed by gram 1.5565 per cent, arhar 1.5071 per cent, pea 1.4822 per cent and the least decline was observed in lentil that too found non-significant. Thus, it may be said area under lentil is stable during the period 1970 to 2005.

So far as production of pulses is concerned all the major pulses except lentil and arhar have been shown decline during the same period. The production of khesari has again shown highest decline. Though the area and production of most of the pulses have declined, the productivity of almost all major pulses except khesari, which shown 3.7091 per cent decline, have shown positive growth rate during the period under study.

Table 2 : Compound growth rate of area, production and productivity of major pulses during 1970 to 2005 in Bihar

Crops	Area	Production	Productivity
Pea	-1.4822***	-0.8257***	0.6664***
Gram	-1.5565***	-0.6721***	0.8984***
Lentil	-00.0142	0.8715***	0.8859***
Arhar	-1.5071***	0.8748***	0.6420***
Khesari	-2.3072***	-1.0439***	-3.7091***
Total Pulses	-1.5365***	-0.4484**	1.1050***

** : 5% significant level *** : 1% significant level

Stability in Area, Production and Productivity of Major Pulses

For the stability analysis co-efficient of variation in area, production and productivity by major pulse-wise was worked out for the period during 1970 to 2005 and presented in Table 3. It is apparent from the table that variability in area of total pulses of the state is comparatively lower i.e. 1.19 per cent followed by production (2.32 %) and productivity (177.60%). It may be said that productivity of pulses shows very unstable in nature followed by production and area.

Table 3 : Co-efficient of variability of area, production and productivity of major pulses during 1970 to 2005 in Bihar

Crops	Area	Production	Productivity
Pea	69.70	114.50	228.64
Gram	6.21	20.12	298.11
Lentil	12.20	17.65	407.15
Arhar	19.67	34.94	153.96
Khesari	2.12	8.19	260.51
Total Pulses	1.19	2.32	177.60

Among major pulses area under pea has shown highest variability about 69.70 per cent implying that unstable in nature whereas area under gram (6.21%) and khesari (2.12%) have shown quite stable and area under lentil and arhar have shown substantially stable in nature. This trend followed in case of production and productivity also.

Area shift with respect to Pulses

To examine the area response of pulses to the price and non-price factors Nerlovian Dynamic adjustment model was used in a time series data during the period 1970 to 2005. Area under chosen pulse crop has been taken as dependent variable and has been studied against the competing crop of the relevant season in terms of price, yield of lagged year, rainfall of sowing season, and moving CV of price and yield for triennium

Table 4 : Area shift and factors affecting area under major pulses

Independent variable	Pea	Gram	Lentil	Arhar	Khesari	Total pulses
A_{t-1}	-0.0915	0.2443	-0.2461	0.5306	0.1865	-0.0145
P_{t-1}	-0.0134	-0.0347	-0.0360	-0.0204*	-0.2554	-0.5579**
Y_{t-1}	1.8823	-4.9915	3.2436	-1.2594	-7.4434	-26.0457
WINRf	0.0368	-0.1173	-0.2049	0.0130	0.3986	1.4634*
SUMRf	0.0150	-0.0672	-0.2439	-0.0963*	0.1772	-00.5703
KHRf	-0.0039	-0.0369	0.0585	0.0016	0.0383	-0.0748
LKHRf	0.0151	0.0155	0.5776***	-0.0303	0.2858*	1.4372***
CVP	0.3064	1.0407	-2.9232	-00.3688	-1.1704	13.2603*
CVY	0.3200	-1.3069	-0.2184	00.1698	-0.0873	-4.8921
Intercept	18.5962	210.1284	170.4714	58.8875	290.6616	1044.5529
$R^2$0.7039	0.8828	0.9104	0.8436	0.9709	0.9752	
S.E.	3.0078	10.6997	17.9307	3.6549	18.3054	28.1651

WINRf winter rainfall, SUMRf summer rainfall, KHRf kharif rainfall, L KHRf late kharif rainfall
* : 10% significant level ** : 5% significant level *** : 1% significant level

concluding lagged year, which have been taken as independent variables.

The rainfall during late kharif has shown very significantly and with a positive co-efficient which means with increase in rainfall during late kharif the area under pulses increases in Bihar (Table 4). Further, the co-efficient of variability in pulse price has also shown positive relationship with the area under pulses which means with higher the fluctuation in prices, area under pulses increases. However, it was observed that price of pulses in one year lagged has shown significantly and negative relationship with area under pulses in current year which means if the price of pulses in the lagged year is higher, area under pulses may decline. This, in fact, seems to be contrast of common notion that higher price of particular crop in the lagged year has inducing impact on area under that crop in the current year. But this notion seems do not hold true in case of pulses. It implies that price, particularly in case of pulses has little or no impact on area expansion rather, some other factors are existing which exert more powerful impact on area response in pulse. The co-efficient of adjustment was found greater that one, implying that adjustment inn area under pulses was more than desirable level. R^2 value has shown that about 97 per cent variation in dependent variable was due to the independent variables included in the model.

Major pulse crop-wise analysis reveals that late kharif rainfall has shown positive and significant relationship with the area under lentil and khesari whereas summer rainfall has shown negative and significant relationship with the area under arhar. Thus, it may be implied that under good rainfall occurs in late kharif season, area under lentil and khesari may likely to be increased whereas when rainfall in summer season occurs area under arhar may likely to be declined.

Conclusions

Among major crops grown in Bihar, the decline in area under barley and pulses was found substantial i.e. 3.85% and 1.53%, respectively and it was marginal in case of rice (0.344%), maize (0.347%) and sugarcane (0.2901%) during the period 1970-2005. Increase in area was observed in case of wheat (0.5095%), mustard (1.2774%) and potato (0.1839%) during the same period. So far as production of major crops in Bihar is concerned almost all crops except Barley, sugarcane and pulses have shown positive growth rate. The decline in production of pulses and barley was found less intense than that of decline in area mainly because of the fact that the productivity of almost all crops have shown positive growth rate during the period under study. Among major pulses khesari has shown highest decline (2.3072%) followed by gram (1.5565%), arhar (1.5071%), pea (1.4822%) and the least decline was observed in case of lentil (0.0142%). Though, the area and production of most of the pulses have declined, the productivity of all major pulses except khesari, have improved during the period. Variably in area of total pulses of the state is comparatively lower i.e. cv about 1.19% followed by production (2.32%) and productivity (177.66%).

Among major pulses area under pea has shown highest variability (cv about 69.70%) implying that unstable in nature whereas area under gram (cv about 6.21 %) and khesari (cv about 2.12%) have shown quite stable and area under lentil and arhar have shown substantially stable in nature. This trend follows in case of production and productivity also.

The results of the Nerlovian Dynamic adjustment model fitted in time series data for the period 1970 to

2005. Suggests, that the rainfall during late kharif has shown significant and positive co-efficient which means with increase in rainfall during late kharif the area under pulses may increase in Bihar. Further, the co-efficient of variability in pulse price has also shown positive relationship with the area under pulses which may imply higher than fluctuation in prices area under pulses may increase. The co-efficient of adjustment was found greater than one, implying that adjustment in area under pulses was more than desire level. Among the pulses, when a good rainfall occurs in late kharif, area under lentil and khesari may likely to be increase whereas rainfall in summer season occurs area under arhar may likely to be declined.

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Effect of chemical preservatives on vaselife of gerbera cut flower (*Gerbera jamesonii)*

PUSHPENDRA KUMAR, PANKAJ LAVANIA, SWAPNIL RAMDASSJI BHATULKAR AND D.S. CHONKAR

Deptt. of Horticulture and Forestry, Shri. F.H. (PG) College, Nidhauli Kalan, Etah-207122(U.P.)

Abstract

This work was performed at the Shri F.H.(P.G.) college, Nidhauli Kalan, Etah. Laboratory trials were carried out to investigate the effect of $AgNO_3$, Sucrose, Ascorbic Acid on the vase life of gerbera cut flower. Freshly cut flower stems of gerbera with three outer disc florets open were put in flower vases containing 20 ppm, 40ppm of $AgNO_3$, 2% & 4% of Sucrose, 20ppm + 2% ($AgNO_3$+Sucrose), 20ppm + 4% ($AgNO_3$+Sucrose), 40ppm + 2% ($AgnO_3$ + Sucrose), 40ppm + 4% ($AgNO_3$+Sucrose), 2% & 4% of Ascorbic Acid & Distilled Water. The treatments were arranged in Factorial Completely Randomized Design (FCRD) with three replications. Gerbera cut flower held in $AgNO_3$ at 2% & 4% significantly delayed Flower Senescence by increasing number of disc florets open, delayed petal fading and abscission. It had significantly higher water content in the flower heads and stems hence, maintaining flower turgidity, reduction in bent neck and flower senescence and increased flower quality after 14 days of holding solution compared to flowers held in distilled water. $AgNO_3$ (Silver Nitrate) 2% & 4% has the potential to be used as a gerbera cut flower preservative solution.

Introduction

Gerbera, also known as Transvaal Daisy or Barberton Daisy. Gerbera Jamesonii is member of asteraceae family. Asteraceae family containing numerous important genera in the floriculture industry such as Aster, Calendula, Centauria, Chrysanthemum, Cosmos, Dahlia, Dendryanthema, Helianthus, Pericallis Solidago, Tagetes and Zinnia. Gerbera is a leading cut flower and ranks among top ten cut flower of the world. Gerbera are valued for their brightly colored daisy like flowers, they are real attraction of graden with their star like flowers are available in wide range of colors including yellow, white, orange, pink, crimson, red, purple etc. Now a days gerbera flower is becoming popular in metro politians city due to it's long vase life and attractive colors. Gerbera is flower with increasing commercial significant for continuous supply of flower this are grown under controlled condition in polyhouse. It is native of South Africa. The genus gerbera was named in the owner of German nature Botanist Traugoot Gerber who travelled in Russia in 1743. The other species of gerbera are namely G. viridifolia, G. aurantiaca, G. linnae, G. anandria, G. asplenifolia, G.kunzeana. Gerbera is most commonly used worldwide as cut flower; however dwarf hybrid lines exist which are suited for potted or bedding plants. Stems are pulled, not cut and the base of stems should be removed before hydration.

Several commercial floral preservatives have been formulated for Gerberas. Flower heads for a few min. in 0.1 mm benzyladenine (BA) to maintain flower weight and senescence. Silver nitrate did not delay leaf senescence in most plants species and its contents in tissues was not correlated with senescence.

Post harvest handling is most important factors besides production as cut flower have to be delivered in gardens fresh condition to the consumer. The flower after detaching from the plants get exposed to environment as well as physiological factors and if care has not been taken to control it the flower loss life and quality quickly. Proper harvesting, post harvest handling and use of floral preservative improve keeping quality of flower for good vaselife of cut flower; it should be placed immediately after harvest in fresh water but not previously used. (Brandis 1979). There for, the object of this study was to investigate the effect of $AgNO_3$, sucrose, Ascorbic acid (chemical preservative) on vase life of gerbera cut flower.

Materials and Method

Laboratory trials were carried out to investigate the effect of chemical preservatives (AgNO3, Sucrose, Ascorbic acid) on the vase life of cut flower gerbera. Flowering stems of gerbera were collected when 2-3 outer disc florets were open from commercial farm, which is situated in Ronkata between Agra to Mathura Highway. Flowers between 50-60cm were pulled from mother plants in the morning, packed and received the same day for research work which was carried out in laboratory of Deptt. of Horticulture of Shri F.H.(PG) college, Nidhauli kalan; Etah. (UP) during Jan to March, 2010.

The flowers were immediately unpacked and were cut off at a average height and then transferred immediately to a bucket containing water in order to rehydrate the flower. Three flowers were used for each

treatment. The selected flowers were placed in 500ml conical flask containing different solutions like $AgNO_3$ 20ppm, $AgNO_3$ 40ppm, Sucrose 2%, Sucrose 4%, $AgNO_3$ 20ppm + Sucrose 2%, $AgNO_3$ 20ppm+Sucrose 4%, $AgNO_3$ 40ppm+Sucrose 2%, $AgNO_3$ 40ppm+Sucrose 4%, Ascorbic acid 2%, Ascorbic acid 4%. The vases containing different solutions were arranged in a Factorial Completely Randomized Design with 3 replications. The control flowers were held in Distilled water. Trials were carried out in a laboratory at an ambient temperature of 20+20c with continuous lighting to maintain temperature and relative humidity.

The vase life of gerbera cut flowers was determined by observing the freshness of flower and also by counting the number of stems with physiological disorder bent neck. Taking a weight of each replication of each treatment with the help of electro balance meter in a 2 days interval for counting the uptake of solution by cut flower gerbera.

The data was statistically analyzed with the help computer using Factorial Completely Randomized Design. The treatments were compared with critical difference suggested by fisher (1958) at 5% level significantly.

Results and Discussion

In laboratory trials, the total uptake of solution during the vase life of cut gerbera under various treatments were calculated and recorded in Table 1 so, the maximum uptake of solution was found under treatment T_2(49.93g) consisted of $AgNO_3$ 40ppm followed by treatment T_1 having vase solution $AgNO_3$ 20ppm. Minimum uptake of solution was under treatment T_9 (20.56g) where ascorbic acid 2% followed by treatment T_{10} (27.56g) consisted of ascorbic acid 4%. In Table 2 vase life of cut flower gerbera were graphically recorded and presented in it, the maximum vase life (14.94 days) was observed in treatment T1 consisted of $AgNO_3$ 20ppm which was significantly superior followed by treatment T_6 (14.66 days) which is consisted $AgNO_3$ 20ppm + Sucrose 4% minimum vase life (6.93 days) was observed in T_{10} treatment. Where ascorbic acid 4% used as a vase solution followed by treatment T_9 (7.30 days) consisted of vase solutions as a ascorbic acid 2%.

In Table 2 weight of cut gerbera the observation in respect of weight of cut gerbera at harvest and final weight at end of vase life as influenced by various chemical preservatives were recorded and presented in Table 2. The maximum loss of weight of cut gerbera 11.56 g was observed under vase solution containing ascorbic acid 4% i.e. treatment T_{10} followed by treatment T_7 as same as treatment T_{11} (8.66 g) vase solution containing AgNO3 40 ppm + Sucrose 2% and distilled water respectively and less loss of weight 3.13 g was observed under vase solution containing $AgNO_3$ 40ppm + Sucrose 4%.

In Table 3, the excellent diameter growth noted in treatment T_2 11.18cm ($AgNO_3$ 40 ppm), T_5 10.69cm ($AgNO_3$ 20 ppm + Sucrose 2%) and found slowest growth of diameter found in treatment T_9 9.83cm i.e. ascorbic acid 2%. Finally the maximum diameter found in treatment T_2 (Sucrose 4%) and minimum found in treatment T_9 (Ascorbic Acid 2%).

The flower is a heterogenous organ, composed of floral parts each of which may be at different physiological development. Gerbera, now a days is in great demand both in indigenous and foreign market due to it's star like flowers of varying colour shade and long vase life. In the growers in India have to export cut flowers. We must realize that only best quality fresh flower are acceptable to the buyers. Marketability of this flower is evaluated on the basis of cultivars, stage of harvest and flower condition. Physiology of cut gerbera needs standardization. Silver nitrate is a preservative present in different concentration in

Table 1: The effect of $AgNO_3$, sucrose and ascorbic acid on uptake of holding solution according to 2 days interval

Treatments	2nd day	4th day	6th day	8th day	10th day	12th day	14th day	15th day	Mean
T1	5.83	6.57	6.50	6.07	7.17	7.80	7.57	2.20	6.21
T2	5.83	7.27	7.27	5.40	6.50	7.53	8.50	1.43	6.24
T3	4.67	5.47	6.27	4.27	6.67	5.93	4.00	0.00	4.66
T4	6.27	5.80	5.43	4.03	5.20	5.10	3.80	0.00	4.45
T5	6.92	7.00	6.70	5.83	7.23	6.13	8.17	0.00	6.00
T6	5.81	6.43	6.47	5.97	6.67	7.03	7.37	0.57	5.79
T7	6.66	6.70	7.43	6.87	7.60	7.73	4.80	0.00	5.97
T8	4.94	6.20	5.77	5.67	7.20	7.40	7.27	0.00	5.56
T9	4.97	6.23	6.53	2.83	0.00	0.00	0.00	0.00	2.57
T10	5.40	6.37	8.03	2.00	2.07	1.90	1.80	0.00	3.45
T11	5.40	6.37	8.03	2.00	2.07	1.90	1.80	0.00	4.31
Mean	5.77	6.29	6.54	4.87	6.00	5.47	4.84	0.38	-
		Tret.	Days	Interation					
SEm+		0.379	0.323	1.073					
CD at 5%		1.051	0.897	2.975					

different floral parts and developmental stage.

Table 2: The effect of $AgNO_3$, sucrose and ascorbic acid on fresh weight change and vase life of gerbera cut flower

Treatments	Fresh wt. at harvest	Fresh wt. at end of vase life	Loss in weight	Vase life
T1	21.70	16.00	5.70	14.94
T2	26.23	18.87	7.37	14.57
T3	21.00	12.67	8.33	13.53
T4	17.18	9.43	8.73	12.70
T5	23.37	15.57	7.80	13.93
T6	19.73	14.57	5.17	14.67
T7	23.57	14.90	8.67	13.73
T8	16.77	13.63	3.13	13.90
T9	18.37	7.90	9.47	7.30
T10	17.73	6.17	11.57	6.93
T11	22.10	13.43	8.67	11.07
Mean	20.79	13.01	7.69	-
	Treat.	Days	Int.	
SEm±	1.467	0.625	2.274	
CD at 5%	4.180	1.782	5.912	

Table 3: Effect of $AgNO_3$, sucrose and ascorbic acid on diameter of flower according to 2 days interval

Treatments	At harvest	2nd day	4th day	6th day	8th day	Mean
T1	9.43	10.03	10.40	10.43	10.33	10.13
T2	10.17	11.07	11.43	11.57	11.67	11.18
T3	9.00	9.73	10.20	10.07	10.17	9.83
T4	8.37	9.10	9.57	9.63	9.73	9.28
T5	9.73	10.53	11.03	11.03	11.13	10.69
T6	9.20	6.77	10.07	10.37	10.40	9.36
T7	9.80	10.70	10.80	10.90	10.93	10.63
T8	8.93	9.53	9.93	10.03	10.10	9.71
T9	9.43	9.97	10.03	9.90	9.83	9.83
T10	8.70	9.60	9.60	9.73	9.27	9.38
T11	8.87	9.87	10.30	10.60	10.63	10.05
Mean	9.24	9.72	10.31	10.39	10.38	-
		Treat.	Days	Int.		
SEm+		0.194	0.131	0.435		
CD at 5%		0.539	0.163	1.206		

From the experimental findings it was observed that the uptake of the vase solution was maximum in the first two, 8th day, 10th day there after that reduces subsequently. Total uptake of vase solution was maximum under the treatment T1 (49.53 g) consisted of $AgNO_3$ 20 ppm followed by treatment T_2 (49.33 g) where $AgNO_3$ 40 ppm as a vase solution. The lowest uptake of solution was recorded under treatment T_9 (20.56 g) where vase solution consisted of Ascorbic acid 2%. The observations in respect of effect of holding solution on vase life of cut gerbera recorded were significant. The maximum vase life (14.94 days) was observed under treatment T_1 where the vase solution consisted of $AgNO_3$ 20 ppm i.e. silver nitrate 20 ppm followed by the treatment T_6 (14.66 days) where vase solution consisted of $AgNO_3$ 20 ppm + Sucrose 4%. The lowest vase life of 6.93 days was observed under treatment T_{10} were ascorbic acid 4% was used as vase solution. Prolong vase life in silver nitrate ($AgNO_3$) might be due to more accumulation of silver nitrate which maintain turgidity and provide energy to flower and also by maintaining the freshness of flower. The flower diameter of cut gerbera under all treatments was cut at a same flower stage. Development of flower influence by various holding solution during vase. The flower diameter was found significantly superior under the treatment T_2 (11.17 cm) where vase solution consisted of $AgNO_3$ 40 ppm over other treatments followed by T_5 (10.69 cm) where vase solution consists of $AgNO_3$ 20 ppm + Sucrose 2% which were at part each other in respect of diameter of flower. The less diameter of flower was observed under treatment T_9 (cm) where vase solution consists of Ascorbic acid 2%. There was no significant difference between the fresh weight of cut gerbera at harvest. However, there was an influence of various treatments on weight of cut gerbera at the end of vase life. The weight of cut gerbera was found significantly superior under treatment T_{10} (11.56 g) as compared to other treatments where vase solution was Ascorbic acid 2% followed by treatment T_7 (8.66 g) as same as treatment T_{11} where vase solution was consisted of $AgNO_3$ 40 ppm + Sucrose 2% and distilled water respectively. The lowest weight was observed under treatment T_8 (3.13 g) where vase solution consisted of $AgNO_3$ 40ppm + Sucrose 4%.

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Effect of potassium and nitrogen application on nutrient content, total uptake and quality of barley (*Hordeum vulgare L.*) in loamy sand soil conditions of Rajasthan

DHARAMVEER SINGH RATHORE, P.S. SHEKAHWAT[1], PRAMENDRA SINGH[1] AND R.P.S. SHAKAWAT[1]

Department of Agronomy, College of Agriculture, Rajasthan Agriculture Uni., Bikaner (Rajasthan)

Abstract

*A field experiment was conducted to study the effect of potassium and nitrogen application on nutrient content, total uptake and quality of barley (*Hordeum vulgare L.*) at Agricultural Research Station, Bikaner, Rajasthan in Rabi Season of 2004-05 with four levels of potassium (control, 20, 40 and 60 kg, K_2O ha^{-1}) and five levels of nitrogen (control, 30, 60, 90 and 120 kg N ha^{-1}) using sandy loam soil. Application of potassium and nitrogen significantly increased the grain and straw yield of barley over control. The content and uptake of NPK by barley also increased with the application of potassium and nitrogen. The content and uptake of NPK was significantly enhanced with the application of 40 kg K_2O ha^{-1} and 90 kg N ha^{-1}. Application of potassium and nitrogen significantly increased the protein content of barley over control.*

Introduction

The antagonistic or synergistic relationships between nutrient ions in plant are fairly well documented. Potassium and nitrogen being essential nutrient play an important role in several metabolic functions in plants. As a result of high potassium and nitrogen application, an increment in NPK content was reported by Gupta et al (2001) and Tomar et al (2004). These studies indicated the possibility of interaction between K and N in plant. However, the present study was carried out to study potassium and nitrogen relationship in barley under sandy loam soil.

Materials and Methods

A field experiment was conducted during Rabi Season of 2004-05 at Agricultural Research Station, Bikaner. Soil was loamy sand with 85.24% and, 6.7% silt and 8.06% clay. The experimental soil had alkaline in reaction (pH 8.3) with 0.08% organic carbon, low in nitrogen (125.72 kg ha^{-1}), medium in phosphorus (18.59 kg ha^{-1}) and potassium (215.14 kg ha^{-1}). A uniform dose of 40 kg P_2O_5 ha^{-1} was applied through SSP at the time of sowing. The treatments comprising of four levels of potassium (control, 20, 40 and 60 kg K_2O ha^{-1} as MOP) and five levels of nitrogen (control 30, 60, 90 and 120 kg N ha^{-1} as urea) were tested in factorial randomized block design with three replication. Barley variety RD - 2508 used as test variety. The crop was raised up to maturity. At harvest the grain and straw yield were recorded. Nitrogen content was determined by kjeldhal method and converted in to crude protein by multiplying with 6.25. In wet tri acid digested sample potassium was determined by flame photometer while phosphorus was determined by Olsen method.

[1]ARS, Rajasthan Agri. University, Beechwal, Bikaner (Rajasthan)

Results and Discussion

Grain and Stray yield

A perusal of data (Table 1) further reveals that application of 40 kg potassium ha^{-1} significantly influenced the grain an straw yield of barley by 63.06 and 43.64 percent, respectively, over control plot. However, further increase in potassium level up to 60 kg K_2O ha^{-1} could not bring any significant variation in grain and straw yield of barley over 40 kg K_2O ha^{-1}. These results corroborate the finding of Singh and Singh (2002) and Dadhania et al (2003) who also observed significantly higher straw and biological yield under similar situation.

