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Study of some Ethnomedicinal plants of family- Papilionaceae and Euphorbiaceae at Narsinghpur district of Madhya Pradesh

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Abstract

An ethnobotanical study was undertaken to collect information from traditional healers on the use of medicinal plants in Gadarwara, Narsinghpur district of Madhya Pradesh during August to December 2008. The study area concentrates in and around the Satputha Hills, which comes under reserved forest. The indigenous knowledge of local traditional healers and the native plants used for medicinal purposes were collected through questionnaire and personal interviews during field trips. In the present paper 31 plant species belonging to family Euphorbiaceae and Papilionaceae used in folk medicine have been documented. Due to poor condition of modern healthcare facilities and poverty, indigenous people of the area fully or partially depend on local medicinal plants. The documented medicinal plants were mostly used to cure skin diseases, cold, fiver, cough, headache, diarrohea, stomach, anemia and jaundice. An attempt has been made to document traditional knowledge from the tribals group of study area of Gadarwara on the treatment of various diseases enumerated.

Key words: Ethnomedicinal Plants, Euphorbiaceae, Papilionaceae diseases, Tribals

Introduction

The ethnic and rural people of India have preserved a large bulk of traditional knowledge of medicinal uses of plants growing around them. Plants have been used in traditional medicine for several thousand years Abu-Rabia (2005). The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani and Siddha. In India, it is reported that traditional healers use 2500 plant species and 100 species of plants serve as regular sources of medicine Pei (2001). In India, the ayurvedic system of medicine has been in use for over three thousand years. During the last few decades there has been an increasing interest in the

study of medicinal plants and their traditional use in different parts of the world Lev (2006) and Al-Qura'n (2005). Documenting the indigenous knowledge through ethnobotanical studies is important for the conservation and utilization of biological resources.Traditional medicine and ethnobotanical information play an important role in scientific research, particularly when the literature and field work data have been properly evaluated Awadh *et al.*, (2004). Today according to the World Health Organization (WHO), as many as 80% of the world's people depend on traditional medicine for their primary healthcare needs. India is one of the twelve mega-biodiversity countries of the World having rich vegetation with a wide variety of plants with medicinal value.India possesses a total of 427 tribal communities Kala (2005) and over 275 papers have been published on specific ethnic groups Jain (2001). There are considerable economic benefits in the development of indigenous medicines and in the use of medicinal plants for the treatment of various diseases Azaizeh *et al.,* (2003).

The objective of this study was to interact with local traditional healers and document their knowledge on medicinal plants of Euphorbiaceae and Papilionaceae their uses and the types of diseases treated etc. Gadarwara is one of the biodiversity richest places of Narsinghpur distict in Madhya Pradesh and the traditional healing systems are still popular here. The present-day traditional healers are very old. Due to lack of interest among the younger generation as well as their tendency to migrate to cities for lucrative jobs, wealth of knowledge in this the area is declining. So far no systematic ethnobotanical survey has been made in this area During the course of exploration of ethnomedicinal plants of the district, the information's have been gathered from the healers of rural villages found near forest areas where the people depend mostly on forests for their need and have sound knowledge of herbal remedies.

Materials and methods

Narsinghpur are old district of Madhya Pradesh. The total geographical area is 5138 Sq.k.m and total population 603480 approximately. The Narsinghpur

district divided into 5 Tahsil Narsinghpur, Gotegoan, Kareli, Gadarwara and Tendukheda. The present investigation has been carried out in the 5 site places of Gadarwara Tahsil scattered in villages (Imalia, Sujanpur, Ganeshnagar, Bhainsa, Mukunda and Baraha Bada). For a proper and orderly study, the study sites were selected considering the population and density of flora. The local informants selected are:- Village farmers, Old persons, Hakims , Vaidhayas , Gunias and Ojhas, Peoples working on field, Ayurvedic doctors and Experts in the field of Herbal Medicine.

During the course of study number of extensive and periodical surveys were conducted among the Gond, Bharia and Koru tribes, inhabiting the forest areas of Gadarwara, Narsinghpur district of Madhya Pradesh. Information pertaining to ethno medicinal uses of the plants was collected from the tribal physicians (vaidyas), tribal headman (mukhia), and Aged tribal and further confirmed with herbalists. The plants are enumerated alphabetically along with their botanical names, vernacular names, major uses, dosage and mode of administration for treating diseases. 31 plant species of the most commonly used herbal drugs in the region are described. An effort was made during field survey to record the local names exactly as it is pronounced by the tribal, the details about the made of application of drugs, the dosage, and preparation process of medicine were based on the information given by local medicine man and tribal.

Field Survey, Collection and Method of Recording of Ethno medicinally Important Plants

The selected sites were visited in twice a week .The field work and periodic collection of plants was conducted by using the guide line suggested by Schultus (1962) and Jain (1988). The standard methods of ethnomedicinal studies have been followed in present work as suggested by several workers like Jain and Mitra (1990) and Alkorn (1985), etc.

After carefully observation, information, on relevant questions were recorded. Discussions were made about the use of some plants of different days and different places with various groups. The collected plant materials were than critically studied and identified in laboratory by consulting literature Hooker (1872); Oommachan and Shrivastava (1996). The plant species were identified and systematically arranged in herbarium of Department of Botany, Govt. P. G. College Gadarwara for further studies.

Results and discussion

The present investigation comprises 31 species of ethnomedicinal plants belonging to family Euphorbiaceae and Papilionaceae. The results of the habitat of Ethnomedicinally important plants are presented in Table 1 and the plants are arranged in alphabetical order. For each species botanical name, family, local name, part used, administration and ailments treated are provided. Traditional healers are using these plants to cure diseases related to skin problem, cold, fiver, cough,headache, diarrohea, stomach, anamia and jaundice.

On the basis of the all plant species as shown in Table 01 they shows the variation in their habit, herb stands first position with 12 species, followed by shrub (8), tree (8) and climber (3) respectively in both the family. The most dominant plant habit of families are herbs (out of 31 plant study) such as *Acalypha indica, Desmodium gangetium, Desmodium triflorum, Dolichos lablab (L.), Euphorbia geniculata, E. hirta, E. prostrata, E. thymifolia, and Phyllanthus amarus*.

The present study also revealed the frequency of different plants used in the prescriptions it is observed that Leaf (26/31=84%) in the commonest plant part which is generally used as leaf juice, paste or powder. Further other parts of the plant used to cure diseases are Seed (24/31=80%), Stem (51%), Root (64%), Flower (35%) and Fruit (45%) in both the family (Fig. 1).

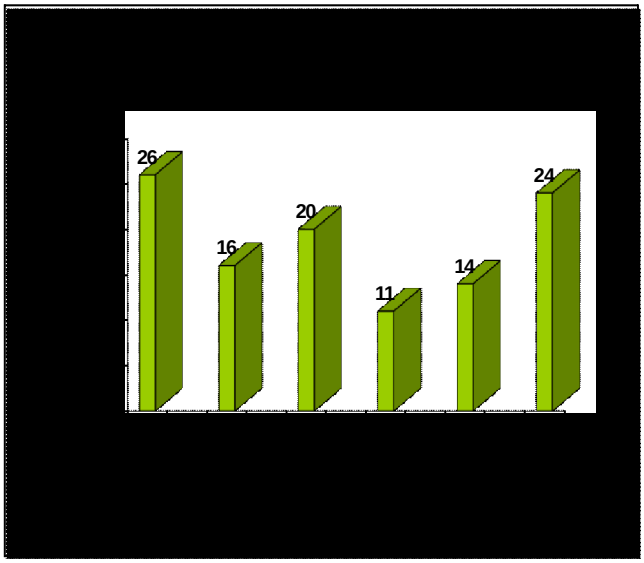
In the present study, it was realized that variations types of ailments are cured by the native tribals and local people of Gadarwara region using locally available plant species (Fig. 2). Following plants of Papilionaceae and Euphorbiaceae are used to cure wide ranges of diseases. The plants are *Acalypha indica* (skin, headache, stomach), *Butea monosperma* (Skin, Women, Fever, Diarrhoea, and Worms), *Euphorbia thymifolia* & *Jatropha curcas* (skin, stomach, diarrhoea), *Jatropha gossypifolia* (skin, liver, stomach), *Euphorbia geniculata* (skin, jaundice), *E. hirta* (skin, liver), *E. neriifolia* & *E. prostrata* (skin, stomach). *Jatropha curcas* (skin, liver, stomach, anaemia, diarrhoea) *Pterocarpus marsupium* and *Pongamia pinnata* (Skin, Fever, Diarrhoea, Cough and Cold), *Phyllanthus amarus* (skin, headache, liver, stomach, anaemia, jaundice, diarrhoea), *Phyllanthus emblica* (liver, stomach, anaemia, jaundice, diarrhoea), *Phyllanthus acidus* (liver, anaemia, diarrhoea), *Ricinus communis* (skin, headache, stomach and jaundice), and *Sesbania sesban* (Skin, Women, Diarrhoea, Cough and Cold).

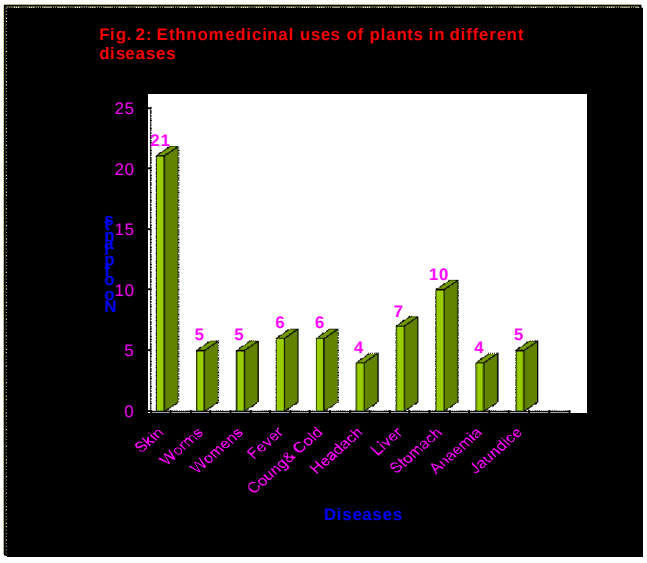
Some times they are used with other natural product like milk, honey, minerals etc. The most common method of preparing medicines is to make and by boiling the fresh or dry plant material in water. In some case the fresh plant material is reported to used as poultice or pounded and mode into paste. A pinch of salt, sugar, honey and pepper is common addictive during the application of medicines, for improving the test of the mixture. Some times dry parts are used as powdered form and in some case seed oil is extracted and is used singly or in combination of other herbs.

Common health problems in the sites of the study area were skin problems such as wounds, cuts, burns and skin diseases. Several studies have enumerated the

Table 1: Comparative study of habit of Ethnomedicinally Important Plants of Family Papilionaceae and Euphorbiaceae.

S. No.	Botanical Name	Local name	Habit			
			Herb	Shrub	Climber	Tree
1	*Abrus precatorius (L.)*	Ratti,Gumchi	-	-	+	-
2	*Acalypha indica (L.)*	Kuppi, Khokli	+	-	-	-
3	*Balisopermum montanum (Blume)*	Jangligota, Dantimul	-	+	-	-
4	*Butea monosperma (L.)*	Palas, Khakra	-	-	-	+
5	*Clitoria ternatea (L.)*	Aparjita, Badi sem	-	-	+	-
6	*Crotalaria juncea (L.)*	San	-	+	-	-
7	*Dalbergia latifolia (Roxb.)*	Black Sisum, Shisen	-	-	-	+
8	*Dalbergia sissoo (Roxb.)*	Shisham	-	-	-	+
9	*Desmodium gangetium (L.)*	Chuppa	+	-	-	-
10	*Desmodium triflorum (L.)*	Kudaliya	+	-	-	-
11	*Dolichos lablab (L.)*	Sem, Semi	+	-	-	-
12	*Euphorbia geniculata (Ortg.)*	Dudhi	+	-	-	-
13	*Euphorbia hirta (L.)*	Dudhi	+	-	-	-
14	*Euphorbia neriifolia (Roxb.)*	Thor	-	+	-	-
15	*Euphorbia prostrata (L.)*	Chottidudhi	+	-	-	-
16	*Euphorbia thymifolia (L.)*	Chottidudhi	+	-	-	-
17	*Jatropa curcas (L.)*	Safedarand, Ratanjot	-	+	-	-
18	*Jatropha glandulifera (L.)*	Janglierandi	-	+	-	-
19	*Jatropha gossypifolia (L.)*	Lal berenda	-	+	-	-
20	*Mallotus philippensis (Lam.)*	Siniduri, Roini, Kamala	-	-	-	+
21	*Mucuna pruriens (L.)*	Kaunch	-	-	+	-
22	*Phyllanthus acidus (L.)*	Chalmeri	-	-	-	+
23	*Phyllanthus amarus (Schum.)*	Jaramla	+	-	-	-
24	*Phyllanthus emblica (L.)*	Amla, Aola	-	-	-	+
25	*Phyllanthus maderaspatensis (L.)*	Kanocha	+	-	-	-
26	*Psoralea corylifolia (L.)*	Bachudi	+	-	-	-
27	*Pongamia pinnata (L.)*	Karanij, Kanji	-	-	-	+
28	*Pterocarpus marsupium (Roxb.)*	Bijasar, Bijo	-	-	-	+
29	*Ricinus Communis (L.)*	Arandi, Andi	-	+	-	-
30	*Sesbania sesban (L.)*	Jait, seh	-	+	-	-
31	*Tephrosia purpurea (L.)*	Sarphonka	+	-	-	-
	Total		12	8	3	8





plants used for wound healing and skin diseases in various parts of the world. Chah *et al.*, (2006) reported 16 plant species that were used for respiratory diseases in north Iran and safety and efficacy of the treatments for respiratory track infections were reviewed Coon & Ernst (2004). Common ailments such as headaches or coughs are considered to be diseases with natural causes and hence their symptoms are treated at the household level, without resource to magical practices Busia (2005). Muthu *et al*., (2006) investigated that, the traditional healers used 85 species of medicinal plants distributed in Kancheepuram district of Tamil Nadu to treat various diseases such as skin, stomach, nervous disorders and poison bites.

Earlier studies on traditional medicinal plants also revealed that the economically backward local and tribal people of Madhya Pradesh prefer folk medicine due to low cost and sometimes it is a part of their social life and culture (Kurmi 2007). It is evident from the interviews conducted in different villages; knowledge of medicinal plants is limited to traditional healers, herbalists and elderly persons who are living in rural areas. This study also points out that certain species of medicinal plants are being exploited by the local residents who are unaware of the importance of medicinal plants in the ecosystem.

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Impact of Input Resources on Physical Parameters at post harvest of Chickpea in Rice- Chickpea Cropping Sequence in Vertisol

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Abstract

The Experiment was conducted at the Research live stock farm of Department of Soil Science and Agril. Chemistry, J. N. Krishi Vishwa Vidyalaya, Jabalpur, during kharif season of 2002-03 in Typic Haplusterts. The trial was laid-out in a factorial RBD, with three main treatments which were I_2 (100% NPKS based on soil test and the optimum level of inputs), I_1 (75% NPKS based on soil test and the moderate level of inputs), I_0 (50% NPKS based on soil test and the minimum level of inputs), which was further divided in nine sub treatments, namely S_1 consisted of 100% dose as per main treatment and through inorganic source only were as S_2, S_3 consisted of 75% and 50% of the prescribed dose through inorganic source + FYM @ 5 t ha^{-1}. Subsequently, the bio inoculants (BGA & Rhizobium*) individually and both were included in S_4, S_5 & S_6 treatments. Other combinations include the applications of Zn & Mo in S_7, S_8 and S_9 treatments. S_7 includes the application of Zn @ 10 kg $ZnSO_4$ ha^{-1} and S_8 Mo @ 0.5 kg $(NH_4)_2 MoO_4$ ha^{-1}. Chickpea (JG-315) was sown. Soil Physical parameters were observed after chickpea crop. The conjunctive use of organic and inorganic fertilizers along with biofertilizers and micronutrients gave lowest bulk density, improved infiltration rate and better aggregation as compared to other input treatments. The optimum moisture regime showed significant difference in case of physical parameters.*

Key words: Resources Physical parameter, Rice- chickpea sequence

Introduction

Physical characteristics of a soil is essential for scheduling agricultural operations and preparation of any management strategy in water conservation, irrigation scheduling, drainage and solute migration and development of various hydrological models (Singh et al. 1988,1992 ; Singh and Bhargava 1994; Singh and Kundu 2005).

Information of the physical properties of soil may help in formulating improved water management strategies and contingency crop planning for irrigated as well as unirrigated areas for improving the prospects of yield enhancement and stabilization in this region therefore resources integration plays an important role for improvement of physical properties (Bulk density, Aggregation and Infiltration rate) of soil. Keep this in view; the study was planed to impact of input resources on physical parameters.

Materials and Methods

The present investigation was carried out during *Kharif* & *Rabi* seasons of 2002-2003. Rice crop was grown during *Kharif* season and Chickpea crop in *Rabi*

Table 1: Treatment details

Sub-treatments	Main treatments (NPKS kg ha^{-1})		
	I_1 **(1 irrigation) with** (40:62.50:20:46.85)	I_2 **(2 irrigations) with** (60:93.75:30:70.28)	I_3 **(3 irrigations) with** (80: 125:40:93.7)
S_1	50% NPKS	75% NPKS	100% NPKS
S_2	75% NPKS of S_1 + FYM (5t ha^{-1})	75% NPKS of S_1 + FYM (5t ha^{-1})	75% NPKS of S_1 + FYM (5t ha^{-1})
S_3	50% NPKS of S_1 + FYM (5t ha^{-1})	50% NPKS of S_1 + FYM (5t ha^{-1})	50% NPKS of S_1 + FYM (5t ha^{-1})
S_4	S_2 +BGA (@ 10 kg ha^{-1}/1.5 kg ha^{-1} *Rhizobium* to chickpea)	S_2 +BGA (@ 10 kg ha^{-1}/1.5 kg ha^{-1} *Rhizobium* to chickpea)	S_2+BGA (@ 10 kg ha^{-1}/1.5 kg ha^{-1} *Rhizobium* to chickpea)
S_5	S_2 + PSB (@ 1.5 kg ha^{-1})	S_2 + PSB (@ 1.5 kg ha^{-1})	S_2 + PSB (@ 1.5 kg ha^{-1})
S_6	S_2 + PSB +BGA / *Rhizobium*	S_2 + PSB +BGA /*Rhizobium*	S_2 + PSB +BGA/ *Rhizobium*
S_7	S_6 + Zn (@ 2.1 kg ha^{-1})	S_6 + Zn (@ 2.1 kg ha^{-1})	S_6 + Zn (@ 2.1 kg ha^{-1})
S_8	S_6 + Mo (@ 260 g ha^{-1})	S_6 + Mo (@ 260 g ha^{-1})	S_6 + Mo (@ 260 g ha^{-1})
S_9	S_6 + Zn + Mo	S_6 + Zn + Mo	S_6 + Zn + Mo

season, respectively.

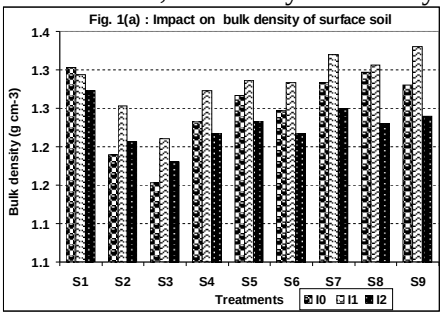
Rice crop (cv JR 201) was sown on July 7, (2002) and harvested on October 25, 2002. After harvesting of rice, the chickpea crop (cv JG-315) was sown on December 4, 2002 and harvested on March 29, (2003). The experimental details are present in Table 1.

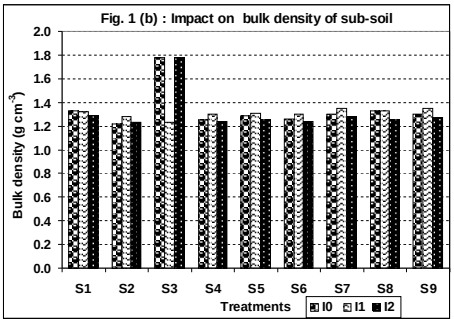
Under those treatments combination sulphur being added through single super phosphate and zinc sulphate was also accounted for.

Representative soil-samples were collected from experiment plots after the harvest of each crop. The soil samples for the estimations of bulk density were collected by undisturbed Core-Method (Richards, 1954) only from 0 to 15 cm and 15 to 30 cm soil layers after the harvest of chickpea crop. A fix volume of soil sample was collected with the help of a core sampler and its dry weight was recorded after drying at 105° C. The bulk density values were computed taking the ratio of the dry soil mass and its actual volume. The moisture content was considered as nearly uniform at the stage. Infiltration rate was measured *in situ* Pounding Method with double-ring infiltrometer method described by Haise *et al.* (1956). For aggregate analysis Surface (0-15 cm) and subsurface (15-30 cm) soil samples collected from each treatment were gently broken at their natural cleavage while air drying at room temperature and the water stable aggregates were estimated by the Yoder's wet sieving method (Yoder, 1936).

Results and Discussion

Soil bulk density, aggregation and water intake rate were evaluated in the present investigation considering them as the most sensitive soil physical parameters that should reflect the impact of any change in the soil physical constituents, which may dominantly affect soil productivity. The data pertaining to these three parameters were studies.





Soil bulk density:

The soil bulk density values for the surface and the sub-soil are illustrated in Fig. 1 (a & b). The data indicated that the bulk density values from different treatments of both soil layers (surface & sub-soil) differ significantly. The bulk density of surface soil layer was low and that of the sub-soil layer was marginally high. The highest value of soil bulk density of surface layer ranged between 1.33 g cm^{-3} to 1.15 g cm^{-3}. For sub-soil layer these values were 1.33 & 1.18 g cm^{-3}, respectively.