Similarly grain and straw yield of barley was significantly influenced by the application of nitrogen. Application of 90 kg nitrogen ha^{-1} significantly increased the grain and straw yield by 2303 and 2157 kg ha^{-1}, respectively over control. Improvement in yield attributes with increasing nitrogen levels has been also reported by Kumar et al (2001), Respiene (2001), Singh et al (2003) and Mann et al (2003).

Nutrient content

The application of potassium significantly influenced nutrient content of barley over control (Table 2). Application of 40 kg K2O ha^{-1} significantly increased the N, P and K content in grain and straw of barley over control by 1.17, 6.0, 3.78, 22.80, 9.36 and 1.76 percent, respectively. Similar result also reported by Bedi et al (2001), Shivay et al (2002) and Tomar et al (2004).

Application of nitrogen significantly increases the nutrient content in grain and straw of barley over control.

Table 1: Effect of potassium and nitrogen application on yield and protein content of barley

Treatment	Grain Yield(kg ha^{-1})	Straw Yield(kg ha$_{-1}$)	Biological Yield(kg ha^{-1})	Protein Content(%)
Potassium (K_2O kg ha^{-1})				
0	2055	2518	4574	10.63
20	2750	3256	6006	10.72
40	3351	3617	6969	10.80
60	3419	3630	7049	10.86
S.Em. ±	148.75	131.44	199.80	0.04
CD 5%	425.86	376.30	572.03	0.13
Nitrogen (N kg ha^{-1})				
0	1362	1856	3218	10.49
30	2496	2874	5370	10.62
60	3198	3449	6647	10.75
90	3665	4012	7677	10.89
120	3750	4086	7836	11.00
S.Em. ±	94.07	83.13	126.36	0.02
CD 5%	269.33	237.99	361.78	0.08

Table 2: Effect of potassium and nitrogen application on nutrient content of barley

Treatment	Nitrogen content(%)		Phosphorus Content(%)		Potassium content (%)	
	Grain	Straw	Grain	Straw	Grain	Straw
Potassium (K2O kg ha^{-1})						
0	1.70	0.300	0.291	0.057	0.299	1.70
20	1.71	0.312	0.297	0.065	0.313	1.71
40	1.72	0.318	0.302	0.070	0.327	1.73
60	1.73	0.320	0.304	0.072	0.340	1.74
S.Em. ±	0.007	0.003	0.002	0.001	0.003	0.005
CD 5%	0.021	0.009	0.008	0.005	0.009	0.016
Nitrogen (N kg ha$_{-1}$)						
0	1.67	0.286	0.277	0.060	0.295	1.67
30	1.69	0.298	0.293	0.062	0.305	1.70
60	1.72	0.313	0.302	0.066	0.321	1.72
90	1.74	0.324	0.308	0.068	0.335	1.75
120	1.76	0.341	0.314	0.074	0.341	1.77
S.Em. ±	0.004	0.002	0.001	0.001	0.002	0.003
CD 5%	0.013	0.006	0.005	0.003	0.006	0.010

The N, P and K content in grain and straw significantly increased due to application of 90 kg N ha^{-1} in a tune of 4.19, 13.28, 11.19, 11.33, 13.55 and 4.79 per cent, respectively over control (Table 2). These results are in close conformity with the findings of Gupta et al (2001) and Meena et al (2002).

Protein content

Application of 60 kg potassium ha^{-1} significantly increased the protein content in grain of barley over control by 2.16 per cent (Table 1). While, the difference between control and 20 kg K_2O ha^{-1}, 20 and 40 K_2O ha^{-1} & 40 and 60 kg K_2O ha^{-1} was found non-significant with respect to protein content in grain of barley. These results are in close conformity with the result observed by Bedi et al (2001).

The data presented in Table 1 further indicated that successive addition of nitrogen up to 120 Kg ha^{-1} significantly increased the protein content in grain of barley. Addition of nitrogen level from control to 30 kg N ha^{-1}, 30 to 60 kg N ha^{-1}, 60 to 90 kg N ha^{-1} and 90 to 120 kg N ha^{-1} increased the protein content to the extent of 1.24, 1.22, 1.30 and 1.01 per cent, respectively. These

findings are in close conformity with findings of Gupta et al. (2001).

Nutrient uptake

The total nutrient uptake by plant is significantly increased due to application of potassium over control (Table 3). Each increase in potassium levels up to 40 kg K2O ha^{-1} significantly increased the total N, P and K uptake by barley. The magnitude of increase in N, P and K uptake over control level was 26.95, 5.26 and 24.61 kg ha^{-1}, respectively. However, further increase in potassium level up to 60 kg K2O ha^{-1} could not bring a significant increase in total nutrient uptake by barley over 40 kg K2O ha^{-1}. Similar result also reported by Bedi et al (2001), Shivay et al (2002) and Tomar et al (2004).

Similarly application of 90 kg N ha^{-1} significantly increased the total N, P and K uptake by barley over control by 48.719.16 and 47.41 kg ha^{-1}, respectively (Table 3). While, further increment in the nitrogen level up to 120 kg ha^{-1} bring non-significant increase in total nutrient uptake by barley compared with 90 kg N ha^{-1} treatment. These results are in close conformity with the findings of Gupta et al (2001) and Meena et al (2002).

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Marketing of Edible Mushroom in Kashmir Valley

SHABIR A. GANIE AND SHAHID YOUSUF
Rajiv Gandhi Chair, She-e-Kasmir University of Agricultural Sciences and Tech., Kasmir, J &K

Abstract

Mushroom industry has a promising future worldwide as demand side factors are highly favorable for further growth of mushroom output. Although it is grown in the diverse regions of the world, its production and consumption is mainly concentrated in USA and Europe. India produces about 280 species of edible mushroom – white-button mushroom being the front runner. Mushroom production in India jumped from 5,000 Mt in 1990 to 1,00,000 MT in 2006-07 and its exports expanded significantly during this period and recorded a growth rate of about 3.5 percent in the preceding decade. Mushrooms have an insignificant existence in Jammu and Kashmir agriculture and its commercial cultivation is a recent introduction in the state's agri-business industry, however, it is likely to pick up in response to bridge the prevailing demand-supply gap in domestic as well as in international market for mushrooms. This industry is yet too small to have its distinct identity, and to attract traders and consumers as well. Therefore, growers are mostly pessimistic about large scale production in such an immature business environment with the impurities/problems like poor infrastructure, consumer unawareness, technical support and necessary institutional support- as reported by 74 sampled growers from three blocks, one each from three districts. To market their (easily manageable) meager produce growers have a tendency to avoid middlemen, and sell most of their produce directly to consumer (40.37%) or to retailer (47.19%); and rest (12.44%) goes through whole-seller. This tendency was more prominent among farmers having small surpluses, i.e. small farmers. Total marketing costs, including margins incurred varied from rupees 2.50 per kg to rupees 10.65 per kg in three prevailing channels. Producers' share was maximum in the channel wherein the dealt directly with consumer. This channel also had a highest index of marketing efficiency. It was also observed that net margin received by each functionary was directly related to the costs incurred by him in the marketing process. The problems faced by growers were socio/organizational in nature and needed an active institutional participation.

Introduction

Mushrooms are fruiting bodies of higher fungi including both edible and poisonous species. There are about 2,000 edible mushrooms known worldwide, however the major variety grown is European or white-button mushroom which accounts for almost 38% of the total mushroom production in the world. Other popular varieties grown world over are Oyster or Dhingri mushroom, Chinese or paddy-straw mushroom and Japanese or shitake mushroom. Though mushrooms are grown in the diverse regions of the world, its cultivation and consumption is concentrated mainly in EU and USA (Mehta and George, 2003). India is not a major producer of any of the mushroom varieties, but it does cultivate mushrooms of about 280 species, and the most important mushroom collected here is the Guchhi (Morchella species), which is dried and exported to Western countries. However, the literature also reveals that the variety gaining maximum importance in India has been the white-button mushroom, which registered the highest growth rate in production.

Trade in mushrooms has gained importance since recent past. For its nutritious composition, meaty taste and culinary advantage it became popular among the consumers. FAO recommends mushroom as a protein supplement to the diet of developing countries like India, where there is heavy dependence on cereals (Khatkar et al., 2005). Also, for its medicinal value it is also being marketed as tablets/syrups in some parts of world (Chang and Miles, 1989). Realizing the market potential, mushroom production in India augmented, and its exports (mainly to US) expanded significantly since 1990* though it had been exporting so on a small scale earlier. During 1990/91-2001/02, export value of fresh Mushrooms from India recorded a growth rate of 3.43 per cent, while dried Mushrooms grew at 3.11 per cent (Mehta and George, 2003). Since demand side factors were highly favorable for growth in mushroom industry, its production has increased form 5000 metric tones during 1990 to 1,00,000 metric tones at present (Rai, 2007) and is likely to touch five lakh tones per annum in the next 5 years (Alexandra, 2007).

Studies have revealed that in comparison with other crops and agro-industries, mushroom cultivation is an efficient biotechnological process for using and

converting energy, water and agro-waste into a human food (Quimio, 1981); and this experience allows a sustainable model for rural production of mushrooms at regional and micro-regional levels (Carrera, 1998). In this scenario, India is a potential supplier of fresh/canned mushroom to the world for its rich biodiversity, cheap manpower and plentiful agro-wastes. Appreciating this, Mehta and George (2003) see strong backward linkages for mushroom production in India in terms of employment generation, without competing for scarce arable land resource; and, an opportunity to add value to some coarse and inedible biological resources, with a little help from science.

The agro-climate of Jammu and Kashmir too favours the cultivation of mushrooms. Though its production on commercial level has recently started to pick up, but earlier, rural masses used to consume it fresh after collecting it wild. Recently the state government promoted its commercial cultivation through various schemes resulting in the creation on mushroom enterprises. Munshi and Ghani (2003) reported only 730 mushroom growers, mostly from Jammu region; and a total production of 5706 quintals during 2001-02.

Few studies covering aspects of mushrooms other than marketing have been conducted so far in the valley; therefore the present study was carried out to explore the marketing segment of mushroom farming in the valley. Since this is a budding industry in the Kashmir and thereby bears no scope to investigate the higher aspects of its trade, which is virtually absent; therefore the study has been limited to basic features of marketing viz. disposal and channeling of produce, costs, margins and efficiencies involved therein. The study is expected to serve as an input for planners to devise a pragmatic plan for growth of this industry in Jammu and Kashmir.

Methods and Materials

The present study is based on primary as well as secondary data. Secondary information was collected from government sources, various research and other publications. Scarce availability of the secondary information restricted the scope for in-depth study of the marketing aspect of mushroom industry in Jammu and Kashmir. Primary data was collected from mushroom growers and traders through pre-tested questionnaire. A prior survey was carried out to identify the distribution of mushroom growers around the valley, based on which only three districts, inhabiting most of the growers were selected for sampling. After identifying the mushroom growing belts one block from each district was purposively selected for final lot; thus block Bandipora from district Bandipora, block Ganderbal from district Ganderbal and block Sopore from district Baramulla was selected as a sampling area. Since mushroom growers were thinly populated and constituted a small fraction of the society, therefore all the mushroom growers' population, numbering 74, were considered for evaluation.

For finer evaluation all the growers were categorized into three sub-groups depending upon their business size, i.e. number of units (bags) they keep. Growers keeping up to 40 bags were put in the small category whereas those having 40-60 bags and above 60 were categorized as medium and large growers, respectively. Therefore, a sample of 41 small, 22 medium and 11 large farmers was drawn. Besides, only 05 village level wholesalers involved in the trade were identified in the sampled area, and were as such considered for the study. Also, 30 retailers were randomly identified for study from different towns around including Srinagar-the main market.

In order to estimate the marketing efficiency index in each channel, Shepherd's and Acharya's methods were used. Simple percentage and averages were estimated to achieve the set objectives. The primary data reflected pertains to the year-2008.

Results and discussion

Marketing channels and disposal of produce

Production of mushrooms on commercial level is a new endeavor for the people of valley, and almost all the growers ventured it in an attempt to diversify their employment opportunities. Therefore growers are mostly pessimistic about large scale production in such an immature environment with poor infrastructure, unawareness and necessary institutional support. Those who endeavoured are in the initial phase and therefore resort to small production. Coventionally, quantum of produce to be handled is detrimental in deciding the mode of disposal. Since a total of 74 growers who were identified in the sampled are produced a little marketed surplus, the growers have narrow choice with them while marketing their produce. Little produce with few traders in the market simplifies the marketing network and

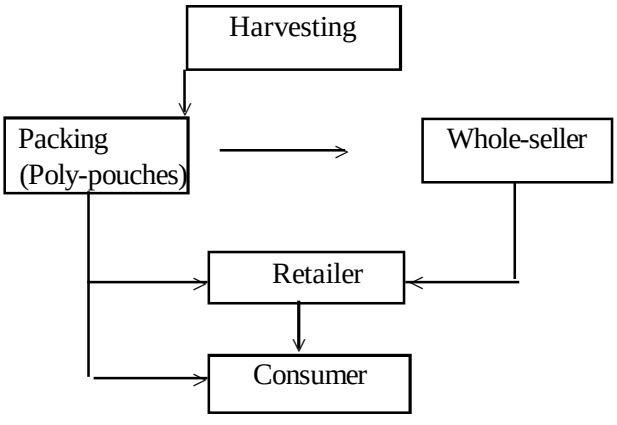

Fig.1 : Post harvest management of mushroom

Table 1: Channel wise disposal of mushroom by different growers (Quantity in quintals)

Channels	Small		Medium		Large		Overall	
	No.	Quntity	No.	Quntity	No.	Quntity	No.	Quntity
I	-	-	7	2.97(17.50)	4	2.52(24.99)	11	5.48(12.44)
II	26	7.92(46.43)	20	8.48(50.01)	7	4.40(43.73)	53	20.80(47.19)
III	30	9.14(53.57)	13	5.51(32.51)	5	3.15(31.24)	48	17.79(40.37)
Total	56	17.06(100.00)	40	16.95(100.00)	16	10.07(100.00)	112	44.08(100.00)

Note: (i) Figures in parentheses indicate the percentage to respective total.
(ii) Number of growers exceeds the actual sample size as a grower may opt for more than one channel.

channeling of the mushroom produce. Figure 1 below reflects the common path through which the produce goes to consumer.

The figure above reveals a simple marketing network followed by the mushroom growers in valley. It is noteworthy that owing to small scale of production of growers sell their produce in fresh form after packing it manually in poly-pouches. Disposal of produce through various channels is presented in Table 1 wherein it is clear that selling through whole-seller is the least preferred channel among mushroom growers. Out of the total 44 quintals of mushroom marketed, only 12.44 percent has been channeled through whole-sellers, whereas 47.19 and 40.37 percent have been sold directly to retailers and consumers, respectively. None of the small farmer has opted for channel-I i.e., through whole-seller. Instead, more than half of the produce of small growers has been sold to consumer directly and the rest of retailer. Selling directly to retailer is the more common among medium and large farmers, though considerable quantity (32.51 and 31.24 percent, respectively) goes directly to consumers. The trend of avoiding whole-sellers by most of the growers can obviously be attributed to the small surpluses with them and the less number of whole-sellers involved with mushroom trading.

Marketing costs and margins

Marketing in true sense adds to the utility of a commodity. The costs involved in this process depend upon the number of intermediaries and extent of value addition, which in turn influences the producer's share and overall efficiency of a particular channel. More mediators mean more costs. Total marketing cost involved in channel-I (Table 2) with two middlemen is more than four times higher than channel-III with no middleman. Inter-channel comparison reveals that about 42 percent of total marketing costs are paid by producer in channel-I, which is even higher (53.63%) in channel-II and highest (100%) in channel-III. Costs incurred by producer in either channel are packaging, weighing, transportation and other costs. Transportation is the highest cost paid by him in channel-I and II, whereas this cost is absent in channel-III wherein the produce is directly sold to consumer in the locality. Whole-seller incurs rupees 2.85 per kilogram (26.76 percent of total marketing cost) as marketing cost in terms of weighing, rent, tax, etc. Retailers pay about 31 and 47 percent of total marketing cost in channel-I and II, respectively. Transportation is the major item of cost (8.55%) paid by them. The other costs include spoilage, re-packing, rent, labour, transportation, etc.

Table 2: Cost involved in marketing of mushroom in different channels (Rs per kg)

Charges paid on a/c of	Channel I	Channel II	Channel III
Producer			
Packaging	0.92(8.64)	0.90(13.58)	0.98(39.20)
Weighing	0.51(4.79)	0.47(7.08)	0.53(21.20)
Transportation	2.26(21.12)	1.37(20.66)	-
Other	0.80(7.51)	0.75(11.31)	0.99(39.60)
Sub total	4.49(42.16)	3.49(53.63)	2.50(100.0)
Whole-seller			
Weighing	0.38(3.56)	-	-
Mandi tax	1.00(9.38)	-	-
Shop rent	0.49(4.61)	-	-
Other	0.98(9.21)		
Sub total	2.85(26.76)		
Retailer			
Rent of shop	0.32(3.00)	0.29(4.38)	-
Transportation	0.91(8.55)	0.87(13.12)	-
Labour	0.30(2.82)	0.27(4.07)	-
Weighing	0.29(2.72)	0.27(4.07)	-
Spoilage	0.59(5.53)	0.58(8.75)	-
Re-packing	0.33(3.10)	0.33)4.98)	-
Other	0.57(5.35)	0.53(8.00)	-
Sub total	3.31(31.07)	3.14(47.37)	
Total cost	10.65	6.63	2.50

(i) Figures in parentheses indicate the percentage to respective total

Costs incurred by each intermediary vary among channels and has a bearing on his net margin received.

Table 3: Price spread in different channels of marketing of mushroom

Particulars	Channel		
	I	II	III
Price received by growers	46.91(67.94)	49.31(75.72)	52.09(100.00)
Cost incurred by growers	4.49(6.51)	3.49(5.36)	2.50(4.80)
Net share by grower	42.42(61.43)	45.82(70.36)	49.59(95.20)
Cost incurred by whole-seller	2.85(4.12)	-	-
Net margin received by whole-seller	6.36(9.21)	-	-
Cost incurred by retailer	3.31(4.80)	3.14(4.82)	-
Net margin received by retailer	9.62(13.93)	12.68(19.46)	-
Price paid by consumer	69.05	65.13	52.09
Index of marketing efficiency			
i. Shepherd's method (E)	6.49	9.82	20.83
ii. Acharya's method (MME)	1.59	2.38	19.83

Note: Figures in parentheses indicate the percentage to respective total (consumer rupee)

Table 4: General problems reported by mushroom growers (Multiple response)

Problems	Small	Medium	Large	Total
Shortage of skilled labour	12(29.27)	5(22.72)	3(237.27)	20(27.02)
High prices of spawn	7(17.07)	2(9.09)	2(18.18)	11(14.86)
Not available/costly raw material	13(31.70)	4(18.18)	1(9.09)	18(24.32)
Poor technical/institutional support	41(100.00)	22(100.00)	11(100.00)	74(100.00)
Non-availability of credit	9(21.95)	6(27.27)	9(81.81)	24(32.43)
Marketing aspect				
Low demand	20(48.78)	8(36.36)	7(63.63)	35(47.29)
Market distance	6(14.63)	3(13.63)	-	9(12.16)
Unawareness among consumers	11(26.82)	4(18.18)	1(9.09)	16(21.62)
No infrastructure for processinf etc.	41(100.00)	22(100.00)	11(100.00)	74(100.00)

Note: Figures in parentheses indicate the percentage to respective sample size

Channel-III offers maximum share to producer (95%) in consumer rupee as compared to channel-I and II wherein the producer gets 61.43% and 70.36%, respectively (Table 3). It is worth mentioning that the percentage contribution to total marketing cost by producer (Table 2) increases from channel-I to III, and his net share in consumer rupee also increases from channel-I to III, indicating direct relationship in the cost incurred by producer and share had by him. Whole-seller is involved only in channel-I and receives 9.21 percent of consumer rupee after investing 4.12 of it. Retailers' margin is higher (19.46%) in channel-II than in channel-I (13.93%). Here again the net margins are relative to the costs incurred.

Marketing efficiency was calculated for each channel via two methods (Table 3). Both the methods revealed high index for channel-III, followed by channel-II.

Problems encountered by common grower

As mentioned earlier that commercial mushroom cultivation is very rarely practiced in the valley, therefore lots of problems are feared to come across the common grower. This industry is in budding stage and is yet to set its backward and forward linkages. As reported by 27 percent farmers (Table 4) that the industry is short of skilled labour, is a problem that will be over as the existing labour catches skills. However, there are problems, more or less institutional/social in nature, highlighted by growers which needs a though by authorities. Lack of guidelines, technical support, trainings, promotional schemes, credit, market infrastructure and product unawareness in consumers is a problem to be addressed through government and NGOs.

Conclusion

Mushrooms form a negligible part of agricultural production in the valley, though it is likely to pick up in response to bridge the prevailing demand-supply gap in domestic as well as in international market for mushrooms. This industry is yet too small to attract traders and consumers and a consequent market set-up. Study revealed that three common channels were prevalent in the sampled area. Growers preferred the channel having fewer middlemen as it gave maximum share to them. Net margins received by middlemen/ producer ware found to be directly relative to the cost incurred. It was also concluded that the problems faced by farmers are more institutional/social than individual in nature and required an active institutional participation.

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Shelf life enhancement of chhana using select preservatives

B.L. YADAV AND M.P. GUPTA[1]
Krishi Vigyan Kendra, Pt. D.D. Upadhyay Pashu Chikitsa Vigyan Vishwavidyalaya evam Go-Anusandhan Sansthan, Mathura-281001(U.P.)

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). 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. The changes in the microbial quality of the product as revealed by SPC, coliform, lipolytic and proteolytic counts as well as yeast and mould counts during storage periods were limited in preservative treated samples as compared to control samples. Full concentrations of preservatives were found more effective than half concentrations. Calcium propionate + oxytetracycline (P_7) and calcium propionate + pot. metabisulphite (P_8) were found more effective in inhibiting yeast and molds, which were major spoilage organisms. The sensory scores revealed that the control sample started 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

Chhana is a traditional Indian dairy product obtained by heat and acid coagulation of milk followed by removal of whey. This soft, semi-solid product forms the base material for a variety of sweets, which are highly popular in the eastern and northern parts of the country (IDA, 2007). The major strength of chhana and chhana-based sweets lies in low capital investment and high profit margin as compared to western dairy products, *viz.* butter, cheese, condensed milk and milk powder. The rapidly growing demand and assured market for chhana-based sweets offer a great opportunity for organized dairy sector in our country to produce and market these products at large scale.

However, the shelf-life of chhana is limited (3 days at 22°C and one day at 37°C) and is influenced by storage temperature and packaging material (De *et al.,* 1971, De, 1980). It is, therefore, imperative to extend the shelf life of chhana to facilitate long-distance transportation and convenience disposal. The present study was, hence, undertaken to extend the shelf-life of chhana using selected preservatives.

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:

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%+7 ppm)	(0.16%+3.5 ppm)
3. Calcium propionate + Potassium metabisulphite(P8)	(0.32%+250 ppm)	(0.16%+125 ppm)
4. Calcium propionate+Sodium benzoate+ Oxytetracycline (P9)	(0.32%+0.1%+7 ppm)	(0.16%+0.05%+3.5 ppm)
5. Calcium propionate+ Sodium benzoate+ Potassium metabisulphite (P10)	0.32%+0.1%+250 ppm)	(0.16%+0.05%+125 ppm)
6.Calcium propionate +Oxytetracycline + Potassium metabisulphite (P11)	(0.32+7 ppm+250 ppm)	(0.16%+3.5 ppm+125ppm)
7. Calcium propionate +Sodium benzoate + Oxytetracycline + Potassium metabisulphite (P12)	(0.32%+0.1%+7ppm+250 ppm)	(0.16%+0.05%+3.5ppm+125ppm)

[1] Professor & Head, Deptt. of Dairy Science.

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

Observations recorded: Changes in sensory (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 mould counts by BIS, 1962) qualities were ascertained.

Results and Discussion

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

All samples of fresh chhana had a normal yellow colour, pleasant sweetish taste, soft body and uniform smooth texture. 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) 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 (A2C1) and 2(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) in protein, fat and total solids content of chhana samples which were more marked on third day. However, appreciable differences were not observed between full and half concentrations of the preservatives.

Changes in microbiological quality: Results on changes in total viable count (SPC), coliform, lipolytic, proteolytic and yeast and mould count in various chhana samples, as influenced by treatment with various

Table 1 (A1C1): Changes in protein, fat and total solids content (%) at 25°C

Treatments	Days of storage											
	D0			D1			D2			D3		
	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS	Protein	Fat	TS
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°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 (A2C1): 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
A2C0	17.43	24.66	47.83	17.17	24.16	47.54	16.59	23.49	47.23	15.60	22.66	47.08
A2C1P6	17.61	24.99	47.92	17.11	24.32	47.53	16.46	23.33	47.17	16.01	22.66	46.85
A2C1P7	17.17	24.33	47.91	16.91	23.33	47.51	16.61	23.33	47.13	16.26	22.66	46.83
A2C1P8	17.50	24.99	47.95	17.14	24.33	47.53	16.74	23.99	47.18	16.20	23.33	46.85
A2C1P9	17.36	24.33	47.81	17.02	24.00	47.37	16.53	23.99	47.10	16.18	23.66	46.76
A2C1P10	17.48	24.64	47.86	17.06	24.29	47.37	16.74	23.99	47.11	16.25	23.99	46.81
A2C1P11	17.12	23.99	47.85	16.79	23.33	47.41	16.26	23.65	47.12	16.01	22.31	46.89
A2C1P12	17.25	23.99	47.88	16.96	23.99	47.44	16.61	23.99	47.13	16.18	22.99	46.83

C0 - Control, A2 - Dipped in distilled water with preservative, C1 - Concentration (Full),
P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

Table 4 (A2C2): 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
A2C0	17.43	24.66	47.83	17.17	24.16	47.54	16.59	23.49	47.23	15.60	22.66	47.08
A2C2P6	17.49	24.66	47.92	17.12	23.99	47.52	16.30	23.66	47.18	15.96	22.99	46.86
A2C2P7	17.13	23.99	47.92	16.77	23.66	47.52	16.54	22.99	47.16	16.18	22.33	46.83
A2C2P8	17.45	24.66	47.95	17.15	24.33	47.55	16.73	23.66	47.19	16.19	23.33	46.88
A2C2P9	17.32	24.33	47.80	16.97	23.99	47.39	16.49	23.66	47.10	16.17	22.99	46.79
A2C2P10	17.42	24.99	47.90	17.03	23.99	47.39	16.72	23.99	47.15	16.23	23.99	46.80
A2C2P11	17.13	24.00	47.89	16.75	23.99	47.53	16.22	22.99	47.15	15.97	22.33	46.85
A2C2P12	17.24	23.99	47.81	17.01	23.99	47.50	16.56	23.66	47.17	16.13	22.99	46.84

C0 - Control, A2 - Dipped in distilled water with preservative, C2 - Concentration (Half),
P6 to P12 - Preservatives, D0 to D3 - Days after manufacture

preservatives (P6 to P12), at two concentrations (C1 and C2) and storage period (D0, D1, D2 and D3) are presented in Tables 3 and 4.

It is revealed from Tables 3 and 4 that the fresh samples had slightly higher SPC count (8.31 cfu/g) than the treated samples. Coliform and yeast and molds were not detectable while the lipolytic and proteolytic organisms were observed in higher number than in treated samples. Such counts (SPC, lipolytic and proteolytic) were slightly higher in samples treated with half concentrations (C2) of the preservatives (Table 4). The SPC, lipolytic and proteolytic counts increased with increase in storage periods. On fourth day (D3), some coliform (5.40 cfu/g) and yeast and mold (6.62 cfu/g) organisms were visible in control samples, while the treated samples did not elicit the presence of coliform organisms but some yeast and molds (2.96-3.24) were noted but in much lesser number than in control samples.

Full concentration of preservative (A2C1) was found 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 number 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^{o}C. These samples were completely unacceptable on fourth day. However, 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.

The results on chemical quality of channa as reported in this study are in accordance with the reported data (Aneja *et al.,* 2002). However, published literature on changes in chemical constituents as influenced by treatments with preservatives during storage at ambient temperatures are meager to support the result of present investigation. However, Yadav *et al.,* (1985) and Yadav and Gupta (2009) 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 *et al.* (2002). Published literature on microbiological quality of fresh and marked paneer, which is a similar product, is abundant (Shrivastava and Goyal, 2007) 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 *et al.,* (2002) have reported that during storage, the product (chhana) develops a sour smell and bitter taste at 25-37°C, while its surface is sparsely covered with molds such as *Aspergillus, Mucur, 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-positive 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, 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. Yadav *et al.,* (1985) have used sodium benzoate and potassium metabisulphite in various concentrations (0.1 to 0.2%), to prolong the keeping quality of chhana at room temperature. The shelf-life enhancement of chhana using sodium benzoate, sodium propionate and sugar has also been demonstrated (EIRI 2006; IDA, 2007). Yadav and Gupta (2009) have also reported the dry application of various preservatives used in this study and found it equally efficacious in extending the shelf-life chhana.

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.

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Effect of draining the rain water to mitigate the adverse effect of SAR waters on pearl millet-wheat crop

R.B.SINGH
AICRP on Use of Saline Water in Agriculture, R.B.S. College, Bichpuri, Agra

Abstract

A field experiment was carried out with pearl millet-wheat rotation, irrigated with EC_{iw} 8 dS/m water varying SARiw levels viz. control, 10, 20, 30 and 40 (mmol/l)$^{1/2}$; three levels of gypsum (0, 25% GR & 25% GR+FYM) and a treatment as drain vs no drain for rain water was imposed for one month of pearl millet crop age only. The crop yield of pearl millet and wheat declined significantly at SAR_{iw} 20 (mmol/l)$^{1/2}$ and further with increase in SAR levels. However, addition of gypsum @ 25% GR proved beneficial i.e. 63.7% average yield of pearl millet increase over with out gypsum [average of SAR_{iw} 30 and 40 (mmol/l)$^{1/2}$]. No drain treatments declined the grain yield by 25.8% in 1999 and 23.6% in 2002 over drain treatments where as in 2000 and 2001 the differences were non-significant. The infiltration rate of soil which was declined with due to SAR_{iw} water irrigations improved with gypsum application.

Introduction

Under arid and semi-arid climatic regions, use of ground water is inevitable for growing crops even it had dissolved varying kind of salts because of non-availability or limited availability of fresh waters. In most of saline waters, sodium content increases in relation to divalent cations, defined in term of sodium adsorption ratio, along with an increase in total dissolve salts. The long-term use of high SAR saline or high alkalinity or both waters has been known to induce permeability problems in soils. Poor intake of the irrigation/rainwater often reduces replenishment of the soil water storage and consequently diminishes water supply to the plant roots. Low permeability of soils to water also leads to poor soil aeration and gas exchange problems. Influence of major ion chemistry of irrigation waters on the hydraulic conductivity of the soils have been evaluated by several workers (Pal et al., 1980, Girdhar and Yadav, 1980, Minhas and Sharma, 1986 and Verma et al., 1987). The swelling process is dominant in clayey soils having montmorillonite/smetite type clay minerals whereas in coarse textured soils (Minhas and Sharma, 1986) clay dispersion and its movement to lower layers will cause irreversible blockage of the soil pores. Salt content of these waters, amount and distribution of rainfall, cropping pattern and the irrigation practices followed usually govern the accumulation of salts in the soil profile and thus the reductions in crop yield (Minhas and Gupta, 1991). In addition to sodium hazards, the water logging during rainy season in early crop growth stages found more hazardous for survival and growth of the crop. Most crops not adopted to wet land conditions , receive severe setback when standing water stagnate even for a short period. The extent of damage to crops depending upon the crop and its growth stage, duration of flooding and prevailing temperature (Russel 1959 and Cannel, 1977). In earlier part of the experimentation it has already been reported that pearl millet found more sensitive to higher SAR-saline irrigation (Singh et al. 1992). Hence, there is need to use amendment to over come the sodium hazard vis-à-vis hydraulic conductivity.

Gypsum and FYM are widely used amendments for improving physical properties of sodic soils. In earlier part of this experiment, a leaching trial was conducted with and without gypsum and reported an improved infiltration of high-SAR irrigated soils. Hence there is need to use gypsum to assess these improvement converted to mitigating the effect in relation to pearl millet yield. Accordingly this experiment was initiated.

Materials and Methods

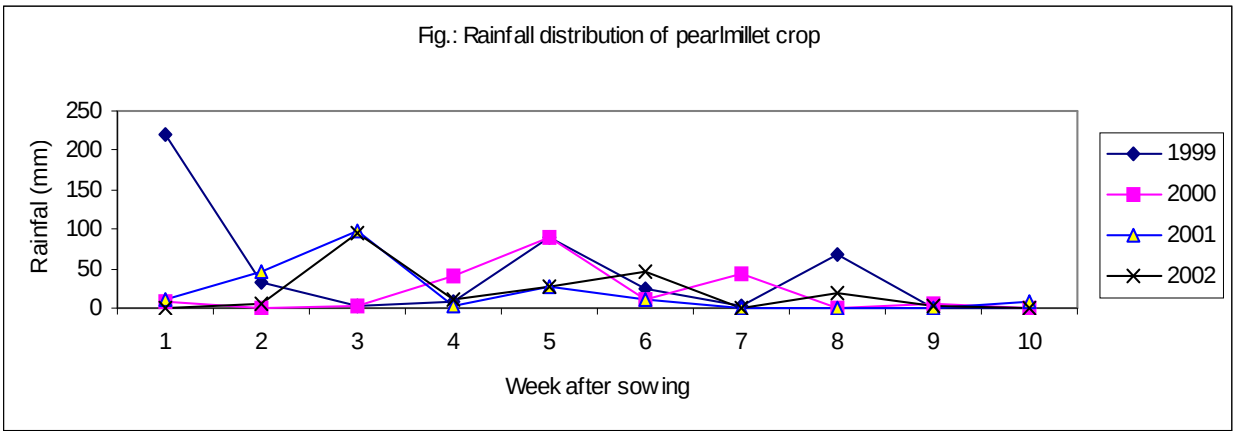
Studies were carried out at the experimental farm of R.B.S. College, Bichpuri (Agra) during 1999-2000 to 2002-2003 on the plots, which were under irrigation with different combination of EC and SAR irrigation waters from last 16 years with wheat-pearl millet crop rotation. The initial soil properties are given in Table 1.

The field plots (2.5 m x 2.5m) were line by polythene sheets down to a depth of 0.9 m to avoid lateral fluxes of salts and water. The present experimentation was done on the plots, which are under irrigation of different SAR waters from last 16 years with pearl millet-wheat rotation. The present treatments were consisted of irrigation with SARiw (10, 20, 30 & 40 (mmol/l)$^{1/2}$); gypsum doses (0, 25 and 50 % GR + 5 t FYM) and surface treatment (Drain and No drain). The gypsum was added only before onset of monsoon each year in the previous deteriorated plots. The irrigation waters were prepared synthetically by adding the slats viz. Na_2SO_4, $CaCl_2$ and $MgSO_4$ in tubewell/canal water. Pearl millet (*Pennisetum typhoids* var. PBH-13) and wheat (*Triticum aestivum* var. Raj.3077) were grown

Table 1: Initial soil properties:

Soil depth (cm)	pH_2	ECe (dSm^{-1})	CEC (cmol+/kg)	Texture	K (mm/h)	Db (Mg/m^3)
0.00 - 0.20	8.5	1.0	12.8	Sandy loam	11.5	1.45
0.20 - 0.45	8.5	2.6	12.6	Loam	6.5	1.52
0.45 - 0.72	8.6	3.2	14.4	Clay loam	6.0	1.52
0.72 - 1.15	8.5	2.0	12.2	Clay loam	6.0	1.51
1.15 - 1.40	8.6	2.5	12.5	Sandy loam	8.1	1.44
1.40 -1.80	8.6	4.5	14.7	loam	18.2	1.42

pH_2, ECe, CEC, K and D_b denote pH of 1:2 soil/water, EC of saturation paste extract, cation exchange capacity, saturation hydraulic conductivity and bulk density, respectively.



in rotation on fixed plots irrigated with different water treatments. Each treatment was replicated four times in a randomized block design. Irrigation schedule was based on the recommendations for the non-saline irrigated soils of the area and 7 cm water was applied in each irrigation. Both crops received recommended does of fertilizers and other cultural practices. The infiltration rate was also determined by using ring method.

Results and Discussion:

Pear millet:

The pearl millet crop yield data are presented in Table 2. The drain treatment applied to release the stagnated rain water during one month of crop age. The drain treatments could be imposed during 1999 and 2002 kharif season only, varied significantly with lower significant yield in no-drain treatment. In the year 2000 and 2001, rain water distribution was such that there was no water stagnation vis-à-vis no drain treatment imposed and according both these treatments was at par. However, SARiw levels differ significantly in all four years and significant both grain and stover yield reduction started from SARiw 20 and further with higher SARiw levels. The grain yield reduction was 18.4, 41.8 & 50.5 per cent in 1999; 20.6, 31.6 & 44.0 per cent in 2000, 12.1, 31.5 & 38.1 per cent in 2001 and 12.0, 53.3 and 70.1 per cent in 2002 at SARiw 20, 30 & 40 over 10 $(mmol/l)^{1/2}$, respectively. The adversely effect of SARiw levels varied in the years because of rainfall with respect to amount and its distribution. The reduction yield was caused by rain and germination, Plant growth and yield attributing characters. The gypsum @ 25 per cent GR along with FYM was added to mitigate the adverse impact of SARiw waters before sowing of pearl millet. The addition of gypsum increased the crop yield significantly over without gypsum. The data in parentheses are the covering of SARiw 30 and 40 only. The addition of gypsum + FYM had not shown any beneficial effect. The gypsum response also had interaction with rainfall quantum and its distribution. In 1999, the increase in yield with gypsum was 110 per cent. Which was higher to other years because it got highest amount of rains. Still the increase in yield with gypsum addition even in SARiw 20 was not match able to without gypsum yield with SARiw 10 (mmol/l)1/2. Plant growth is adversely affected in high SAR saline soils, primarily through the effect of excessive salts on osmotic pressures of the soil solution, resulting in reduced availability of water, through excessive concentration and absorption of individual ions.

Further, the addition of gypsum @ 25 % GR, in general, increased the grain yield significantly, but quantumly the yield level was not match able with the yield of SARiw 10 even. The addition of FYM did not proved fruitful with respect to grain yield. The variation of gypsum response in different years was due to intensity and distribution of rainfall. In 1999, the high

Table 2: Grain yield (q ha^{-1})of pearl millet affected by different treatments.

Treatments	1999		2000		2001		2002	
	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover
Control	21.8	122.6	36.9	106.5	30.0	158.8	30.6	129.2
Surface Treatment:								
Drain	16.3	84.4	25.9	83.7	20.5	115.2	22.0	98.7
No Drain	12.1	72.4	24.1	86.7	21.7	122.5	16.8	83.6
C.D. at 5%	1.8	8.3	NS	NS	NS	NS	2.3	6.2
SAR levels (mmol L^{-1})$^{1/2}$:								
10	19.6	99.3	31.6	91.9	25.7	136.2	29.1	114.0
20	16.0	84.2	25.1	87.7	22.6	130.2	25.6	102.6
30	11.4	66.9	21.6	80.4	17.6	107.7	13.6	75.8
40	9.7	57.3	17.7	73.9	15.9	89.5	8.7	63.0
C.D. at 5%	2.5	11.9	4.6	7.4	6.3	26.9	2.3	8.8
G.R. levels (%) :								
GR 0	11.6(6.1)	66.7(49.9)	21.8(15.9)	80.2(72.0)	18.2(13.8)	110.1(92.6)	17.4(8.9)	80.9(58.2)
GR 25	15.7(12.8)	83.7(67.4)	26.0(24.3)	86.7(82.3)	22.7(19.8)	121.6(104.6)	21.1(13.4)	97.3(80.6)
GR 25+FYM	- (12.6)	- (69.0)	- (22.9)	- (83.1)	- (19.4)	- (110.9)	- (13.4)	- (81.4)
C.D. at 5%	1.8	NS	2.7	4.5	1.3	5.9	2.3	6.2
Interactions								
SAR x GR	NS	NS	NS	NS	NS	NS	NS	NS
SAR x ST	NS	NS	NS	NS	NS	NS	NS	NS
ST x GR	NS	NS	NS	NS	1.8	8.3	NS	NS

( ) indicate data for SARiw 30 and 40 [(mmol L^{-1})$^{1/2}$] only.

Table 3: Effect of different SAR waters on grain yield of wheat (qha^{-1})

Treatments	1999-2000		2000-01		2001-02		2002-03	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
Control	44.7	70.4	41.2	78.4	38.8	77.9	37.0	71.3
Surface Treatment:								
Drain	40.2	50.5	30.5	48.6	32.0	58.2	31.7	55.4
No Drain	41.4	58.4	33.1	55.6	33.6	60.5	32.2	58.2
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
SAR levels (mmol L^{-1})$^{1/2}$:								
10	42.1	60.4	34.4	61.0	37.5	68.2	35.0	60.8
20	41.8	46.2	32.5	52.5	34.4	62.1	32.3	58.1
30	39.0	49.7	30.0	47.3	31.6	59.2	30.4	56.0
40	37.2	49.8	26.4	39.0	27.7	53.3	27.4	49.6
C.D. at 5%	2.4	5.6	3.5	9.8	8.4	13.6	1.7	2.8
G.R. levels (%) :								
GR 0	40.1(37.8)	50.4(57.9)	30.3(27.6)	47.9(40.9)	31.9(28.5)	57.6(51.5)	31.1(28.7)	55.1(52.5)
GR 25	40.2(38.4)	47.4(55.6)	31.4(28.8)	52.2(45.4)	33.8(30.8)	62.2(55.7)	31.5(29.1)	56.7(53.1)
GR 25+FYM	- (41.6)	- (51.1)	- (31.0)	- (47.0)	- (31.5)	- (61.6)	- (32.1)	- (54.3)
C.D. at 5%	NS	NS	NS	NS	1.7	2.8	NS	NS
SAR x GR	NS	NS	NS	NS	NS	NS	NS	NS
SAR x ST	2.8	6.2	NS	NS	NS	NS	NS	NS
ST x GR	NS	NS	NS	NS	2.4	3.9	NS	NS

( ) indicates SARiw 30 and 40 [(mmol L^{-1})$^{1/2}$]

rainfall caused more damage to crop under high SARiw levels, hence addition of gypsum proved more beneficial i.e. 110 % yield increase (average of 30 and 40 SARiw only) compared to 2000 & 2001.

All the interactions between SAR x GR, SAR x Surface Treatment, and SAR x GR X Surface Treatment were found non-significant except GR x Surface Treatment were found significantly

Wheat:

The grain yields of wheat crop are reported in table 3. The drain vs. no drain treatment applied during pearlmillet crop only could not vary with respect to grain

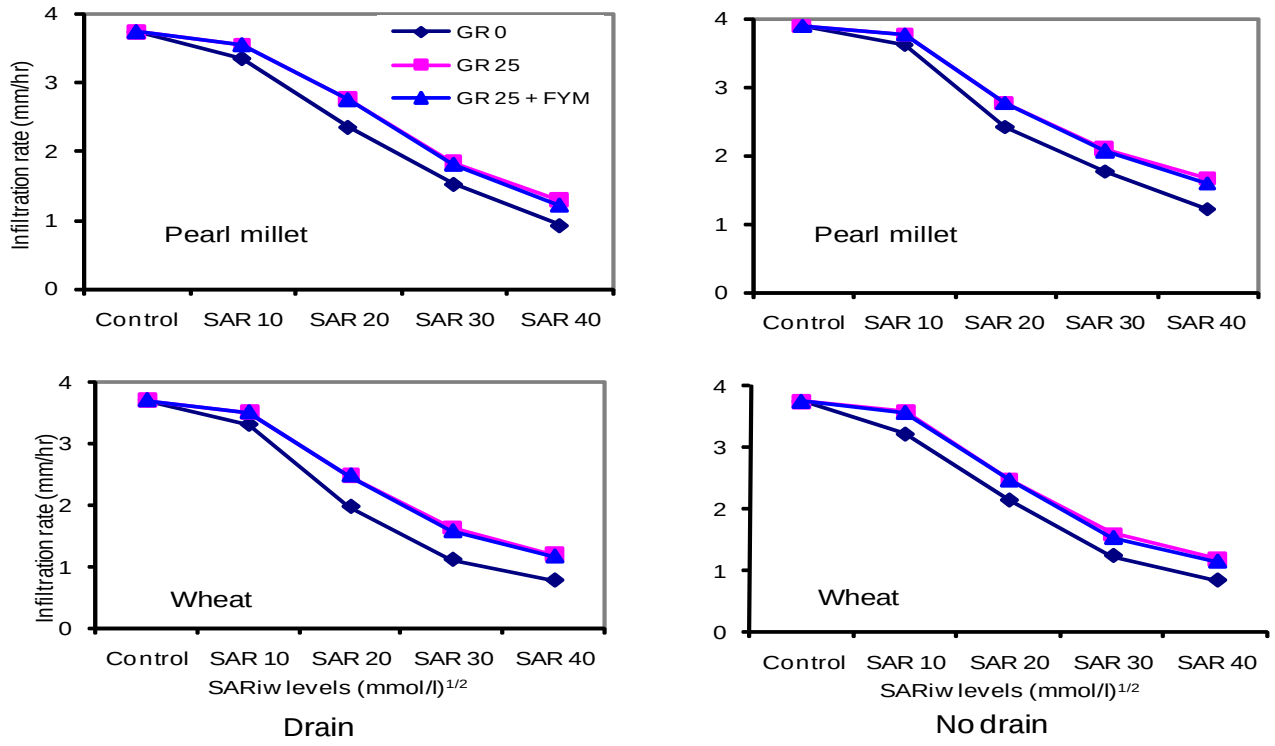


Fig. 1: Infiltration rate after harvest of pearl millet/dhaincha and wheat (Average 4 years)

yield of wheat and both were found at par. While the SARiw levels differ significantly in all the years. The significant yield reduction happened at SARiw 30 over SARiw 10 mmol/l)$^{1/2}$ except 1999-2000. On quantum basis, the grain yield reduction was as 0.7, 7.4 & 11.6 per cent in 1999-2000; 5.5, 12.8 & 23.2 per cent in 2000-2001, 8.2 15.7 & 26.1 per cent in 2001-2002 and 9.5, 13.1 and 21.7 per cent 2002-03 at SARiw 20, 30 & 40 over 10 (mmol/l) $^{1/2}$, respectively. Addition of gypsum only once before pearl millet sowing, did not vary significantly except in 2001-02 due to high rainfall. Again inferred that SARiw effect had interaction with rainfall. The pattern of different parameters on growth and yield attributes was similar to yield. As FYM was applied in SARiw 30 and 40 only the average of yield for SARiw 30 & 40, data given in parenthesis, revealed that FYM addition once before pearl millet enhanced the yield by 6.1 % over gypsum alone.

Infiltration rate :

The infiltration rate decreased with increase of SARiw levels in both drain and no-drain treatments after pearl millet harvest. The value was 1.1 mm/hr in drain and 1.42 mm/hr in no-drain treatment at SARiw 40 compared to 3.9 mm/hr in SARiw 10 (mmol/l)$^{1/2}$. The addition of gypsum could increase the infiltration rate by 0.40 mm/hr only. Similar trend was observed when infiltration rate was determined at harvest of wheat crop (Fig. 1).

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Farmers' Perception about Krishi Vigyan Kendra in Satna District of Madhya Pradesh

DEEPAK RATHI AND S.P. SINGH

Assistant Professors, College of Agriculture, Tikamgrh, JNKVV, Jabalpur (M.P.) E-mail- spsingh_jnkvv@yahoo.co.in

Educating of farmers in terms of imparting training is a crucial input for the rapid transfer and adoption of agricultural technology. The present pace of agricultural production can be increased manifolds if the production development programmes focussing more and on transferring the new technologies from research institutes to the farmers fields and make them more result oriented. Realising this crucial gap, the Indian council of Agril. Research established Krishi Vigyan Kendras as an innovative institution for vocational training and also conducting of farm research for technology refinement to promptly demonstrate the latest agricultural technologies to the farmers as well as the extension workers.