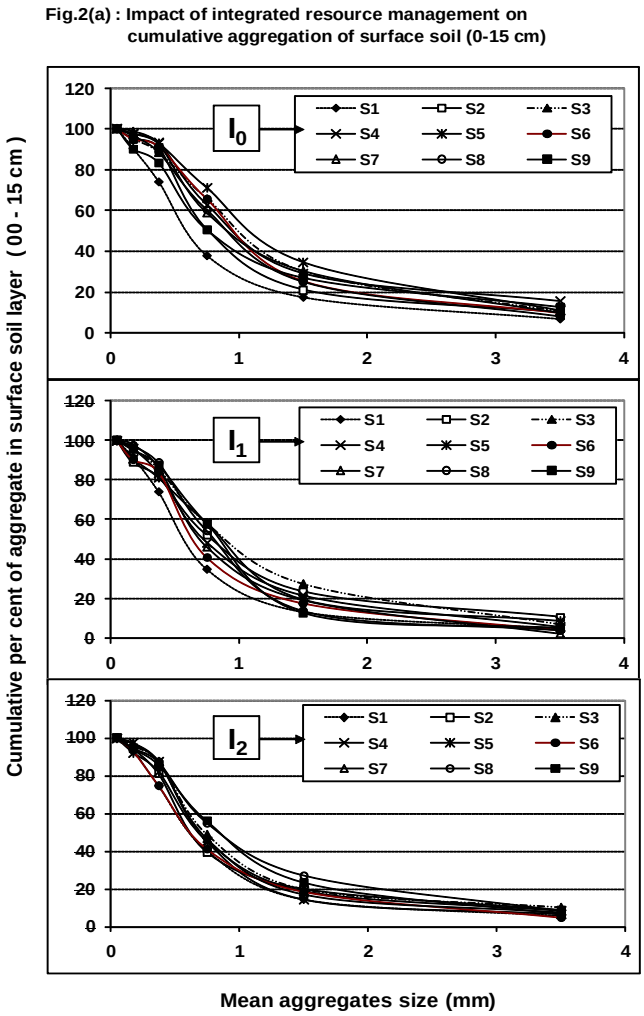
Further, the bulk density values in both soil layers were relatively higher under moderate soil moisture conditions with medium fertility levels. The minimum values were observed in low input conditions.

As regards the magnitude of values under different nutrients sources, the highest value was recorded if the nutrients source was only the inorganic fertilizers and minimum if the inorganic source and FYM was applied simultaneously. The impact of input resources was significant when the application of micronutrients was also integrated. Thus, the bulk density value for the plot, in which most of the input resources were integrated, was found significantly low (1.20 g cm^{-3}). Other treatments exhibited the intermediate conditions. A quite similar trend was recorded from the sub-soil layer under study. This was attributed to the addition of organic matter to the soil that helped in the maintenance and improvement of soil aggregation as well as its porosity, as reflected from the water infiltration rate of these treatments. Pawar (1980), Nambiar & Ghosh (1984), and Nimje (1986) have also reported similar observations.

Table 1 (a): Bulk density (g cm^{-3}) at 0-15 cm depth

Treatments	I_0	I_1	I_2	Mean
S_1	1.33	1.32	1.29	1.31
S_2	1.22	1.28	1.23	1.24
S_3	1.78	1.23	1.78	1.20
S_4	1.25	1.30	1.24	1.26
S_5	1.29	1.31	1.25	1.29
S_6	1.26	1.30	1.24	1.27
S_7	1.30	1.35	1.28	1.31
S_8	1.33	1.33	1.25	1.30
S_9	1.30	1.35	1.27	1.31
Mean	1.27	1.31	1.25	1.28
CD for Irrigation		0.0042		
CD for Nutrient		0.007		
CD for Interaction		0.012		

Additional improvement of integrated input management was also attributed to the addition of biomass through crop residues and the better biological & bio-chemical activities under these situations. Haynes and Naidu (1998) reported that the application of lime, fertilizer and manure causes improvement of soil physical



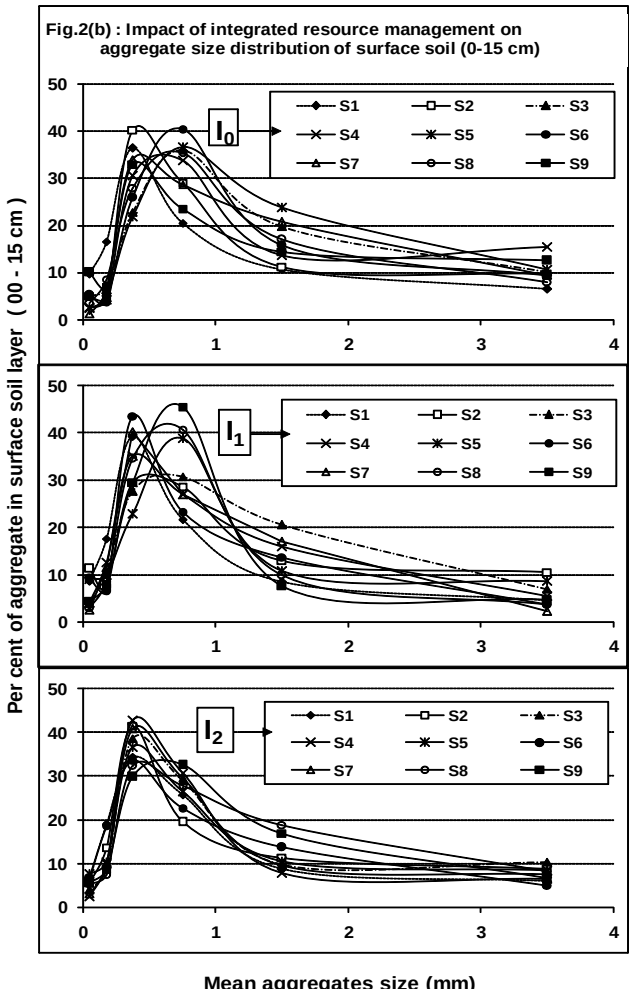


Table 1 (b): Bulk density (g cm^{-3}) at 15-30 cm depth

Treatments	I_0	I_1	I_2	Mean
S_1	1.30	1.29	1.27	1.29
S_2	1.19	1.25	1.21	1.22
S_3	1.15	1.21	1.18	1.18
S_4	1.23	1.27	1.22	1.24
S_5	1.27	1.29	1.23	1.26
S_6	1.25	1.28	1.22	1.25
S_7	1.28	1.32	1.25	1.28
S_8	1.30	1.31	1.23	1.28
S_9	1.28	1.33	1.24	1.28
Mean	1.25	1.28	1.23	1.25
CD for Irrigation	0.007			
CD for Nutrient		0.012		
CD for Interaction		0.021		

properties as it improve the water stable soil aggregation, infiltration rate and decrease soil bulk density.

Soil aggregation:

The data related to the impact of applied resources on soil aggregation are presented in Fig. 2 (a & b). It represents three levels of input resources as well as their different combinations.

The illustrations corresponding to the surface soil indicated that the changes in soil aggregation due to different levels of resources were marginal in case of high fertility (100% dose) and optimum moisture conditions. However, the impact on aggregate size distribution was more pronounced when the level of input resources were moderate to low (75% or 50% level, of the required dose). Zhu-Hz & Yao-XL (1993) also recorded similar results. They noted decrease in percent of bigger size aggregates only if inorganic sources of nutrients were used. It was attributed to the degradation of coarse aggregates by the impact of inorganic fertilizers, as also reported by Sengar (1990) and Singh (2002). Mishra and Sharma (1997) also reported improvement in soil aggregation due to application of organic manures.

Infiltration:

A water infiltration rate of each treatment plot was measured after the harvest of the rice crop. The data of the constant infiltration rate is given in Table 2. The data of constant infiltration rate indicated that the water intake rate was significantly improved if the input sources were integrated with in organic manures irrespective of the level of nutrients application. The infiltration rate was about 1 to 1.2 mm/hr under the treatments were only the

Table 2: Impact of integrated resources management on water infiltration rate (constant rate mm hr^{-1}) after chickpea

Treatment	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9
I_0	1.1	4.7	1.8	4.6	4.8	5.1	5.2	5.3	5.4
I_1	0.9	4.0	2.7	3.8	4.3	4.1	3.7	4.2	3.7
I_2	1.2	3.3	2.4	3.4	3.5	3.4	3.4	3.6	3.8
Average	1.1	4.0	2.3	3.9	4.2	4.2	4.1	4.4	4.3

inorganic sources were used. These values got raised to 2.7 to 5.4 mm/hr when the organic sources were used in combination to the inorganic sources. However, the impact of bio-inoculants on the infiltration rate, over the treatments receiving organic manures was not prominent.

The values of cumulative infiltration were relatively higher under I_0 and were minimum under I_2, which was at par with I_1 level. The lowest values of cumulative infiltration registered if only inorganic sources for the addition of nutrients were used. It was attributed to the partial degradation of bigger size soil aggregates with the impact of inorganic fertilizers as also supported from the soil aggregation size distribution data presented in Fig. 4 & 5.

The higher infiltration rate was recorded in all treatments at moderate level of application with FYM as in these treatments the soil aggregation was better. Rasende (1987) and Tiwari (1991) also reported increase of initial infiltration rate in clay soils due to applications of FYM along with the inorganic fertilizers.

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Studies on Budding Success in Aonla as Affected by Date of Budding and Environment

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Abstract

The length and diameter of rootstock, number of leaves, determinate and indeterminate shoot per plant were more in field grown rootstock than polythene bag. The percentage of bud-take bud-sprouted, length of scion, diameter of graft below union, number of determinate shoots and leaves, percentage of successfully budded plants were also more in field grown graft than those of polythene bags. The percentage of graft alive after establishment and marketable were more when the rootstock were raised in polythene bags. Rootstock should be raised in polythene bag and budded in June-July for obtaining the maximum survival and maximum number of saleable grafts in western U.P. conditions.

Key Words: Aonla (*Emblica officinals Gaertn),* environment, date of budding

Introduction

Aonla or Indian Gooseberry (*Emblica officinals* Gaertn.) is indigenous to India and thrives well throughout the tropical land sub-tropical climate of the country (Firminger, 1947). Recently, the cultivation of aonla is extending in western U.P., M.P. Rajasthan etc. due to its wider adaptability, high nutritive value, immense industrial importance and more profit on marginal and sodic soils as compared to other fruit crops. However, genuine plant materials of standard varieties are not available. Traditional procedure of raising aonla rootstock results in high rate of mortality while shifting rootstock from seed bed to nursery bed and even after transplanting of graft in the field. The problem is further intensified due to dry and climate with desiccating wind in May and June and dry weather in September-October in Agra region. The technique of budding in polythene tube in ber has been standardized by Pareek (1978a & 1978b). Kaundal *et al.,* (1984) reported that budding success was correlated with temperature and relative humidity during the following the period of budding in ber. This signifies the appropriateness of time of budding for a specific species, at a particular place. Middle of May to middle of August was the most appropriate for budding of aonla (Pathak *et al.*, 1991). No specific recommendation is available for Agra tract. With these considerations in view, an experiment was conducted at RBS College, Bichpuri, Agra to find out ideal date of budding of aonla and environment.

Materials land Methods

The trial was conducted with a view to find out the suitable duration of budding for raising aonla graft in polythene bag and field under Agra conditions. The plant material comprised four months old uniform seedlings raised in polythene bag measuring 25 cm x 15 cm and filled with a mixture of garden soil land leaf mould in equal proportion into which FYM, N, P and K was incorporated @ of 200 g, 200 kg, 80 kg and 80 kg per hectare respectively (56 g FYM, 1.04 kg Urea, 0.49 g and 0.37 g MOP per bag) 3 to 4 seeds which were already kept ;moist for 5to 6 days were drilled in each bag and covered with kans (*Saccharam spontenaum*) until the start of seedlings emergence. To provide proper space and to obtain heal their rootstock, bags filled with soil without seed were kept in between polythene bag rows. Seedlings were thinned out to one per bag after attaining an height of 15 cm and arranged in rows 30 cm apart to provide space. The seedlings were top dressed with urea @ 1.0 g per seedling at two month age.

For budding under field conditions, 45 days old seedlings were transplanted at 30 cm x 30 cm in a nursery bed which was fertilized with FYM, Nitrogen, Phosphorus and Potassium @ 200 q, 200 kg, 80 kg and 80 kg per hectare respectively. The rootstocks grown in field and bag were sprayed twice with 0.5 and 1.0% tresol at 2 and 3 months age respectively for inducing vigorous growth. The seeds sown on 12th February, 25th March, 15th April and 15 May in polythene bag and field were budded on 15th day of May, June, July and August respectively. The experiment was conducted randomized block design with three replications having 20 plant per net plot.

Results and Discussion

Health of rootstock

The health of rootstock at the day of budding in terms of length (cm) and diameter of rootstock (mm), number of leaves, determinate and indeterminate shoot per rootstock varied significantly on various dates of budding. The minimum value for these attributes of the

stock was noted in June budding and increased in subsequent months touching the maximum limit in September budding, though the age of rootstock on all the dates of budding was common i.e., four months (Table 1). The rootstock raised under field conditions were more vigorous and exhibited more values for the above growth attributes as compared to those of polythene bags.

Sprouting of scion bud

The days taken for sprouting of 1st scion bud was the lowest under the earliest date of budding and increased significantly on subsequent dates of budding. On the contrary, the percentage of bud-take and percentage of successfully budded plants were maximum in July budding and was followed by June, August and September budding in descending order (Table 2). Similar results were reported by Moti and Chaturvedi 1976 and Pathak *et al.,* 1991. Field condition proved superior than polythene bag with regard to percentage of bud-take, scion-bud sprouted and successfully budded plant.

Growth of graft

Health of the graft in respect of length (cm) and diameter of graft (mm) above and below the union, number of determinate shoots and leaves per graft at 10 weeks after budding were maximum in grafts budded in July which was followed by June, August and September in decreasing order (Table 3) Moti and Chaturvedi 1976 and Pathak *et al.,* 1991 also found better response from June and July budding. Hertmann and Kester (1972) and Kaundal *et al.,* (1984) opined that the budding success was correlated with temperature and humidity during and following the period of budding. Similarly the plants ;raised under field conditions were healthier as compared to those of polythene bags in above respects. Bhambhota and Singh (1971) advocated the raising of aonla rootstock in polythene bag and planting them for in-situ budding while Pareek (1978a & 1978b) reported that four month old rootstock of ber raised in polythene tube and budded in June become ready for transplanting in August.

Marketable graft

The graft raised infield were lifted, packed in jutti (*Saccharum spontenaum)* and placed in green house at 60 DAB alongwith the grafts raised in polythene bags for establishment studies for 15 days. The percentage of graft alive after establishment period and percentage of marketable plant raised in polythene bag was much more as compared to those raised in field. The percentage of

Table 1: Effect of environment and date of budding in aonla on the health or rootstock

Character studied	Environment	Date of budding									
		First year					Second year				
		D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
Length of root stock at the day of budding											
	E_1	82.94	110.28	115.46	127,47	109.04	87.35	106.87	118.02	131.32	110.89
	E_2	89.89	111.24	130.11	143.56	118.70	92.58	124.16	135.11	146.42	124.57
Mean		86.42	110.76	122.78	135.51	-	89.96	115.51	126.57	138.87	-
S.Em (±)	E	1.637	D	2.315	E x D	3.274	E	1.303	D	1.840	E x D	2.607
CD (5%)		4.537		6.416		NS		3.613		5.109		NS
Diameter of rootstock (mm) at the day of budding											
	E_1	7.24	7.55	8.02	8.57	7.85	7.41	7.59	8.22	8.35	7.89
	E_2	7.62	9.62	10.27	10.92	9.61	7.50	9.29	10.49	11.02	9.58
Mean		7.43	8.59	9.14	9.75	-	7.46	8.44	9.36	9.69	-
S.Em (±)	E	0.054	D	0.076	E x D	0.108	E	0.037	D	0.052	E x D	0.074
CD(5%)		0.150		0.212		0.299		0.102		0.144		0.204
Number of determinate shoot at the day of budding											
	E_1	50.71	60.32	71.29	113.26	73.89	52.52	62.544	73.81	115.42	76.05
	E_2	56.56	107.33	112.26	252.58	132.33	59.49	109.82	115.00	255.67	134.99
Mean		53.84	83.83	91.77	183.02	-	56.00	86.13	94.40	185.54	-
S.Em (±)	E	9.682	D	0.965	E x D	1.364	E	0.678	D	0.959	E x D	1.356
CD(5%)		1.891		2.674		3.781		1.879		2.657		3.758
Number of indeterminate shoot at the day of budding											
	E_1	0.00	0.92	3.39	5.51	2.46	0.00	0.99	3.78	5.92	2.67
	E_2	0.00	7.39	6.69	13.23	6.83	0.00	7.58	7.02	13.72	7.08
Mean		0.00	4.16	5.04	9.37	-	0.00	4.28	5.40	9.82	-
S.Em (±)	E	0.049	D	0.069	E x D	0.097	E	0.080	D	0.112	E x D	0.159
CD(5%)		0.135		0.190		0.269		0.220		0.312		0.441

Where – E : Environment
E_1 : Budding in polythene bag
E_2 : Budding infield condition
D : Date of budding
D_1 : 15th June
D_2: 15thJuly
D_3 : 15th August
D_4: 15th September
DAB: Days after budding

Table 2: Effect of environment and date of budding in aonla on the budding success

Character studied	Environment	Date of budding									
		First year					Second year				
		D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
Days taken for sprouting of Ist bud											
	E_1	12.44	18.56	19.00	23.11	18.28	11.67	18.11	18.78	23.00	17.89
	E_2	12.11	18.11	19.33	22.78	18.-8	11.33	17.67	18.33	22.33	17.42
Mean		12.28	18.33	19.17	22.94	-	11.50	17.89	18.56	22.67	-
S.Em (±)	E	0.076	D	0.107	E x D	0.151	E	0.096	D	0.136	E x D 0.192
CD (5%)		NS		0.296		NS		0.266		0.376	NS
Bud-take (%) at 32 DAB											
	E_1	65.56	66.67	55.56	72.78	65.14	67.78	70.00	58.33	75.56	67.92
	E_2	70.56	74.44	62.78	85.56	73.33	75.00	76.11	70.00	89.44	77.64
Mean		68.05	70.56	59.17	79.17	-	71.39	73.06	64.17	82.50	-
S.Em (±)	E	1.143	D	1.616	E x D	2.285	E	0.832	D	1.176	E x D 01.663
CD(5%)		3.167		4.479		NS		2.300		3.260	NS
Bud-sprout (%) at 32 DAB											
	E_1	62.78	64.44	48.89	49.44	56.39	66.11	67.78	52.78	55.22	59.72
	E_2	69.44	72.78	56.67	55.00	63.74	72.78	73.89	58.33	55.56	65.14
Mean		66.11	68.61	52.78	52.22	-	69.44	70.83	55.56	53.89	-
S.Em (±)	E	0.944	D	1.334	E x D	1.887	E	0.636	D	0.900	E x D 1.272
CD(5%)		2.615		3.699		NS		1.7630		2.497	NS
Successfully budded plant (%)											
	E_1	62.78	59.44	42.78	40.56	51.39	64.44	61.11	44.44	41.67	52.92
	E_2	69.44	64.44	47.78	45.00	56.67	73.89	66.11	49.44	46.67	59.03
Mean		66.11	61.94	1.239	42.78	-	69.17	63.61	46.04	944.17	-
S.Em (±)	E	0.876	D	3.433	E x D	1.752	E	0.808	D	1.227	E x D 1.736
CD(5%)		2.427		0.190		NS		2.405		3.401	NS
Number of leaves on rootstock at the day of budding											
	E_1	3042.7	3619.3	4221.8	6773.1	4914.2	3108.2	3658.0	4225.1	6835.6	4456.1
	E_2	3417.3	6551.1	6735.3	15166.6	7967.7	3499.0	6651.1	6804.7	15115.5	8017.9
Mean		3230.0	5085.2	7478.6	10969.9	-	3303.6	5154.6	5514.9	10975.5	-
S.Em (±)	E	45.52	D	64.38	E x D	91.04	E	48.12	D	68.05	E x D 96.24
CD(5%)		126.18		178.45		252.36		133.38		188.63	266.77

Where – E : Environment
E_1 : Budding in polythene bag
E_2 : Budding infield condition
D : Date of budding
D_1 : 15th June
D_2: 15thJuly
D_3 : 15th August
D_4: 15th September
DAB: Days after budding

graft alive and marketable after establishment were more in June-July budding as compared with those of latter dates of budding (Table 4) Chundawat (1990) made similar suggestion for maximum success in arid and semi-arid conditions.

Interaction (ExD)

The rootstock raised under field conditions and budded on latter dates were longer, thicker and possessed more number of leaves, determinate and indeterminate shoot as compared to those of polythene bags. On the contrary, the rootstock raised under field conditions land budded on earlier dates produced healthier and more vigorous graft as compare to those of polythene bags. The plants budded in June in polythene bags exhibited higher percentage of marketable plants and more percentage of grafts alive as compared to those of field. The highest number of saleable grafts were obtained from polythene bag grown stock budded in June-July (Interaction of Tale 1, 2, 3, & 4).