Krishi Vigyan Kendras, Majhgawan has been in action since 1992 in Satna district of Madhya Pradesh. The kendra is well equipped in terms of specialists manpower and resources. Need based training programmmes are conducting by the kendra in various disciplines viz , crop production , animal science, horticulture, home science, agro-forestry, agril. Engineering and others. Therefore, it was imperative to find out the extent of farm technologies transferred by the kendra and response of farmers in adoption of technologies with economic viability. The study also focus strong and wear points of kendra activities with a view of improving future performance.

Methodology

The study was confined to Majhgawan block of Satna district of krishi vigyan kendra was established. In this block maximum number of farmers were benefitted by the kendra. Four villages namely Patni, Pindra, Deolha and Majhgawan from selected block and 42 farmers who were adopted by KVK, Majhgawan for transfer of technology during kharif and rabi season were selected from these villages for detailed survey. Expert team of KVK, Majhgawan only given different component of crop production and Home Science Technology to the selected farmers. Survey method by personal interview was used for collecting the required information on component wise crop production technology transferred, extent of adoption of technology by contact farmers, discipline wise training organized by KVK and farmers response towards training, costs and returns of crop production technology etc. to accomplished the objectives of the study. The data collected for this study refer to the year 1996-97 and 1997-98. Required secondary data regarding discipline wise achievements of training conducted were borrowed from the Annual Report of Zonal Coordinating unit for TOT projects, ICAR , Jabalpur 1999. Tabular analysis has been done to present the results.

Results and Discussion:

Training Achievements:

Training is one of the important function of KVK. Its aim to acquaint the farmers with latest technical known how in agriculture and allied fields and transferring important skills. The KVK identified need based training programmes to improve knowledge and developed new skills required for adoption of the latest technology and builds up scientific attitude among farm community. Training programmes were also conducted for rural youth and in-service personnel.

Table 1 reveals that Krishi Vigyan Kendra, Majhgawan, Satna engaged in seven facets of farming systems viz., Crop Production, Animal Science, Horticulture, Women in Agriculture, Fisheries, Agro-forestry and Agril. Engineering. Among these training offered, training on home science (women in agriculture) was found to be more useful. This may be due to the fact that specialized and intensive practical training was imparted. The training on fisheries, agro-forestry, animal science were found to be less useful to the trainees may be because the training aspects were not closely related to the needs of the respondents. Thus, there is a lot of scope to increase the usefulness of training programmes conducted by KVK, Majhgawan. Training coverage needs to the improved either by increasing training duration or imparting only specialized training during the scheduled period.

Transfer and Adoption of Technology

To assess the extent of transfer of technology under Krishi Vigyan Kendra in Majhgawan block of Satna district, the data on component of crop production technology viz., seed bed preparation, improved varieties, seed treatment, seed rate, sowing time, fertilizer application irrigation plant protection measures and storage of grain etc. were collected season wise from the selected respondents and the results are presented in Table 2.

Table 1 : Achievements on trainings conducted for practicing farmers

S. No. Particular	Crop production	Animal science	Horticulture	Women in Agril.	Fisheries	Agro-forestry	Agril Engg.	Total
1. No. of trainings	11	5	9	15	6	4	4	54
2. Duration (day)	31	18	28	151	27	13	19	287
3. No. of participants								
i) Schedule caste								
Male	37	14	5	26	29	34	15	160
Female	15	5	6	77	5	5	4	117
ii) Schedule tribe								
Male	87	40	56	38	30	37	59	347
Female	17	10	9	144	5	5	4	194
Total	104	50	65	182	35	42	63	541

Table 2: Component wise technology diffusion and adoption by the respondents during kharif and rabi season

S. No. Component of technology	Kharif (n=42)			Rabi (n=40)		
	C	P	N	C	P	N
1. Seed bed preparation	22	20	0	28	12	—
2. Use of improved seed	13	23	6	22	12	6
3. Seed rate	18	24	0	27	13	0
4. Seed treatment	10	22	10	—	—	—
5. Sowing method	19	23	0	26	14	0
6. Fertilizer application	13	21	8	16	16	8
7. Irrigation	—	—	—	17	16	7
8. Plant protection measures	10	20	10	9	11	20
9. Storage	16	17	9	12	14	14
Adoption index (%)	35.98	50.57	13.38	49.06	33.75	17.18

C= Complete, P= Partial, N= Nil

As regards the extent of transfer of technology paddy, till and jowar during kharif season and gram and wheat crops were included during rabi season for purposes of demonstration of improved cultivation practices. In all 42 and 40 demonstrations during kharif and rabi season were laid out. Out of 42 demonstrations 21 were on till alone followed by jowar (11) and paddy (10). During rabi, 20 plots each were reported in wheat and gram crop.

On component basis the highest adoption was reported for seed bed preparation followed by sowing seed rate. Use of improved seed. Seed treatment, fertilizer application plant protection measures, storage components of transfer of technology were least adopted by the respondents under field practices. It means that farmers were conscious of use of improved seed and its treatment and least responsive to application of fertilizers and plant protection measures which happen to be the purchased inputs and accounting the major part of the total cost of package of practices.

Table 2 further inferred that during kharif season, complete adoption of transfer of technology was limited to nearly 35.98 per cent of the 42 plots against 49.06 percent during rabi to apply advance technology of crop production partial adoption of demonstrated technology was slightly higher during kharif season where as complete adoption was higher in rabi crop.

Training Programme:

Imparting of training to farm families was considered as an important component of KVK. Six subject matter specialists viz; Agronomy, animal science, Horticulture, Home Science, Agro-forestry and Agril. Engineering were involved in training programme as shown in Table 3.

It may be noted from the Table 3 that kitchen gardening, fruit preservation, tailoring and preparation of badi, papad etc were the important training caught more attention in home science front. Child nutrition is still unpopular in study area as its scientific adoption is quite expensive. Nearly 11 training for agronomical practices and animal science were organised by KVK followed by horticultural (9). Training on agro-forestry (94) and agril. Engineering was also initiated. As regards farmers response about training programmes they

Table 3: Discipline wise training impartted by Krishi Vigyan Kendra Majhgawan (Satna).

S.No	Technology	No. of training organised	No. of participant		Total	Adoption			Total
			M	**F**		**C**	**P**	**N**	
1.	Agronomy Paddy-4 Mustard-4 Disease-1 Germination-1 Storage-1	11	87	17	104	37	53	14	105
2.	AnimalScience Cow-1 Buffalo-1 Goat-1 Disease-2	5	40	10	50	6	32	12	50
3.	Horticulture Kharif Onion-3 Solanaceous crop-2 Bottle Gourd, cucumber-2 Ginger & Turmeric-1 Seed Production-1	9	56	9	65	12	33	20	65
4.	Home Science & Women in Agriculture Kitchen Gardening Trg.-5 Papad, Badi, Chips & namkin-2 Tailoring Training-2 Complementing Ration-1 Wool Budder-1	16	38	144	182	32	110	40	182
5.	Fisheries TankManagement-1 Fish Store Technology-2 Use of Fertilizer Technology-2 Extra Ration Technology-1	6	30	5	35	9	16	10	35
6.	Agroforestry Forest & Fruit Trees-2 Hillocks in trees & grasses-1 Control of Gully erosion-1	4	37	5	42	12	22	8	42
7.	Agril Engineering Plough Related Technology-1 Cultivaator-1 Harrows-1 Weed Control (Hoe)-1	4	59	4	63	12	31	20	63

reported highest understandability for crop production technology (Agronomy) although poor in application of fertilizers and plant protection measures as these involves chemicals and various trade names. On the basis of farmers response, it suggests that frequently and more intensive training programmes should be organised by KVK so that farmers grasp what is delivered to them.

Constraints responsible for poor adoption of farm technology

Effects were puts in the present study to assess the constraints faced by the farmers in adoption of the recommended agricultural technologies released to them through organized training and planed visits. These constraints may be useful to the KVK to get feed back from the field level so as to reinvent further technology.

There were eight major constraints reported by the selected farmers with higher frequency of the marketing constraint. It is true that the agricultural marketing did not receive that weightage which it deserved. Money received by the producer is more important than the physical output obtained due to use of the crop production technology. It was observed that about 83 per cent mentioned scattered and small sized land holding. Other important constraints encountered by the respondents were lack of adequate library facility at the KVK centre, lack of improved implements for adoption of non-conventional technology, difficulty in under standing lectures delivered by the scientists. Low

Table 4: Constraints reported by respondents for poor adoption of technology

S. No.	Constraints	% respondents reported
1.	Poor infrastructure for proper training about maximum utilisation of available resources.	47
2.	No markenting facilities available in the near by villages for selling the produce.	88
3.	Excessive involvement of scientists in arranging for inputs.	83
4.	Scattered and small size of holding.	81
5.	Lack of adequate library facility at KVK centre	74
6.	Lack of improved implements	62
7.	Difficulty in understanding lectures delivered by scientists	59
8.	Low price of farm produce	54

Table 5. Profitability analysis of crop production technology (Rs/ha).

Crops	Production Cost	Gross return	Net return	Benefit cost ratio
Paddy	6570	10815	4245	1.65
Jowar	3250	6210	2960	1.91
Soybean	4680	8840	4160	1.89
Til 2610	9250	6630	3.53	
Wheat	6830	18700	11870	2.73
Gram	6410	24125	18965	3.76

price of farm produce also responsible for low level of adoption. These constraints can be mitigated factfully if the recommended inputs are provided in required quantity at the most convenient places and at appropriate time.

Economics of crop production technology

Table 5 noted that wheat indicated the highest cost (Rs. 6830) per unit area followed by paddy (Rs. 6570/ha), gram (Rs. 6410/ha). The net return per hectare and benefit cost ratio was found highest for gram. The profit per hectare obtained from wheat was Rs. 11870 followed by til (Rs. 6630), paddy (Rs. 4245) and lowest from jowar (Rs. 2960) provided package of practiced are followed by the farmers.

The benefit cost ratio of jowar and soybean was almost same although higher than paddy. Thus, paddy during rabi season and gram in rabi season appeared to be the best option to the farmers in the study area.

Conclusion

The crop production technology disseminated by krishi vigyan kendra, Majhagawan gave substantial additional returns. This substantiated the utility and the need of the krishi vigyan kendra's. The subject matter specialists of KVK should have greater involvement in training, demonstration through frequent follow-ups which have educational value to disseminate the needed farm technology. The technology transferred must be profitable and acceptable to the local farmers. Further research on different facets of KVK such as feed back, linkages, training needs etc be planned.

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Marketing Channels, Costs and Price Spread of Paddy in Chandauli district of Uttar Pradesh

GOVIND PAL
Indian Lac Research Institute, Namkum, Ranchi- 834010 (Jharkhand)

Abstract

The study was undertaken to analyze the marketing costs, margins, price spread in different marketing channels and relationship between arrivals and wholesale prices of paddy in district Chandauli. Data have been collected from 100 farmers selected with stratified random sampling. Chandauli market was selected purposively and 15 cases of each market functionaries were studied. The correlation coefficient between arrivals and wholesale prices of paddy and rice was negative and significant. Three paddy marketing channels were operating in the study area. Majority of marginal farmers sold maximum surplus of their produce to village Beopari. *Total marketing cost and margin was highest in channel- II (producer - village* beopari *- wholesaler-I - miller - wholesaler- II - retailer-consumer) followed by channel-III (producer - wholesaler-I (through commission agent) - miller - wholesaler-II - retailer - consumer) and channel-I (producer - government agency). The producer's share in consumer's price was 63.91 and 65.58% in channel-II and channel-III respectively. Price spread was maximum in channel II followed by channel III and channel I. Market efficiency in channel-I was very high because only paddy marketing was taken into consideration and lack of intermediaries. Channel-III was more efficient than channel-II. For efficient marketing in the study area, there is need to strengthening co-operative marketing and market information service.*

Introduction

In India, agricultural sector is contributing about 25 per cent to the total Gross Domestic Product besides sustaining the livelihood of more than two third of the population. Foodgrains account for about 63 per cent of country's agricultural output. The foodgrains production stepped up from 51.00 million tonnes in 1950-51 to 212.05 million tonnes in 2003-2004 (anonymous, 2005). Paddy is the most important cereal crop and the national production is 93.1 million tones in which Uttar Pradesh contribution is 12.46 million tones during 2001-02 (anonymous, 2004). Paddy is also an important crop of district Chandauli, the study area, occupies a prominent position amongst all districts. It contributes about 40 per cent of total cereals production and nearly 41.5 per cent of total area under cereals.

In a production-oriented agricultural economy, an efficient agricultural marketing system is a pre-requisite for two reasons – first, for ensuring the farmers the remunerative prices of their products of that they can get an incentive to produce more and second, for transporting the products from producers to consumers in an economic way (Kumar, 1994). Works on marketing channels, costs, margins and price spread have been reported by a number of workers in paddy for different locations (Agrawal *et al*. 1995; Karwasra and Arora, 1995; Srivastava and Sahoo, 1998). Information on marketing channels, costs, margins and price spread in paddy in district Chandauli is meager. Keeping in view the above facts, it was felt necessary to conduct a micro-level study to examine the marketing costs, margins, price spread in different marketing channels and relationship between arrivals and wholesale prices of paddy in district Chandauli.

Methodology

The study was carried out in Chandauli district of Uttar Pradesh the sample size of the study was 100 farmers which were selected on the basis of stratified random sampling method. Chandauli regulated market was selected purposively because it was an important market which was serving to the study area. All the functionaries operating in this market as well as arrivals and prices of paddy and rice were studied. For working out the producer's share in consumer's rupee, marketing costs, marketing margins etc., 15 cases of each marketing channels of paddy marketing were randomly selected and studied. The enquiry was conducted by survey method. The primary data were collected by direct personal interview from respondents with the help of pre-tested schedules. During the course of investigation several visits were made to collect the reliable data from the farmers and market functionaries. The Correlation coefficient was worked out to examine the relationship between arrivals and prices of paddy in the market. The marketing efficiency was estimated by the formula given by Shepherd (Acharya and Agarwal, 1999).

Result and Discussions

Arrivals and prices

The correlation coefficient between arrivals and wholesale prices of paddy and rice was worked out to be -0.748 and -0.805 respectively, which was significant at one per cent level of probability. Thus indicated that the decrease or increase in prices of paddy and rice was significantly associated with corresponding increase or decrease in its arrivals in the market.

Marketing channels

The study indicated the following marketing channels operating in the district.

Channel- I: Producer - Government agency

Channel - II: Producer - Village *beopari* - Wholesaler-I - Miller - Wholesaler- II - Retailer - Consumer

Channel - III: Producer - Wholesaler-I (through commission agent) - Miller- Wholesaler-II- Retailer - Consumer

In channel-I, it was found that the Government agencies like FCI, co-operatives and food & supply department procure paddy directly from farmers with a view to provide minimum price to them. This procured paddy after processing is supplied to consumers through fair price shop. In channel-II and III, where the 40 per cent rice from the millers is purchased by the Government through its own agencies i.e. FCI, co-operatives and food & supply department. The levied rice and procured paddy is stored in FCI, SWC and CWC godowns and distributed through fair price shop or it supplied to the public sector demand. All the marketing expenses incurred in the process of marketing are made by the Government. Levied and procured rice is made available to the consumers at the same price which Government has paid or sometimes it is supplied at low rate for the welfare of human being. Hence, in this channel attempt to work out the producer's share in consumer's price has not been made.

Distribution of marketed surplus

The data pertaining to distribution of marketed surplus of paddy through various marketing channels under different size groups have been given in Table 1. Marginal farmers sold maximum surplus of their produce in channel-II (61.64 per cent) because they were indebted by the village *beopari*. So, after harvesting they sold their produce to the village *beopari* even at low price. On the other hand large farmers sold maximum share (50.78 per cent) of their marketed surplus to channel-III due to the availability of large quantity produce with them to be sold in the market. In general farmers sold comparatively less quantity in channel-I due to the need for cleaning of produce and late payment at Government purchase centers. The largest quantity of marketed surplus marketed through channel-III followed by channel-II and Channel-I.

Marketing costs and margins

Marketing costs and margins are important items determining the share of producer / farmer in the price paid by consumer. The data in Table 2 indicates marketing cost, processing cost paid by producer / intermediaries and margins of intermediaries under different marketing channels. It is evident from the table that total marketing cost (per quintal of paddy) was highest in channel- II (Rs. 153.00) followed by that in channel-III(Rs. 152.00) and channel-I (Rs. 25.00). Total marketing cost in channel-I was very low (Rs. 25.00) because only paddy marketing was taken into consideration. The major share of marketing cost incurred by intermediaries was transportation of paddy. Margins were also highest in channel-II (Rs. 130.43) followed by channel-III (Rs. 115.93). There were no intermediaries margins in channel-I because producer sell his produce directly to Government agencies. Retailers margins was highest (Rs. 45.00) in both the channels. Maximum amount of marketing cost incurred by miller (Rs. 41.00) followed by wholesaler-I and wholesaler- II. The total marketing cost and margins was found highest in channel-II due to involvement of large number of intermediaries.

Producer's share in consumer's price

The data on producer's share in consumer's price and percentage distribution of different costs and margins in paddy marketing have been presented in table 3. Farmers received a maximum price i.e. Rs. 500.00 in channel I followed by channel III and channel II. Maximum price in channel I is obviously due to the absence of intermediaries between producer and the consumer. The producer's share in consumer's price was highest in channel-I (95.00 per cent) followed by channel-III (65.58 per cent) and channel-II (63.91 per

Table 1: Distribution of marketed surplus of paddy through various marketing channels under different size group of holding

S. No.	Size group (ha.)	Quantity distributed (Q.) Channels			Total (Q.)
		I	II	III	
1	0-1	71.82(25.99)	170.34(61.64)	34.18(12.37)	276.34(100.00)
2	1-2	111.33(36.00)	95.71(30.95)	102.20(33.05)	309.24(100.00)
3	2 & above	170.26(27.90)	130.11(21.32)	309.91(50.78)	610.28(100.00)
	TOTAL	353.41(29.55)	396.16(33.13)	446.29(37.32)	1195.86(100.00)

(Figures in parentheses indicate percentage of total quantity distributed in respective size group)

Table 2: Details of marketing costs, processing costs and margins of intermediaries for paddy under different marketing channels (Rs./Q.)

S. No. Particulars	Marketing channels I	II	III
A. Producer			
1 Transportation	15.00	-	10.00
2 Weighing	3.00	-	2.00
3 Loading and unloading	3.00	-	3.00
4 *Arhat* (@Rs.1.50/Rs.100.0)	-	-	8.00
5 Cleaning / others	4.00	-	1.00
Sub total of marketing cost	25.00	-	24.00
B. Village *Beopari*			
1 Transportation	-	17.00	-
2 Weighing	-	2.00	-
3 Loading and unloading	-	3.00	-
4 Others	-	3.00	-
5 Margin	-	16.00	-
Sub total of marketing cost	-	25.00	-
C. Wholesaler-I			
1 Commission	-	10.00	10.00
2 Market fee	-	10.00	10.00
3 Weighing	-	2.00	2.00
4 Loading and unloading	-	3.00	3.00
5 Storage	-	6.00	6.00
6 Others	-	3.00	3.00
7 Margin	-	15.00	15.00
Sub total of marketing cost	-	34.00	34.00
D. Miller			
1 Transportation	-	12.00	12.00
2 Loading and unloading	-	2.00	2.00
3 Weighing	-	3.00	3.00
4 Processing	-	8.57	8.57
5 Bags	-	20.00	20.00
6 Others	-	4.00	4.00
7 Margin	-	35.43	36.93
Sub total of marketing cost	-	41.00	41.00
E. Wholesaler-II			
1 Transportation	-	13.00	13.00
2 Market fee	-	12.00	12.00
3 Weighing	-	2.00	2.00
4 Loading and unloading	-	3.00	3.00
5 Others	-	3.00	3.00
6 Margin	-	19.00	19.00
Sub total of marketing cost	-	33.00	33.00
F. Retailer			
1 Transportation	-	15.00	15.00
2 Loading and unloading	-	3.00	3.00
3 Others	-	2.00	2.00
4 Margin	-	45.00	45.00
Sub total of marketing cost	-	20.00	20.00
Gross total of marketing costs	25.00	153.00	152.00
Gross total of margins	-	130.43	115.93
Processing cost	-	8.57	8.57

cent). Producer's share in consumer's price was very high in channel-I because only paddy marketing was taken into consideration in this case. Lack of intermediaries in this channel also contributed towards the higher value of Producer's share in consumer's price. In absolute term the highest price was received by producer in channel-I (Rs. 475.00) followed by channel-III (Rs.460.00) and channel-II (Rs. 455.00). In case of margins retailer's margins were maximum in channel-II and III and it was being Rs. 31.50.

Price spread

Table 4 indicates the summary of price spread and market efficiency in marketing of paddy under different marketing channels. As evident from the table, the difference in producer's net price and consumer's price was maximum in channel II (36.09 per cent) followed by channel III and channel I. Average marketing charges paid by middlemen in channel II and III was 19.26 and 15.98 per cent of consumer's price respectively. This high share was due to involvement of large number of intermediaries. The average margins of middlemen were 15.62 and 13.79 per cent of consumer's price in channel II and III respectively. Price spread was maximum in channel II followed by channel III and channel I. Market efficiency in channel-I was very high because only paddy marketing was taken into consideration and lack of intermediaries. Channel-III was more efficient than channel-II.

Conclusion and policy implications

Hence from the analysis it was found that the significantly high and negative correlation existed between arrivals and wholesale prices of paddy and rice. Three marketing channels were operating in the study area. Majority of marginal farmers sold maximum surplus of his produce to village *beopari* because they were indebted by them. Total marketing cost and margins was highest in channel- II followed by channel-III and channel-I. The major item of marketing cost incurred by intermediaries was transportation and maximum amount of marketing cost incurred by miller. The producer's share in consumer's price was 63.91 and 65.58 per cent in channel-II and channel-III respectively. Market efficiency in channel-I was very high because only paddy marketing was taken into consideration and lack of intermediaries. Channel-III was more efficient than channel-II.

There is need to open new market centers within the reach of farmers. The co-operative societies can play an important role in collecting even the small marketable surplus available with the farmers on procurement price fixed by Government. Development of warehousing and storage facility can also increase the income of farmers. The market information service needs to be strengthened by the concerned marketing authorities to disseminate current prices of produce to the farmers.

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Table 3 : Producer's share in consumer's price and percentage distribution of different costs and margins in marketing of paddy under different marketing channels (Rs. / Q.)

Particulars	Channel I		Channel II		Channel III	
	Value (Rs.)	Per cent	Value (Rs.)	Per cent	Value (Rs.)	Per cent
1. Producer's sale price	500.00	-	455.00	-	484.00	-
2. Marketing charges paid by producer	25.00	5.00	-	-	24.00	3.42
3. Net price received by producer	475.00	95.00	455.00	63.91	460.00	65.58
4. Producer's sale price/Purchase price of V.B. (village *beopari*)	500.00	-	455.00	-	484.00	-
5. Marketing charges paid by V.B.	-	-	25.00	3.51	-	-
6. Margins of V.B.	-	-	16.00	2.25	-	-
7. Sale price of V.B./ Purchase price of wholesaler -I	-	-	496.00	-	484.00	-
8. Marketing charges paid by wholesaler – I	-	-	34.00	4.78	34.00	4.85
9. Margins of wholesaler – I	-	-	15.00	2.11	15.00	2.14
10.Sale price of wholesaler–I/Purchase price of miller	-	-	545.00	-	533.00	-
11. Charges paid by miller	-	-	49.57	6.96	49.57	7.07
12. Returns from one quintal of paddy from miller						
a. Rice (70.0 Kg.)	-	-	@ Rs. 8.30 = 581.0		@ Rs. 8.15 =570.5	
b. Rice bran (7.0 Kg.)	-	-	@ Rs. 7.0 = 49.0		@ Rs. 7.0 = 49.0	
c. Husk * (23.0 Kg.)	-	-	-			
Total return to miller	-	-	630.00	-	619.50	-
13. Margins of miller	-	-	35.43	4.98	36.93	5.27
14. Sale price of miller/purchase price of wholesaler-II	-	-	630.0	-	619.50	-
15. Marketing charges paid by wholesaler-II	-	-	23.10	3.25	23.10	3.28
16. Margins of wholesaler-II	-	-	13.30	1.87	13.30	1.90
17. Sale price of wholesaler-II/purchase price of retailer	-	-	666.40	-	65.90	-
18. Marketing charges paid by retailer	-	-	14.00	1.97	14.00	2.00
19. Margins of retailer	-	-	31.50	4.41	31.50	4.49
20. Sale price of retaile / purchase price of consumer	-	-	711.90	100.0	701.40	10.00
21. Producer's share in consumer's price (in percentage)	95.00		63.91		65.58	

* Husk 23.0 Kg., not considered in calculation of returns

Table 4 : Net price spread and marketing efficiency in marketing of paddy under different marketing channels (Rs. /Q.)

Particulars	Channel I		Channel II		Channel III	
	Value (Rs.)	Per cent	Value (Rs.)	Per cent	Value (Rs.)	Per cent
1. Net price received by producer	475.00	95.00	455.00	63.91	460.00	65.58
2. Marketing charges paid by producer	25.00	5.00	-	-	24.00	3.42
3. Marketing charges paid by middlemen	-	-	137.10	19.26	112..10	15.98
4. Margins of middlemen	-	-	111.23	15.62	96.73	13.79
5. Processing cost	-	-	8.57	1.21	8.57	1.23
6. Purchase price of consumer	500.00	100.0	711.90	100.0	701.40	100.0
7. Difference in producer's net price and consumer's price	25.00	5.00	256.90	36.09	241.40	34.42
8. Producer's share in consumer's price (percentage)	95.00		63.91		65.58	
9. Marketing efficiency	19.00		1.77		1.91	

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Technological gap in potato production technology in relation to Socio-economic features of small farmers of Agra Region (U.P.)

RAMA KANT SHARMA AND D.B. TYAGI
Deptt. of Agril. Extension, Shri M.S. Degree College, Abidgarh, Agra.

Abstract

The study was conducted in potato growing area of the Agra Region of U.P. State. Majority of the respondents (42.00%) were found to be medium level adopters. Maximum respondents (73.54%) fell into up to 20% existing gap with regard to Integrated seed management. The maximum technological gap was found (43.32%) in plant protection (weed control and pest control). Age of the farmers and caste were significantly correlated with technological gap, size of holding and income of the respondents have negative impact over the extent of adoption of potato technology.

Introduction

Potato (*Solanum tuberosem* L.) is one of the most important food crop after wheat (*Triticum aestivum*), maize (*Zea mays* L.) and rice (*Oryza sativa*). In India potato is believed to have been introduced in the early 17th century most probably by the Portuguese traders or British Mission arise from its initial status of garden vegetable in western India. In early 17th century potato cultivation spread to diverse eco-zones in India over the next two and half centuries.

Potato has attained the status of the most important cash and food crop in U.P. as well as in India. It is rightly named as king of vegetables in the world it has more special features such as wide regional and seasonal adaptability and suitability to various type of soil with regards to soil pH and structure, capability to produce economic biomass in shortest possible time, suitability to fit in a wide crop protein and yield in terms of energy, biological nutritive value protein and carbohydrate per hectare per day which are not present in any crop.

By 2020 the population of India would be 1.3 billion and requirement of potato would be 49 million tonne. To achieve this target there is need to bridge the yield gap by promotion of potato production technologies viz. potato based cropping system etc. and updating package of practices (Khurana and Kumar, 2001).

Today there is a big gap between what is achieved of the research station and what farmers know and apply in the fields. So it is high time to carry the technology developed by the Agricultural Universities and Research Stations to the farmers field and to convert it into production. The main task today is to narrow this gap so that the farmers in general may get the same level of production as is obtained at the research station and can accelerate their socio-economic standard.

Objectives of the Study

1. To study the socio-economic status of the respondents with adoption of potato production technology.
2. To find out the technological gap of respondent regarding potato production technology and relationship with socio-economic features.

Methodology

The study was conducted in 10 villages of district Agra of Agra Region of Uttar Pradesh. District Agra was selected randomly from seven districts of Agra Region. A sample of 300 small potato growers was drawn from the selected villages using random sampling technology. Based on the experts / subject matter specialists opinions, five major recommended potato production technologies were selected for studying gap in adoption of potato production technology. Personal interviews were conducted using a pre-tested semi structured interview schedule.

Findings and Discussion

It is evident from Table 1 that majority of respondents were found in the age group of 25 to 45 years while 21.67 per cent belong to the age group of up to 25 years and 15.00 per cent small farmers belong to the age group of above 45 years; 45.00 per cent respondents belong to General caste, while OBC and SC/ST farmers are comparatively having low percentage i.e. 21.00 and 34.00 per cent respectively. Majority of the respondents are educated up to High School / Intermediate which clearly indicates the level of education is satisfactory in the area under study; 48.00 per cent respondents are having up to 1 hectare of land.

Table also reveals that the 25.00 per cent respondents have made the urban contact weekly and same percentage of the respondents have made contact with urban area fortnightly.

Majority (53.00%) of respondents have agriculture as their main occupation. The table under reference indicates that the majority of small farmers are living in

Table 1: Socio-economic status of the respondents with the adoption of potato production technology

S.No.	Category	Group/ Categories	No. of respondents	%tage
1.	Age	Up to 25 Yrs.	65	21.67
		25 - 45 Yrs.	190	63.33
		45 & above	45	15.00
		Total	300	100.00
2.	Caste	General	135	45.00
		O.B.C.	63	21.00
		SC / ST	102	34.00
		Total	300	100.00
3.	Education	Illiterate	45	15.00
		Primary / Middle	60	20.00
		High School	70	23.34
		Intermediate	68	22.66
		Graduate / P.G.	36	12.00
		Professional course	15	5.00
		Doctorate	6	2.00
		Total	300	100.00
4.	Land ownership	Up to 1 ha.	145	48.34
		1 to 2 ha.	155	51.66
		Total	300	100.00
5.	Housing	Kachcha	75	25.00
		Pucca	180	60.00
		Mixed	45	15.00
		Total	300	100.00
6.	Urban contact	Not even once	0	0.00
		Thrice a week	63	21.00
		Weekly	75	25.00
		Fortnightly	75	25.00
		Monthly	36	12.00
		Quarterly	30	10.00
		Half yearly	15	5.00
		Yearly	6	2.00
		Total	300	100.00
7.	Occupation	Labour (Agril.)	34	11.34
		Caste artician	36	12.00
		Independent Profe.	50	16.66
		Farming	159	53.00
		Service	21	7.00
		Total	300	100.00
8.	Family type	Single	245	81.66
		Joint	55	18.34
		Total	300	100.00
9.	Family size	Up to 4 members	195	65.00
		Above 4 members	105	35.00
		Total	300	100.00
10.	Social participation	Member of one organization	165	55.00
		Member of more than one organization	89	29.66
		Office bearer	25	8.34
		Public leader	21	7.00
		Total	300	100.00
11.	Income	Below Rs.5000	12	4.00
		Rs.5000-10000	15	5.00
		Rs.10000-15000	75	25.00
		Rs.15000-20000	90	30.00
		Rs.20000-25000	66	22.00
		Rs.25000-30000	24	8.00
		Rs.30000 & above	18	6.00
		Total	**300**	**100.00**
12.	Farm power	Bullock cart	24	8.00
		Tubewell	90	30.00
		Diesel pump set	75	25.00
		Chaff cutter	150	50.00
		Tractor	24	8.00
13.	Farm implements	Desi plough	45	15.00
		M.B. Plough	30	10.00
		Potato planter / digger	45	15.00
		Harrow	30	10.00
		Sprayer	30	10.00
		Cultivator	45	15.00

Note : More than one item in farm power and farm implements has been reported by the respondents hence total percentage exceeds to 100.

single family system. Table further reveals that majority of the respondents (65.00%) having up to 4 members in their family.

Table 2: Overall socio-economic status of the farmers.

S.No.	Socio-economic status	No. of respondents	%tage
1.	High status	44	14.67
2.	Medium stuatus	126	42.00
3.	Low status	130	43.33
	Total	300	100.00

Table further shows that social participation of small farmers was found to be very low. 30.00 per cent respondents have earned the annual income in the range of Rs.15000/- to Rs.20000/- followed by 20.00 per cent respondents as they earned Rs.10000/- to Rs.15000/-.

The table further reveals that 50.00 per cent respondents have chaff cutter, 30.00 per cent respondents have diesel pump set and 15.00 per cent respondents have cultivator respectively.

From the above results it is concluded that 43.33 per cent respondents belong to low socio-economic status (Table 2), whereas 42.00 per cent have maintained

Table 3: Extent of technological gap of selected recommended practices regarding potato production technology with respect to respondents.

(N = 300)

S.No.	Existing gap in (%)	Integrated nutrient management		Integrated seed management	Integrated irrigation management	Integrated Pest management		Integrated Post harvest management
		Soil	Fertilizers			Weed	Pest	
1.	Up to 20	44.91	65.53	73.54	71.83	40.00	44.44	40.00
2.	21 to 40	13.75	11.42	11.79	7.16	--	23.45	5.00
3.	41 to 60	4.58	4.93	--	--	--	--	--
4.	61 to 100	36.75	18.11	14.66	21.00	60.00	32.11	55.00

medium socio-economic status while only 14.67 per cent respondents have high socio-economic status.

A perusal of data presented in Table 3 reveals that maximum respondents i.e. 73.54 per cent fell into up to 20.00% existing gap with regard to integrated seed management followed by 71.83 per cent and 65.53 per cent respondents in the same existing gap group with regard to irrigation management and fertilizer management technology, respectively. Maximum existing gap group regarding in this study was considered as 61 to 100% gap. Table also reveals that 60.00 per cent of the respondents showed existing gap between 61 to 100% in weed control technology followed by 55.00 per cent respondents in integrated post-harvest management of potato cultivation in the same existing gap group. Number of respondents was observed nil in respect to integrated seed management, integrated irrigation management, integrated pest management and integrated post-harvest management practices in existing gap group of 41-60% while no any one practices in existing gap group of 41-60% while no any one respondents was observed in existing gap group of 21-40% with regard to weed control aspect of pest management technology.

Table 4: Technological gap in the adoption of potato production technology.

S.No.	Component of Technology	Gap in term of %	Rank
1.	Integrated nutrient Management	25.04	V
2.	Integrated seed Management	29.70	III
3.	Integrated Irrigation Management	27.11	IV
4.	Integrated weed/pest Management	43.32	I
5.	Integrated Post harvest Management	34.37	II

The data given in Table 4 shows that integrated weed / pest management and post harvest technology were the major technologies which have wide gap as 43.32 and 34.37 per cent respectively in the production of potato crop. Gap per cent in case of seed management was reported as 29.70 per cent by the respondents. The gap percentage in irrigation management and nutrient management was reported as 27.11 and 25.04 per cent respectively.

From the above discussion, it may be concluded that inspite of best efforts by the government and other institution and agencies, the insect / pest management and special guidance programme based on the needs and the understanding of the people should be arranged and make aware and convinced to adopt this technology so that gap can be minimize and ultimately the level of production is also enhanced.

Out of ten variables studied it's evident from Table 5, that relationship between socio-economic features of the respondents viz. age, caste, education, occupation and family type with technological gap of potato production was found significantly positive. Therefore, socially and economically forward as well as higher educated small farmers have a clear significant relationship with the technological gap of potato growers means technological adoption level was significant with the advanced strata of the farmers.

The higher education develops the mental horizon, which most probably makes farmers able to establish contact with varied technological information. The educational status and farming experience showed a negative and significant relationship with adoption. Farmers with higher education and experience of farming were skeptical of the practices recommended and probably wanted to ensure benefits by observing others who first adopt such practices. This finding is in line with the findings of Sheriff (1998), while size of holding and income of the respondents have negative

impact over the extent of adoption of potato technology.

Table 5: Correlation / Association between Independent variables (Socio-economic variables and technological gap among small farmers)

Independent variables	Correlation	Association
1. Age	r	0.214*
2. Caste	X2	29.55*
3. Education	X2	74.89*
4. Occupation	X2	41.58*
5. Size of holding	r	-0.177*
6. Family size	X2	4.067 NS
7. Family type	X2	33.331*
8. Income	r	-0.268*
9. Social participation	X2	16.432 NS
10. Socio-economic status	r	0.238*

NS= Non-significant

*= Significant at 5% level of significant

Conclusion

Majority of farmers showed low socio-economic status and 60.00% and 55.00% respondents showed 61-100% existing gap in weed control and integrated post harvest management technologies respectively. However, maximum gap (i.e. 43.32%) was found in integrated weed / pest management technology by the overall respondents followed by integrated post-harvest management technology while minimum gap was shown in integrated nutrient management technology. Age, caste, education, occupation and family type was found positively correlated with the adoption of potato production technology, socio-economic status was also found significantly correlated with the technology adoption in relation to potato production technology. It may be concluded that as the socio-economic status of farmers increases, level of adoption also increases, hence efforts should be made to increase socio-economic status of the farmers.

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Effect of variety and level of nitrogen and zinc on seed yield per plant and some of its important attributes in Okra

GOPI CHAND AND R.P. AGRAWAL
Krishi Vighyan Kendra, R.B.S. College, Bichpuri, Agra

Abstract

The present investigation consist of three varieties of Okra viz. Parbhani Kranti, Varsa Uphar and Arka Anamika which were grown under 0, 60 and 180 kg N/ha and 0, 20 and 40 kg Zn/ha levels in summer season of 2000 and 2001 under Agra condition of U.P. The results showed that among these three varieties as Parbhani Kranti the pod length, number of seed/pod, seed weight per pod and seed yield/plant higher in 120 kg N/ha and 20 kg Zn/ha were recorded in both the years.

Introduction

The seed is a basis input which revolves the whole cycle of food production and management. In the light of population growth rate of country, it is the most crucial to enhance the yield production through the variety of high quality seed which is one of the limit of Okra, in our country. The seed yield contributed characters a greatly influenced by number of agronomic practices especially by the application of nitrogen and micro nutrients. Since this is limited information available. On seed production and varieties, therefore, the present investigation was under taken of study the effect of level of nitrogen and zinc in the three varieties of Okra.

Materials and Methods

The field experiment was carried out at Agriculture Research Farm of R.B.S. College, Bichpuri (Agra) during summer seasons of 2000 and 2001. The experiment was laid out in split plot design with as main treatment different levels of nitrogen and zinc. The four levels of nitrogen 0, 60, 120 and 180 kg/ha and three levels of zinc 0, 20 and 40 kg/ha were main treatments and varieties Parbhani Kranti, Varsha Uphar and Arka Anamika as sub treatments in them. The treatment were replicated three times and each treatments was represented by 5 rows (Ridge) of three meter length, each spaced at 50 cm and plant to plant distance was maintained as 20 cm. All the recommended agronomic practices were followed as and when required to size normal crop. The observation were recorded on pod length, number of seed per pod, weight of seed per pod (g) and seed yield/plant (g) characters. The analysis of variance for the design of experiment was made according to method given by Snedecor and Cochran (1967).

Results and Discussion

The results showed that an four characters viz. pod length, number of seed per pod, weight of seed per pod and seed yield per plant were significantly different in both the year, which are given the interaction among the nitrogen x zinc was recorded significant for weight of seed per plant in both the years.

Pod length:

The data recorded on the growth of the pod as indicated by length of pod are presented in Table 1. The perusal of the results revealed that the longest pod of 17.35 and 16.51 cm were recorded in variety Parbhani Kranti in both the years 2000 and 2001 which was significant higher to those in Varsha Uphar.

The effect of nitrogen levels of pod length was statistically significant in both the years, it is evident from table that in both the years the pod length were increased from 14.01 and 13.33 cm at zero N level to 19.70 and 18.74 cm at 120 kg N/ha in the years 2000 and 2001 respectively. This is an conformity with the finding of Singh el al. (1993) and Birbal et al. (1995). The study effect of the levels of Zn on length of pod showed similar trend as that of the effect of nitrogen levels, the length of pod increased from that at) level (16.23 and 15.44 cm) to 17.76 cm and 16.90 cm at 20 kg Zn/ha in both the years respectively. The length of fruit was decreased in the higher dose i.e. 40 kg Zn/ha and the decrease statistically significant.

Number of seed per pod:

The data collected on the number of seeds per pod are presented in Table 1. The effect of variety and level of nitrogen and zinc were statistically significant on the number of seeds per pod in both the years. The variety Parbhani Kranti was significantly superior to the other two varieties because it gave the maximum number of seed per pod (46.0 and 43.92) in both the years 2000 and 2001, respectively as compared to 44.03 and 42.08 in Varsha Uphar and 44.97 and 42.83 in Arka Anamika.

The number of seed per pod had increased as the level of nitrogen from 0 kg to 120 kg N/ha in both the years. The highest (54.70 and 52.26) number of seed per pod was recorded in both the year and its was significantly superior to all other levels and higher levels in this respect in both the years. The number of seed per pod was increased significantly with the application of 20 kg Zn/ha in both the years. The maximum number (47.78 and 45.64) of seed per pod were recorded win Zn 20 kg/ha which were significant higher to the lower (42.72 and 40.69 under Zn 0 kg/ha) and higher (44.50 and 42.50 seed/pod under Zn 40 kg/ha) levels in this

Table 1: Effect of variety, level of nitrogen and zinc on length of pod, No. of seedsper pod, seed yield per pod and seed yield per plant in okra (2000 and 2001).

Treatments	Pod length (cm)		No. of seed/pod		Seed yield/pod (gm)		Seed yield/plant (gm)	
	2000	2001	2000	2001	2000	2001	2000	2001
Varity:								
Parbhani Kranti	17.35	16.51	46.00	43.92	2.60	2.48	19.82	18.32
Varsa Uphar	16.72	15.91	44.03	42.08	2.50	2.39	18.99	18.04
Arka Anamica	16.90	16.08	44.97	42.83	2.55	2.44	18.11	18.16
CD at 5%	0.42	0.45	1.39	1.22	0.07	0.07	0.10	0.11
Nitrogen levels (kg/ha):								
0	14.01	13.33	35.44	33.81	1.91	1.82	17.62	16.74
60	16.36	15.56	41.63	39.70	2.32	2.21	18.45	17.53
120	19.70	18.74	54.70	52.26	3.22	3.07	20.97	19.92
18 0	17.89	17.02	48.22	46.00	2.77	2.64	19.47	18..50
D at 5%	0.67	0.58	1.83	1.85	0.10	0.309	0.14	0.14
Zinc leves (kg/ha):								
0	16.23	15.44	42.22	40.69	2.33	2.22	18.70	17.77
20	17.76	16.90	47.78	45.64	2.73	2.60	19.61	18.63
40	16.98	16.16	44.50	42.50	2.61	2.49	19.07	18.12
CD at 5%	0.58	0.50	1.58	1.60	0.08	0.08	0.12	0.12
Interactions								
Variety x Nitrogen	0.40	0.31	0.45	0.63	1.00	0.97	1.60	1.26
Variety x Zinc	0.81	0.063	0.27	0.37	0.27	0.26	0.63	0.50
Nitrogen x Zinc	0.37	0.29	0.28	0.36	0.54	0.52	0.55	0.44

respect in both the year 2000 and 2001, respectively. The results are in conformity with those reported by Sannigrahi and Choudhary (1998).

Weight of seed per pod:

The data on weight of seed per pod as obtained in different varieties, nitrogen and zinc levels are given in Table 1. It is evident from the table that the maximum (2.60 and 2.47g) weight of seed per pod were noted in Parbhani Kranti which were significantly higher than those in Varsha Uphar and Arka Anamika. The similar results were reported Somkumar, et al. (1997). The significant effect of level of nitrogen on seed weight per pod were reported in both the years. An increase in the nitrogen from 0 kg N ha to 120 kg N/ha has significantly higher (3.22 and 3.07 gm) weight of seed per pod which was significantly higher than those 1.99 and 1.82 gm under No kg/ha, 2.32 and 2.21 gm under N60 kg/ha and 2.76 and 2.63 gm under N180 kg/ha in both the year 2000 and 2001, respectively.

The effect of level of zinc on weight of seed per pod was increased significantly with the increase in the level of zinc from Zn 0 kg/ha to Zn 20 kg/ha in both the year, further increase in the level of zinc from Zn 20 to Zn 40 kg/ha reduced it significantly over Zn 20 kg/ha during both the year. Similar results were also reported by Bose and Tripathi (1996) and Ali, et al. (2001).

Seed yield per plant:

the effect of variety, level of nitrogen and zinc were statistically significant on seed yield per plant in both the year, the maximum (19.28 and 18.32gm) seed yield per plant was recorded in Parbhani Kranti were significantly higher than those in to Arka Anamika and Varsa Uphar. It is clear from the table in both the years the each increase in the level of nitrogen 0 kg N to 120 kg N/ha seed yield per plant were recorded significantly higher in both the years. The higher level of N 180 kg/ha found significant decrease over 120 kg N/ha in both the years.

The study of effect of Zn on seed yield per plant revealed that the seed yield per plant was increased significantly with the increase in the level of zinc from Zn 0 to Zn 20 kg/ha in both the years. A further increase in the level of zinc from Zn 20 to Zn 40 kg/ha reduced it significantly over Zn 20 kg/ha during both the years.

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Cost and Returns of tomato cultivation in Mathura District of U.P. – A case Study

SUDHAKAR DWIVEDI AND DINESH GUPTA[1]
Deptt. of Agril. Economics, She-e-Kasmir University of Agricultural Sciences and Tech., Kasmir, J &K

Abstract

Tomato is the major vegetable crop in India. It is more labour and capital intensive crop, which also provides better return per rupee of investment being about rupees 3.78, 4.59, 4.96 and 5.06 on marginal, small, medium and large farm size groups respectively. The overall average return per rupees of investment came to Rs.4.83.

Introduction

India has made lot of progress in agriculture since independence in terms of growth of output, yields and area under many crops. It has gone through a green revolution, a white revolution, a yellow revolution and a blue revolution. Today, India is the largest producer of milk, fruits, cashewnuts, coconuts and tea in the world, the second largest producer of wheat, vegetables, sugar and fish and the third largest producer of tobacco and rice. Now a days Indians have achieved self sufficiency in food grains. Truly speaking agriculture is not only assuming a way of life but it is a business preposition for the people in the country.

Vegetable production has touched new heights in the recent past, producing 90 million tones. Due to advent of hybrid technology and general awareness of nutritional security among the people. Vegetable production is getting the right momentum interestingly during the last decade the increase in area under vegetable crops was nearly the increase in area under vegetable crops was nearly 0.42 percent while production has increase by 78.91 percent. The credit for his vertical expansion in vegetable production goes to improved varieties/hybrids and advance production and protection technologies, however, as the country's population is increasingly @ 1.8 percent, our vegetable requirement up to 2010 be around 135 million tones. According to the recent national family health survey, our 53 percent children under four year of age are malnourished.

In our country more than 70 types of vegetables are grown but maximum emphasis has been given on important vegetables like tomato brinjal, chilli, cauliflower, cabbage, pea and few important cucurbits, besides a number of minor vegetables are grown in different parts of the country. Through presently the area under minor vegetable is very limited, for many neither minor crops there is no statistical information. Some of these vegetable are fetching very high price in multi star hotels and other tourist restaurants. In Himanchal Pradesh cultivation of asparagus and broccoli is increasing very fast.

Tomato is the world's largest vegetable crop and known as protective food both because of its special nutritive value and also because of its wide spread production. Tomato is one of the most important vegetable crops cultivated for its fleshy fruits. Tomato is considered as important commercial and dietary vegetable crop. Tomato is protective supplementary food. It is short duration crop and gives high yield it is important from economic point of view of hence area under its cultivation is increasing day by day. Tomato is used in preserved products like Katch-up, Sauce, chutney, soup, paste, puree etc. Tomato is a rich source of minerals, vitamins and organic essential amino acids and dietary fivers.

Tomato is known as productive as well as protective food. It is a rich source of vitamin – A and C. It also contains minerals lie iron, phosphorus. Tomato contains lychopene and betacarotene pigments.

Objective of the study

1. To estimate the extent of area under Tomato crop on different size of farms.
2. To examine the cost and returns on different size of farm from tomato crops.

Research Methodology

The three villages namely Nagla Chandrabhan, Bishu and Pingri were selected purposively since villages having more area under tomato in the Farah block of Mathura district.