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Table 3: Effect of environment and date of budding in aonla on the growth of graft

Character studied	Environment	Date of budding									
		First year					Second year				
		D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
Length of scion at the day of lifting											
	E_1	50.81	53.48	28.83	19.91	38.26	52.38	55.05	30.42	21.51	39.84
	E_2	58.60	61.50	37.03	27.54	46.17	60.13	63.08	38.62	28.07	47.48
Mean		54.71	57.49	32.93	23.73	-	56.26	59.07	34.52	24.79	-
S.Em (±)	E	0.313	D	0.442	E x D	0.625	E	0.759	D	1.074	E x D	1.519
CD (5%)		0.866		1.225		NS		2.105		2.977		NS
Diameter of graft above union at the day of budding (mm)											
	E_1	5.87	6.53	4.13	3.43	4.99	6.07	6.73	4.33	3.63	5.19
	E_2	6.23	7.13	4.48	3.60	5.36	6.44	6.83	4.68	3.74	5.43
Mean		6.05	6.83	4.31	3.52	-	6.26	6.78	4.51	3.69	-
S.Em (±)	E	0.053	D	0.075	E x D	1.06	E	1.09	D	0.155	E x D	0.219
CD(5%)		0.147		0.209		NS		NS		0.428		NS
Number of determinate shoot/graft at the day of lifting											
	E_1	45.72	48.41	23.90	16.36	33.60	47.72	50.52	25.97	17.41	35.41
	E_2	54.97	57.64	33.38	23.57	42.39	57.63	58.62	35.36	25.50	44.28
Mean		50.34	53.03	28.64	19.96	-	52.68	54.57	30.67	21.45	-
S.Em (±)	E	0.224	D	0.317	E x D	0.448	E	0.453	D	0.641	E x D	0.906
CD(5%)		0.603		0.878		NS		1.255		1.796		NS
Number of leaves/graft at the day of lifting											
	E_1	2725.11	2904.67	1334.00	981.33	2011.28	2867.33	3024.67	1548.22	1100.67	2135.22
	E_2	3441.56	3458.67	2002.67	1414.00	2524.22	3418.00	3578.67	2123.33	1511.78	2657.94
Mean		3033.33	3118.67	1718.33	1197.67	-	3142.67	3301.67	1835.78	1306.22	-
S.Em (±)	E	17.07	D	24.14	E x D	34.15	E	85.14	D	120.40	E x D	170.28
CD(5%)		47.32		66.92		NS		235.99		333.74		NS

Where – E : Environment; D : Date of budding; D_3 : 15th August
E_1 : Budding in polythene bag; D_1 : 15th June; D_4: 15th September
E_2 : Budding infield condition; D_2: 15thJuly; DAB: Days after budding

Table 4: Effect of environment and date of budding in aonla on the graft alive and marketable plant

Character studied	Environment	Date of budding									
		First year					Second year				
		D_1	D_2	D_3	D_4	Mean	D_1	D_2	D_3	D_4	Mean
Graft alive (%) after establishment											
	E_1	91.11	91.11	86.67	86.67	88.89	91.11	88.89	82.22	80.00	85.56
	E_2	71.11	71.11	64.44	64.44	67.78	73.33	68.89	60.00	57.78	65.00
Mean		81.11	81.11	75.56	75.56	-	82.22	78.89	71.11	68.89	-
S.Em (±)	E	1.743	D	2.466	E x D	3.487	E	1.724	D	2.438	E x D	3.448
CD (5%)		4.832		NS		NS		4.779		6.758		NS
Percentage of marketable plant after establishment											
	E_1	91.11	91.11	86.67	31.11	75.00	84.44	84.44	77.78	33.33	70.00
	E_2	73.33	71.11	53.33	48.89	61.67	71.11	71.11	55.56	40.00	59.44
Mean		82.22	81.11	70.00	40.00	-	77.78	77.78	66.67	36.67	-
S.Em (±)	E	2.305	D	3.260	E x D	4.610	E	1.848	D	2.614	E x D	3.696
CD(5%)		6.390		9.036		12.779		5.122		7.244		10.249

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Impact of resource conservation technologies for sustainability of irrigated agriculture in Uttar Pradesh-India

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Abstract

India is rightly proclaimed as an agricultural dominating country. Agriculture is the largest commodity producing sector and mainstay of the country's economy. Rice and wheat are as a main staple food crop of India grown only 10.5 million hectares of land every year. India's population is increasing at an alarming pace and it has reached to about 120 million already at present. Resultantly, with the exception of few years, India had to import wheat from international market on expense of huge foreign exchange to meet food requirements of its burgeoning population. It is, therefore, imperative to enhance wheat productivity by encouraging farmers, predominantly small farmers, to grow more wheat with efficient and judicious use of land and water resources. Land and water resources especially for agricultural purposes are getting scarce day by day due to their large scale mismanagement. This water deficient scenario is also posing serious threats to food security for generations to come. A shift in the production techniques intervening flooded irrigation methods for efficient utilization of resources is being recommended and same has been actively adopted in many courtiers of South Asia in recent past. The resource conservation technologies (RCTs) mainly include furrow irrigated raised bed planting technique, zero tillage technology, crop diversification and crop residues management. Adoption of laser land leveling has shown encouraging results under zero tillage technique wheat is sown using residual moisture with no or minimum tillage without irrigating the fields with the aim to sow wheat in time after rice, conservation of water, and reduced cultivation cost. The technology has been adopted on thousands of hectares and presently farmers have large numbers of their own zero tillage drills. Similarly, crops especially vegetables are being planted on the raised beds to minimize water losses caused in the flood irrigations. Although these technologies are being adopted on wide scale, yet some quarters are still showing their concerns viz., weed control, pest management and impact on soil structure in relation to adoption of such technologies in rice-wheat system of the Uttar Pradesh. Other faction of scientists/experts is advocating adoption of zero tillage in the country because of embedded benefits of these technologies; for example, alternative tillage practices that reduce costs and raise productivity are being tested and promoted by agricultural research scientists in the country. Adoption of zero- tillage practices over an area of 0.5 million hectares, anticipated to be under RCTs by 2002-03 would produce additional one million tonnes of wheat, saving 30-40 million litres of diesel through reduced fuel consumptions. These benefits would increase dramatically if extended across the rice-wheat regions 13.5 million hectares in South Asia. Adoption of zero- till on, say, 5 million hectares would represent a saving of 5 billion cubic meters of water each year. That would fill a lake 10 kilometers long, 5 kilometers wide and 100 meters deep. In addition, annual diesel fuel savings would come to 0.5 billion liters and efficient use of water and other inputs, cost effectiveness compared to conventional methods of sowing, and above all, advancement of planting date of wheat by reducing turnaround time between rice harvest and successive wheat sowing. Latest dimensions of zero tillage and bed planting are also being highlighted in favour of this technology including improving soil biodiversity, reduced air pollution, mitigation of environmental degradation after residue burning.

Key words: Irrigated farming, sustainability, resource conservation techniques, productivity, conservation

Introduction

The rice-wheat production system of South Asia is among the most productive cropping systems in the world. Despite expanding populations, production of rice and wheat has kept pace with demand in South Asian countries, and especially in India. However, the system is showing signs of fatigue and evidence suggests that natural resource degradation may be reducing productivity in South Asia's rice – wheat system. This has serious implications for millions of farmers who depend on this system for their livelihoods, and for meeting the ever-increasing food demand due to uncontrolled population

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growth. Rice and wheat dominate India's food supply, accounting for over 70 percent of total food grain production. Although average rice and wheat yields increased at about 2 percent per year between 1960 and 1990, these impressive rates are no longer being maintained. With traditional sources of productivity growth being nearly exhausted, analyst believe that production increases will be hard pressed to cope with even a very modest growth in demand over the long run, associated with rising incomes of the people. It is thus a formidable challenge for the researchers and the policy makers to find out ways to improve the food production scenario to keep pace with ever- increasing demand. This paper attempts to analyze the impact of resource conserving technologies for sustainability of irrigated agriculture in Uttar Pradesh with a view to finding remedial actions to resume the productivity growth on a sustainable basis without affecting the natural resources base.

The crop productivity of the country is very low as majority of the farmers are still practicing traditional farming techniques. Moreover, cost of production has increased many times due to rising prices of fuel and other agricultural inputs. The existing crop production technologies do not offer effective and efficient utilization of natural resources, particularly that of water. Extremely low efficiency of input use has led to wastage and depletion of natural resources besides environmental degradation. Water shortages are increasingly a global issue. Environmental impacts from all uses of water, particularly irrigated agriculture urgently need special attention and an early solution because water supplies involve hydrologic basins that may cross local, state, and international jurisdictions/boundaries. Water is, therefore, certain to remain a major issue during coming years and it seems likely that climate change will be a perennial agenda at global gatherings for resource conservation. As such, it is highly important to develop better understanding for water scarcity and its trend in future. It is also necessary to consider possible strategies based on increasing water productivity (producing more crop per drop) leading to efficient management of the scarce water resources. Soil organic matter is declining, new weeds, pest and diseases are creating more problems, and paucity of irrigation water is resulting in excessive ground water pumping. Farmers are complaining about high input costs and low prices for their produce. Marketing of excess production is a burden for farmers and a problem to governments for storage. There is therefore a huge challenge ahead in the region to sustainably meet future food demands without damaging the natural resource base on which agriculture depends, producing food at a cost that is affordable by the poor, and with incentives to farmers that allow them to improve their livelihoods and ultimately alleviate poverty. This paper describes various resource conserving technologies to attain the goal of raising productivity in the region and meeting food security needs while at the same time efficiently using natural resources, including water, providing environmental benefits and improving the rural livelihoods of farmers.

Current Challenges

The evidence are accumulating that increase in yields of rice, wheat and other crops has started slowing down in the high potential agricultural areas of Western Uttar Pradesh. The factors that stalled the Green Revolution are; mining of soil nutrients, declining organic matter, increasing salinity, fluctuating water tables, and buildup of weed infestation and pest population . Another important element in stagnation of productivity could be traditional way of cultivation leading to heavy tillage. Also population of India is increasing at an annual rate of over two percent. These conflicting realities i.e. declining rate of production and increasing population growth are of course very serious concerns. Moreover, inputs use efficiencies for crop production are very low in India as compared to other countries with similar conditions. It is reported that about1,500 liters of irrigation water is used for producing 2 and 1 kilogram of rice in China and India, respectively. It is therefore, warrants to adopt such technologies that offer effective and efficient utilization of natural resources for crop production. Luckily, productivity enhancement technologies exist that do not pose any threat to natural resources.

Conserve agricultural resources

Population of Uttar Pradesh was only 50 million in 1960 that has increased to over 120 million. Resultantly, per capita land availability has been declined from 2.28 to 1.06 ha (2002-03). Likewise, per capita water availability has also reduced from 5,410 m^3 (1951) to 1,902 m^3 (2001) and predicted 1,465 &1,235m^3 in (2025&2050), respectively. The above facts reveal that an abrupt change in crop production system is essential that can be achieved through adoption of new technologies for making efficient use of available natural resources. It will otherwise become extremely difficult to fulfill food demand of the population. The best option is adapt to conservation agriculture approach.

Crop Production Constraints

The rice-wheat cropping system, which is one of the major cropping system in India and parts of the South Asia, is confronted with many management problems. Rice requires puddled compacted soils to hold standing water during the growing season, while wheat grows best in well-drained soils to allow deep penetration of the root system. The puddling operation to form hardpan is important for water retention for rice cultivation but unless this hardpan is broken, wheat may suffer problem of water logging. However, some of the major production constraints in rice-wheat cropping system in Uttar Pradesh are discussed as under:

(a) Puddling and its impacts on soil

In the IGP, where rice-wheat system predominates, 3-4 week old seedlings are transplanted into puddled fields to grow the rice crop. Puddling is achieved through ploughing and leveling the field, followed by a soaking

irrigation and stirring or ploughing of the surface layer while saturated. Puddling reduces soil permeability to water, control weeds, improves nutrient availability and preserve the aquatic, anaerobic conditions suited for growth of wetland rice. Presence of impermeable puddled layers changes water infiltration, profile moisture contents and ground water recharge, root penetration and growth of following crops until the soil is tilled again. The puddled layer retains higher moisture at low tensions and remains wet for longer periods due to reduced evaporation. Thus, puddling alters the physical and chemical environment in the plough layer and has implications on preparatory tillage for the succeeding wheat crop and to some extent on its irrigation water requirement. Unless finer textured soils have the optimum moisture regime at ploughing, large clods are formed that are difficult to pulverize for better seed-soil contact and crop germination.

(b) Late sowing of wheat crop:

One obvious cause of delayed planting of wheat is the late harvest of preceding rice crop. Farmers grow basmati rice that is a long duration,photosensitive, high quality rice but it matures late. They prefer to grow thisvariety despite its lower yields because of its high market value,pleasent grain with good straw quality for livestock feed. It is planted over 52% of the total rice cultivated area in Western Uttar Pradesh. Basmati varieties can, therefore, not be readily replaced by a shorter duration rice variety and the rice harvest is inevitably delayed leading to late sowing of wheat. Accordingly, there is short window of time available for land preparation before wheat. It is also experienced that the turnaround time normally takes 2-3 weeks under India conditions for rice fields to become workable for land preparation due to antecedent moisture. Moreover, reduced day length and sunshine decreases soil and ambient temperatures at the time of wheat sowing. It has been observed that wheat is planted late on 60% of the area in Western Uttar Pradesh. It has also been established that delay in wheat planting after optimal sowing time results in reduction of potential yield by 35-40 kg ha^{-1} day^{-1}. Moreover, farmers cultivate land often without achieving suitable seedbed conditions for planting wheat, which results in poor crop yields.

(c) Irrigation capacity expanded to the maximum viable point:

Irrigation expansion, which played a pivotal role in the success of rice- wheat system has also been exploited to the extent that it is economically viable. The area under irrigation in India has increased from 31.4M hectare to 50.2 M hectares between 1980 and 1995. However, the availability of irrigation water at subsidized rates has led to enormous misuse. In the high intensity zone in rice-wheat systems are being over- irrigated by 15 percent; this may deplete the ground water table at an alarming high rate.

(d) Degradation of natural resources:

With the reduction in the rate of yield and growth, there are indications that the natural resource base on which the systems depend is also weakening. Water induced land degradation, salinization, sodification and ground water depletion have become a major problem. Slow loss of soil fertility due to the continuous extraction of nutrients that surpasses the input application and management of organic matter is causing concern.Continuous monocropping has also led to an increased incidence of pests, diseases, and weeds.

(e) Conventional planting techniques:

Another factor, hinder that unachieving optimum wheat yield in paddy areas, is that wheat seed is generally broadcast into soil profile leading to much reduced plant emergence . It is not surprising that wheat yields in rice wheat area are significantly lower as compared to other irrigated areas of the state.

(f) Low plant population of rice:

Low rice plant population has been identified as one of the main constraints in improving rice yields. Like other South Asian countries, rice crop in India is established by hand transplanting of young rice seedlings. The nature of job is cumbersome that involves enormous drudgery and human stress in sweltering weather. The operation is also very laborious as it takes 110-125 man-hours per acre or 40 percent of total labour requirement of the crop. In recent past, with the onset of industrialization in urban area, employment opportunities increased and an acute shortage of labour is experienced during transplantation. Non-availability of labour has further aggravated the situation and paddy transplanting has emerged as the stark problem in all rice growing areas. Optimum plant density and timeliness of transplanting operation in paddy is considered essential for optimizing paddy yields and this can be achieved, if dependence on hired labour is minimized.

(g) Unlaveled topography:

A considerable amount of water is wasted during irrigation of un-leveled fields.Studies have indicated that a significant (20 to 25%) amount of irrigation water is lost during its application at the farm due to poor farm designing and uneven fields .The problem is more pronounced in case of paddy fields. It has been noted that most of the farmers apply irrigation water until the highest point in a field is covered. This leads to over-irrigation of low-lying areas and under-irrigation of higher spots, which results in accumulation of salts in such areas. Over irrigation leaches soluble nutrients from the crop root zone, makes the soil less productive and degrades groundwater quality. The fields being not properly levelled cause wastage of land, low irrigation efficiencies, and ultimately results in substantially lesser yield than the potential.

Description of the various resource conserving technologies

A basket of resource conserving technologies are being developed and made available to farmers for experimentation and adoption. Some are based on reduced tillage for wheat including zero-tillage. Bed planting

systems are being promoted to increase water use efficiency and when combined with reduced tillage in a permanent bed system provide even more savings. Laser leveling combined with these tillage systems provides additional benefits. Many of the benefits of the tillage options for wheat are lost when rice soils are traditionally puddled (plowed while wet). System based technologies are now being promoted that do away with puddling so that total system productivity is raised. The various technologies are described briefly below:

Precision Land leveling

Unevenness of the soil surface adversely influences the farming operations, energy use, aeration, crop stand and yield mainly through nutrient-water interactions. The general practices of land leveling used by the farmers in India is either through use of plankers drawn by draft animals or by small tractors. Farmers in Indo–Gangatic Plains especially Punjab, Haryana and Uttar Pradesh are using iron scrappers/ leveling boards drawn by 4-wheel tractors. But, these leveling practices are not so perfect even after best effort for leveling which results in less input use efficiencies and low yield at the cost of more water. Laser land leveling is one of the few mechanical inputs in intensively cultivated irrigated farming that meets the twin objectives of achieving a better crop stand, save irrigation water and improves the input use efficiencies. Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut(U.P.), India in collaboration with Rice-Wheat Consortium, New Delhi and CIMMYT introduced Laser land leveling technology in 2000 in Uttar Pradesh with only one leveler and now the farmers have purchased more than 500 laser land levelers in Western Uttar Pradesh. At the time of introduction of this technology in 2000 there was not even a single manufacturer and now about 50 manufacturers are working on this.

Benefits of laser land leveling

* Improving crop establishment
* Improving uniformity of crop maturity
* Approximately 3 (canal irrigated area) to 6 % (tube well irrigated area) increase in cultivable area
* Has potential to increase water application efficiency by over 50 %
* Increase in water productivity of crops
* Increase in yield of crops (15 to 25 %)
* Approximately 25-30% saving in irrigation water
* Increase in nutrient use efficiency (15- 25 %)
* Reduces weed problems and improves weed control efficiency

Surface seeding :

Surface seeding is the simplest zero-tillage system being promoted. In this tillage option wheat seed is placed onto a saturated soil surface without any land preparation. This is a traditional farmer practice for wheat, legume and other crop establishment in parts of Eastern India. Wheat seed is either broadcast before the rice crop is harvested (relay planted) or after harvest. Promotion of surface seeding to plant wheat has been done for several years in areas where the soils are fine textured, drain poorly, and where land preparation is difficult and often results in a cloddy tilth. The key to success with this system is having the correct soil moisture at seeding. Too little moisture results in poor germination and too much moisture can cause seed to rot. A saturated soil is best. The roots the moist soil and follow the saturation fringe as it drains down the soil profile. The high soil moisture reduces soil strength and thus eliminates the need for tillage. Additional irrigation may not be needed if the roots can follow the water table down the profile.

Zero-tillage

Zero tillage is a 'cornerstone' of CA, and can be practiced in both large and small farming systems in western Uttar Pradesh. With zero till (also termed no-tillage and direct drilling) technique the quantity of seeds and fertilizers are applied directly into the soil having stubble of the previous crop. Gradually, organic matter of the surface layers of zero tilled land increases, due to reduced erosion, increased yields resulting in more crop residue added to the soil surface, and differences in the assimilation and decomposition of soil organic matter. Gradually, organic mulch is developed on the soil surface, and this is eventually converted to stable soil organic matter because of reduced biological oxidation compared to conventionally tilled soils. Zero tillage is effective in mitigating many of the negative on-farm and off-site effects of tillage, principally erosion, organic matter loss, reduced biodiversity and reduced runoff. These conditions are replaced with permanent soil cover, improvements in soil structure, organic matter status, water use efficiency, soil biology and nutrient recycling.

This technology had been in use since long in many parts of the world and then it was introduced in India. Initial trials were confined to progressive and large farmers. Although yields results were impressive but uptake of the technology remained limited. This was partly because of high cost of zero tillage seed drills with limited availability. Therefore, it could not be popularized among the farming community despite lot of advantages. Zero tillage technology introduced amongst theWestern Uttar Pradesh farmers during 1999-2000. The technology was rapidly accepted by the farmers due to its contribution in reducing cost of production, conservation of resources, and improving yields. The area under zero tillage increased exponentially over last ten years (1999- 2009). Considerable efforts were made to motivate the farmers to adopt zero tillage technology. A faction of experts/ scientists has, however, shown its concern regarding negative effects of zero tillage on soil texture, carry over of insect pest on successive crop especially rice stem borer, and higher weed infestation in adopting the technology at wider scale. Had these apprehensions been put forward and redressed zero tillage technology would have been adopted on a large area expeditiously. The situation warrants to conduct evaluation studies on this technology for answering any such concerns.Dr. Naresh

and his team started the work in the year 2000 with a small area of only 10 ha and this area expanded rapidly year by year and now it has been extended to even a much larger area. The benefits of this technology are as follows:

* Saving of about US$ 55 ha^{-1} in cost of diesel for land preparation where as yield per hectare is same or more than conventional tillage.
* Saving in irrigation water requirement (1000 m^3 of water per hectare at field level)
* Helps in timely planting of wheat. (prevent yield losses due to late planting of wheat @ 35-40 kg/ha/day)
* Retention of crop residues helps in improving soil organic matter, soil structure and microbial population.

Furrow irrigated raised bed planting system

The major concern of this system is to enhance the productivity and saving of the irrigation water. There are evidences for the greater adoption of this practice in the last few years in other parts of the country like high-yielding, irrigated wheat growing area of India. Potential agronomic advantages of beds include improved soil structure due to reduced compaction through controlled trafficking, and reduced water logging and timelier machinery operations due to better surface drainage. In western Uttar Pradesh beds also create the opportunity for mechanical weed control and improved fertilizer use efficiency. In RW systems western and eastern Uttar Pradesh permanent beds also provide the opportunity for diversification to water logging sensitive crops not suited to conventional flat layouts, and the ability to respond rapidly to market opportunities. While the potential benefits of beds for wheat production in India have been known for time of evaluation of beds for rice and permanent beds in RW systems commenced more recently and it has potential to be the future technology as its adoption can make it possible to grow more rice with less water (Gupta et al. 2002). There are several reports of reduced irrigation amounts or time, with similar or higher yields, for wheat on beds compared with conventional tilled wheat, from farmer participatory trials and researcher plots across the country. Typical irrigation savings range from 18% to 30-50% (Hobbs and Gupta 2003). Farmer and researcher trials in the IGP suggest irrigation water savings of 12 to 60% for direct seeded (DSRB) and transplanted (TRB) rice on beds, with similar or lower yields for TRB compared with puddled flooded transplanted rice (PTR), and usually slightly lower yields with DSRB (Balasubramanian et al., 2003). We started the work in the year 2000 with a very small piece of land i.e. 4 ha in farmer participatory mode and it has extended to more than 12,00,000 ha in western Uttar Pradesh.