First of all a list of the farmers growing tomato was taken from the village Lekhpal. These farmers were divided into four categories viz. marginal, small, medium and large, the total number of farmers was 28,37, 39 and 18 respectively.

About 405 cases were selected randomly. Thus 11, 15, 15 and 7 cases were selected in marginal, small, medium and large farm size groups respectively in all 48 cases were studied. The primary data were collected by survey method. The primary data relate to year 2002 – 2003.

Department of Agril. Economics D.D.U.I.R.D., Dr. B.R.A. University Agra-282 002 (U.P.)

Results and discussions

The following table shows variable cost and fixed cost. Here the variable cost includes the cost of human labour, tractor charges, value of fertilizer and manures, seed and seedling values, irrigation charges, plant protection and interest on working capital and fixed cost includes rental value of land, depreciation and interest on fixed cost.

Table 1: Items wise Break-up of cost of cultivation of tomato crop in different farm size groups.

S. No.	Items	(In Rs/farm) Marginal	Small	Medium	Large	Overall
	Variable cost					
1.	Human labour					
	Hired labour	409.00	288.20	560.00	857.10	528.57
	Owned labour	840.10	904.00	1012.00	1200.00	989.02
2.	Tractor charges	172.70	206.60	460.00	714.20	388.37
3.	Fertilizer and manure					
	Fertilizer	1799.50	2130.30	4536.30	7189.40	3913.12
	Manure	526.80	630.30	1403.00	2186.40	1186.62
4.	Value of seeds and seedings	413.70	830.00	1446.60	2296.34	1251.16
5.	Irrigation charges	927.20	1240.00	2560.00	4200.00	2231.80
6.	Plant protection	270.20	350.00	806.60	1300.00	683.45
7.	Interest on working capital	137.67	169.07	327.05	580.21	303.50
	Sub total	5521.87	6748.47	13111.55	20520.65	11475.61
	Fixed cost					
8.	Rental value of land	2200.00	4333.30	9200.00	14800.00	7633.32
9.	Depreciation	410.52	852.60	1611.20	1940.50	1203.70
10.	Interest on fixed capital	425.21	872.00	1632.00	1980.10	1227.32
	Sub total	3035.73	6057.90	12443.20	18720.60	10064.34
	Total cost	8557.60	12806.37	25554.75	39241.25	21539.95

Table 2: Production of tomato per hectare and per farm under different farm size groups

Farm size groups	Area under tomato (ha)	Tomato production (qtls) Per farm	Per ha
Marginal	0.25	27.00	108.00
Small	0.50	49.00	98.00
Medium	1.15	105.80	92.00
Large	1.85	165.57	89.50
Overall	0.84	86.84	96.87

The total input overall perform came to Rs.21,539.95 out of which family labour accounts Rs.989.02, hired human labour Rs.528.57, tractor labour cost came to Rs.388.37, manure and fertilizer cost came to Rs.5099.74, cost of seeds and seedlings came to Rs.1251.16, irrigation charges came to Rs.2231.80, plant protection cost came to Rs.683.45, interest on working captain was Rs.303.50, rental value of land comes to Rs.7633.32, depreciation cost came to Rs.1203.70 and interest on fixed capital was Rs.1227.32 respectively. Manure and fertilizer, tractor charges and seed and seedlings were the measure items of variable cost on the farms.

The above table shows that the per farm production of tomato overall average came to 86.84 qtls. The yield per ha overall average came to 96.87 qtls. The yield per ha came high on marginal farms as compare to other categories of farms.

Table 3 : Gross value of tomato per farm and per ha. On different farm size groups (in Rs.).

Farms size groups	Gross value of tomato Per farm	Per ha.
Marginal	32.400.00	129600.00
Small	58800.00	117600.00
Medium	126960.00	110400.00
Large	198684.00	110400.00
Overall	104204.00	116244.00

The overall average gross values in case of tomato per farm and per ha. Came to Rs.104208.00 and

Table 4: Net Income from tomato on different size of farms

Farm size group	Gross value of tomato (Rs.)	Total cost of cultivation (Rs.)	Net income (Rs.)	Input-output ratio per farm
Marginal	32400.00	8557.60	23841.40	1:3.78
Small	58800.00	12806.37	45993.63	1:4.59
Medium	126960.00	25554.75	101405.25	1:4.96
Large	198684.00	39241.25	159442.75	1:5.06
Overall	101208.00	21539.95	82668.05	1:4.83

Rs.116244.00 respectively. In case of marginal, small, medium and large farms, the per ha. Value comes to Rs.129600.00, Rs.117600.00, Rs.110400.00 and Rs.107400.00 respectively.

The table 4 shows that the overall average net income per farm comes to Rs. 82668.05. In case of marginal, small, medium and large farm size groups, it come to Rs. 23842.40, Rs.45993.63, Rs.101405.25 and Rs. 159442.75 respectively.

The overall average input-output ratio came to 1:4.83. The input-output ratio on marginal, small, medium and large farms came to 1:3.78, 1:4.59, 1:4.96 and 1:5.06 respectively. It can be concluded that return per Rupees of investment was highest on large farms, while the per hectare production was highest on small farms.

Conclusion

Tomato is more labour intensive as well as capital intensive crop. Since labour cost forms the major part of total cost. The turn over from tomato cost is also quite satisfactory i.e. The overall average return per rupees of investment came to 4.83. The farm size increases the per rupees investment also increases, while per hectare production of tomato crop was highest on marginal farms followed by small, medium and large farm respectively. It is sign of commercial farming in this locality.

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Response of Phosphorus, Sulphur and PSB inoculation on yield and nutrient content and uptake in Wheat (*Triticum aestivum* L.) var. HD-2643

PRASOON SINGH, S. ELAMATHI AND RUBINA GILL
Allahabad Agricultural Institute-Deemed University, Allahabad-211007.(UP).

Abstract

A field experiment was conducted during rabi 2003-2004 at crop research farm, Department of Agronomy, Allahabad Agricultural Institute-Deemed University, Allahabad (U.P.). The treatment comprising three levels of phosphorus (20,40 and 60 kg ha^{-1}) and sulphur (0,30 and 60 kg ha^{-1}) and two levels of PSB inoculation (no inoculation and inoculation) making total 18 treatment combinations were replicated three times in a randomized block design. Results showed that increasing levels of phosphorus and sulphur up to 60 kg ha^{-1} significantly increased the seed yield, straw yield, nitrogen, phosphorus and sulphur content in seed and straw and their uptake. The inoculation of seed with PSB significantly enhanced grain yield (30.30 q ha^{-1}) and straw yield (45.99 q ha^{-1}), nitrogen, phosphorus and sulphur content in seed and straw and their uptake over uninoculated control. Seed yield was positively and significantly correlated with no. of effective tillers, no. of grains per ear, test weight and total nitrogen, phosphorus and sulphur uptake by crop.

Introduction

Phosphorus is the backbone of any fertilizer management programme and occupies a key place in intensive agriculture. It is the second important plant nutrient for the growth and yield of wheat. Application of phosphorus not only increases the crop yield but also improves the crop quality and imparts resistant against diseases. It is involved in a wide range of plant processes from permitting cell division to the development of a good root system. It is required mostly by young fast growing tissues and performs a number of functions related to growth, development, photosynthesis and utilization of carbohydrates. It is the constituent of ADP and ATP which are the most important substances in the life processes.

Sulphur is the secondary plant nutrient which plays a significant vital role in increasing production. Sulphur is essential for synthesis of sulphur containing amino acids viz., methionine, cystine and cysteine and chlorophyll. It is essential for metabolism of carbohydrates, proteins, oils and synthesis of coenzyme-A.

Indian soils are generally low to medium in available phosphorus and not more than 30 percent of applied phosphate is available to the current crop. The remaining parts gets converted into relatively unavailable forms. The most feasible and economically viable fertilizer package is one which improves the crop yields without deteriorating soil health. Therefore, keeping these facts in view a field experiment entitled "Response of phosphorus, sulphur and PSB inoculation of wheat" was planned and conducted during rabi season 2003-2004 at crop research form of Agronomy in Allahabad Agricultural Institute-Deemed University, Allahabad.

Materials and Methods

A field experiment was conducted during rabi 2003-2004 at crop research farm, Department of Agronomy, Allahabad Agricultural Institute- Deemed University, Allahabad on sandy loam soil having 140.50, 18.60, 248.65 kg/ha of available N,P and K respectively with organic carbon content 0.237% and pH 8.20. A field trial was conducted in a factorial randomized block design with three replications. The treatment consisted of 3 levels of phosphorus (20,40 and 60 kg ha^{-1}) and sulphur (0,30 and 60 kg ha^{-1}) and PSB inoculation (no inoculation and inoculation). As per recommendations a dose of 120 kg N/ha was applied. Half of which was applied as basal dose through urea adjusting the quantity of N supplied by DAP. The remaining half was supplied in two splits at 1st and 2nd irrigation phosphorus was applied through DAP before sowing in furrows as per treatments. Sulphur was applied through gypsum as per treatment and thoroughly incorporated in soil. The half quantity of required seed was treated with appropriate strain of PSB as per standard method and dried in shade. Wheat "HD-2643" was sown 22.5 cm apart in rows on 5 December 2003 with a seed rate of 100 kg ha^{-1} and harvested on 10 April 2004. In order to minimize weed competition hoeing cum weeding was done one month after sowing. In all, six irrigations were given to the crop excluding one pre-sowing irrigation.

Results and Discussion

The total uptake of N,P and K due to various levels of fertilizers were found significant and increased with the increase in levels of fertilizers. The highest uptake of nutrient was noticed (120, 60 and 60 kg ha^{-1} of N, P_2O_5 and K_2O) which was highly significant compared to those of the reduced levels of fertilizers. This was mainly due to the fact that better nutrient utilization by more healthy and vigorous plants under recommended levels and resulting in more dry matter accumulation, which ultimately increased the total uptake of NPK ha^{-1}. Similar observation was made by Choudhary et al. (1997).

Table 1: Effect of phosphorus, sulphur and PSB inoculation on yield attributes and nutrient (NPK) content in grain and their uptake in grain (%)

Treatments	Seed yield (q/ha)	Straw yield (q/ha)	N content in grain (%)	Total N uptake (kg/ha)	P content in grain (%)	Total P uptake (kg/ha)	S content in grain (%)	Total S uptake (kg/ha)
Phosphorus (kg/ha):								
20	27.01	41.80	1.65	67.21	0.469	18.25	0.322	12.57
40	29.99	45.80	1.86	90.45	0.533	23.33	0.327	14.52
60	31.74	48.39	1.92	99.63	0.585	27.32	0.329	15.69
SEm±	0.246	0.131	0.004	0.097	0.005	0.033	0.001	0.091
CD at 5%	0.718	0.377	0.123	0.281	0.014	0.095	0.002	0.261
Sulphure (kg/ha):								
0	27.11	41.85	1.69	69.84	0.478	18.68	0.317	12.42
30	29.97	45.99	1.83	88.84	0.551	24.27	0.330	14.52
60	31.66	48.15	1.91	98.62	0.558	25.96	0.331	15.69
SEm±	0.246	0.131	0.004	0.097	0.05	0.033	0.001	0.091
CD at 5%	0.708	0.377	0.0126	0.281	0.014	0.095	0.002	0.261
PBS inoculation:								
No inoculation	28.86	44.66	1..79	87.72	0.523	22.23	0.325	13.89
Seed inoculation	30.30	45.99	1.82	88.80	0.535	23.70	0.327	14.63
SEm±	0.201	0.107	0.004	0.079	0.004	0.027	0.001	0.074
CD at 5%	0.578	0.308	0.010	0.229	0.011	0.077	0.002	0.213

Application of 60 kg P_2O_5 ha^{-1} significantly enhanced the seed and straw yield by 17.51 and 5.83, 16.00 and 5.65 percent over 20 and 40 kg P_2O_5 ha^{-1}, respectively. Application of 60 kg P_2O_5 ha^{-1} significantly increased the nitrogen content in seed (16.36, 3.22%) over 20 and 40 kg P_2O_5 ha^{-1} respectively and also its application @ 60 kg ha^{-1} increased the nitrogen uptake (48.23 and 10.14%) over 20 and 40 kg P_2O_5 ha^{-1}. Application of 60 kg P_2O_5 ha^{-1} significantly enhanced the phosphorus content in seed (24.73, 9.75%) and uptake (49.67, 17.13%) over 20 and 40 kg P_2O_5 ha^{-1}. Application of 60 kg P_2O_5 ha^{-1} significantly increased the sulphur content in grain (2.17 and 0.61%) and uptake (24.76 and 8.0%) over 20 and 40 kg P_2O_5 ha^{-1}. These observations are in agreement with those of Gorbanov and Kostadinova (2000).

Application of 60 kg S ha^{-1} significantly enhanced the grain (16.77, 5.63%) and straw yields (15.05, 4.69%) over control and 30 kg S ha^{-1}. Application of 60 kg S ha^{-1} significantly increased the nitrogen content of grain (13.01 and 4.27%) and uptake (42.21, 11.00%) over control and 30 kg S ha^{-1}. Application of 30 kg S ha^{-1} significantly increased the phosphorus content of grain over control. While application of 60 kg S ha^{-1} significantly increased the phosphorus uptake (38.95 and 6.96%) over control and 30 kg S ha^{-1}. Application of 30 kg S ha^{-1} significantly increased the sulphur content of grain upto 60 kg S ha^{-1} and control. While application of 60 kg S ha^{-1} significantly increased the sulphur uptake (26.30, 8.00%) over control and 30 kg S ha^{-1}. Similar observations were made by Kaushik et al. (1997).

Inoculation of seed with PSB culture significantly increased the seed (5.0%) and straw (2.99%) yields over no inoculation. Nitrogen phosphorus and sulphur content of seed and their total uptake increased significantly due to seed inoculation with PSB culture over no inoculation. Similar observations were made by Sunder et al. (2002).

Interaction effect of phosphorus and sulphur was significant for straw yield, total N and P content and uptake in grain. While interaction effect of phosphorus and PSB inoculation was significant for phosphorus content in grain and phosphorus uptake. The maximum values of these attributes obtained with 60 kg P_2O_5 + PSB inoculation. These observations are in agreement with those of Randhawa et al. (2000).

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The study of phosphorus fractions and adsorption processes in three Mollisols of Pantnagar

JAIPAUL, M.S. NEGI AND M.K. DIWEDI
VCSG College of Horticulture (GBPUA&T, Pantnagar), Bharsar, Distt. Parui (Uttarakhand)-246 123.

Abstract

A laboratory experiment was conducted to study the different fraction of phosphorus and processes in three Mollisols, which differed in textural properties. It was found that among the different fraction of phosphorus the calcium-P has the highest content in all the soils followed by iron-P, aluminium-P and saloid-P. To study the nature of phosphate adsorption processes a plot of – In (C_t/C_0) and time (hours) was made and it was observed that phosphorus adsorption process is two step process (i) up to the first 12 hours of the adsorption reaction the process was considerably rapid, comparing the lateral portion and known as physical adsorption and (ii) the other one (12 to 144 hours) is governed by the much slower chemical process, which is referred as chemisorption. The amount of phosphorus adsorption is differed among the three soils i.e. highest adsorption is in Beni silt clay loam followed by Haldi loam and Patharchatta sandy loam.

Introduction

Present agricultural advancement, the world over, is the product of the rapid scientific and agricultural developments in the field. With the present set of available knowledge, technology has reached the level of near perfection. Under the present situation of food demand, efforts are required to be channelized in the directions to derive maximum returns from the available inputs. Information about the available nutrients, essential for plant growth is perhaps the foremost need. Of the essential plant nutrients, phosphorus holds a high position. Total phosphorus content in soil is around 200-50000 mg kg^{-1} with the world average of 600 mg kg^{-1} (Larsen, 1967). Though, this parameter dose not provide the size of the available-P pool in the soil, yet can be rated as low. In this respect, it is pertinent to know how much phosphate can be made available to the growing plants from the native available pool. One of the major contributors of the soil available pool is the applied fertilizer. Applied fertilizer soon breaks down into several fragments. Fragments getting adsorbed and precipitated play important role in determining the size of the available pool. It is drawing increasing attention to develop an understanding of the facts involving in phosphorus adsorption and availability in soil.

Materials and Methods

The study of phosphorus fractionations and adsorption in three Mollisols of Pantnagar was conducted in the laboratory. Three Mollisols (Beni silt clay loam, Haldi loam and Patharchatta sandy loam) were selected for the study (Table 1). The pH and electrical conductivity (EC) of the soils determined in 1:2 soil- water ratio, the organic matter content of the soils was done by modified Walkley and Black (1934) method and cation exchange capacity (CEC) of soils was estimated by neutral normal ammonium acetate method (Jackson,1973). For the fractionation of soil inorganic phosphorus, the scheme suggested by Petersen and Corey (1966) was followed. Available phosphorus was estimated by 0.5 M sodium bicarbonate (pH 8.5) extraction (Olsen et al., 1954). Total phosphorus was estimated by diacid method as described by Jackson (1973).

For phosphorus adsorption study, glass columns (50 cm long x 5.5 cm in diameter) with a sintered base were used to prepare soil columns. Whatman No.42 filter paper circles placed at the bottom on the sintered base, reached a thin layer of glasswool. In each column, 790g soil was packed, which was added in a number of equal installments of 90 to 100g. After each addition, soil was duly packed by tapping to achieve a uniform bulk density of 1.15 to 1.26 Mg m^{-3}. A filter paper circle was also placed at the top to avoid any perturbation of top surface of soil. Each soil column was saturated by 0.02 M $CaCl_2$ containing 15 ug ml^{-1} P in the form of KH_2PO_4 was allowed to leach through the saturated soil column. To achieve a steady flow rate of the percolating solution, a constant head of 5 cm solution was maintained over soil column. It gave a flow rate of 1.5 to 5.7 ml hr^{-1} with the average flow rate being 2.7 ml hr^{-1}, 4.7 ml hr^{-1} and 1.6 ml hr^{-1} at 30^0K for soil column of Beni silt clay loam, Haldi loam and Patharchatta sandy loam, respectively. The leachates were collected at every hour from the second to 12^{th} hr and then at 24^{th}, 48^{th}, 72^{nd}, 96^{th}, 120^{th} and 144^{th} hrs. then leachate collected at

[1]Asstt. Professor, Department of Natural Resource Management, VCSG College of Horticulture, Bharsar, Distt. Pari (Uttarakhand) –246 123

each interval, measured and the total volume was computed. The concentration of phosphorus in the leachate solution was determined by ascorbic acid method (Murphy and Riley, 1962).

To determine the rate of reaction, the values of C_t/C_0 were calculated following the Miscible Displacement Technique equation outlined by Sparks (1986).

C_t/C_0 = Change in P concentration with time

Where,

C_t = Amount of ion on the colloid at time t

C_0 = Amount of ion on the colloid at equilibrium

Results and Discussion

It is seen from Table 1 that pH of soils varied from 7.25 to 7.60. The highest pH value was found in Beni silt clay loam series, whereas the lowest pH value was found in Patharchatta sandy loam series; and Haldi loam series was in between the two. However, Deshpande et al. (1971) and Srivastava (1973) found that pH ranged from 5.70 to 7.29 for Mollisols of Tarai region. The EC values varied from 0.360 to 0.430 dSm^{-1} . The highest EC value was found in Beni silt clay loam series, whereas the lowest EC value was found in Patharchatta sandy loam series; and Haldi loam series was in between the two. However, Mukhopadhyay (1987) found that EC value of Pantnagar Mollisols was 0.165 dSm^{-1}. As shown in Table 1 the organic matter content varied from 11.8 to 20.0 g kg^{-1}. The lowest content of organic matter was found in soil sample of Patharchatta sandy loam and Beni silt clay loam series had the highest. Deshpande et al. (1971) and Srivastav (1973) reported the organic matter content to range from 14.5 to 36.0 g kg^{-1} in Mollisols of Nainital Tarai, which were slightly higher than the observed value. The cation exchange capacity (CEC) of soils varied from 12.50 to 26.75 cmol (p+) kg^{-1} (Table 1). The soil sample of Beni silt clay loam series had highest CEC value, whereas it was least in Patharchatta sandy loam series. Mukhopdhyay (1987) also reported the average value of CEC for Pantnagar Mollisols to be 15.20 cmol kg^{-1}.

Data regarding the total phosphorus, available-P inorganic fractions of phosphorus viz. saloid-P, A1-P, Fe-P and Ca-P of the three soils are presented in Table 1. The amount of total phosphorus in soil indicated the reserve of phosphorus, which may eventually be available to plants in due course of time. As shown in Table 1 the total phosphorus content in these soils varied from 560.0 to 1050.0 mg kg^{-1}. The highest content was found in Beni silt clay loam series, whereas the lowest content was found in Patharchatta sandy loam series; and Haldi loam series was in between the two. Similar results were obtained by Om Prakash (1966), for the soils of Tarai. He reported that average value of total phosphorus for Pantnagar soils was 310.0 mg kg^{-1}. The available-P indicated the content of phosphorus, which is present in the plant available form.

Table 1: Physical and chemical properties and phosphorus fractions in three molisols of Pantnagar

Property	Beni silt clay loam	Haldi loam	Patharchatta sandy loam
pH	7.60	7.55	7.25
EC dSm^{-1}	0.430	0.39	0.36
SOM gkg	20.00	17.80	11.80
CEC cmol(p+)kg^{-1}	26.75	17.75	1.50
Total-P $mgkg^{-1}$	1050.00	770.00	560.00
Available-P $mgkg^{-1}$	28.90	21.50	16.20
Phosphorus fractions			
Saloid-P $mgkg^{-1}$	9.40	8.60	4.45
Aluminium-P $mgkg^{-1}$	25.30	19.20	9.75
Iron-P $mgkg^{-1}$	32.00	48.25	28.20
Calcium-P $mgkg^{-1}$	160.25	105.00	96.75

The amount of available-P ranged form 16.20 to 28.90 mg kg^{-1} (Table 1). The lowest amount of Available-P content was found in soil sample of Patharchatta sandy loam and Beni silt clay loam series had the highest and Haldi loam series fall between the two. The results are comparable with those of Om Prakash (1966), viz. mean available-P level in soil of Tarai region to be 31.68 mg kg^{-1}. However, it matched more closely with those reported by Dhyani (1985) and Mishra (1988), for the western Uttar Pradesh soils, range being 8.0 to 32.8 mg kg^{-1}. It is seen from the Table 1 that the amount of saloid-P in these soils ranged from 4.45 to 9.40 mg kg^{-1}. the highest content was found in Beni silt clay loam series, whereas the lowest content was found in Patharchatta sandy loam series; and Haldi loam series fall between the two. Anjaneyulu (1972) reported the saloid-P fraction to range from 1.83 to 9.96 mg kg^{-1} for Mollisols. Present finding is fully in agreement with the above. The amount of A1-P ranged from 9.75 to 25.30 mg kg^{-1} in the three soils. The lowest amount of A1-P content was found in soil sample of Patharchatta sandy loam and Beni silt clay loam series had the highest and Haldi loam series fall between the two. Dhyani (1985) and Mishra (1988) while studying the fraction in Western Uttar Pradesh soils, recorded its content to be between 21.0 to 80.0 mg kg^{-1}. The amount of Fe-P varied from 28.20 to 4825 mg kg^{-1}. The amount of Fe-P was found in the order Haldi loam series> Beni silt clay loam> Patharchatta sandy loam series. Om Prakash (1966) found that amount of Fe-P ranged from 56.50 to 91.50 mg kg^{-1} for soils of Tarai. However, Dhyani (1985) and Mishra (1988) found that Fe-P fraction in western Uttar Pradesh soils, varied from 6.0 to 49.0 mg kg^{-1}. Observed departure in the values of A1-P and Fe-P from those of Dhyani (1985) and Mishra (1988) could be due to sampling variations. It is seen from Table 1 that the amount of Ca-P ranged from 96.75 to 160.25 mg kg^{-1}. Its occurrence in the three soils can be arranged in the order Beni silt clay loam> Haldi loam series> Patharchatta

sandy loam series. This fraction is found to occur in soils under study in amounts very much in agreement with the existing reports, viz. 45.50 to 106.0 mg kg^{-1} in Nainital Tarai soils (Om Prakash, 1966); Dhyani (1985) and Mishra (1988) 80.0 to 235.0 mg kg^{-1} for Western Uttar Pradesh soils. On the basis of content, the different Phosphorus fraction can be arranged in the order Calcium-P>Iron-P>Aluminium-P>Saloid-P.