Benefits of Bed Planting

* Reduced tillage and direct seeding with permanent beds that reduce costs of labor, diesel, and machinery when offset against the costs of initial bed formation and maintenance.
* Increased opportunities for crop diversification in both wet and dry seasons that allow response to market opportunities as well as to the reduced supply of water for example, research at SVPUAT Meerut has concluded that vegetables could be grown more profitably than rice and arrest soil structural degradation and hardpan formation.
* Mechanical weeding and inter-culture operations in wheat and other non-rice crops that reduce herbicide or labor costs, these advantages may also extend to rice on beds.
* Mechanical placement of fertilizers below the soil surface, leading to improved fertilizer use efficiency.
* Reduced seed requirement of a range of crops compared with flat surfaces.
* Reduced cost of irrigation-this includes the digging, maintenance, and deepening of wells as well as power for pumping and labor time for irrigation.
* Greater yields of all crops that can be obtained in response to better soil structure and surface drainage, timely sowing because of direct seeding and good drainage, and other management operations.
* Current and impending water scarcity-bed culture promotes the possibility (i) to grow rice with intermittent irrigation to save water and (ii) to diversify crops to other less water-demanding crops.
* Less reduced chances of plant submergence due to excessive rain or over-irrigation
* Lesser crusting of soil around plants and, therefore, more suitable for saline and sodic soils
* Adaptable for various crops without changing basic design/layout of farm

Crop Residue Management:

Drop in soil organic matter (SOM) due to limited return of organic biomass owing to residue burning and remove /export from original field have been identified as few of the key factor for unsustainability of the system. Burning crop residues due to lack of efficient and user-friendly technologies for *in-situ* recycling not only leads to loss of considerable amount of N, P, K and S but also contributes to the global NO_2 and CO_2 budget (Grace *et al.*2002) and destruction of beneficial micro-flora of the soil (Jat and Pal, 2000; Timsina and Connor 2001). The substantial quantum (80.12 MT $annum^{-1}$) of crop residues is available (Pal *et al*, 2002) for recycling in rice- wheat system having a nutrient potential (NPK) of 1.61 MT and fertilizer replacement value of 0.804 MT if, location/ situation specific efficient technologies are made available to the farmers. Management of crop residues in zero till systems have been a challenge for the researchers and farmers with the tyne type openers. Sufficient efforts are being made during the recent past to develop the efficient technologies but development of new generation drills has been proved to be the most significant achievement in the direction of conservation agriculture. Design, development and evaluation of new generation drills (happy seeder, roto-disc drill, double disc drill, punch planter) is the first milestone in the way of conservation agriculture in India. There are evidences that stubble retention

increases microbial biomass, which has been correlated with increased organic carbon content, nitrogen mineralization, non-symbiotic nitrogen fixation, and microbial diversity. High organic carbon content stimulates microbial activity and secret high amount of microbial polysaccharides causing stability of soil aggregate (Tisdall and Oades, 1982). The same in turn results in improved soil fertility/health.

The major losses/damages associated with burning of residues are as :

• Deterioration of general condition of the soil
• Lowering of soil capability/fertility to produce high yields
• Burning of beneficial insects/micro-organisms in the soil
• Endangers natural environment
• Considerable financial loss to farmers as the residues removed from

fields would be used for some other purpose e.g. fodder, straw sale,

and kitchen fuel.

Benefits of Crop Residue Management

• Better soil health and productivity
• Addition in organic matter contents
• Enhances infiltration rate
• Improves water and nutrients use efficiency
• Accelerates microbial activity
• Lowers weeds infestation
• Increases yield by 15-20 percent
• Reduces environmental pollution
• Removal of residues can provide additional income from grain

recovery and straw sale and also dry feed for livestock

Diversification of rice-wheat systems:

Small and marginal farmers having subsistence farming need assistance for making their agriculture profitable so they can improve their livelihoods and eventually help themselves escape form the ill effects of poverty spiral. The solution seems to lay in diversification of rice-wheat systems. Crop diversification ameliorates the adverse effects of seasonality on family incomes and peak labor demands, reduces risk due to fluctuating monsoon patterns, helps asset improvement on farms, conserve rainwater and saves irrigation water, facilitates easier weed and nitrogen management, reduces water logging, and often results in better yield. The issue of 'Fallow Land'is important in western UP because of the predominance of sugarcane in the region. Many fields remain fallow in rabi season when cane is spring planted. -While emphasis on legumes would continue, other crops including grain legumes, fodder legumes, green manure crops and vegetables with potential could also be considered. Thus a wide range of crops and cropping system options could be evaluated for their potential contributions to overall system productivity, profitability, generating additional income for the smallholders and for their effects on sustainability of the rice-wheat systems of particular importance would be to elicit farmer preference of different options for greater inclusion of legumes and other crops in rice and /or wheat based cropping systems. In order to promote diversification there is a need for development of technological options (genetic and management) for alleviating the major biotic and abiotic constraints to adoption of legumes and other crops in RWCS and assess adoption and quantify impact of diversified systems. We have observed that permanent system of planting crops on raised beds promotes diversification of the rice-wheat system leading to advantages to the system ecology. However, for achieving our objectives we need to adapt the 4-wheel equipments to 2-wheel and animal drawn systems more appropriate in eastern areas. These are the areas where rice fallows provide vast opportunities for crop diversification and crop intensification.

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Integrated Nutrient Management for optimum productivity and soil health under paddy (*Oryza sativa L.*)-okra ((*Abelmoschus esculentus* (L.) Moench).) cropping system

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Abstract

*An experiment was conducted on paddy- okra cropping system under foothills of Nagaland to study the effect of integrated nutrient management practices on growth, yield attributes, yield and economics of paddy- okra cropping system with realization maximum system productivity and sustainable soil health during kharif-rabi 2005-06 and 2006-07 under rain-fed conditions. The results revealed that growth, yield attributes and yield of paddy as well okra was significantly influenced by various integrated nutrient management. Maximum grain yield of paddy was observed under combination of crop residues (5 tonnes/ha), FYM (5 tonnes/ha) and biofertiliser. Also the 50 % recommended dose of fertilizer (RDF) with crop residues (5 tonnes/ha), FYM (5 tonnes/ha) and biofertiliser had resulted an equal increase in paddy and okra yield over higher levels of recommended fertilizer. Soil fertility build up in terms of available nitrogen, phosphorus and potash was also observed improved in soil under integrated nutrient management practice of combination of crop residues (5 tonnes /ha), FYM (5 tonnes/ha) and biofertiliser(*Azospirillum*, PSB) from paddy-okra cropping system.*

Key words: Integrated nutrient management, paddy- okra cropping system, growth and yield attributes

Introduction

Comprehensive nutrient management is crucial to achieve sustainable high productivity under intensive cropping system. There may be three approaches for nutrient management, organic nutrient management, chemical/ fertilizer based nutrient management and integrated nutrient management. In state of Nagaland the first one i.e. organic nutrient management by default is the main practice being followed by farmers and the fertilizer based nutrient management is not getting much acceptance among the farmers due some or other reasons. The inappropriate nutrient management under such circumstances is leading to declining crop productivity not only from jhum lands but also from low land and terrace paddy fields. The fertilizer based nutrient management could not solve the problem as a matter of fact, the use of fertilizer is lowest in Nagaland in India (2.5 kg/ha) (Anonymous, 2000).

The favorable climatic conditions build up good organic sources in the state, because of this reason the soils of Nagaland are rich in organic matter (1.5-4.0%). The farmers are utilizing high native soil organic matter as only nutrient sources since long back. But now the intensification of cropping system led to accumulation of less and less organic matter in soil in humic from. In many of the areas the un-decomposed fresh organic matter being used for nutrient source which many a times harbors insect especially termites. Given the situation there is need of nutrient management approach which can supply nutrient to the crop plant as per requirement and integrated nutrient management which combine all sources of nutrient including organic and inorganic has the potential to address the problem on sustainable basis. The organic nutrient sources as crop residue, biofertilisers and FYM can be optimum nutrient sources along with inorganic nutrient sources which will also help in mobilization of nutrient sources from organic inputs. The need was felt to standardize the proportion of organic and inorganic nutrient sources in a cropping system mode. The study was under taken in paddy and maize based cropping system and the observations were be recorded on plant and soil to know the nutrient dynamics .Keeping these points in view a project was executed as integrated nutrient management with the objective to achieve optimum crop productivity and soil health under foot hills of Nagaland.

Materials and Methods

A field experiment was conducted at main scheme farm of ICAR Research complex for North-eastern Hill Region (NEHR), Nagaland Centre Jharnapani during *kharif* and *rabi* season from 2005-06 to 2006-07 in

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paddy- okra cropping system. The experiment site was located between 25.45º N latitude 93.53º E longitude with a mean altitude of 250 m above sea level. Temperature and relative humidity during the experiment ranged from 8.5 to 35 ºC and 80.5 to 92.0%, respectively. The experiments were conducted in split plot design with three replications with sixteen treatment combinations. The main plot treatments consist of combination of organic sources as crop residues M_1 (10 tonnes/ha), FYM- M_2 (10 tonnes /ha), biofertilizer - PSM & *Azospirillum* (M_3) and mixed of crop residues (5 tonnes/ha) , FYM (5 tonnes/ha) , biofertilizer-PSM & *Azospirillum* (M4) i.e. four main plot treatments and in sub plot , different combination of chemical fertilizers as control (S_1), 50% NPK (S_2), 75% NPK (S_3) and 100% NPK (S_4). The 100 % recommended N, P and K for paddy and okra were 80:60:50, 60:50:50 kg/ha under foothills of Nagaland. The varieties used were RCM-9, Arka anamika, of paddy and okra, respectively .The soil fertility dynamics under various treatments were estimated by soil analysis of composite soil sample from each plot before sowing and after harvesting of crops. The soil of the experimental site was sandy loam, acidic in reaction with pH 5.10 and deficient in nitrogen, moderate in phosphorus with fare amount of fixed phosphorus, moderate to high in available potash. The experiment was conducted in split plot design with three replications and was.

Results and discussion

Performance of paddy in paddy-okra cropping system

The growth and yield attributes of paddy as plant height (cm) at harvest, no. of effective tillers, panicle length (cm), no. of filled / panicle, days to 50 % flowering, 1000 grain weight (gm) responded significantly to various treatment combinations except no. of days to 50 % flowering during both the year of experimentation. Plant height (cm), no. of effective tillers, no. of filled grain /panicle, days to 50 % flowering , 1000 seed weight were improved significantly under biofertilizer : PSM , *Azospirillum* + *Azolla* and also under combination of crop residues (5 tones/ha) , FYM (5 tonnes/ha), PSM + *Azospirillum*+ *Azolla* , except for panicle length (cm) but almost all growth and yield attributing characters were increased significantly over only crop residues (10 tones/ha) during 2005-06 (Table 1). Fertilizer doses of 50 and 75 and 100 % recommended doses of fertilizer had influenced the plant height (cm) significantly over control. The lower doses of fertilizer i.e. 50 % RDF were resulted in equal effect on increase of plant height, no. of effective tillers, no. of filled grains/panicle. Days to 50 % flowering and test weight were not influenced significantly during both the year (Table 1 & 2). Jae Young *et.al*, 2008, Roy *et.al*. 2001 also reported the similar findings. The highest paddy yield was achieved in plots where inorganic and organic fertilizers were added on the basis of integrated nutrient management as it provides suitable macro and micronutrients on a continuous basis (Benipal, D. S *et al*., 2004).

The combination of crop residues (5 tones/ha) , FYM (5 tonnes/ha), PSM + Azospirillum+ Azolla with 75 % RDF was recorded with maximum yield advantage and also increases in no. of effective tillers, panicle length (cm), no. of filled / panicle, days to 50 % flowering, 1000 grain weight (gm) in paddy over other treatment combination. The lower doses of fertilizers helps in mobilization of nutrients from organic sources and at higher doses the bio-fertilizers did not respond. The improved growth and yields of rice under integrated nutrient management could have been due to increased

Table 1: Growth and yield attributes and yield of paddy (*Oryza sativa* L.) under different treatments of INM during 2005-06

Treatments	Plant height (cm)	No. of effective tillers	Panicle length (cm)	No. of filled/panicle (gm)	days to 50% flowering	1000 grain weight (gm)	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index
Main plot									
M_1 crop residues @ 10 tonnes /ha	85.40	14.40	23.92	136.42	101.00	18.94	26.05	64.65	40.28
M_2 farm yard manure (FYM) @ 10 tonnes/ha	97.45	14.57	24.65	135.50	100.75	19.01	27.50	65.00	42.44
M_3 (PSM) & *Azospirillum* + *Azolla*	96.00	13.75	24.35	137.47	101.25	18.40	35.75	66.75	43.15
M_4 crop residues (5 tonnes/ha, FYM (5 tonnes/ha), biofertilizer	100.00	13.00	26.70	142.97	100.75	19.37	38.37	63.63	47.32
CD 5%	6.20	1.21	2.15	5.58	NS	NS	3.12	6.50	3.91
Sub plot									
S_1 control	93.32	11.47	24.35	139.95	100.50	18.70	24.50	54.65	43.08
S_2 50% NPK	98.40	15.75	24.57	145.17	101.50	19.09	26.82	61.75	41.79
S_3 75% NPK	98.15	15.07	24.57	131.77	100.75	19.42	36.55	67.00	45.52
S_4 100% NPK	98.97	13.42	24.12	135.47	101.00	18.51	39.80	76.63	42.80
CD 5%	6.32	1.20	2.15	6.10	NS	1.21	3.32	6.60	4.12

Table 2: Growth and yield attributes and yield of okra (Abelmoschus esculentus (L.) Moench) under different treatments of INM during 2005-06

Treatments	Plant height (cm) at harvest	No. of plant /sq metre	No. of branches /plant	Days to 1st flowering	Days to 50 % flowering	Fruit diameter (mm)	Fruit length /plant	No. of fruit/plant (cm)	Pod yield (q/ha)
Main plot									
M_1	78.0	8.75	15.5	64.5	69.0	19.60	10.20	9.5	100.2
M_2	85.6	9.25	15.2	64.0	68.0	18.60	10.00	12.5	115.6
M_3	99.2	11.50	18.2	63.0	66.5	24.50	12.50	19.6	135.2
M_4	107.2	12.00	21.5	63.0	67.0	25.20	13.50	20.5	140.0
CD 5%	8.2	0.85	1.3	NS	NS	1.45	1.25	2.5	11.3
Sub plot									
S_1	78.2	8.20	12.2	62.0	68.0	13.00	7.50	10.5	112.3
S_2	98.3	9.70	15.3	62.0	68.0	19.30	11.20	15.3	130.0
S_3	105.2	10.20	19.2	61.0	65.0	20.30	13.10	18.5	136.2
S_4	112.3	12.20	22.3	58.0	65.0	22.50	15.10	23.5	145.6
CD 5%	7.9	0.88	1.3	NS	NS	1.50	1.30	2.8	11.3

nutrient uptake. The integrated use of organic and fertilizer N lead to increased nutrient uptake and greater grain yield of rice than application of fertilizer alone (Yadav et al., 2000., Aulakh et al., 2000). It was observed that combined application of manure and fertilizer reduces bulk density, resistance to penetration, improves water soluble aggregates, total porosity, hydraulic conductivity, water holding capacity and reduces nutrient losses (Patra et al., 2000). Yadav et al. (2000) reported that efficiency of inorganic fertilizer is improved when used in conjunction with organic manures. Also high root density was reported under integrated nutrient management due to improved physical conditions of the soil enhances nutrient absorption capacity of the crop (Boparai et al., 1992), thereby improving biological yield at a even at low level of fertilizer application.

Yield of paddy

Maximum paddy yield 38.37 q/ha was recorded in combination of crop residues (5 tones/ha), FYM (5 tonnes/ha), PSM + Azospirillum+ *Azolla* , which was significantly higher over only crop residues and only FYM (10 t/ha) but was statistically at par (P=0.05) with biofertilizer PSM+ *Azospirillum*+ *Azolla*. The use of crop residues @ 10 tonnes/ha resulted in least grain yield of paddy. Similar was the trend with fertilizers, 100 % RDF was observed a maximum increase in grain yield which was also significantly more than the paddy grain yield in control and 50% RDF but statistically at par with 75% RDF during both the years of experimentation (Table 1 & 2). Prasad et al., 2002 also reported significantly increased grain yield of rice under combined use of organic sources of nutrient along with RDF.

Residual effect on growth and yield attributes of okra in paddy-okra cropping system

The growth attributes as no. of plants per square metre, days to first flowering days to 50 % flowering fruit diameter (mm), fruit length and no. of fruits per plant were influenced significantly under FYM @ 10 tonnes per ha over crop residues @ 10 tonnes per ha and found to be statistically at par with only biofertilizers and combination of crop residues (5 tonnes/ha), biofertilizer and FYM (5 tonnes/ ha) except for plant height at harvest, no. of branches per plant, which were recorded maximum under combination of crop residues (5 tonnes/ha), biofertilizer and FYM (5 tonnes/ ha). The fertilizers combination at different levels was recorded varied with response to growth and yield attributing character of okra during both the years of experiment under paddy-okra cropping system. The 50 % RDF was recorded with significantly higher increase in plant height (cm) at harvest, no. Of plant/sq metre, no. of branches/ plant, days to 1st flowering, days to 50 % flowering, fruit diameter (mm), fruit length (cm), no. of fruit/plant (Table 2 & 4).

Pod yield of okra was recorded maximum with combination of crop residues (5 tonnes/ha), biofertilizer and FYM (5 tonnes/ ha). The significantly higher pod yield was recorded in FYM @ 10 tonnes per ha over only crop residues (10 tonnes/ha) which was also statistically at par with bio fertilizer and combination of crop residues (5 tonnes/ha), biofertilizer and FYM (5 tonnes/ ha). In sub plot the trend in pod yield was similar to the growth and yield attributing character. Days to first and 50 % flowering was not affected by any of the treatments during both the years. Vennila and Jayanthi (2008) also revealed significantly increased in okra fruit yield due to improved in the number of fruits /plant, fruit weight (g per fruit) and fruit yield q/ ha of okra under integrated nutrient management. Okon et al. (2005) stated that the optimum level of organic manures can sustain rapid growth and better yield of okra even faster

than NPK.

Soil fertility dynamics

The organic carbon content was recorded 1.32-1.54 % and it gradually increased up to 1.85 % during 2005-06 to 2006-07 respectively. The soil fertility dynamics was estimated by analysis of composite soil sample from each plot after harvest of each crop in 2005-06 and 20006-07. The maximum organic C was recorded under combination of crop residues (5 tonnes/ ha), biofertilizer and FYM (5 tonnes/ ha) treatment (Table 5). The proportionate increase organic carbon was observed with increase of doses of fertilizer, it ranged between 1.39- 1.53 % during first year and in second year, the content of O.C. in soil was estimated between 1.45-1.75 %. More N accumulation was observed under FYM (10 tonnes/ha) and combination of crop resisues (5 tonnes/ha), FYM (5 tonnes/ha), biofertiliser. Similar was the trend in phosphorus and potash content in upper soil surface (0-30 cm) during both the years. However contrast results were obtained in case of available K in the soil. The maximum available K was recorded in crop residues (10 tonnes /ha). The increasing dose of fertilizer had proportionally increased the organic carbon, available N, P and K in the soil (Table 5). There was significant increase in organic carbon, available N, P and K in the soil with 50 %, 75 % and 100 % RDF over control.

Increased uptake of P and K with higher doses of organic manure has been reported by Sharma and Mittra (1991) and that of N by Mishra and Sharma (1997). An increase in the organic carbon content under integrated nutrient management crop is attributed to accumulation of residual fertility in the soil and also addition of biomass of crop plant (Thakur and Sharma, 1988).

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Performance studies on onion advance lines for possible use in breeding

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Abstract

The study conducted at National Horticultural Research and Development Foundation, Nashik during Rabi *2006-07 and 2007-08, recorded that advance lines-652, 474, 501, and 352 performed better regarding yield and yield contributing traits. The check also performed better. The above lines can be possible used in breeding programme for development of onion varieties for different areas.*

Key words: Horticultural, Foundation, breeding

Introduction

Onion is one of the major vegetable crops grown in India. It is cultivated during *Kharif, late Kharif* and *Rabi* season in different part of the country. The main onion growing states in India are Maharashtra, Gujarat, Karnataka, Tamilnadu, Orissa, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Bihar and Punjab. It is predominantly a Rabi season crop and most onion cultivars are sensitive to photo period and thus their range of adoption is limited (Pandey and Bhonde 2002). Because of its high export potential it comes under cash crop apart from vegetable (Pandey 1989). It is used as a salad or cooked in various ways in all curies, fried or baked and also used in processed form e.g. flakes powder, paste, crush and pickle, etc. It has many medicinal properties. During 2008-09, onion was grown on an area of approximate 5.34 lakhs hectare with the production of 76.37 lakhs tons. To meet out the domestic requirement and also to fulfill the export demand, selection of suitable high yielding varieties for growing under different agro climatic condition is required.

Materials and Methods

The present investigation was carried out at National Horticultural Research and Development Foundation at Nashik, Maharashtra, during *Rabi* 2006-07 and 2007-08. The experiment was laid out in randomized block design with three replications. The Nashik (20^0 N latitude and 73^0 E longitudes) is located at altitude of 492.0 meter above mean sea levels. The minimum and maximum temperature and humidity is ranging between 16.0^0C to 40.0^0C and 48.0 % to 80.0% respectively with an annual rain fall around 881.0 mm. The soil of the trial was clay loam, medium in organic carbon (0.58%), available nitrogen (385.2 kg/ha), phosphorus (45.13kg/ha) and high in available potash (291.2kg/ha).The study comprises twenty six diverse onion advance lines selected among more than 400 germplasms evaluated at this centre along with two checks Agrifound Light Red and Agrifound White. Eight week old seedlings of each advance lines were transplanted in flat beds during the last week of December at the spacing of 15 cm x 10 cm in a plot of 3.6 m x 1.8 m size. The recommended package of practices was uniformly followed during whole experiment period to raise a successful crop. Randomly selected ten plants from each plot were taken to record the observations on plant height (cm), leaves per plant, neck thickness (cm), bulb diameter (cm), bulb size index (cm^2), weight of 20 bulbs (kg), days for bulb initiation, days for harvesting, doubles (%), bolters (%), total soluble solid (%), dry matter content (%), gross yield (q/ha) and marketable yield (q/ha). The pooled data of 2006-07 and 2007-08 were analyzed to find out and identified the superior genotypes for development of onion varieties suitable for different agro climatic conditions.