It is seen from Table 2 that relative phosphorus concentration changed with contact time and up to first 12 hours the values of $-\ln (C_t/C_0)$ of the three soils decreased very fast and then slow down with the passage of contact time i.e. up to 144 hours. Further, to confirm and to know the nature of phosphate adsorption a plot of $-\ln (C_1/C_0)$ and time (hours) was made. A critical observation of phosphate adsorption curves hint that the adsorption reaction could be split into parts. Up to the first 12 hours of the adsorption reaction the process was considerably rapid, comparing the lateral portion. As such the adsorption sites on the exchanger have been divided as one where adsorption is a physical process and the other one is governed by the much slower chemical process, which is referred as chemisorption (Hsu, 1964; Kue and Lotse, 1973; Parfitt et. al., 1989).

Table 2: Relationship between -In Ct/Co and time for three Mollisols of Pantnagar

Time (hrs)	Beni silt clay loam	Haldi loam	Patharchatta sandy loam
1	0.73	0.73	0.67
2	0.73	0.71	0.61
3	0.73	0.67	0.57
4	0.69	0.67	0.54
5	0.67	0.65	0.49
6	0.67	0.63	0.47
7	0.65	0.59	0.44
8	0.63	0.56	0.4
9	0.59	0.54	0.37
10	0.57	0.49	0.34
11	0.56	0.44	0.31
12	0.54	0.43	0.28
24	0.47	0.37	0.26
48	0.4	0.32	0.23
72	0.35	0.27	0.19
96	0.26	0.19	0.17
120	0.18	0.12	0.13
144	0.11	0.03	0.08

Finally it is concluded that the phosphorus fractions can be arranged in the order Calcium-P> Iron-P> Aluminium-P> Saloid-P. The adsorption of phosphate is two step process (1) initially rapid physical adsorption, (2) then it is slow step process or chemisorption.

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Economics of milk production in crossbred cows in various categories of milk producers

SATYENDRA SINGH[1] AND M.P. GUPTA
Dept. of Dairy Science, Pt. Deen Dalyal Upadhyay Veterinary University, Mathura-281001 (U.P.)

Abstract

A study was undertaken to assess the role of the State Dairy Federation (PCDF) in raising income generation through milk production from upkeep of crossbred cows in different herd size groups of members and non-members of PCDF in Agra district. The study involved various aspects related to milk production, which revealed that the overall net maintenance cost of crossbred cows was lower in member producers than in non-member groups but the net return from milk production in various households and herd size groups was much greater in case of milk producers who were members of dairy cooperative societies (PCDF) as against those (non-members) who did not avail benefits of various inputs related to milk production enhancement.

Introduction

Dairying in India is an integral part of total farming system. In terms of value of output, milk is now the single largest agricultural commodity, higher than paddy or wheat. Dairying contributes close to the third of gross income of rural households and in case of landless farmers nearly half of their gross income. An estimated 70 million rural households are engaged in milk production. India is now the largest milk producing country in the world, with estimated milk production of 116 million metric tones (Bhasin, 2010). India had already entered in the international market in milk products. A greater emphasis is now being laid to enhance milk production and milch animal productivity to meet future demands for milk and milk products as well as to boost export of milk products.

Increased availability of feed and fodder is of crucial importance to provide support for the targeted increase in milk production. Due to increasing pressure of human population on our land, there is hardly any scope for increasing area under pasture and cultivated fodders. The gap between the requirement and availability of dry feeds, green fodder and concentrates have been widening steadily over the years. To fill this gap, there is need to exploit agro-industrial by-products as animal feed and create new feed resources (Sadana, 2001).

Production cost is one of the vital factors and plays a significant role in decision making of the farmers in the upkeep of milch animals for milk production. Generally, a milk producer can increase his dairy income in two ways, *viz.* by increasing milk production per animal, or by reducing the cost of milk production. A number of factors influence the cost of milk production, amongst which feeds and fodders account for nearly 70% of total cost of milk production. To escalate milk production, the milk producers prefer to rear crossbred cows over desi cows. The Pradeshik Cooperative Dairy Federation (PCDF) in the state has also been playing a pivotal role in augmenting milk production by assisting the member milk producers through various ways. The present study critically examines the various factors involved in economics of milk production in crossbred cows in members and non-member milk producing households in Agra district.

[1]Dairy Development Department, Govt. of U.P., Agra.

Research Methodology

The present study pertained to Agra district of Uttar Pradesh, which is under the operation of PCDF of U.P., for procurement, milk production enhancement, processing and marketing of milk and milk products.

Selection of villages and cases: Two villages from each of five collection centres located on Pilthera route, thus, a total of 10 villages were selected. The milk producers in these villages were divided into two categories, viz. members and non-members of PCDF. Further, the members and non-members were categorized in three herd size groups, depending upon the number of milch animals reared, viz. I Herd size (having one milch animal), II Herd size (2 milch animals), and III Herd size group (having 3 milch animals). A total of 150 cases (75 members and 75 non-members) were selected randomly.

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 in such way as would cover almost all aspects of rearing milch animals for milk production. The data thus collected were compiled and tabulated systematically. Standard cost and income measures were used to work out the profitability of milk production.

The total cost incurred on dairy enterprise could be classified into two parts, *viz.* fixed cost and variable cost. Fixed cost: It included the expenditure incurred whether or not the production is carried out. It included depreciation and interest on fixed capital. No depreciation

was charged on animals upto third lactation. Subsequently, 10% was charged up to fifth lactation and 20% thereafter. Straight line method of depreciation was applied on buildings and equipments as per the life of assets in use. Interest on fixed capital was charged at existing rate.

Variable cost: It included feed, labour, veterinary and miscellaneous costs.

The income from dung and young stock were subtracted from the total maintenance cost. The milk yield was noted and the average sale price of milk reported by the respondents were also recorded. The data were subjected to tabular analysis for estimating the net returns from milk production.

Results and Discussion

The results on maintenance cost of cross bred cows per annum on different herd size groups of members and non-members are laid down in Table 1. Various data suggested that the overall net maintenance cost of crossbred cows (per animal) was observed to be about Rs. 18060 in case of members as against Rs. 19170 in the category of non-members. Out of the total maintenance cost, variable cost accounted for about 93% on member household and about 92% on non-member households. The total maintenance cost incurred on rearing of crossbred cows in I, II and III herd size groups varied with the size of cattle holdings in both the categories of sample households. The variable cost and the fixed cost were significantly higher in case of non-member category than in member category of PCDF. Further, these costs were found to be the lowest in the III herd size groups of both the category of milk producers.

Among the various items of variable cost, the maximum share to the total cost was due to cost of green fodder, followed by the value of concentrates and cost of human labour in case of both member and non-member milk producers. It was further observed that the feeds and fodders accounted for about 65.4% and 66.6% of the total cost incurred on up keeps of crossbred cows in categories of member and non-member farmers.

The total as well as net maintenance cost per animal were lower in category of member producers of PCDF than in the non-member group. Further, the gross and net maintenance costs were found to be higher in I herd size group in both the categories because most of the milk producers were landless in this category irrespective of affiliation to PCDF. Such costs were, however, lowest in III herd size groups of both members and non-members as they possessed some land and spared a part of it for cultivation of green forage and home-produced concentrates. The overall net maintenance cost per crossbred cow was higher (Rs.19170.00) in non-member producers than in member

Table 1: Peranimal maintenance cost of crossbred cows (Value in Rs.)

Inputs	Members				Non-members			
	I	II	III	Overall	I	II	III	Overall
Green fodder	5639.25 (30.9)	6347.00 (33.6)	6244.50 (34.5)	6003.30 (32.6)	6240.00 (32.6)	6953.00 (34.8)	6073.80 (31.8)	6405.80 (32.8)
Dry fodder	1916.25 (10.5)	1907.90 (10.1)	1701.40 (9.4)	1850.90 (10.1)	2145.00 (11.0)	2177.80 (10.9)	2101.00 (11.0)	2148.60 (11.0)
Concentrates	3942.00 (21.6)	4118.00 (21.8)	4325.90 (23.9)	4088.10 (22.2)	4251.00 (21.8)	4375.60 (21.9)	4526.70 (23.8)	4452.80 (22.8)
Human labour	4781.50 (26.2)	4495.80 (23.8)	4018.20 (22.2)	4511.70 (24.5)	5011.50 (25.7)	4475.00 (22.4)	4450.30 (23.3)	4570.00 (23.4)
Veterinary expenses	365.00 (2.0)	321.29 (1.7)	253.40 (1.4)	331.50 (1.8)	273.00 (1.4)	239.80 (1.2)	152.80 (0.8)	195.00 (1.0)
Misc. expenses	273.75 (1.5)	226.70 (1.2)	253.40 (1.4)	239.40 (1.3)	214.50 (1.1)	159.80 (0.8)	152.80 (0.8)	175.80 (0.9)
A. Variable cost	16917.75 (92.7)	17416.60 (92.2)	16796.80 (92.8)	17033.90 (92.5)	18135.00 (93.0)	18381.00 (92.0)	17457.40 (91.4)	17948.00 (91.9)
Dep. on fixed assets	292.00 (1.6)	377.80 (2.0)	380.10 (2.1)	349.90 (1.9)	312.00 (1.6)	439.80 (2.2)	534.80 (2.8)	468.70 (2.4)
Interest on fixed assets	1040.25 (5.7)	1095.60 (5.8)	923.10 (5.1)	1031.20 (5.6)	1053.00 (5.4)	1160.00 (5.8)	1107.80 (5.8)	1113.30 (5.7)
B. Fixed cost	1332.25 (7.3)	1473.40 (7.8)	1303.20 (7.2)	1381.10 (7.5)	1365.00 (7.0)	1599.00 (8.0)	1642.60 (8.6)	1582.00 (8.1)
Total maintenance cost	18250.00 (100)	18890.00 (100)	18100.00 (100)	18415.00 (100)	19500.00 (100)	19980.00 (100)	19100.00 (100)	19530.00 (100)
Dung value	370.00	380.00	390.00	355.00	360.00	380.00	385.00	360.00
Net cost	17880.00	18510.00	17710.00	18060.00	19140.00	19600.00	18715.00	19170.00

(Figures in parenthesis indicate percentage) I, II, III indicate herd size groups

Table 2: Net returns from milk production in cross bred cows (Value in Rs.)

Inputs	Members				Non-members			
	I	II	III	Overall	I	II	III	Overall
Milk yield (Litre/lactation)	2220	2100	2190	2170	1980	1860	1935	1925
Gross Income (per animal)	31080	29400	30660	30380	25740	24180	25155	25025
Net Income (per animal)	13200	10890	12950	12320	6600	4580	6440	5875
Cost of milk production (Rs./L)	8.05	8.81	8.08	8.32	9.66	10.53	9.67	9.96
Cost/Benfit ratio	1:1.74	1:1.59	1:1.73	1:1.68	1:1.34	1: 1.23	1:344	1:1.31

I, II, III indicate herd size groups

producers (Rs. 18060.00) of PCDF. This was because of availability of some inputs from the milk producers' societies (PCDF) to members at subsidized rates. The non-members had to purchase various items of feeds and fodders from local markets which added to the cost of maintenance of their milch animals.

Our results agreed with the data of Bharadwaj *et al.*(2006) and Singh *et al.* (2006) who reported that feeds and fodders were major components of total maintenance cost. Bharadwaj *et al.* (2006) inferred from their studies on economics of milk production in buffaloes that the feed cost constituted for about 70 to 71% of total maintenance cost. The costs on feeds and fodders vary depending on availability of home-produced feeds and/or feeds purchased from local markets. The cost on labour also varies from family labour to hired labour. But such results substantiate that about two-third or more expenses are incurred on these items.

Net return from milk production: The net income from milk production in crossbred cows was worked out by subtracting the net maintenance cost from the gross income. The data on per milch animal net income in sample households are presented in Table 2.

It was observed (Table 2) that the overall net income per milch animal in all herd size groups was significantly greater in case of member producers of PCDF as compared to non-members. Further, the net income per milch animal was highest in I herd size group in both the categories of producers. The overall average net income in case of member producers worked out to be Rs. 12320.00 as against Rs. 5875.00 in case of non-members.

The factors that contributed to greater net returns from milk production (Table 2) in member producers of PCDF were: higher milk production per animal per lactation and the higher rate at which the milk was sold to the PCDF, as no middlemen were involved in marketing of milk through dairy cooperative societies. Contrarily, because of short supply of inputs or availability of inputs at higher market price to non-members coupled with a lower milk price due to involvement of middle men/venders, a lower milk production per lactation and lower price per unit fetched much lower return from milk production to non-members of PCDF. The margin of return was almost 2-fold and highly significant between these two groups of milk producers.

The above contention is further explicit from cost of milk production per litre and cost-benefit ratio. The cost of milk production was lower and subsequently cost-benefit ratio much higher in case of member producers in all herd size groups than in non-members. Various schemes regarding milk production enhancement have helped raising milk production and subsequently increased income therefrom in case of those who were the members of PCDF. The non-members were deprived of such benefits as available to members for production enhancement.

Shah *et al.* (1996) and Shah (1997) as well as other workers (Singh and Singh 2003) in their studies on milk production and marketing indicated that the households covered under cooperative system (PCDF) benefited more than those not covered.

It is, hence, concluded that the milk producers should be motivated to become members of PCDF in order to derive benefits from various milk production enhancement schemes to help in raising their income through enhanced milk production, and effective marketing to get remunerative price of their produce.

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Contribution of training programme on knowledge and adoption of tomato crop production

R.P.SINGH, J.P.SINGH[1], D.V.SINGH[2] AND VANDANA KUMARI[3]
Associate Director Extension, K.V.K. Hastinapur. S.V.B.P.U.A.&T. Meerut.

Introduction

One of the main tasks of Krishi Vigyan Kendra is to provide and improve the knowledge of the trainees about the improved farm practices, because knowledge is cognitive component of individual's mind and plays an important role in covert as well as overt behaviour of individuals. A greater knowledge of technical nature of improved practices would lead to a high adoption possibly because knowledge is not inert. Once knowledge is acquired and retained in the mind, it undergoes and produces changes in the thinking process and mental alchemy. The result of this active functioning of knowledge may some times be seen in the overt behaviour of an individual i.e. in the actions or decisions taken by him. Lack of correct and adequate knowledge leads to under or over adoption of innovation, which proves fatal to the farming business. Attention was, therefore focused in this study to analyze as to what extent the training program affected the level of knowledge of its trainees. This also involved the process of relating and the extent; the respondents were expected to answer questions, which were posed in the test situations than the learning situation. Degree of adoption of any item of package may be complete or full, partial and non--adoption .In the present study, adoption means the degree of actual use of any recommended package of practices of tomato crop. The success or failure of many a rural socio-economic reforms would mainly depend upon the client's knowledge and income which are essential components for the better implementation and success of KVK training program. Keeping this in view an attempt was made to ascertain the level of knowledge and adoption of improved practices of tomato crop.

Methodology

KVK Hashtinapur Meerut was purposively selected for the purpose. Tomato being the important commercial crop was considered for the study. The study was undertaken in two adopted villages namely Lawar and Nihori of Dourala block, where most of the farmers are growing tomato for commercial purpose. In order to measure the impact of the training program, the farmers were grouped as 'trainees' and 'non-trainees' and a random sample of 25 farmers from each group was drawn from both villages for testing their level of knowledge and extent of adoption through well structured schedule.

The level of knowledge was categorized as low, medium, and high on the basis of scores. Adoption was measured with the help of adoption scale developed by Fulzele (1986) with suitable modifications. Scoring was done on the basis of correctness of the responses and scoring was given for full adoption 2, Partial adoption l and Non-adoption 0, and the total adoption score was calculated accordingly. Adoption behaviour was categorized as low, medium, high on the basis of total scores obtained by the individual respondent for all the recommended practices.

Results and Discussion

A perusal of the data in Table 1 reveals that majority of the trainees had high (56 per cent) level of knowledge, followed by medium level of knowledge (44 per cent), whereas, in the case of non-trainees 52 per cent respondents had medium level of knowledge, 32 per cent had low level of knowledge and 16 per cent had high level of knowledge. The tomato crop grower trained had higher level of knowledge than the untrained.

The calculated value of 't' was 4.54, which is greater than table value at 0.01 probability level for 48 degree of freedom significant difference between trainees and non-trainees regarding their knowledge about improved package of practices of tomato crop.

The impact of KVK training in terms of adoption of recommended technology of tomato crop by trainees and non-trainees has been analyzed and presented in Tables 2 and 3. Majority of the trainees farmers had fully adopted recommended dose of nitrogen i.e. (96 per cent), earthing the tomato plant (92 per cent), high yielding varieties according to their sowing time and scheduled irrigation (88 per cent), seed rate and recommended dose of phosphorus and the row to row and plant to plant distance (84 per cent), time and method

[1] Ex.Head, Department of Agricultural Extension, R.B.S. College Bichpuri ,Agra.
[2]Lecturer , Department of Agricultural Extension R.B.(P.G.)College, Agra.
[3]Research Scholar,Department of Agricultural Extension,R.B.S.College,Agra.

Table 1:Level of knowledge of respondents regarding tomato crop technology.

Level of knowledge	Trainees		Non-trainees	
	Frequency	Percentage	Frequency	Percentage
Poor (up to 5)	00	00	08	32
Fare(Above 5 upto 10)	11	44	13	52
Good(Above 10)	14	56	04	16
Total	25	100	25	100

Table 2: Adoption of recommended tomato technology by trainees and non-trainees.

Package of practices	Extent of adoption					
	Trainees			Non-Trainees		
	High *f* (%)	Medium *f* (%)	Low *f* (%)	High *f* (%)	Medium *f* (%)	Low *f* (%)
High yielding varieties	20(80)	04(08)	01(04)	12(48)	13(52)	00(00)
Seed treatment	16(64)	03(12)	06(24)	02(08)	06(24)	17(68)
Sowing time	22(88)	02(08)	01(04)	03(12)	15(60)	07(28)
Seed rate	21(84)	02(08)	02(08)	04(16)	11(44)	10(40)
Time and method of raising nursery	20(80)	04(16)	01(04)	05(20)	09(36)	11(44)
Row to row and plant to plant distance	21(84)	04(16)	00(00)	04(16)	13(52)	08(32)
Nursery in raised bed.	19(76)	06(24)	00(00)	03(12)	10(40)	12(48)
Use of the organic manures.	16(84)	08(32)	01(04)	04(16)	14(56)	07(28)
Chemical fertilizer						
Nitrogen	24(96)	01(04)	00(00)	22(88)	02(08)	01(04)
Phosphorus	21(84)	04(16)	00(00)	04(16)	16(64)	05(20)
Potash	11(44)	09(36)	05(20)	01(04)	09(36)	15(60)
Micronutrient	08(32)	05(20)	12(48)	02(08)	04(16)	19(76)
Earthing the tomato plant	23(92)	02(08)	00(00)	09(36)	13(52)	03(12)
Scheduled irrigation	22(88)	03(12)	00(00)	11(44)	11(44)	03(12)
Control of weeds in nursery	12(48)	13(52)	00(00)	15(60)	07(28)	03(12)
Integrated pest management	06(24)	09(36)	10(40)	00(00)	02(08)	23(92)
Insecticide and fungicide for control of insect/pest and disease.	18(72)	06(24)	01(04)	02(08)	10(40)	13(52)
Use of plant hormone.	03(12)	07(28)	15(60)	00(00)	01(04)	24(96)

of raising nursery, whereas in case of non trainees farmers 88 per cent adopted recommended does of nitrogen, 36 per cent earthing the tomato plant, 12 per cent high yielding varieties of tomato the nursery in raised bed; 16 per cent recommended seed rate, row to row and plant to plant distance. Only 48 per cent and 20 per cent non-trainee farmers had grown high yielding varieties of tomato crop and followed the time and method of raising nursery.

The partially adopted practices by majority of trainees farmers were control of nursery and tomato field by Integrated Pest Management (52 per cent) and use of potash (36 per cent), use of organic manure (32 per cent) and use of plant of hormone (28 per cent). In the case of non-trainees farmers, 28 per cent controlled weeds in nursery and tomato field, 36 per cent used recommended does of potash, 8 per cent followed Integrated Pest Management, 56 per cent used the organic manure, followed by 4 per cent who used plant hormone.

Non adoption of recommended practices by farmers were use of plant hormone (60 per cent), use of micro-nutrients (48 per cent), followed by Integrated Pest Management (40 per cent) and seed treatment (24 per cent), whereas in case of non trainees farmers, non adoption of recommended technologies were plant hormone (96%), micro-nutrient (76%), Integrated Pest Management (92%) and seed treatment. (68%).

Table 3 shows that most of the trainee (80 per cent) had higher level of adoption followed by medium

Table 3: Distribution of respondents according to their extent of adoption of tomato crop

Extent of adoption	Trainees		Non-trainees	
	Frequency	Percentage	Frequency	Percentage
Low(Up to 12)	00	00	08	32
Medium (above 12 Upto 24)	05	20	16	64
High (Above 24)	20	80	01	04
Total	25	100	25	100

X^2=30.95, 't' = 9.79

level (20 per cent), whereas most of non-trainees had medium level of adoption (64 per cent) followed by low level of adoption (32 per cent).

In order to find out differences between trainees and non-trainees with regard to the adoption of package of practices related to tomato crop, the X^2 test and 't' test were used.

It was found that 'X^2.,' (30.95) and 't' (9.79) values were significant at one per cent level of significance. Hence there was significant difference between trainees and non-trainee regarding the extent of adoption of package of practices of tomato crop. Thus, it is concluded that trainees (tomato grower) had higher level of adoption of recommended technology than the non-trainees. This finding is identical to the finding of Rade and Patil (1987) and Sharma *et al* (2000).

Conclusion

Majority of the trainee had high (56 per cent) level of knowledge, followed by medium level of knowledge (44 per cent), whereas, in the case of non - trainees 52 per cent had medium level of knowledge followed by 6 per cent with high level of knowledge. There is significant difference between trainees and non-trainees regarding their knowledge about tomato crop. We therefore conclude trainees have greater knowledge than the non-trainees about tomato crop farming. Most of the trainees (80 per cent) have higher level of adoption followed by medium level (20 per cent), whereas most of the non-trainees have medium level of adoption (64 per cent) followed by low level of adoption (32 per cent). It is concluded that tomato growing trainees have higher level of adoption of recommended technology of tomato crop than non-trainees.

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Studies on the effect of gibberellic acid on germination percentage and seedling height of sunflower (Helianthus annuus L.) cv. GHS 323

ADESH KUMAR, V.K. BHATNAGAR, AND LOKPAL YADAV
Deptt. of Botany, Hindu College, Moradabad (U.P.)

Abstract

Seed germination percentage and seedling height experiment were conducted during kharif season on February, 2010 laboratory in Department of Botany, Hindu College, Moradabad to study the effect on sunflower (Helianthus annuus L.) in different concentration of gibberellic acid. CV. GHS 323 were treated with GA_3 in beaker for 12 hours and seeds were transferred in to petriplate for germination. Studies were conducted on the various concentration of GA_3 i.e. 10, 25, 50, 100, 100, 200, 400 and 800ppm and compared with control. Middle (200 ppm) concentration of GA_3 increased germination percentage and seedling height and higher and lower concentration decreases the germination percentage and seedling height.

Introduction

Sunflower (Helianthus annuus L.) is the third most important oil seed crop in the world next soybean and groundnut. Although believed to have originated in north America and the other major sunflower producing countries are Argentina, Ukraine, USA, Romania, Spain, South Africa, Chile, France, USSR, Canada, Bulgaria and Turkey.

Karnataka, Maharastra and Andhra Pradesh are the major sunflower producing states. It is also grown in Punjab, Haryana, Tamil Nadu, Uttar Pradesh, Bihar and West Bengal.

Sunflower leaves are phototropic and will follow the sun's rays with a lag of 120 behind the sun's azimukh. This property has been shown to increase light interception and possibly photosynthesis. Sunflower belongs to family compositeae (Asteraceae) and genus Halianthus. It is meal rich in protein and vitamin B complex.