Results and Discussion

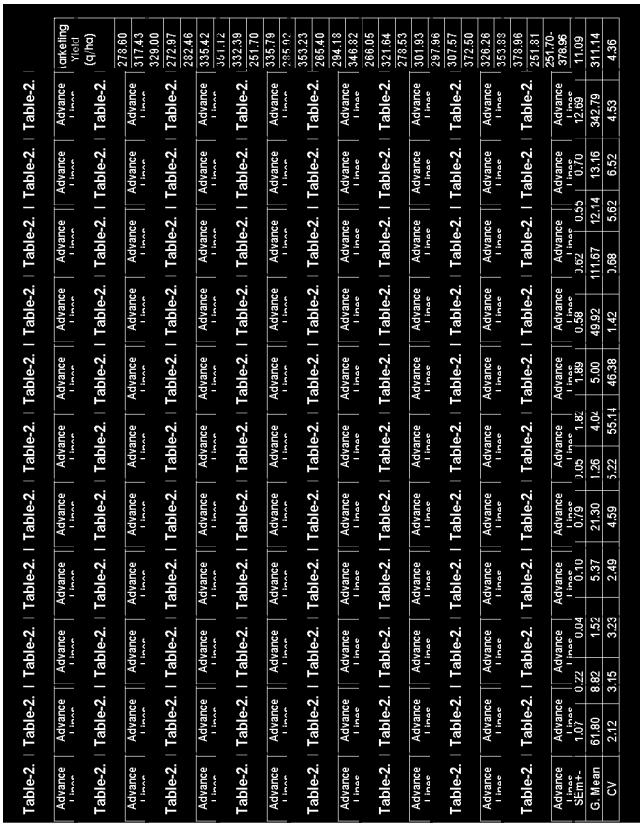
The analysis of variance (ANOVA) for fourteen characters indicated that there is a considerable variation in respect to all the traits studies (Table 1). The pooled data presented in Table 2 indicated significant yield differences among the onion advance lines and revealed that the ranges of gross yield and marketable yield was (266.66-394.97 q/ha) and (251.70-378.96 q/ha) respectively. The highest gross yield (394.97 q/ha) and marketable yield (378.96 q/ha) was observed for check variety Agrifound light Red followed by L-652 (393.57 q/ha) and (372.50 q/ha), L-474 (377.01 q/ha) and 353.23 q/ha) and L-380 (376.74 q/ha) and 335.42 q/ha). Highest plant height (65.96 cm) and leaves per plant (9.80) was noted for Agrifound Light Red and L-501. The minimum neck thickness (1.36 cm) was observed for L-494 followed by L-343 (1.40 cm). Highest bulb diameter (5.62 cm) and 20 bulb weight (1.46 kg) was observed for L-

Table-1 Analysis of variance (ANOVA) for different traits in onion lines

S. N.	Traits	Mean sum of square			
	Source of variations	Replication	Genotypes	Error	F
	Degree of Freedom (DF)	(2)	(25)	(50)	
1	Plant height (cm)	2.107	13.77**	1.721	8.001
2	Leaves per plant	0.287	0.276**	0.078	3.553
3	Neck thickness (cm)	0.000	0.023**	0.002	9.352
4	Bulb diameter (cm)	0.002	0.039**	0.018	2.179
5	Bulb size index (cm2)	0.627	2.632**	0.959	2.746
6	Weight of 20 bulbs (Kg)	0.007	0.021**	0.004	4.71
7	Doubles (%)	20.42	15.52**	4.966	3.125
8	Bolters (%)	10.58	38.81**	5.387	7.207
9	Days for bulb initiation	3.721	10.39**	0.504	20.605
10	Days for harvesting	1.885	6.243**	0.581	10.74
11	Total soluble solids (%)	0.242	1.129**	0.466	2.423
12	Dry matter (%)	0.480	0.946**	0.738	1.282
13	Gross yield (q/ha)	170.36	3543.0**	241.58	14.666
14	Marketable yield (q/ha)	214.08	4073.6**	184.61	22.065

** Significant at 1% level

652 followed by check Agrifound Light Red (5.55 cm) and (1.32 kg) and L-501 (5.52 cm) and (1.33 kg). It is observed that, the plant height, bulb diameter, bulb size index and weight of bulb positively correlated to increase for yield (Singh 1991, Mohanty, 2001 and Singh *et. al.* 2010). The minimum doubles (1.60%) and bolters (1.07%) were noted for Agrifound Light Red and 652 respectively. Khar *et. al* (1999) reported that incidence of premature bolting was significantly higher in *rangda* crop compared to *Kharif* and *Rabi* crop. Similarly dark Red Kharif onion cultivars were observed to be more susceptible for premature bolting than the Light Red *Rabi* onion cultivar during late *Kharif* season (Bhonde *et. al* (1992) and Warade *et. al* (1996). L-352, took minimum duration (46.66 days) for bulb initiation followed by L-474 (47.16 days) and L-424, 627, 629 (47.50 days). Highest TSS (13.44) and dry matter (14.31%) was noted for check variety Agrifound White followed by L-652 (13.29%) and (14.06) and Agrifound Light Red (13.16%) and (13.96%) respectively. Thus from the study it may be concluded that the onion lines L-652, 474, 501, 352, check Agrifound Light Red and Agrifound White performed better regarding yield and yield contributing traits.



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Present status, Constraints and future prospects of horticultural crops in Tikamgarh district of Bundelkhand Agro-climatic zone

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Abstract

Tikamgarh district under Bundelkhand Agro-Climatic zone of Madhya Pradesh is more suitable for cultivation of fruits, vegetable and spices on account of favorable climatic, soil condition and irrigation facilities. Guava, custard apple, aonla*, mango, potato,* colocasea*, tomato, ginger, chilli and onion crops may be profitable in Tikamgarh district. The district faces the problem of low productivity of almost all the horticultural crops cultivated here. The constraints of low productivity are non availability of improved varieties seed /seedlings / saplings, non adoption of improved agro techniques, heavy incidence of insect, disease and weeds, post harvest losses, lack of storage and marketing facilities. In order to enhanced productivity of horticultural crops in the district. There is need to assessment of integrated nutrient management, integrated pest management, post harvest technologies at micro level, demonstrate the production efficiency of latest technologies on farmer's field and capacity building and back stopping of farmers are the solutions. These activities should be implemented in organized way though efficient extension functionaries. More ever, the good quality planting material of recommended varieties made available. Awareness of fertilizer, irrigation and plant protection measures should be advocated. Finally a strong linkage between farmers, scientists and horticulture development department should be established.*

key words: Agro-Climatic, constraints, productivity, efficient

Introduction

Tikamgarh district is situated in the northern part of Madhya Pradesh and located in the Wheat – Sorghum Crop Zone of Bundelkhand Agro-climatic zone. The topography of district is characterized with 0 to 5 % slope and small hillocks spreading over major part of district. This has facilitated of in construction water tank for irrigation and constituting watersheds. The district has variety of soils, which include Heavy soils (*kabar/ mar*) 20%, Medium (*Padua*) 36% and Light 44% soils.

Agriculture is primarily characterized by rainfed production systems and therefore, Monsoon rains largely determine success of farming. The Rain starts with the onset of South – West Monsoon in the second fortnight of June and extended up to September with an average annual rainfall of 1001.1 mm and characterized by prolonged dry spells. The monthly maximum and minimum temperature of the district vary between 31.6^{0}C to 45.5^{0}C and 3.3^{0}C to 25.0^{0}C respectively. Total geographical area of the district is 5.04 lakh ha, net sown area is 2.40 lakh ha, which accounts for 47.80 % of the total geographical area. Gross cropped area is 3.70 lakh ha including the double cropped area of 1.26 lakh ha (41 %) against net sown area of 2.40 lakh ha with the cropping intensity of 154.10 %. The district has an area of 1.62 lakh ha under irrigation, which is about 67.63 % of the net sown area. Most of the irrigated area (76 %) is under well irrigation.

In view of the low rainfall pattern, dry climate and predominately light soils with small hillocks the Tikamgarh district is more suitable for arid fruits like Guava, *Ber*, *Anola*, Custard apple, Tamarind and *Karonda*. Besides the fruit crops, the district is also suitable for spices and vegetable crops like ginger, onion, turmeric, chilli, coriander, potato, *colocasea*, brinjal, tomato and sweet potato because of availability of 64 % irrigated area, out of which 76 % area comes under well irrigation. The productivity of fruits, vegetable and spices crops is very low as compared to its potential yield expected from improved technologies.

Objective of the study

- To find out constraints of production.
- To find out need of assessment of technologies at micro level.
- To find out the need of demonstrate of production efficiency of latest technologies.
- To find out necessity of skilled based capacity building.
- To get feed back for further research.

Status of horticultural crops

Table 1: Area, Production and Productivity of Horticultural crops during 2008-09 in Tikamgarh district of Madhya Pradesh

Crops	Area (ha)	% of total area	Production (mt)	% of total production	Productivity (mt/ha)
Fruits	714	3.40	5488	1.402	7.69
Vegetables	18019	85.84	356775	91.128	19.80
Spices	2215	10.55	29220	7.463	13.19
Flowers	12	0.06	24	0.006	2.00
Medicinal	32	0.15	41	0.010	1.28
Total	20992	100.00	391548	100.000	18.65

Horticultural crops are grown over an area of 20992 ha with an annual production 391548 metric tonnes and an average productivity of 18.65 tonnes/ha during 2008-09 in Tikamgarh. Out of the total area covered by different horticultural crops, 714 ha (3.42 %) is under fruit crops, 18019 ha (85.83 %) is under vegetable crops and 2215 ha (10.55 %) is under spices crops (Table 1) in Tikamgarh district of Madhya Pradesh. Annual production of the fruit, vegetable and spices crops is 5488, 356775 and 29220 metric tonnes respectively and its average productivity 7.69, 20.00 and 13.19 metric tonnes/ha (Table 1). The flower and medicinal crops are cultivated only 12 and 32 ha with an annual production of 24 and 41 metric tonnes respectively and productivity 2.00 and 1.00 metric tonnes/ha. During the last 22 years, there has been a steady increase in area and production of horticultural crops in Tikamgarh district (Table 2). From 1985-86 to 2008-09, area under horticultural crops has increased more than three and half times, from 5860 to 20992 ha, and production increased six times from 62610 to 391548 metric tonnes.

Table 2: Comparison of Area, Production and Productivity of fruit, vegetable and spice crops from 1985-86 to 2008-09 in Tikamgarh district of Madhya Pradesh

Crops	1985-86	2008-09
Fruits		
Area (ha)	347	714
Production (mt)	2603	5488
Productivity (mt/ha)	7.50	7.69
Vegetables		
Area (ha)	4423	18019
Production (mt)	51058	356775
Productivity (mt/ha)	11.54	19.80
Spices		
Area (ha)	1090	2215
Production (mt)	9249	29220
Productivity (mt/ha)	8.49	13.19
Total Horticultural Crops		
Area (ha)	5860	20948
Production (mt)	62910	391483
Productivity (mt/ha)	10.74	18.69

The area of fruit crops doubled from 347 ha in 1985-86 to 714 ha in 2008-09. There is also increase in production from 2603 metric tonnes in 1985-86 to 5488 metric tonnes in 2008-09. The yield level increase slightly from 7.50 mt/ha to 7.69 mt/ha in this period. The area under vegetable crops was only 4423 ha in 1985-86 which has increased to 18019 ha in 2008-09. This increase is only four times, however we get seven times more annual production. The production of vegetable was only 51058 metric tonnes in 1985-86 which has increased tremendously to 356775 metric tonnes in 2008-09. The average yield of vegetable increased only 1.7 times during this period. Area under spices has doubled from 1090 ha (1985-86) to 2215 ha (2008-09). However, spices production increased three times from 9249 metric tonnes to 29220 metric tonnes in 2008-09. The yield level of spices is also increased from 8.49 mt/ha in 1985-86 to 13.19 mt/ha in 2008-09. This quantum jump in production is to be attributed to the development of improved technologies and their wide spread adoption by farmers.

Among fruits Guava (147 ha), Custard apple (127 ha), Mango (81 ha) and *Aonla* (72 ha) are the important crops occupying 60.25 % of area under fruits and accounting 72.21 % of total fruit production followed by lime (68 ha), papaya (35 ha) and Jackfruit (19 ha).

Garden pea (13590 ha) is the principal vegetable crop in Tikamgarh district accounting 75.42 % and 76.18 % of total area and production of vegetable crops respectively. Potato (1050 ha) is the second important vegetable crop occupying 5.82 % of total vegetable area and contributes 5.59 % of the total vegetable production followed by Tomato (750 ha), *Colocasea* (667 ha), Brinjal (497 ha) and Sweet potato (483 ha).

Ginger (972 ha), Chilli (520 ha) and Onion (388 ha) are the main spices crops in Tikamgarh district accounting 84.86 % of the total area and contributes 90.67 % of the total production of spices crops followed by Coriander (161 ha), Turmeric (95 ha) and Garlic (49 ha).

Area, production and productivity of fruit, vegetable and spices crops in Tikamgarh district is given in Table 3.

Constraints of lower productivity

Table 3: Crop wise Area, Production and Productivity of Fruits, Vegetables and Spices crops during 2008-09 in Tikamgarh district of Madhya Pradesh

Crops	Area (ha)	% of total area	Production (mt)	% of total production	Productivity (mt/ha)
Fruits					
Guava	147	20.59	2205	40.18	15.00
Custard apple	127	17.79	190	3.46	1.50
Mango	81	11.34	810	14.76	10.00
Aonla	72	10.08	648	11.81	9.00
Lime	68	9.52	612	11.15	9.00
Papaya	35	4.90	700	12.76	20.00
Jackfruit	19	2.66	152	2.77	8.00
Others	165	23.11	171	3.12	1.04
Total	714	100.00	5488	100.00	7.69
Vegetables					
Garden pea	13590	75.42	271800	76.18	20.00
Potato	1050	5.83	19950	5.59	19.00
Tomato	750	4.16	14250	3.99	19.00
Colocasea	667	3.70	11339	3.18	17.00
Brinjal	497	2.76	12425	3.48	25.00
Sweet potato	483	2.68	9660	2.71	20.00
Lady finger	185	1.03	555	0.16	3.00
Cauliflower	83	0.46	2490	0.70	30.00
Cabbage	44	0.24	1320	0.37	30.00
Cowpea	23	0.13	46	0.01	2.00
Others	647	3.59	12940	3.63	20.00
Total	18019	100.00	356775	100.00	19.80
Spices					
Ginger	972	43.88	14580	49.90	15.00
Chilli	520	23.48	4160	14.24	8.00
Onion	388	17.52	7760	26.56	20.00
Corinder	161	7.27	322	1.10	2.00
Turmeric	95	4.29	1900	6.50	20.00
Garlic	49	2.21	294	1.01	6.00
Fenugreek	12	0.54	24	0.08	2.00
Others	18	0.81	180	0.62	10.00
Total	2215	100.00	29220	100.00	13.19

1. Lack of quality seed / seedlings / sapling of improved varieties.
2. Non adoption of recommended horticultural activities.
3. Flower and fruit dropping in fruits crops.
4. Alternative bearing and malformation in mango.
5. Dominance of local varieties of *Aonla* and *Ber*.
6. No organized orchard of custard apple.
7. Lack of interest in rejuvenation of old orchards.
8. Heavy incidence of leaf curl viral disease in Chilli and tomato, shoot & fruit borer in tomato and brinjal, yellow vein mosaic in lady finger, *phytophthora* leaf blight in *colocasea*, stem rot in ginger, powdery mildew in coriander, aphid in cauliflower, purple leaf blotch and thrips in onion.
9. Low use of inputs particularly pesticides, fertilizers and manures.
10. Higher post harvest losses.
11. Majority of marginal and small farmers.
12. Poor resource base and investment ability of farmers.
13. Non availability of storage and processing facilities.
14. Lack of marketing facilities.

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Weed flora of soybean [*Glycine max* (L.) Merrill] in different blocks of Tikamgarh district of Madhya Pradesh

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Abstract

*A survey of weed flora of soybean was undertaken to study the floristic composition of weeds in soybean [*Glycine max *(L.) Merrill] at 44 fields of farmer's in different blocks of Tikamgarh district* viz*., Tikamgarh, Prithvipur and Niwari during July to August, 2007 and 2008. The survey revealed that fields were infested with 26 weed species belonging to 11 families. Out of 26 weed species recorded, 9 species were of grasses, two of sedges and 15 species belonged to broadleaf weeds. The most abundant grass weed species were* Cynodon dactylon, Elusine indica, Dactyloctenium aegyptium *and* Digitaria cilliaris*. The density of these weed species in Tikamgarh, Prithivipur and Niwari blocks varied from 2.4 to 8.4 plants/m^2, 2.8 to 6.1 plants/m^2 and 4.8 to 9.2 plants/m^2, respectively. Among 15 species of broadleaf weeds,* Celosia argentia, Commelina benghalensis, Trianthema monogyna *and* Euphorbia hirta *were the major broadleaf weeds with varied density from 6.8 to 10.2 plants/m^2 in Tikamgarh block, 5.4 to 12.0 plants/m^2 in Prithivipur block and 9.8 to 13.4 plants/m^2 in Niwari block.* Cyperus rotundus, Commelina benghalensis, Trianthema monogyna *and* Celosia argentia *were four major weeds with 100% occurrence in all three blocks of Tikamgarh district. The major botanical family was Gramineae with 9 species followed by Compositeae and Amaranthaceae with 3 species, Cyperaceae and Euphorbiaceae with 2 species, while rest of families* viz*., Commelinaceae, Nyctaginaceae, Asteraceae, Aizoaceae, Solanaceae and Tiliaceae were represented by only single species*

Key words: *Glycine max* (L.), relative density, soybean, survey, Tikamgarh, weed flora

Introduction

Weeds are an important factor in the management of all land and water resources, but their effect is greatest on agriculture. Since, both weeds and crops are plants, they have basically same requirement for growth and development. Weed species differs from location to location and the density of weeds occupying a certain area depends upon many factors, such as type of crops, climatic conditions, soil type, fertilizer level and methods of crop management (Buhler *et al*., 2001). In general, among all the biotic stresses, the annual loss in agricultural crops, only weeds account for nearly 45 per cent in India. The losses due to infestation of crops by insect-pests, incidence of diseases and other factors account for 30, 20 and 5 per cent, respectively (Mukhopadhayay, 1992).

Soybean [*Glycine max* (L.) Merrill] is predominantly cultivated as rainfed crop or under restricted irrigation supply during monsoon season in Tikamgarh district of Madhya Pradesh. The low level of productivity of soybean in India has been ascribed to several constraints. Among these, crop-weed competition has been established as major constraint for its low productivity. Weed infestation in soybean is known to cause an annual yield loss amounting to 35-77 per cent depending on their nature, intensity and period of occurrence during crop growth stages (Khurchania *et al*., 1996). Identifying the major weeds of a crop enables the researcher to design sound weed management strategies. So, knowledge of weed species associated with crops in a region is necessary for planning an effective weed control programme. In Tikamgarh, the mean annual rainfall received is 900 mm with a major share of during south-west monsoon. The higher share of south-west monsoon supports the infestation of weed flora in soybean and hindering them to express their full yield potential. Therefore, an extensive survey was conducted during two consecutive seasons of *kharif* 2007 and 2008 to enlist the major weeds of soybean at farmer's field in different blocks of Tikamgarh district of Madhya Pradesh.

Materials and methods

To study the floristic composition of weeds in soybean [*Glycine max* (L.) Merrill] at farmer's field in different blocks of Tikamgarh district *viz*., Tikamgarh, Prithvipur and Niwari, 44 fields were surveyed during July and August, 2007 and 2008 as this period depicted most appropriate representation of majority of weed species as the weeds have cumulative effects of all

agronomic practices, soil type, fertilizer and irrigation application and weed control measures adopted during initial crop growing period. The road map of Tikamgarh district was followed and route were planned to establish sampling localities as equidistantly as possible avoiding inhabited areas. Four observations on density of individual weeds were recorded per field from four fields at one spot by using quadrate (0.5 x 0.5 m) 100 m deep inside the field. Pooled average value (of 16 observations) of weed density and percent occurrence of individual weeds was thus calculated as given below:

$$\text{Densit} = \frac{\text{Total no. of individual in all quadrates}}{\text{Total no. of quadrates}}$$

$$\text{Relativedensity}(\%) = \frac{\text{No. of individual in all quadrates}}{\text{No. of all species in all quadrates}} \times 100$$

$$\text{Frequency}(\%) = \frac{\text{No. of occurrence of a species in a block}}{\text{Total no. of observations recorded in a block}} \times 100$$

Results and discussion

According to the result of surveys, total 26 weed species belonging to 11 families were found to infest soybean fields after 30-50 days of sowing (Table 1). Out of 26 species recorded, 9 species were of grasses (monocotyledonous), two of sedges and 15 species belonged to broadleaf (dicotyledonous) weeds. The major family was Gramineae with 9 species followed by Compositeae and Amaranthaceae with 3 species, Cyperaceae and Euphorbiaceae with 2 species, while rest of families *viz.*, Commelinaceae, Nyctaginaceae, Asteraceae, Aizoaceae, Solanaceae and Tiliaceae were represented by only single species (Table 1). The maximum number of species in Gramineae might be due to better mechanism, more seeds and high adaptability of weeds species under prevailing environmental conditions.

The most abundant grass weed species were *Cynodon dactylon*, *Elusine indica, Dactyloctenium aegyptium* and *Digitaria cilliaris*. The density of these weed species in Tikamgarh, Prithivipur and Niwari blocks was found varied from 2.4 to 8.4 plants/m^2, 2.8 to 6.1 plants/m^2 and 4.8 to 9.2 plants/m^2, respectively (Table 2). Other wide spread grassy weeds with density of 2.8 to 4.6 plants/m^2 was *Setaria glauca* occurring at 55% site surveyed in Niwari block, whereas in Prithivipur and Tikamgarh blocks, this weed occurred at only 40 and 35% sites surveyed. *Cyperus rotundus* was the leading sedge found to infest the soybean field in all the blocks of Tikamgarh district and its density varied from 9.6 to 13.8 plants/m^2. Out of 15 species of broadleaf weeds, *Celosia argentia, Commelina benghalensis,*

Table 1: Weed flora of soybean in different blocks of Tikamgarh district of Madhya Pradesh

Botanical name	Family	Common name
Cynodon dactylon	Gramineae	Bermuda grass
Digitaria cilliaris	Gramineae	Crab grass
Dinebra Arabica	Gramineae	Lona grass
Elusine indica	Gramineae	Goose/wire grass
Echinocloa crusgalli	Gramineae	Barnyard grass
Echinocloa colona	Gramineae	Jungle rice
Saccharum sponteneum	Gramineae	Tiger grass
Setaria glauca	Gramineae	Yellow fox tail grass
Dactyloctenium aegyptium	Gramineae	Crow foot grass
Cyperus rotundus	Cyperaceae	Purple nut sedge
Fimbristylis miliacea	Cyperaceae	Fimbristylis)
Euphorbia hirta	Euphorbiaceae	Spurge
Digera arvensis	Amaranthaceae	Lahsua
Commelina benghalensis	Commelinaceae	Day flower
Boerhavia diffusa	Nyctaginaceae	Hog weed
Eclipta alba	Compositeae	False daisy
Celosia argentia	Amaranthaceae	Quail grass/white cockscomb
Chorcorus tridens	Tiliaceae	Jew's mellow jute
Trianthema monogyna	Aizoaceae	Horse purslane
Amaranthus viridis	Amaranthaceae	Pig weed
Physalis minima	Solanaceae	Ground cherry
Caesulia axillaries	Compositeae	Cesulia
Ageratum conyzoides	Compositeae	Bill goat weed/ Mahakua
Parthenium hysterophorus	Asteraceae	Congress grass
Phyllanthus niruri	Euphorbiaceae	Niruri

Trianthema monogyna and *Euphorbia hirta* were the major broadleaf weeds with density varied from 6.8 to 10.2 plants/m^2 in Tikamgarh block, 5.4 to 12.0 plants/m^2 in Prithivipur block and 9.8 to 13.4 plants/m^2 in Niwari block. Other dominant broadleaf weeds were *Physalis minim*, *Amaranthus viridis*, *Ageratum conyzoides* and *Digera arvensis* with density in Tikamgarh, Prithivipur and Niwari blocks varied from 3.1 to 7.8 plants/m^2, 2.4 to 5.4 plants/m^2 and 2.9 to 6.2 plants/m^2, respectively (Table 2). High density of weeds might be the consequence of prolific seed production and high emergence potential. The large seed bank ensures the dense weed population as species with high seed output high capacity to colonize and establish themselves (Nizami, 1989).

Among total 25 weed species, *Cyperus rotundus, Commelina benghalensis, Trianthema monogyna* and *Celosia argentia* were four major weeds with 100% occurrence in all three blocks of Tikamgarh district. Similarly, *Cynodon dactylo, Dactyloctenium aegyptium, Euphorbia hirta, Ageratum conyzoides and Amaranthus viridis* were other wide spread weeds in soybean field with 60 to 85% occurrence in all blocks of Tikamgarh district.

In Tikamgarh block, *Cyperus rotundus* was the most dominating weed with relative density (RD) of

Table 2. Density, Relative density (R.D.) and Frequency of Soybean weed flora in different blocks of Tikamgarh district of Madhya Pradesh

Weed species	Tikamgarh			Prithivipur			Niwari		
	Density (No./m²)	R. D. (%)	Frequency (%)	Density (No./m²)	R. D. (%)	Frequency (%)	Density (No./m²)	R. D. (%)	Frequency (%)
Cynodon dactylon	8.4	6.0	85	4.3	3.1	60	5.8	3.6	40
Digitaria cilliaris	3.2	1.9	12	4.4	3.0	20	3.6	2.4	35
Dinebra arabica	0	0	0	0	0	0	0.6	0.4	8
Elusine indica	2.4	1.4	40	6.1	4.3	60	4.8	3.3	47
Echinocloa crusgalli	0.6	0.3	25	2.7	1.6	40	3.4	2.2	20
Echinocloa colona	0	0	0	4.0	2.5	35	2.3	1.7	15
Saccharum sponteneum	0.7	0.4	60	0.4	0.2	20	2.8	1.6	34
Setaria glauca	3.9	2.8	35	2.8	1.7	40	4.6	3.4	55
Dactyloctenium aegyptium	8.0	6.3	60	6.6	5.1	75	9.2	8.2	85
Cyperus *rotundus*	13.8	10.1	100	9.6	6.0	100	10.2	6.8	100
Fimbristylis miliacea	0.2	0.1	40	0	0	0	0	0	0
Euphorbia hirta	6.8	5.3	75	5.4	3.8	60	9.8	7.8	80
Digera arvensis	7.6	5.8	45	5.4	3.7	30	6.2	4.9	50
Commelina benghalensis	9.4	6.7	100	10.8	8.3	100	12.3	9.5	100
Boerhavia diffusa	0.6	0.4	20	0	0	0	0	0	0
Eclipta alba	2.2	1.1	40	0.4	0.2	10	2.0	1.1	18
Celosia argentia	6.8	4.9	100	11.5	8.9	100	13.4	10.1	100
Chorcorus tridens	0.2	0.1	2	0.2	0.1	3	0.3	0.1	3
Trianthema monogyna	10.2	7.9	100	12.6	9.4	100	11.8	8.0	100
Amaranthus viridis	3.1	2.4	60	2.4	1.9	40	2.9	2.0	70
Physalis minima	6.1	4.0	40	4.8	2.7	50	4.2	2.6	60
Caesulia axillaris	2.0	1.0	10	1.6	1.1	20	2.6	1.8	35
Ageratum conyzoides	7.8	5.2	60	6.5	5.1	50	6.0	4.9	40
Parthenium hysterophorus	2	1.1	20	3.4	1.9	35	3.2	1.8	30
Phyllanthus niruri	2.3	1.4	15	2.6	1.1	25	4.5	3.0	45

10.1% followed by *Trianthema monogyna* (7.9%), whereas in Prithivipur block, *Trianthema monogyna* had the highest RD (9.4%) closely followed by *Celosia argentia* (8.9%) and *Commelina benghalensis* (8.3%). However, *Celosia argentia* was the dominating weed with relative density of 10.1% closely followed by *Commelina benghalensis (9.5%)* and *Dactyloctenium aegyptium* (8.2%). Non-cropped area weed like *Parthenium hysterophorus* although was very low in density showed their presence in soybean field. *Fimbristylis miliacea*, a broadleaf weed, showed its presence only in Tikamgarh block with a lower density of 0.2 plants/m². Infestation of grassy weeds *viz*., *Echinocloa colona*, *Echinocloa crusgalli* and *Elusine indica* was more in Prithivipur and Niwari blocks as compared to Tikamgarh block.

The results concluded that *Dactyloctenium aegyptium Cynodon dactylon*, *Elusine indica,* and *Digitaria cilliaris*. *Celosia argentia*, *Commelina benghalensis*, *Trianthema monogyna* and *Euphorbia hirta* were the major weeds infested the soybean crop in different blocks of Tikamgarh district of Madhya Pradesh. The prevalence of these weeds might be due to their prolific seeds out put which ensure their large seed quantity in the filed. The study focus on the weed flora of soybean crop in Tikamgarh district provides opinion/ideas about what strategy should be adopt for the proper weed control.

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Attitude and knowledge of farmers regarding scientific cultivation of paddy technology in western U.P.

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Abstract

In the present research paper an effort has been made to study the attitudinal changes occurred and level of knowledge of the respondents (farmers of different size group) towards scientific cultivation of paddy crop. The study was conducted in two districts i.e. Mathura and Aligarh. Two blocks, eight villages and 225 respondents were selected through random sampling technique. All the scientific steps were taken into account while preparing the extension tool, data collection, tabulation, analysis and its final interpretation. The outcomes of the study reveals that majority of the large farmers have favourable attitude towards scientific cultivation of paddy crop while medium and small farmers comparatively having less favourable attitude. Regarding knowledge the similar trend was also observed as majority of the large farmers have good or fair knowledge regarding almost all the practices of paddy cultivation as compared to medium and small farms.

Key words: scientific, interpretation, knowledge, cultivation

Introduction

The growth and development of agriculture sector lies in the availability of all important essential inputs and their scientific use by the farming community in the field situation. The paddy crop is one of the most important crop being consumed by majority of the people in the country at national and international level and has wide range scope in the agriculture sector. Uncounted researches have been conducted in the past in the country and abroad. Keeping in view of its broad based scope, the present study was conducted with the sincere hope that outcomes of the study will be of immense important to the farming community, extension personnel, policy makers and scientists. The present study is based on two specific objectives viz. (1) General profile of the respondents, and (2) their attitude and knowledge regarding scientific paddy cop technology.

Methods and Materials

The present study was conducted in western Uttar Pradesh. The main focuss was confined to two districts viz. Mathura and Aligarh. Two blocks from each district were selected through random sampling techniques. Under each block, two villages from each block thus in all eight villages and 225 respondents comprising 75 small, 75 medium and 75 large farmers were selected through random sampling technique. The primary data was collected with the help of scientific developed extension tool and this was employed among all the respondents. The primary data collection was done personally. The collected data was compiled, classified, tabulated, analysed with the help of percentage and X2 test. After proper analysis the tables and results were presented accordingly.

Results and Discussion

The important outcomes were discussed and presented in two aspects viz. Attitude of farmers regarding scientific cultivation of Paddy crop in the nursery and level of knowledge of farmers pertaining to Paddy crop in nursery husbandry. The results are presented below.

Attitude of farmers regarding scientific cultivation of paddy crop:

In order to determine the farmers attitude towards high yielding varieties of paddy cultivation, the attitude scale developed by Nair (1965) was used with minor modification. Five categories of attitude scale is structured based on the score.

These are; most unfavourable (25-28), Unfavourable (29-32), Neutral (33-36), Favourable (37-40) and most favourable (41-44).

The frequency and corresponding percentage distribution of the responses on this aspect is given in Table 1.

The Table 1 shows that 58.66% small, 70.68% medium and 80.00 per cent large farmers have either favourable or most favourable attitude towards H.Y.V. rice cultivation. It was also observed that 20.00 per cent small, 13.34 per cent medium and 6.66 per cent large farmers have either Unfavourable or Most unfavourable attitude towards H.Y.V. paddy cultivation.

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Table 1: Attitude of farmers towards High Yielding Varieties of paddy

S. No.	Attitude of farmers	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Most unfavourable(25-28)	7	9.34	4	5.34	2	2.66	13	5.78
2.	Unfavourable (29-32)	8	10.66	6	8.00	3	4.00	17	7.55
3.	Neutral (33-36)	16	21.34	12	22.67	10	13.34	38	16.88
4.	Favourable (37-40)	28	37.33	34	45.34	36	48.00	98	43.56
5.	Most favourable (41.44)	16	21.33	19	25.34	20	32.00	59	26.22
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Table 2 (a) : High Yielding Varieties of paddy crop.

S. No.	Level of knowledge regarding soil technology	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	30	40.00	35	46.66	40	53.34	105	46.66
2.	Near correct	20	26.66	25	33.34	30	40.00	75	33.34
3.	Incorrect	25	33.34	15	20.00	5	6.66	45	20.00
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 17.523* D.F. = 4 * Significant at 5% level

Overall data shows that 69.77% respondents have Favourable and Most favourable attitude, 13.33% respondents have Unfavourable and Most unfavourable attitude, and 16.88% respondents have Neutral attitude towards H.Y.V. paddy cultivation. It is clear from the above explanation that majority of large farmers have favourable and most favourable attitude in comparison to medium and small farmers.

2. Level of knowledge of farmers regarding scientific cultivation of paddy crop :

Under this head an attempt was made to assess the level of nowledge of farmers regarding various practices of paddy cRop technology.

Knowledge of farmers about HYV of seed, seed rate and seed treatment :

The level of knowledge of respondents regarding HYV of seed, seed rate and seed treatment is presented as under:

Knowledge of farmers about High Yielding Varieties:

The knowledge about HYV of seed has been divided in to three categories i.e. correct, near correct and incorrect response.

(a) Table 2(a) clearly shows that 40.00% small farmers have correct knowledge, 26.66% have near correct knowledge and 33.34% have incorrect knowledge. In case of medium farmers, 46.66% have correct, 33.34% have near correct and only 20.00% have incorrect knowledge and in case of large farmers, 53.34%, 40.00% and 6.66% have correct, near correct and incorrect knowledge respectively abouve HY Varieties of paddy. The overall table reveals that 46.66% have correct, 33.34% have near correct and 20.00% have incorrect knowledge regarding HYV of paddy. Thus it may be concluded that large farmers had comparatively good knowledge about improved varieties in comparison to small and medium farmers.

(b) Table 2(b) indicates that 42.66%, 30.67% and 20.67% small farmers have correct, near correct and incorrect knowledge. In case of medium farmers, 46.66%, 37.34% and 16.00% have the similar trend of knowledge. The large size farmers comparatively are better as 53.34% have correct knowledge, 41.33% have near correct and only 5.33% have incorrect knowledge

Table 2 (b) : Level of knowledge of seed rate.

S. No.	Level of knowledge regarding seed rate	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	32	42.66	35	46.66	40	53.34	107	47.56
2.	Near correct	23	30.67	28	37.34	31	41.33	82	36.44
3.	Incorrect	20	26.67	12	16.00	4	5.33	36	16.00
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 16.066* D.F. = 4 * Significant at 5% level

Table 2 (c) : Level of knowledge about seed treatment.

S. No.	Level of knowledge of seed treatment	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	10	13.34	17	22.67	33	44.00	60	26.67
2.	Near correct	13	17.33	23	30.67	22	29.34	58	27.78
3.	Incorrect	52	69.33	35	46.66	20	26.66	107	47.55
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 36.788* D.F. = 4 * Significant at 5% level

regarding seed rate. Overall data shows that about 47.00% respondents had correct knowledge regarding soil technology.

Chi-square was found significant which indicates that association is found between size of farm and level of knowledge regarding seed rate practice.

(c) Table 2(c) reveals that 13.34% small, 22.67% medium and 44.00% large farmers have correct knowledge regarding seed treatment. Overall data shows that 26.67% farmers have correct knowledge, 27.78% farmers have near correct and 47.55% farmers have incorrect knowledge. In all the result indicates that large farmers are better having correct knowledge in comparison to small and medium farmers.

Chi-square value was significant which indicates that there is association between the size of farm and the level of knowledge of seed treatment.

(ii) Level of knowledge of farmers regarding nursery management:

Level of knowledge regarding area of nursery, application of manure & fertilizer in nursery , use of irrigation and plant protection measures in Nursery management have been given in the following tables.

(a) Level of knowledge of farmers about area of nursery for paddy crop:

Table 3(a) reveals that 40.00% small farmers,

Table 3 (a) : Level of knowledge about area of nursery.

S. No.	Level of knowledge about area of nursery	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	30	40.00	35	46.66	40	53.34	105	46.66
2.	Near correct	22	29.34	29	38.68	30	40.00	81	36.00
3.	Incorrect	23	30.66	11	14.67	5	6.66	39.	17.34
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Table 3(b): Level of knowledge about application of manure and fertilizers in nursery

S. No.	Level of knowledge about manure and fertilizer	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	20	26.66	20	26.66	30	40.00	70	31.11
2.	Near correct	20	26.67	30	40.00	33	44.00	83	36.89
3.	Incorrect	35	46.67	25	33.34	12	16.00	72	32.00
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 17.280* D.F. = 4 * Significant at 5% level

Table 3(c) : Level of knowledge of farmers about irrigation use in nursery of paddy crop.

S. No.	Level of knowledge of farmers about irrigation in nursery	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	30	40.00	35	46.66	42	56.00	107	47.55
2.	Near correct	26	34.66	30	40.00	29	38.66	85	37.78
3.	Incorrect	19	25.34	10	13.34	4	5.34	33	14.67
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 13.277* D.F. = 4 * Significant at 5% level

Table 3(d) : Level of knowledge of farmers about plant protection use in nursery of paddy crop.

S. No.	Level of knowledge of about plant protection in nursery	Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total No.	Total %
1.	Correct	15	20.00	22	29.34	35	46.67	72	32.00
2.	Near correct	18	24.00	25	33.33	25	33.33	68	30.22
3.	Incorrect	42	56.00	28	37.33	15	20.00	85	37.78
	Total	75	100.00	75	100.00	75	100.00	225	100.00

Chi-square = 30.814* D.F. = 4 * Significant at 5% level

46.66% medium farmers and 53.34% large farmers have correct knowledge regarding use of manure & fertilizer in nursery.

Chi-square was also found significant at 5% level which indicates that there is association between the size of farm and the level of knowledge about area of nursery.

(b) Level of knowledge about application of manure & fertilizer in nursery :

Table 3(b) indicates that 26.66% small, 26.66% medium and 40.00% large farmers have correct knowledge regarding manure and fertilizer application in nursery. Overall data revealed that 31.11%, 36.89% and 32.00% respondents have correct, near correct and incorrect knowledge respectively regarding manure and fertilizer technology.

Chi-square was also found significant at 5% level which indicates that there is association between the size of farm and the level of knowledge about manure and fertilizer application in nursery.

(c) Level of knowledge of farmers about irrigation in nursery in paddy crop:

Table-3(c) shows that 40.00% small farmers, 46.66% medium farmers and 56.00% large farmers have correct knowledge regarding irrigation use in nursery of paddy crop. Overall data indicates that out of total 225 farmers, 47.55%% farmers have correct knowledge, 37.78% farmers have near correct knowledge and only 14.67% farmers have incorrect knowledge regarding irrigation in nursery.

Chi-square was found significant at 5% level which indicates that there is association between the size of farm and the level of knowledge about irrigation in nursery.

(d) Level of knowledge of respondents about plant protection in nursery of paddy crop:

Table 3(d) reveals that 20.00% small farmers, 29.34% medium farmers and 46.67% large farmers have correct knowledge regarding plant protection use in nursery.

Chi-square was found significant at 5% level which indicates that there is association between the size of farm and the level of knowledge about plant protection in nursery.

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Adoption of technology in scientific dairy farming practices by ex-trainees through KVK trainings

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Abstract

Krishi Vigyan Kendra (KVKs) conducted a variety of trainings for the benefit of farmers and rural youth of their district. Any KVK training programme starts with identification of training needs, the most important step in organization of any training programme. The present study on adoption of technology in scientific dairy farming practices of the ex-trainees was conducted by K. V. K., Awagarh of Etah district in Uttar Pradesh during 2003-04 to 2007-08. A sample of total 125 on campus, off campus and rural youth trainees were selected randomly based on the four important areas of breeding, feeding, management/health care and fodder production in this study.

Key words: Training, trainees, dairy farming, technology, adoption

Introduction

The major drawback of dairy sector in India is its low productivity. The major reasons of low productivity could be due to traditional dairy farming practices by the farmers. It is well recognized that for increasing productivity and production with aim to make dairy business more remunerative, it is essential to go for adoption of scientific dairy farming practices in the field of breeding, feeding, health care and management (Kumar et al. 2011).

Krishi Vigyan Kendra (KVK), an innovative institution of ICAR is engaged in the transfer of all feasible technologies in the field of agriculture and allied field to farmer's at field level through various means like training to farmers, rural youth and extension worker under its TOT programme. Front line demonstration, animal health camp, on farm trial, kishan mela, farm advisory services other extension activities are also organised by KVK in the operational area. Training plays an important role in the advancement of human performance and also provides a systematic improvement of knowledge and skills which in turn helps the trainees to function effectively and efficiently in their given task after acquisition of new skills, attitude and knowledge in the context of preparing for entry into a vocation or improving ones productivity in an organization or enterprise *(Sajeev and Singha, 2010)*.

KVK Awagarh (Etah) was established in the year 1982 under administrative control of Raja Balwant Singh College, Agra (U. P.), with aim to improve the socio-economic status of poor farmers/animal keepers in the most backward Etah district of Uttar Pradesh. KVK, trainings play a vital role in the process of transfer and adoption of technology. The present study was under taken with the objective of measuring the adoption of technology in scientific dairy farming practices of ex-trainees.

Methodology

The present study was conducted during 2003-04 to 2007-08 (5 years) at Krishi Vigyan Kendra, Awagarh of Etah district in Uttar Pradesh. The study based on ex-trainees participation for the transferred specific technology of different trainings programme in the subject of Animal Husbandry and Dairying.

Out of four major categories of KVK training- on campus, off campus, rural youth and extension functionary, three categories were selected having maximum number of trainees as practicing dairy farmers. The consisting 10-10 on and off campus and 5 rural youth ex-trainees were selected in each year. A sample of total 125 on campus, off campus and rural youth trainees were selected randomly for the study. Based on the judges opining four important areas of dairying viz. - breeding, feeding, management/health care and fodder production were selected for studying level of adoption by the dairy farmers.

Personal interviews were conducted using a pretested structured interview schedule. The tabular analysis and percentage were used to analyse the data.

Results and Discussion

The data analysed and presented in Table 1. It is clear from the information that maximum number of trainees participated in on campus (314) and off campus (951) training programmes.

It shows that the major activity of KVK consisted of conducting the specific skilled technology and need

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Table 1: Achievement of KVK trainings in different category of AH & Dairying

S. No.	Type of training/ category	No. of courses 03-04	04-05	05-06	06-07	07-08	Total	No. of total participants (trainees) 03-04	04-05	05-06	06-07	07-08	Total
1	On campus	4	4	4	4	4	20	83	52	50	64	65	314
2	Off campus	26	16	16	16	16	90	283	151	137	195	185	951
3	Rural Youth (R. Y.) for self employment	1	1	1	1	1	5	11	13	10	22	15	71
4	Extension Functionaries (E. F.)	-	1	1	4	1	7	-	10	23	100	20	153
	Total	31	22	22	25	22	122	377	226	220	381	285	1489

Table 2: Adoption of technology in major area of dairy farming

Name of specific technology/ skilltransferred through trainings	Individual adoption of livestock owner (in percent) 2003-04	2004-05	2005-06	2006-07	2007-08	Overall
A. Breeding						
1. Improvement of local breeds	32.00	30.00	34.00	35.00	30.00	32.20
2. Knowledge about infertility	45.00	46.00	48.00	50.00	45.00	46.80
3. Heat detection	55.00	58.00	60.00	62.00	62.00	59.40
4. Proper time of mating	62.00	60.00	64.00	62.00	60.00	61.60
5. Care of repeat breeders	45.00	46.00	48.00	45.00	46.00	46.00
Overall						**49.20**
B. Feeding						
1. Balance ration computation & feeding	58.00	60.00	65.00	70.00	75.00	65.60
2. Treatment of paddy/wheat straw by urea	0.00	0.00	0.00	5.00	5.00	2.00
3. Mineral mixture feeding	20.00	20.00	32.00	28.00	30.00	26.00
4. Common salt and chalk feeding	55.00	59.00	58.00	58.00	58.00	57.60
5. Milch animals feeding	82.00	85.00	86.00	88.00	82.00	84.60
6. Colustrum feeding	91.00	82.00	83.00	89.00	80.00	85.00
7. Use clean water for drinking	80.00	82.00	85.00	82.00	80.00	81.80
8. Pregnant animals feeding	65.00	58.00	60.00	62.00	60.00	61.00
9. Heifers feeding	35.00	38.00	38.00	34.00	35.00	36.00
Overall						**55.51**
C. Management and Health care						
1. Deworming of calves	65.00	66.00	67.00	70.00	68.00	67.20
2. Deworming of large dairy animals	30.00	32.00	35.00	30.00	32.00	31.80
3. Demerits of oxitocin	45.00	48.00	50.00	52.00	52.00	49.40
4.Prevention of ecto & endo parasite	65.00	70.00	59.00	65.00	62.00	64.20
5. care of milch animals	65.00	68.00	68.00	70.00	72.00	68.60
6. Care of pregnant cows and buffaloes	55.00	58.00	60.00	62.00	64.00	59.80
7. Correct milking method	32.00	34.00	35.00	36.00	38.00	35.00
8. Clean milk production	40.00	40.00	42.00	45.00	42.00	41.80
9. Castration of calf and bull	70.00	72.00	70.00	74.00	68.00	70.80
10. Dehorning of calves	32.00	34.00	35.00	30.00	32.00	32.60
11. Cleaning of cattle shed	60.00	62.00	62.00	60.00	62.00	61.20
12. H. S. and F. M. D. vaccination	66.00	60.00	65.00	62.00	64.00	63.40
Overall						**53.82**
D. Fodder Production						
1. Fodder crop and variety	65.00	66.00	68.00	70.00	72.00	68.20
2. Multicut fodder production in summer season	40.00	42.00	44.00	46.00	46.00	43.60
3. Balance green fodder production around the year	8.00	10.00	10.00	12.00	10.00	10.00
4. Silage and hay making	2.00	4.00	3.00	4.00	5.00	3.60
Overall						**31.35**

based training in the important areas of dairy farming. The study has been carried out the adoption of technology of dairy farming in individual practices in each major area. The adoption responses have been shown in Table 2.