Gibberellic acid is very important hormone whose natural occurrence in plants controls their development. Since GA_3 regulates growth, application of very low concentration can have a profound effect.

Materials and Methods

Certified seeds of different CV. Has been obtained from Agronomy Department of G.B. Pant University of Agriculture and Technology, Pant Nagar (U.A.) and I.A.R.I., Pusa, New Delhi. GA_3 obtained from Central Drug House (P) Ltd., New Delhi. The seed germination experiment was carried out in plant physiology lab, Department of Botany, Hindu College, Moradabad (U.P.) during summer March, 2010. The optimum temperature for germination is 30.7^0C to 35^0C and it does not germinate below 15.6^0C. first the solution of GA_3 are prepared in different concentration for ambinition/ soaking. The seeds were sterilized with 0.1% $HgCl_2$ (Mercuric chloride)for 5 minutes and selected for experimentation and after this are soaking for 12 hours at 10, 25, 50, 100, 200, 400 and 800 ppm level. After soaking seeds transferred, in to petriplate for germination and all petriplate kept in B.O.D. at room temperature ($30\text{-}35^0$C). 10 seeds of each treatment were counted for one replication. All the treatment will be three replicated and 10 uniform size seed after also in control. Regular and uniform moisture is maintained by distilled water. The first germination count was taken after 8^{th} days and after 15^{th} days of soaking. Effect of Ethephon (2-chloroethyl phosphonic acid) on germination and seedling growth of okra (Abelomoschus esculanthus (L.) Moench.) cv. Parbani Kranti. Singh and Bhatanagar (2009). Interaction studies of phenols and GA_3 on early seedling growth of Cajanus cajan (Tayal and Sharma, 1981).

Due to greater variation in the data is some of the treatments the critical difference was worked out (Panse and Sukhatma, 1967).

Results and Discussion

Effect of germination percentage

Germination percentage very effective at 100, 200 ppm level 78.34, 79.18% in 8^{th} days and 83.34, 86.30% in 15^{th} days respectively and after this higher concentration (400, 800 ppm) level germination percentage decrease. Shown in Table 1.

Effect of seedling height

The maximum seedling height in 8^{th} days at 100 and 200 ppm level 16.33 and 17.32 cm respectively and 15^{th} day at 100, 200 ppm 19.56 and 20.32 cm

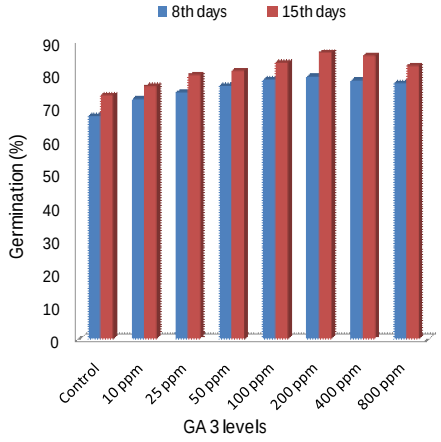

Fig.1: Germination percentage in different concentration of GA_3

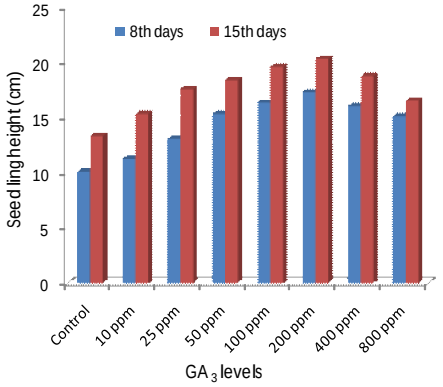

Fig. 2: Seedling height in different concentration of GA_3

Table 1: Effect of GA_3 on germination percentage at different concentration on seeds of sunflower

Hormone (GA_3)	Germination (%) 8th days	15th days
Control	67.34	73.48
10 ppm	72.35	76.38
25 ppm	74.31	79.65
50 ppm	76.45	80.91
100 ppm	78.34	83.34
200 ppm	79.18	86.39
400 ppm	78.10	82.33
800 ppm	77.31	82.33
CD at 5%	3.77	4.04

Table 2: Effect of GA_3 on seedling height (cm) at different concentration on seeds of sunflower

Hormone (GA_3)	Seedling height (cm) 8th days	15th days
Control	10.11	13.35
10 ppm	11.25	15.32
25 ppm	13.10	17.58
50 ppm	15.32	18.36
100 ppm	16.33	19.56
200 ppm	17.32	20.32
400 ppm	16.01	18.73
800 ppm	15.11	16.53
CD at 5%	0.71	0.87

respectively. The lower and higher concentration of GA3 seedling hight is decreases as shown in Table 2.

Conclusion

Based on the present study, the following conclusion could be drawn. The middle concentration of GA_3 was best for seed germination and seedling hight. In lower and higher concentration of GA_3 decrease the germination percentage and seedling height.

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Opinion of trainees regarding various training programmes of K.V.K., Awagarh

RAJEEV CHAUHAN, J.P. SINGH[1], AND SUSHMA SINGH[1]
Programm Assistent, R.V.S.K.V.V., Krishi Vigyan Kendra, Shivpuri (M.P)

Abstract

In this research article an emphasis was made to generalize the opinion of the trainees regarding training programmes organized by the K.V.K. staff members of Awagarh, District Etah. For this purpose one hundred twenty trainees from C.D. Block, Awagarh covering 4 villages were selected purposively. The trainees were asked varieties of questions regarding different aspect of training programmes running in the KVK. The responses made by the trainees constitute their opinion. The dimension on which opinion was derived were, duration, timeliness teaching method, usefulness of training course, contents, boarding and lodging facilities. The study concludes that 60 per cent trainees considered training as adequate, 65% respondents observed training programmes held in time, 55 per cent were of the opinion that teaching methods need was most useful to them, 65% trainees expressed training programmes as very useful, about 75% trained were satisfied with facilities of lodging and boarding during training programmes. A very high majority i.e. 85% respondents have considered course content was adequate. In nutshell, the overall results emphasize that the training programmes organized by KVK, Awagarh was somehow found to be satisfactory level.

Introduction

Training has gained wide acceptability for upgrading the professional competence of different levels of farmers. The training scheme as a whole seems to be the gigantic one. The main objective of the training programme is to develop skill and related knowledge of the farmers in a shortest period enabling them to utilize the agricultural technology for higher production effectively. Training of farmers have been accepted as a very important activity of extension programme since the introduction of new strategy of agricultural programme in India.

An efficient training programme capable of timely dissemination of need based farm technology among farming communities is of paramount importance for achieving sustained growth in agriculture. Inspite of the diffusion and acceptance of the other aspects training is equally important to the farmers, extension workers, planners and policy makers with regard to job, duties and responsibilities with the help of organizing proper training programme. The problems, doubts, questions and thoughts can be clearly understood, clarified and thus the efficiency of the participants (trainees) can be increased. The importance of training cannot be ignored in the era of fast role of technology transfer. Farmer is the crucial element that can bring increased food production at the rapid race. When the scientific research in agriculture is moving fast and practically every month new practices, machinery and varieties of different crops are coming to light, it is essential that the farmers are in constant touch with latest agriculture know-how by way of having systematic and planned education.

Training of farmers on an institutional basis was started in India with the introduction of high yielding varieties in the year 1966-67 (Green Revolution era), thereafter White, Blue and Brown Revolution came across. These revolutions directly or indirectly are supported by National, State and Regional Training Institutes/centers. In these sequences K.V.Ks also came into practice and now played a vital role in TOT.

Besides TOT, the KVK's now regarded as one of the prominent institution facilitating all types of Agro-technical know-how farming situation. Thus it has multifarious activities in multi disciplinary specially at the field of Agriculture and allied aspect. Therefore, the present study was undertaken with the specific objectives to know the general profile and their opinion regarding training programmes imparted by KVK staff of Awagarh centre.

Material and Methods

The present investigation was conducted in C.D. Block, Awagarh, district Etah of Uttar Pradesh. In order to get the opinion of trainees about K.V.K., Raja Balwant Singh College, Awagarh, district Etah (U.P.) was selected purposively. Four Nyay Panchayats from C.D. Block, Awagarh were selected viz., Pondary, Jinaoli, Mudhsoma and Noohkhod. The trainees of these four villages were drawn on the basis of maximum numbers of trainees. For the final selection of respondents a

[1] Deptt. of Agril. Extension, R.B.S. College,Bichpuri,Agra.

comprehensive list of all those villages from where maximum number of farmers participated in the training programme during 2003-2004 were obtained from the K.V.K., R.B.S. College, Awagarh, Etah. One hundred twenty respondents were drawn randomly. The primary data were collected by personal interview method by using a well structured interview schedule, which was pre-tested and designed according to local dialect. The analysis was done simply on percentage basis.

Table 1 : Showing socio-economic characteristics of trainees (respondents)

Characteristics	Frequency	%tage
(a) Age		
1. Below 25 years	84	70.00
2. 26 to 50 years	24	20.00
3. Above 50 years	12	10.00
(b) Caste		
1. High caste	72	60.00
2. Middle caste	30	25.00
3. Lower caste	18	15.00
(c) Education		
1. Illiterate	24	20.00
2. Up to Primary	12	10.00
3. Middle	24	20.00
4. High school	36	30.00
5. intermediate and above	24	20.00
(d) Size of holding (ha)		
1.Small (up to 2 ha)	84	70.00
2. Medium (2 to 5 ha)	24	20.00
3. Large (above 5 ha)	12	10.00
(e) Income (Rs.)		
1. Below Rs 20000/-	54	45.00
2. Rs 20000/- to Rs 40000/-	30	25.00
3. Rs 40000/- to Rs 60000/-	18	15.00
4. Rs. 60000/- to Rs 80000/-	12	10.00
5. Above Rs 80000/-	06	5.00
(f) Size of family		
1. Up to 5 members (small)	48	40.00
2. 5 and above (medium to large)	72	60.00
(g) Type of family		
1. Single	72	60.00
2. Joint	48	40.00
(h) Social participation		
1. Participation in organisations	36	30.00
2. No participation in any organisation	84	70.00
(i) Farm power		
1. Having draught animals	70	58.33
2. Not having draught animals	50	41.67
(j) Milch animals		
1. Buffaloes	18	15.00
2. Cow	16	13.33
3. Goat	14	11.67
4. Buffaloes and cow	54	45.00
5. Buffaloes and goat	06	05.00
6. Buffaloes, cows and goat	12	10.00

Results and Discussion

Table 1 clearly reveals that majority of respondents i.e. 70% each belonged to the age group of below 25 years, have small size of holding (up to 3 ha) and had no participation in any organization. Of the total 120 respondents, 60 per cent of them belong to high caste, came from single family and have 5 and more members in their family. Majority i.e. 58.00 per cent respondents have drought animals while 70% respondents have annual income up to Rs.40000/ and 45 per cent respondents buffaloes and cows as milch animals. Similar findings have also been observed by Sharma et al. (1995-96).

Table 2: Opinion of the trainees about various aspects of training programme

Opinion	Frequency (N = 120)	%tage
1. Opinion of trainees about duration of the training		
i. Adequate	72	60.00
ii. Inadequate	48	40.00
2. Opinion of trainees timeliness of the training programm		
i. Fully satisfied	78	65.00
ii. Partially satisfied	42	35.00
iii. Not satisfied	-	-
3. Opinion of trainees about teaching method used during training period		
i. Most appropriate	66	55.00
ii. Appropriate	42	35.00
iii. Not appropriate	-	-
4. Opinion of trainees about usefulness of training programme		
i. Very useful	78	65.00
ii. Useful	42	35.00
iii. Somewhat useful	-	-
5. Opinion of trainees about course content covered during training period		
i. Adequate	102	85.00
ii. Partially adequate	18	15.00
iii. Inadequate	-	-
6. Opinion of trainees about loding facilities during training period		
i. Most appropriate	42	35.00
ii. Appropriate	48	40.00
iii. Inappropriate	30	25.00
7. Opinion of trainees about boarding facilities during training period		
i. Most appropriate	24	20.00
ii. Appropriate	84	70.00
iii. Inappropriate	12	10.00

Table 2 shows that 60.00 per cent respondents had expressed that duration of the training was adequate, whereas 40.00 per cent were of the opinion that duration of training period was inadequate. Similar findings were also observed by Sharma, K. (1983). Majority i.e. 65.00 per cent respondents were satisfied about the timeliness of the training, whereas 35.00 per cent were partially satisfied. The above facts are also supported by Panwar (1977). Majority 55.00 per cent and 35.00 per cent trainees were fully satisfied and expressed it as 'most appropriate' and 'appropriate'. Only 10.00 per cent respondents were not satisfied. Majority i.e. 65.00 per cent trainees viewed that training was very useful, while 35.00 per cent were of the opinion that it was useful.

Regarding course content, a very high majority i.e. 85.00 per cent respondents have reported that training period was adequate, while only 15.00 per cent felt that content was partially adequate. In case of lodging facilities only 35.00 per cent trainees were satisfied with lodging arrangement made during the training period and expressed as 'most appropriate' while 40.00 per cent trainees expressed their opinion as 'appropriate', the rest 25.00 per cent trainees were dissatisfied with loding arrangement. Majority i.e. 70.00 per cent trainees were satisfied with the boarding facilities and they considered as 'appropriate' while 20.00 per cent and 10.00 per cent trainees opined regarding boarding facilities as 'most appropriate' and 'not appropriate' respectively.

Conclusion

On the basis of above the study concludes that 'majority i.e. 70% respondents each belonged to the age group below 25 years, have small size of holding (up to 2 ha.) and had no participation in any organization. Most of the trainees were fully satisfied with duration of the training programmes. Those who were not satisfied, they wanted to extent it for 5 days. Most of the participants were fully satisfied with the teaching method used during training period. Course content used during training period was adequate enough. Regarding lodging and boarding facilities, most of the trainees were fully satisfied.

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A study of the impact of the developmental programmes on scheduled caste women in the rural area

YATENDRA PAL SINGH AND NEERAJ KELKAR
Research Scholar, Deptt. of Business & Administration, R.B.S.College, Agra

Abstract

Empowerment involves a structural dimension including policy, legal and institutional elements as well as accountability by state and individual dimension designed to equip individuals and groups to claim their rights. Gender discrimination is now recognized as a fundamental denial of human rights. However Women have been given plenty of rights and privileges in the Constitution, Legislation, Acts and Statues, but in actual practice they are deprived of even ordinary rights and privileges and the condition of Scheduled Cast women is more miserable. By the end of 19th century, things had changed considerably. This produced a good number of women at each important centre. They were conscious to their right and sought to promote their right intersect. Thus in the 20th century the development of women became a high priority area. Government and non-government efforts were intensified for their upliftment. The present study is essentially an attempt to assess the impact of developmental programmes on Scheduled Caste women in rural society.

Introduction

Economic empowerment for women and girls help in enhancing women's ownership and control over productive resources, access to market, and movements up the production and market value chain is secure and sustainable base. Economic empowerment involves recognizing and valuing women's paid and unpaid work equally with men's at all levels of society. Ushvinder Kaur Popli remarks that Economic empowerment also involves building the capacity of the woman producers and entrepreneurs in product development, production process, business and financial development, ensuring access to and use of information and marketing, including the ability to effectively respond to market change. It also includes enabling women to recognize and claim their economic rights, including the rights to sustainable livelihood, access to skill, information and market in accordance with international human rights instruments and relevant international labor conventions. Pais (2004) clears that when India became an independent nation, among several other problems, it confronted the problem of social and economic backwardness of some section of people. Such backwardness was primarily due to lack of education among them. In another study (2007), He again said that it was believed that with the spread of education among different section of the population, not only would several social evils eventually disappear, but it would also enable the SC and OBC to get better employment opportunities. The government of India tried to impart education and creat such facilities for their social and economic uplift.

Development programmes mean the programme devised by the state to improve the socio-economic conditions of any section of population or area. In essence there are wide ranging efforts and provisions for Scheduled Caste women on the part of the government for raising their socio-economic status and level of participation and ensuring social justice. The development of scheduled caste women does not imply only their economic development which can be assessed in terms of a few quantitative measurable variables like income, employment, assets, productivity etc. but also includes their development. Bikram K. Patnaik in Empowerment of women and rural development shows that employment of women is higher in rural areas than in urban areas (1977); a socio-economic analysis of the role of women in agriculture Shashikant Verma shows the increasing strength of women workers in the field (1992). Prasad (2006) the International Fund of Agriculture Development (IFAD) is working closely with the government to improve the lives of rural women and other vulnerable groups particularly the scheduled caste and scheduled tribes. Rippen (2007) A strategy which seeks to change social altitudes for women, improve their self perception, foster economic empowerment and education of women, upgradation of service for women would ensure a gender just society. Thangamani and Balan (2004) concluded that the government has given special importance to women enterpreneuship development activities through the five year plans. Sirkar (1987) maintains that the bulk of women workers is in agriculture and allied activities. How rural women have been actively participating in productive activities. Non-government organization is becoming more and more militant as developmental practitioners; they are looked

as a mobilisers, transfers and catalysts in society (Suresh 1998). Dev (2000) discloses the greater role of non-government organizations in developmental programmes for self dependence and enterpreneunership. The present study was undertaken.

A. To examine the impact of developmental programmes on scheduled caste women.
B. To judge their awareness level regarding developmental programes and
C. To assess the role of non-government organizations in uplifting the condition of scheduled cast women.

Research methodology

The present study was conducted during the month of August 2010 in Agra town. The rural area has been deliberately selected with the rightful assumption that the women are found predominantly in Saiyan Block of Agra district. A sample of 150 was selected through proportionate random sampling techniques and the investigator himself collected data with the help of pretested interview scheduled. The statistical measures which have been used in this study were percentage and average.

Results and Discussion

The level of participation of any section of the society happens to be an indicator of development of that section. In fact development and participation are two very closely related phenomenons. The former is the process while the later is the result. Since the development is a continuous process, the result is also not a discreet one.

In aforesaid table 1, it is easily observed that Jatav acquired maximum (61.33) advantages of reservation policy in the categories of jobs. Their representation is almost uniformly beneficiaries of reservation policy. Their representation of 6.52% in central service grade I, 8.69% in state administrative sources of grade I and as high as 14 out of 92 (15.22%) and 13 out of 92 (14.13%) in higher banking services and medical services/ practitioners respectively shows that the jatavs have been able to make maximum advantages of reservation. Their number is large also in the service of Public Sector Undertaking (PSUs) where they are 5 out of 92 (i.e. 5.43%) and more in higher grade teaching jobs where they are 20 out of 92 i.e. 82.74%. It is Rajak who have been second major beneficiaries of reservation policy. Their number is 32 out of 150 (i.e. 21.33%). Balmiki (3.33%) are the most backward community among scheduled castes followed by Khatiks (9.33%).

Table 2 reveals that the scheduled caste career women feel that the special recruitment drives were greatly helpful in finding employment for them. They believe that the Appointing Authorities are always biased against scheduled cast and scheduled tribes, they are not selected if they deserve. They, however, came to believe that under special recruitment drives there were no chance of any one b0eing biased against them since they had no choice between scheduled caste and non-scheduled caste.

Table 3 is a very important table to study the political awakening and participation of the respondents of our sample. This table shows that out of 150 respondents 69 (46.67) respondents had an independent outlook as regards the casting of votes. They can cast their votes even against the wishes of the male members of the family. But there is a lot of difficulty in finding this fact with accuracy and precision. When asked whether the respondents were members of any political party, sister organizations or have a strong independent commitment to any political party the answer was in alternating form 85 or 56.67% of respondents out of 150 respondents replied positively while 72 or 48.00% negatively and 22 i.e. 14.66% gave no certain answer. As regards the third question related to the plan of contesting election for any office, most of the respondents were uncertain. As many as 56 or 37.33% of respondents said that they could not reply to this question with a certain answer. Contrary to it 40 said that coming across the opportunity they could contest in the election but a greater number 51 or 34.00% ruled out any such possibility or nursing any such ambition.

Table 1: Showing clockwise distribution of taking benefit of reservation in employment.

Category	Total No.	Jatav	Rajak	Khatik	Balmiki	Others
1st Grade Admistration Job of Central Govt.	9(6.00)	6(6.52)	2(6.25)	1(7.14)	0	0
F. G. A. J. of the State Govt.	12 (8.00)	8(8.69)	2(6.25)	0	0	2 (28.57)
Higher Banking Service	22 (14.67)	14 (15.27)	5 (15.62)	1(7.14)	1(20.00)	1 (14.28)
Medical Service/ Practioners	22 (14.67)	13(14.13)	4(12.5)	2 (14.28)	2(40.00)	1 (14.28)
Para Medical Services	30 (20.00)	18(19.56)	7 (21.87)	3 (21.42)	1(20.00)	1 (14.28)
Higher Grade Teaching Job	26 (17.33)	20(21.74)	3(9.37)	2 (14.28)	0	1 (14.28)
Public Sector Undertaking	10 (6.66)	5(5.43)	3(9.37)	1(7.14)	1(20.00)	0
Lawyers (Engaged/ Practiioners)	6 (4.00)	3(3.26)	2(6.25)	1(7.14)	0	0
Engineers & Technocrates	4(2.66)	2(2.17)	0	2(4.28)	0	0
Others	9 (6.00)	3(3.26)	4(12.5)	1(7.14)	0	1 (14.28)
Total	150 (100.0)	92(61.33)	32 (21.33)	15(9.33)	7(3.33)	7(4.67)

The simple conclusion of the table is that the participation level of the respondents is sufficiently high.

Table 2: Showing Distribution of Opinion Regarding Benefit Drawn Special Recruitment Drive

S. No.	Opinion	No. of Respondants	Percentage
1	Very Highly Beneficial	112	74.67
2	Highly Beneficial	18	12.00
3	Moderate Beneficial	9	6.00
4	Little Benefited	5	3.33
5	Insignificant Beneficial	6	4.00
Total		150	100.00

Table 3: Showing Distribution of Respondents regarding Political Participation in Response to Certain Statement

Statement	Yes	No	Uncertain
Free to Vote	69 (46.67)	88 (58.67)	23(15.33)
Member political party	85 (56.67)	72(48.00)	22(14.67)
Tthink/plan to contest elections	40 (26.67)	51(34.00)	56(37.33)

Table 4: Showing Distribution of the opinion of the Respondents regarding Performance of Leadership Training Imparting to the scheduled caste women by Non-Government Organizations.

Opinion	No.	CN	CN%	C%
Very Effective	4	4	2.67	2.67
Effective	27	31	18	20.67
Moderately Effective	32	63	21.33	42.00
Little Effective	60	123	40	82.00
Insiginificantly Effective	27	150	18	100.00
Total	150		100	

Table 5: Showing Distribution of Opinions of the respondents regarding Efficacy of the Employment Training Programmes run by Non-Government Organization.

Sl. No.	Opinion	No.	CN	%	CF
1	Very Highly Useful	8	8	5.33	5.33
2	Highly Useful	39	47	26	31.33
3	Useful Normally	41	88	27.33	58.66
4	Little Useful	56	144	37.33	95.99
5	Non-effective	6	150	4	100.00

Table 4 shows that the role of Non-Government Organization has not been highly effective. 4 (2.67%) out of 150 respondents highly praised the role of NGOs while 27 of 150 or 18.00% recognized it as effective only. Out of the total 32 respondents opined that the efforts of NGOs have been moderately effective. Out of total 150 respondents 27 or 18.00% and 60 or 40.00% claimed that the role of Non-Government organization has been insignificantly effective or little effective.

Table 5 reveals that 8 or 5.33% believe that the employment training programmes have been very highly effective and 39 or 26.00% endorse the same view, saying that they have been highly effective. Out of total 150 respondents 41 or 27.33% believe that such programmes are normally useful, while 6 respondents said non-effective or insignificantly useful.

Conclusion

It may be concluded that these privileged sections among underprivileged sections have been economically socially and politically so powerful that they resist any kind of move. They do not actually allow any deliberation or debate on it. Among all the respondents of all sub-castes the Jatavs are much better off than the others. Social participation and involvement has an interesting and penetrating analysis shows that now the impediments of social interaction and social inter-mixing among scheduled castes and non-scheduled castes is phasing out very fast. The study also clears that NGOs have not been able to make much headway in promoting the interest of scheduled caste career women.

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