Breeding:

In case of breeding, the adoption of proper time of mating 61 percent, more than 59 percent trainees adopted heat detection technology. Considerable proportion of trainees has also adopted the knowledge about infertility, care of repeat breeding and improvement of local breed. In case of overall breeding area adoption, 49 percent of dairy farmers were in nearby medium adoption category.

Feeding:

In case of feeding, above 80 percent adoption consisted of colustrum feeding, milch animals feeding and use of clean water for drinking. The treatment of paddy/wheat straw by urea adoption was very low.

In case of overall adoption of feeding, 55 percent of trainees were in medium adoption category. These results were in line with finding of Kaushik (1988) and Chugh & Chand (1996).

Management/health care:

In case of management/health care adoption, 70 percent trainees opted for castration of male calf and 68 percent opted for care of milch animals. Adoption of deworming of calves was 67 percent and prevention of ecto & endo parasite adoption was 64 percent. In case of overall management/health care adoption, 52 percent of dairy farmers were in medium adoption category.

Fodder production: In case of fodder production, 68 percent trainees adopted fodder crop, variety and 43 percent adopted multicut fodder production in summer season. In case of overall adoption of fodder production, 31 percent were in low adoption category. The study is comparable with the earlier studies under field condition. (Raut et al. 1989, Shreesailaja and Veerabhadraiah.1992. and Kumar et al. 2009)

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To study the adoption behavior of the respondnts to wards the programmes of the KVK's

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Abstract

It is highly imperative to undertake analytical studies on the impact of KrishiVigyan Kendra on the farmer of district and to make suggestion for making KrishiVigyan Kendra more beneficial for the farmers.The KrishiVigyan Kendra provides a strong training support for bringing about production breakthrough in agriculture.KVK has major thrust to transfer the technologies among the farmers in order to enhance the productivity of agriculture and allied enterprises. In the findings it was found that more than half of the respondents of KVKs (Shahjahanpur, Sultanpur and Bareilly) reported to have fully adopted the technology. The low adoption may be owing to the technology not suited for the agro-climatic conditions. Besides, the farmers are extremely poor with small holdings and fewer resources and hence could have difficulties in adopting technology without proper incentives and subsidies. On the other hand the highest adoption at KVKs, from NGOs may be due to better and adequate infrastructure and other facilities.

Key words: suggestion, agro-climatic, adequate, infrastructure

Introduction

Looking into the rapid expansion of KrishiVigyan Kendra to meet the growing demand of people and incurring huge investment in meeting recurring and non-recurring expenditures of the Krishi Vigyan Kendra, it is high time to have a wholesome thinking about the enduring influences of the Krishi Vigyan Kendra. Nevertheless when India has very high hope from Krishi Vigyan Kendra and it is planned to cover the entire country under the network of Krishi Vigyan Kendra. The Krishi Vigyan Kendra provides training to the farmers, household ladies and dairy and Horticulture in the latest technology developed by Agricultural universities and research stations for their upliftment or various aspects relating to the farming community. Training are also provided by Krishi Vigyan Kendra regarding allied occupation such as bee keeping, mushroom cultivation, pickle making, candle making, doll making, dairy training. So it was thought to evaluate the performance of selected Krishi Vigyan Kendra's with objective of to study the adoption behavior of the respondents towards the programmes of the KVK's.

Methodology

Selection of the Krishi Vigyan Kendras

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

Selection of villages

Five villages were selected from the each selected KVK for the selection of the respondents, two adjacent to KVK, two in the radius of 25-30 km and one beyond 30 km from the KVK. Only such villages selected where farmers attended the training programmes of the KVK. 25 respondents were selected from each selected village.

Selection of Respondents

The lists of beneficiaries of three selected Krishi Vigyan Kendra were prepared. 125 beneficiaries from each selected Krishi Vigyan Kendra were selected randomly as respondents for the study. By this the total 350 beneficiaries were selected from three Krishi Vigyan Kendra's.

Adoption Behaviour

Adoption of recommended agriculture technology concerning to the cultivation practices was measured by means of "Adoption Intensity Index". The procedure was followed for selected practices under study, viz., land preparation, varieties, nursery preparation, seed rate, seed treatment sowing time, transplanting time, spacing, fertilizer dosage, weeding, irrigation, disease control and insect/pest management. Total 12 practices were incorporated in the test which itself were further classified into Parts. The total numbers of questions in the adoption test was 12.The adoption of farm practices by individual farmers is measured with method which is suggested by Singh and Singh (1990) and Roger's (1962). The adoption behaviour of beneficiaries was worked out for individual respondent for all the 12 practices. The procedure was applied for all the 350 beneficiaries to get individual extent under each practice,

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is given below:

Measurement of adoption level

Fully adopted - 3
Partially adopted - 2
Not adopted - 1

Some questions were asked in such a way to get the answer in correct/incorrect type. The correct answer was given two (2) weightage, while incorrect answer scored one (1).

The following formula was used to work out the individual adoption extent.

Adoption extent =

Where x1, x2, x3 - - - - - - -xn are correct answer for first, second, third - - - - -nth question and 'N' is the maximum score possible to secure. Finally, the adoption index was measured as the ratio given interviews of percentages between the total number of innovations adopted and those applicable in each case of responds by the formula.

Adoption index = x 100

The respondents were further divided into three categories as low, medium and high on the basis of scores obtained by them. The following criteria were used for categorizing the adoption behaviour of the respondents.

Up to 8 – low
9 - 16 – Medium
Above 17 – high

Collection and analysis of the data

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

Results and Discussion

Adoption behavior of the respondents on the programmes of the Krishi Vigyan Kendras.

Table 1: Showing adoption behavior score of beneficiaries

S. No.	Categories	Number of Beneficiaries	%age
1	Low (upto-10)	99	33.00
2	Medium (10-20)	128	42.66
3	High (above-21)	73	24.34
Total		300	100.00

From the table 1 it is clear that the majority of beneficiaries (42.66%) were found medium adoption behavior group where as 33% of the beneficiaries were possessed low adoption category. 24.34 percent of beneficiaries showed high adoption behavior regarding new Agricultural technologies provided by the Krishi Vigyan Kendra. On the basis of above finding it can be concluded that majority of respondents have adopted new Agricultural technologies provided by the KVK either fully or partially.

Different Innovative technologies adopted by the beneficiaries provided by the KVK's

Table 2: New agricultural technologies adopted by the beneficiaries provided by the KVK, Shahjahanpur

S. N.	Practices	Beneficiaries	Rank
1	Soil testing	54	IX
2	New crops	65	VII
3	Balance fertilizer dosage	81	I
4	Seed rate	67	V
5	Checking soil erosion	2	XII
6	Sowing time	68	IV
7	Crop rotation	56	VIII
8	Application of fertilizer	71	III
9	Management of farm waste	77	II
10	Vermi compost	29	X
11	Herbal crops	14	XI
12	Seed treatment	66	VI

Table 2 clearly indicates the new Agriculture technologies accepted by beneficiaries. Balance fertilizer doses was accepted by 81% beneficiaries and ranked Ist while management of farm waste was accepted by 77% beneficiaries and ranked 2nd. Application of fertilizer was accepted by 71% beneficiaries, ranked 3rdwhere as sowing time was accepted by 68% beneficiaries and ranked 4th. Seed rate was accepted by 67% beneficiaries and ranked 5th while seed treatment was accepted by 66% beneficiaries, ranked 6th. 65 percent beneficiaries accepted new crops suggested by KVK and ranked 7thwhereas crop rotation was adopted by 56 percent beneficiaries with 8th rank. Soil testing was accepted by 54% beneficiaries and ranked 9th while vermicomposting was accepted 29 percent beneficiaries, ranked 10th. 14 percent beneficiaries accepted herbal crops with 11th rank where as 2% accepted soil erosion checking measures.

Table 3: New agricultural technologies adopted by the beneficiaries provided by the KVK Sultanpur

S. N.	Practices	Beneficiaries	Rank
1	Soil testing	52	IX
2	New crops	62	VII
3	Balance fertilizer dosage	79	I
4	Seed rate	65	V
5	Checking soil erosion	11	XII
6	Sowing time	68	IV
7	Crop rotation	52	VIII
8	Application of fertilizer	71	III
9	Management of farm waste	77	II
10	Vermi compost	47	X
11	Herbal crops	24	XI
12	Seed treatment	66	VI

Table 3 clearly indicates the new Agriculture technologies accepted by beneficiaries. Balance fertilizer

doses was accepted by 79% beneficiaries and ranked Ist while management of farm waste was accepted by 77 percent beneficiaries and ranked 2nd. Application of fertilizer was accepted by 71% beneficiaries, ranked 3rdwhere as sowing time was accepted by 68% beneficiaries and ranked 4th. Seed rate was accepted by 65% beneficiaries and ranked 5th while seed treatment was accepted by 66% beneficiaries, ranked 6th. 65 percent beneficiaries accepted new crops suggested by KVK and ranked 7thwhereas crop rotation was adopted by 52% beneficiaries with 8th rank. Soil testing was accepted by 52% beneficiaries and ranked 9th while vermi compost was accepted 47% beneficiaries, ranked 10th. 24% beneficiaries accepted herbal crops with 11th rank where as 11% accepted soil erosion checking measures.

Table 4: New agricultural technologies adopted by the beneficiaries provided by the KVK Bareilly

S. N.	Practices	Beneficiaries	Rank
1	Soil testing	50	IX
2	New crops	61	VII
3	Balance fertilizer dosage	85	I
4	Seed rate	57	V
5	Checking soil erosion	14	XII
6	Sowing time	68	IV
7	Crop rotation	52	VIII
8	Application of fertilizer	70	III
9	Management of farm waste	46	II
10	Vermi compost	49	X
11	Herbal crops	19	XI
12	Seed treatment	59	VI

Table 4 clearly indicates the new Agriculture technologies accepted by beneficiaries. Balance fertilizer doses was accepted by 85% beneficiaries and ranked Ist while management of farm waste was accepted by 46 percent beneficiaries and ranked 2nd. Application of fertilizer was accepted by 70% beneficiaries, ranked 3rdwhereas sowing time was accepted by 68% beneficiaries and ranked 4th. Seed rate was accepted by 57% beneficiaries and ranked 5th while seed treatment was accepted by 59%beneficiaries, ranked 6th. 61 percent beneficiaries accepted new crops suggested by Krishi Vigyan Kendra and ranked 7thwhereas crop rotation was adopted by 52% beneficiaries with 8th rank. Soil testing was accepted by 50 percent beneficiaries and ranked 9th while vermi compost was accepted 49% beneficiaries, ranked 10th. 19 percent beneficiaries accepted herbal crops with 11th rank where as 14 percent accepted soil erosion checking measures.

Rate of adoption by the respondents of different KVKs

The table shows that more than half of the respondents of KVKs (Shahjahanpur, Sultanpur and Bareilly) reported to have fully adopted the technology. The low adoption may be owing to the technology not suited for the agro-climatic conditions. Besides, the farmers are extremely poor with small holdings and fewer resources and hence could have difficulties in adopting technology without proper incentives and subsidies. The Kendra also lacks proper facilities to provide adequate work experience to the trainees. On the other hand the highest adoption at KVKs, from NGOs may be due to better and adequate infrastructure and other facilities.

Table 5: Extent of adoption by the respondents of different KVKs

S. No.	Extent of Adoption	Frequency and percentage at KVK Shahjahanpur	Sultanpur	Bareilly	Total
1.	Fully	51(51.00)	55(55.00)	45(45.00)	151(50.33)
2.	Partially	34(34.00)	39(39.00)	36(36.00)	109(36.33)
3.	No	15(15.00)	6(6.00)	19(19.00)	40(13.34)

It may be inferred that the training programmes of Krishi Vigyan Kendra under NGO have proved more effective in providing various benefits to the farmers. The KrishiVigyan Kendra of NGO have benefited the respondents more in terms of enhanced productivity but the university system KVKs have better records in providing employment benefits to the farmers..

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Analyzing the extent of adoption of Integrated Pest Management approach with respect to some socio-economic attributes in Nadia district of West Bengal

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Abstract

The indiscriminate use of broad spectrum chemicals has resulted in reduction in biodiversity of natural enemies, outbreak of secondary pests, development of resistance to pesticides, pesticides induced resistance and contamination of food and ecosystem. All these incidences resulted to grow the awareness of integrated pest management concept. Keeping these in view, this study was carried out in Ranaghat-I and Chakdah blocks of Nadia district in West Bengal to evaluate the efficacy of the IPM. The purposive and random sampling techniques were carried out for selection of district, blocks, villages and respondents. To assess the nature and level of adoption of IPM techniques by the IPM trainee favours thirteen socio-economic variables were considered. The data were collected through pre-tested, structured interview schedule and processed into simple correlation, multiple regression, step-down regression and path analysis. The data revealed that 69% of the IPM trainees had fully adopted followed by 18% trainees for partial adoption. The rest portion of trainees had decided to adopt IPM. The trainees belong to the age group from 29 years to 48 years having education from primary level to high school level. These analyses revealed that extension contact and utilization of communication sources yielded a substantial effect on adoption of IPM. The selected predictor variables had together explained about 32 percent of total variation embedded with the predicted variable. The path analysis depicted that the variables land holding and extension contact had channeled the highest indirect effect of other seven and eight variables respectively for the prediction of adoption index of the Integrated Pest Management.

Key Words: Integrated pest management, Social status, Path analysis, Skill development

Introduction

Today's ecological set up of the world has been thrown into the fragility of balances and performances through an indiscriminate use and incorporation of permitted pesticides and other agro-chemical into the very system. The oblivious component of environmental pollution needs to be meticulously examined to assess and delineate its pathway and process of distorting the much needed balances (Shoemaker *et al.*, 1977). In order to erase the scurrying memory of "silent spring", the intellects, social activists, the scientists and technocrats should resolve together as to what we may call a sustainable approach in managing the danger of indiscriminate chemicalisation of agriculture to achieve the best from the least of adding entropy. The world scenario reveals that the crop losses due to all pests including insects, diseases and weeds are estimated to be nearly 48 percent. This includes 35% pre-harvest losses and 9 percent post harvest losses (D. Pimentel and Terhune, 1977). Because of these substantial losses of valuable food, we need to assess present paradigm of pest control as an integral part of the total systems. A majority of the pest management specialists and cognate policy makers in government made an attempt to this ambitious target of marching forth with the concept of Integrated Pest Management (IPM) to all sectors of pest control and in the farmers' field. Thus in implementing the IPM programme, it is imperative to understand the attitude of farmers towards IPM programme. Since the ultimate decision regarding the adoption of IPM programme rest with the farming community, Wiley (1974) reported that sound professional judgment is crucial to successful application of IPM programme. He also stated that application of IPM must not require unbearable economic risk to adopter.

Keeping all these in view this study tries to explore the area of extent of adoption of IPM approach with respect to the socio-economic attributes of the beneficiaries under IPM programme.

Methodology

The study was conducted in nine villages of Ranaghat-I and Chakdah block in Nadia district. The

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blocks were purposively selected for this study according to the opinion of Principal Agricultural Officer of Nadia district due to the presence of ample IPM programme beneficiaries. The nine villages from these two blocks were randomly selected for this study. Also for drawing hundred respondents random sampling technique was adopted. The dependent variable, adoption of IPM technique through the programme had been operationalised as well as measured. The causal variables viz. socio-personal, agro-economic, socio-psychological attributes of the respondents had measured with the help of instruments developed or modified for this study. Not only that but also some conventional instruments like Dasgupta (1968) adoption scale, Pareek and Trivedi scale, Bloom and Other (1960) scale etc. had directly taken to operationalise and measure some variables. Data were collected with the help of structured interview schedule. The analytical framework of the study included the statistical tools like frequency, percentage, coefficient of correlation, multiple regression and path analysis. In case of measuring the adoption index for IPM practices, respondents were asked about the 15 different IPM practices for it's adoption in their field. This adoption was categorized and scored as fully adopted - '3', partially adopted - '2'and not adopted -'1'.

Results and discussion

From table 1 it is to infer that most participation of the farmer in IPM programme is between the age group of 36 to 40 years and least participation is between the age group of 46 to 50 years.

Table 1: Classification of the respondents according to their age

Category (Years)	Frequency	Percentage
26-30	20	20
31-35	20	20
36-40	30	30
41-45	16	16
46-50	14	14
Total	100	100

From table 2 it is very clear that 69% respondents had adopted the IPM practices and 13% respondents had not at all adopted the technology.

Table 2: Classification of the respondents according to their adoption index on IPM

Score	Frequency	Percentage	Category
30-40	69	69	Fully adopted
20-29	18	18	Partially adopted
0-19	13	13	Not adopted
Total	100	100	

Table 3 presents co-efficient of correlation between adoption of IPM, the consequent variable and 13 other causal variables. It is found that the variable land holding, family income, extension contact, material possession, cropping intensity and utilization of communication sources wielded a substantial effect on adoption of IPM technology.

Table 3: Co efficient of correlation and multiple regression analysis of adoption index(Y) on IPM with other thirteen causal variables

Variables	Correlation co-efficient (r)	Multiple Regression co-efficient (b)	β X R	t value of b
Age (X_1)	-0.0404	-0.097	1.243	0.947
Education (X_2)	0.1765	0.434	9.484	1.783
Family size (X_3)	-0.0228	-0.491	0.897	0.904
Land holding (X_4)	0.2953**	0.810	24.210	0.884
Family income (X_5)	-0.3156**	-0.210	16.714	1.452
Extension contact (X_6)	0.2494**	-0.003	-19.316	0.803
Materials possession (X_7)	0.2729**	-0.003	-19.316	0.803
Cropping intensity (X_8)	0.2672**	0.622	13.467	0.947
Mass Media exposure (X_9)	0.1495	0.018	3.408	0.652
Utilization of communication sources (X_{10})	0.3400**	0.353	18.409	1.271
Knowledge about IPM (X_{11}) 0.211		-0.0277	-0.100	0.254
Skill development on IPM(X_{12})	-0.1284	-0.587	4.501	1.019
Irrigation index (X_{13})	0.1802	0.891	12.469	1.889

** Significant at 5% level of significance $R^2 = 0.3161$

Size of holding and family income presents the resource capability of a farmer's adoption of any innovation. Adoption of IPM involves a scope for improvement, risks in any contingent situation and demands a high conceptual profile which again has intensive characteristics for the resource rich farmer. That is why IPM still remains as a proposition for elite farmers.

Also cropping intensity has gone to provide resource support to any risk imbibing technology. The failure of crop could have been compensated by the higher number of crops and that was why a farmer with higher cropping intensity had allowed his proportionate landmass for experimenting and trying out with a technology intervention for which efficacy was still in question.

Higher utilization of communication sources builds up a profile of cosmopolitans, a composite information endowment and adequate readiness to respond to and adopt any proposed innovative practices as IPM. Extension contact is not only providing yeomen information about the relatively complex technologies but also providing human interaction in minimizing the risk, tensions or any stressed situation in transferring a

Table 4: Path analysis

Variables	Total effect(r)	Direct effect(β)	Indirect effect(r-β)	Substantial indirect effect I	II	III
Age (X_1)	-4.04	-0.0973	0.0569	0.0466 (X_6)	-0.0361 (X_4)	0.0281(X_2)
Education (X_2)	0.1765	0.1966	-0.0001	-0.0194 (X_{13})	-0.0155(X_1)	0.0124(X_9)
Family size (X_3)	-0.0228	-0.1247	0.1019	-0.1220 (X_6)	0.1176 (X_4)	0.0729(X_7)
Land holding (X_4)	0.2953	0.2595	0.0358	0.2292(X_6)	0.1240(X_7)	0.1039(X_8)
Family income (X_5)	-0.3156	-0.1676	-0.1480	-0.0453 (X_{10})	-0.0401(X_3)	-0.0290 (X_4)
Extension contact (X_6)	0.2494	-0.2452	0.4946	0.2426(X_4)	0.1279(X_7)	0.1031(X_8)
Materials possession (X_7)	0.2729	0.1612	0.1117	0.1996 (X_4)	-0.1945 (X_6)	0.1038 (X_8)
Cropping intensity (X_8)	0.2672	0.1595	0.1077	0.1691 (X_4)	-0.1584 (X_6)	-0.0275 (X_3)
Mass Media exposure (X_9)	0.1495	0.0722	0.0773	0.303 (X_2)	0.0279 (X_{12})	0.0249 (X_{10})
Utilization of communication sources (X_{10})	0.3400	0.1714	0.1686	0.0636 (X_{13})	0.0563 (X_4)	-0.0460 (X_6)
Knowledge about IPM (X_{11})	-0.0277	-0.0291	0.0014	-0.0686 (X_8)	0.0663 (X_{10})	0.0641 (X_{13})
Skill development on IPM(X_{12})	-0.1284	-0.1110	-0.0174	0.0483 (X_{13})	0.0481 (X_6)	-0.0456 (X_4)
Irrigation index (X_{13})	0.1802	0.2191	-0.0389	0.0497 (X_{10})	-0.0337(X_8)	-0.0245 (X_{12})

Residual: 0.6839

new concept from a source to its ultimate users.

Material possession is an indicator in assessing the resource level and also the proportionate capability in adopting any cost intensive and risk involving agricultural technology.

The same table presents the multiple regression with beta value, â x r, co-efficient of b and t values. It is interesting to note that none of the t values for respective beta-co-efficient has come of significant. Of course the variables education (X_2), family incomes (X_s), irrigation index (X_{13}) can have wielded a regressional value almost nearer to significant level.

The column β x r, presents the proportion of contributions in the variability (32 percent) of different variables. It has found that the variables land holding (X_4), family income (X_5), utilization of communication sources (X_{10}) have been effected the adoption of item to the extent of 24.87 percent, 17.50 percent, 17.05 percent of cumulatively about 59 percent and thus depicts there overwhelming domination in characterizing the nature and extent of adoption of IPM.

It is noticeable that all variables put together, the extent of explained variability had gone upto 31.61 percent and therefore, presents a need for inclusion of more relevant variables with higher extent of interdependencies.

Table 4 presents the path analysis where the r-values has been decomposed into direct and indirect effect. It has found that in case of variable irrigation index (X_{13}) the direct effect (0.2191) is higher than the total effect (0.1802) of r. In case of variable extension contact (X_6) the substantial direct effect has been negative (- 0.2452) while the total effect has gone positive (0.2494). For the variable irrigation index (X_{13}) it is interesting to note that some of the effect has gone implicit while total effect of some variables is taken into consideration. Irrigation boosts up cropping intensity and cropping intensity in turn influenced the adoption of IPM. That is why in a web of interaction, the direct value has come up substantially higher while the total effect did not even record a level of significance.

For extension contact (X_6), some justification is to be given whether mere contact can generate a positive effect in influencing the adoption pattern. Information overloading for the receiver, already gone saturated, might have imperceptible effect of distorted influence on the adoption pattern. That is why for the variable the direct effect is negative while r value is positive. The table presents also substantial indirect effect. It is for the variable extension contact (X_6) at least in seven instants has channeled substantial indirect effect on the adoption of IPM and also land holding (X_4) wields in as many as eight instances of substantial indirect effect and these variables together have channelized as many as in fifteen instances of the substantial indirect effect and thus merits a meticulous attention in managing and planning the adoption behaviour of IPM amongst the target group.

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Impact of elevated CO_2 on growth and biochemical changes in chickpea

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Abstract

*In an experiments laid out in open top chamber during 2007-08 at research station N.R.C.W.S., Jabalpur with two CO_2 levels (elevated CO_2 -550ppm and Ambient CO_2 -360) in combination with chickpea, chickpea+*chenopodium album*, chickpea+Phalaris minor,* chenopodium album *and Phalaris minor and replicated thrice . In open top chamber one chamber the CO_2 concentration was maintained at 360±20 ppm (Normal air CO_2 Concentration at the experimental site, NRCWS Jabalpur.) and in the other chamber the CO_2 concentration was maintain at 550±30 ppm by injecting CO_2 gas (commercial grade) from the cylinders (45 Kg Capacity). The CO_2 concentration was monitored and controlled using l- T CO_2 monitor /controller. Chickpea and weeds (*Chenopodium album *and Phalaris minor) were sown in pure and mixed (1:1) culture. Outcome of the study was that Chickpea plants gained biomass due to high CO_2 even in mixers and the increase was about 60% and 34% when it was in association with* chenopodium album *and Phalaris minor respectively. While reduction was found 14% and 16% under ambient condition. Similarly elevated CO_2 increased leaf area, number of pods, grain yield, and test weight in Chickpea as compared to ambient condition. Phalaris minor was more competitive than* Chenopodium album *in reducing the yield of chickpea. There was significant increase in ascorbic acid content in leaves and protein content in grains of chickpea due to CO_2 enrichment.*

Key words: Elevated CO_2, ambient condition, weeds, Biochemical, Chickpea

Introduction

Global climate changes are unique research challenge to the agriculture scientist. The exponential rise in CO_2 concentration of the atmosphere is one of such important change which effectively influences the productivity of the crop plants.

Increase in concentration of CO_2 in the atmosphere, as well as potential changes in temperature and precipitation, many have important consequences for crop losses due to weeds. The physiological plasticity of weeds and there greater intra-specific genetic variation compared with most crops could provide weeds competitive advantage in a changing environment.

Due to the ongoing increases in atmospheric CO_2 there would be stimulation in leaf photosynthesis in C_3 plants by increasing the CO_2 level in the leaf interior and by decreasing the loss of CO_2 by photorespiration. The C_4 plants, however, have internal biochemical pump for concentrating the CO_2 at carboxylation site that reduces the oxygenase component of the Rubisco, thereby eliminating the carbon loss by photorespiration. Because of this differential response of the plants to the CO_2, it has been postulated that with higher CO_2 levels in the atmosphere, there may be significant alterations in the competitive interactions and certain genotypes or species may become extinct after several generations of altered competition. This differential response by C_3 and C_4 plants to higher CO_2 is specifically relevant to crop-weed competition because, most of the crops are C_3 plants and most of the weeds are C_4 plants.

Therefore the investigation was planned on the influence of Elevated CO_2 on Growth and Biochemical Changes in Chickpea.

Materials and Methods

An experiments was carried out in open top chamber during 2007-08 at research station N.R.C.W.S., Jabalpur with two CO_2 levels (elevated CO_2 -550ppm and Ambient CO_2-360ppm) in combination with chickpea, chickpea+*chenopodium album*, chickpea+Phalaris minor, *chenopodium album* and Phalaris minor and replicated thrice . In open top chamber one chamber the CO_2 concentration was maintained at 360±20 ppm (Normal air CO_2 Concentration at the experimental site, NRCWS Jabalpur.) and in the other chamber the CO_2 concentration was maintain at 550±30 ppm by injecting CO_2 gas (commercial grade) from the cylinders (45 Kg Capacity). The CO_2 concentration was monitored and controlled using l- T CO_2 monitor / controller. Chickpea and weeds (*Chenopodium album* and Phalaris minor) were sown in pure and mixed (1:1) culture. The shoot length, root length, leaf area was taken using Licor Laser area meter, No. of leaf and dry weight and plant dry biomass were observed. The protein content in chickpea plant samples from Lowry's Method described by Lowry *et. al.* (1951). The total carbohydrate and starch content in plant was estimated from Anthrone method by Hedge and Hofreiter (1962). The ascorbic acid was determined by volumetric method,

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Harris and Ray (1935).

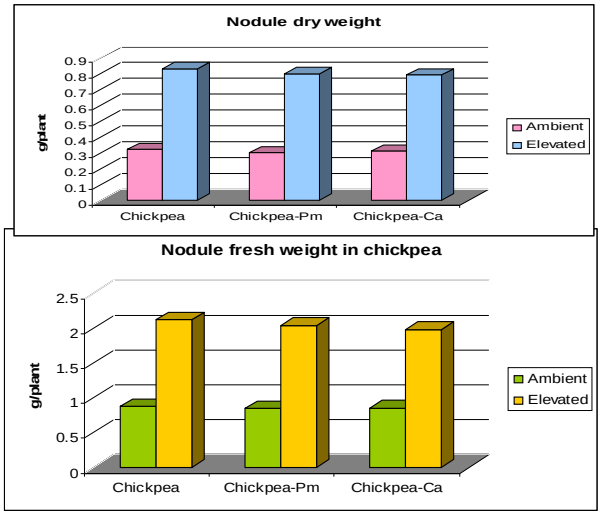
Results and Discussion

Exposure of Chickpea and associated weeds to elevated levels of CO_2 caused primitive effect on both crop and weed. High CO_2 grown Chickpea plants had increased plant height compared to ambient grown plants. Similary Pal *et.al*. (2008) also reported that the plant exposed to elevated CO_2 showed increases in growth characteristics shoot length, nodule numbers, total number of branches, No. of seeds per plant seed yield and carbohydrate content.

The association with weeds had caused significant reduction in plant height. CHEAL caused more reduction than PHAMI in chickpea plant height. Fresh weight dry weight nodulation in chickpea was two fold more in case of elevated CO_2 than ambient and enhancement was more in case pure than mixed culture (Fig. 1) .

Weeds have reduced the nodule weight but not to a significant extent. Association with weeds caused a significant reduction in number of leaves in chickpea. CO_2 enrichment increased the number of leaves but it was higher in pure culture Similarly Radoglou and Jarvis (1990) found 8% to 16% response by elevated condition. Elevated CO_2 has increased the leaf area in chickpea and the competition with the weeds has reduced the leaf area (Fig. 3). The reduction was higher at elevated

Fig 1: Effect of elevated CO_2 on Nodulation in chickpea



CO_2 compared to ambient CO_2. PHAMI caused more reduction in leaf area than CHEAL under elevated CO_2. Leadley *et al.* (1987) also recorded 10% increment in leaf thickness for elevated CO_2.

Competition with weeds reduced the root length in Chickpea and high CO_2 enhanced the root length in pure and mixed culture at later stages. The root shoot ratio was increased chickpea under elevated CO_2 (Fig. 4).

Enhancement in chickpea biomass production was significant at 60 DAS onwards in pure culture and at harvest in mixed culture. Competition with caused significant reduction in biomass at all stages. Increase in biomass production in chickpea due to enrichment was about 85% when compared to the plants grown under ambient condition. Association with chickpea did non cause much change in CHEAL biomass under ambient as well as elevated CO_2 condition.

The relative growth rate (RGR) in chickpea was affected by competition with weeds and it was enhanced by high CO_2 especially between 75 DAS to harvest (Fig 2). This was due to increased flowering and grain filling under high CO_2. However, the CO_2 induced increase in RGR in chickpea in mixed culture with PHAMI was less than that of chickpea in pure culture under ambient condition. From the over all data on biomass it can be noted that only chickpea biomass production was reduced in case of chickpea+ PHAMI followed by chickpea+ CHEAL mixed culture.

High CO_2 increased the grain yield due to increased number of pods per plant and test weight which, contributed to total grain yield. Yield increase due to CO_2 enrichment was 45% in pure culture. The yield loss was 13% and 27% respectively due to competition by CHEAL and PHAMI under ambient condition (Table-1). Whereas, the yield loss was 18% and 26% respectively under elevated CO_2 condition. Ascorbic acid, Protein and Carbohydrate content in chickpea seed was significantly more in elevated CO_2 than ambient CO_2, but maximum was observed in pure Chickpea followed by Chickpea (with CHEAL) and Chickpea(with PHAMI) (Table 2).

Vu,Alllen & Bowes (1989). Observed morphological changes in elevated CO_2 may involve increased carbohydrate storage, leaf thickness, and mesophyll cell number per unit storage and mesophyll cell number per unit of leaf area etc. Elevated CO_2 increased the plant biomass and thereby sink capacity; this had resulted into increased uptake of primary nutrient like NPK.

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Effect of sulphur and boron nutrition on yield attributes and yield of Soybean (*Glycine max* L.)

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Abstract

A field experiment was carried out during kharif *2007 and 2008 on vertisol of Kota region to find out the effect of different levels of sulphur (0.0, 10.0, 20.0, 30.0 and 40.0 kg/ha) and boron (0.0, 0.5, 1.0, 1.5 and 2.0 kg/ha) on yield attributes and yield of soybean. Soybean responded significantly to the application of sulphur and boron. Among the Sulphur treatments, 30.0 kg S /ha increased the number of branches/plant, number of pods/plants and number of seeds/pod by 29.03%, 23.86% and 11.58% respectively and produced 16.08% higher seed yield (1588.0 kg/ha) over the control. In case of different levels of boron an increase in major yield components viz. number of branches/plant (3.77), number of pods/plant (36.76) and number of seeds/pods (3.125) was recorded along with higher seed (1534 kg/ha), straw (2078 kg/ha) and biological yield (3612 kg/ha) by application of 1.0 kg B/ha as compared to control and other treatments. Overall results showed that 30.0 kg S and 1.0 kg B are economically best suitable doses for obtaining higher yield attributes and yields of soybean.*

Key words: Soybean, Sulphur, Boron, Yield attributes and Yield

Introdction

Among the nine oilseed crops of India, soybean occupies an important place in respect of area and production. Although soybean is a highly nutritive and profit oriented crop but since last few years its productivity remains stagnant owing to erratic distribution of rainfall, increased incidence of pest and diseases and inadequate and imbalance supply of nutrients (Ramesh and Sammi Reddy, 2004). In addition to this, intensive cropping without proper replenishment of essential nutrients and organic matter causes low fertility status of soils. Consequently, soils have led to depletion of NPK reserves and some other nutrients such as S, B, Zn, etc. Therefore all these factors are responsible for hampering the productivity of soybean.

Among the fertilizer elements sulphur (S) requirement of oilseed crops is quite high as compared to other crops (Das and Das, 1994). Sulphur is involved in the synthesis of fatty acids and S containing amino acids which improves the quality of soybean. Similarly boron (B) is not only involved in synthesis of protein and oil, but also plays an important role in nodulation of legumes. A lot of research work has been done on NP and K fertilization for soybean and other crops, but a meager work has been carried out on secondary and micro elements fertilization for soybean. Keeping the above mentioned facts in mind, the present study was undertaken to investigate the effect of S and B nutrition on yield attributes and yield of soybean.

Materials and Methods

A field experiment was conducted during *Kharif* 2007 and 2008 on vertisol of Agricultural Research Station, Kota. The experimental site was clay loam in texture with pH 7.5, organic carbon 0.56%, available N 320.0 kg/ha, P_2O_5 23.0 kg/ha, K_2O 275.0 kg/ha, S 9.5 kg/ha and available B 0.46 ppm. The experiment was laid out in factorial randomized block design replicated thrice. The treatments included five levels of sulphur (0.0, 10.0, 20.0, 30.0 and 40.0 kg/ha) and five levels of boron (0.0, 0.5, 1.0, 1.5 and 2.0 kg/ha). The gross and net plot size of experiment was 6.0 x 3.6 m and 5.0 x 2.4 m respectively. Soybean variety JS 93-05 was grown in spacing of 30x 10 cm at seed rate of 80 kg/ha. The fertilizer NPK and Zn were applied 20.0, 60.0, 20.0 and 5.0 kg/ha respectively. Sulphur and boron were applied by Gypsum and Borax. The recommended package of practices for crop was followed. The observation on growth, yield attributes and yield were recorded at harvest. During both the years, soybean crop was sown in July and harvested in October month. The pooled data was analyzed statically.

Results and Discussion

Growth and Yield Attributes

Table 1: Effect of sulphur and boron nutrition on plant height, number of branches/plant, pods/plant, number of seeds/ pod and seed index of soybean (pooled data *kharif* 2007 & 2008)

Treatments	Plant height(cm) at harvest	Branches/plant (Nos)	Pods/plant (Nos)	Seeds/pod (Nos)	Seed index (g)
Levels of Sulphur (kg/ha)					
S_0	39.43	3.10	31.22	2.85	9.99
S_{10}	39.47	3.53	33.48	3.02	10.04
S_{20}	39.82	3.76	36.67	3.05	10.09
S_{30}	40.26	4.00	38.67	3.18	10.17
S_{40}	39.62	4.07	39.17	3.22	10.22
CD(P=0.05)	NS	0.33	3.40	0.143	NS
Levels of Boron(kg/ha)					
$B_{0.0}$	39.38	3.30	31.67	2.79	9.99
$B_{0.5}$	39.68	3.52	34.74	3.08	10.02
$B_{1.0}$	39.87	3.77	36.76	3.13	10.10
$B_{1.5}$	39.91	3.88	37.46	3.16	10.18
$B_{2.0}$	39.74	4.00	38.65	3.16	10.23
CD(P=0.05)	NS	0.33	3.40	0.143	NS

The study of two years pooled data revealed that there is no significant effect of levels of sulphur and boron on plant height of soybean at harvest. Although the highest plant height viz. 40.26 cm and 39.91 cm was obtained in treatments of 30 kg S/ha and 1.5 kg B/ha respectively whereas the lowest plant growth of soybean in respect of plant height was observed in control(Table 1).

All yield attributing characters viz. branches/plants, pods/plant, seeds/pod except seed index of soybean varied significantly with different levels of sulphur. The optimum dose of S fertilization for soybean was 30.0 kg/ha as at this dose number of branches/plants, number of pods/plant and number of seeds/pod were increased to tune of 29.03%, 23.86% and 11.58% respectively over the control. Chaubey *et. al*.(2000) reported the similar results with respect to yield attributing characters in case of groundnut. Different levels of boron also produced significant variation in respect of the yield components so the most suitable values of number of branches/plants (3.77), number of pods/plant (36.76) and number of seeds/pod (3.125) were recorded by application of 1.0 kg B /ha as compared to control and other boron levels (Table1). The above findings were also in conformity with the results of Sarkar *et. al*. (2002) that the highest yield components were found when the soybean was fertilized with 30.0 kg S and 1.0 kg B/ha and control produced lowest. Havlin *et. al* (1999) reported that flowering and fruit development were restricted by a shortage of boron. The seed index of soybean was non

Table 2: Effect of sulphur and boron nutrition on Seed yield, straw yield, biological yield, harvest index, net return and B:C ratio (pooled data *kharif* 2007 & 2008)

Treatments	Seed yield	Straw yield	biological yield	harvest index	Net return	
B:C ratio		(kg/ha)	(kg/ha)	(kg/ha)	(%)	(Rs./ha)
Levels of Sulphur (kg/ha)						
S_0	1368	1861	3229	42.23	7073	1.88
S_{10}	1459	1981	3439	42.26	8084	2.00
S_{20}	1528	2068	3596	42.33	8828	2.08
S_{30}	1588	2145	3732	42.39	9451	2.15
S_{40}	1610	2175	3784	42.39	9827	2.18
CD(P=0.05)	74.36	91.48	165.67	NS	900.11	0.097
Levels of Boron(kg/ha)						
$B_{0.0}$	1393	1896	3289	42.19	7335	1.91
$B_{0.5}$	1474	1968	3472	42.32	8215	2.02
$B_{1.0}$	1534	2078	3612	42.33	8883	2.09
$B_{1.5}$	1571	2123	3694	42.38	9291	2.12
$B_{2.0}$	1581	2135	3715	42.38	9530	2.14
CD(P=0.05)	74.36	91.48	165.67	NS	900.11	0.097

significantly influenced by the different levels of sulphur and boron.

Yields and Monetary Returns

Ii is revealed from data that seed, straw and biological yield of soybean was significantly influenced by different levels of sulphur and boron (Table2). Among the treatments, 30.0 kg S/ha significantly produced higher seed (1588kg/ha), straw (2145kg/ha) and biological yield (3732 kg/ha) which were 16.08%, 15.26% and 15.58% respectively higher over the control. These were also found at par with 40.0 kg S/ha. The high seed yield of soybean at S_{-30} might have resulted due to its favourable effect on the yield attributing characters and plant metabolism (Tiwari *et.al.*1997). At the same time, the high straw yield was obtained due to improvement in the vegetative growth of plant. The results obtained in this regard are similar with findings of Sarkar *et. al.*(2002). Same dose of S inflenced yield and mineral nutrition of repeseed has also been reported by Basumatary and Talukdar (2007).

Boron showed a significant variation on seed, straw and biological yield of soybean. The best dose of boron was 1.0 kg/ha which produced 1534 kg/ha seed, 2078 kg/ha straw and 3612 kg/ha biological yield. The lowest seed, straw and biological yield was produced from control (Table 2). All types of yield were improved by boron as it plays an important role in nodulation and seed formation processes. The results of study are consistent with that of Sarkar *et. al*. (2002) and Ahmed *et. al*. (1991) they were reported that seed and straw yield increased significantly with each increment of sulphur and boron. In contrary, Tripathy et.al. (1999) stated that high rates of S slightly decreased the yield of gram. Similarly Panwar *et. al*. (1998) reported that straw yield was less inflenced by high levels of B. The interaction effect of sulphur and boron in relation to seed and straw yield was found non significant. The results revealed that there was no significant effect of different levels of sulphur and boron fertilization on harvest index of soybean. The analysis of data(Table-2) indicated that although the highest net returns and benefit: cost ratio were obtained in the maximum levels of S and B, but long term sustainability of soil in terms of soil health and nutrient reserves has been obtained through balanced fertilization. Keeping these facts in mind better economics was recorded by application of 30.0 kg S and 1.0 kg B/ha. Based on foregoing discussions it may be concluded that 30 kg S and 1.0 kg B/ha individually or in combination along with the recommended rates of NPK and Zn fertilzers should be applied for obtaining higher yield and better quality of soybean under the agro-climatic condition of Kota region of Rajasthan.

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Impact of Economic Condition of Women Employed In Urban Unorganised Sector (A Study in Gorakhpur City of U.P.)

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Abstract

Indian economy is based on agriculture. Unorganized sector provides employment major part of the population of economy and has maintained its dominance. Almost all activities of production like agriculture, animal husbandry & poultry, construction, mining transport and a part of the services, other primary occupation of rural sector are counted as a part of unorganized sector. Some production such as animal husbandry and poultry farming, manufacturing and construction works also take place in urban unorganized sector the unorganized sector of India which has a share of 61 percent is gross domestic production, predominantly women work forces are attached in unorganized sector due to ignorance poverty illiteracy and lack of mobility. Women have lack of for training, skills upgrading and literacy for employment. Job of women work and their performance underestimated due to their neediness. They are engaged in agriculture and allied activities (like animal husbandry & poultry farming), building construction as labour, plantation and some social sectors like health and educations. Economic life of women is very important since other factors of a woman life are dependent upon its purity and prosperity and it also shapes their social life. The means of money earning should be genuine. Unorganized sector improves economic condition of women by providing them employment.

Key words: agriculture, occupation, construction, predominantly, employment

Introduction

Indian economy is a developing economy, based on agriculture. The main source of employment generation is the unorganized sector of the Indian economy including self employment and small business wherein the percent contribution as high as 92 percent of the total employed labour force. Although unorganised sector provides employment to 92 percent of total employed labour force, but the nature of their employment is casual and seasonal. Wages of unorganised sector are much lesser than in organized sector. Unorganised sector does not provide job security and other benefits. In unorganised sector level of production is also smaller and

with small capital by using labour-intensive and capital saving technology.

Production techniques of unorganised sector are backward. Unorganised sector faces a number of other problems like inefficient management, non availability of sufficient capital, unresponsive production pattern etc.

Almost all activities of production like agriculture, animal husbandry & poultry, construction, mining transport and a part of the services, other primary occupation of rural sector are counted as a part of unorganised sector. Some production such as animal husbandry and poultry farming, manufacturing and construction works also take place in urban unorganized sector. The unorganized sector of India which has a share of 61 percent is gross domestic production, is when indifferently seen and makes.

Women are the half of the population, they play vital role in economic development of a country. Women are not only taking care their homes as housewives and also employed in regular government and private organizations to upgrade their economic status. They play as important role as man in production and development of a country but women face many problems in their employment and place of employment. Most of the working women engaged in unorganised sector like agriculture and allied activities, animal husbandry & poultry farming, building construction as labour, plantation and some social sectors like health and educations.

A bulk of woman labour-force is deployed in unorganized sector. It becomes of paramount significance then to study intensively the economic conditions of women working in this sector and along with that a proper strategy can be formed to improve their gradually deteriorating condition.

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Objectives of the Study:

The main purpose of the present research study is to study the economic conditions of women employed in unorganized sectors in Gorakhpur city. Other important purposes of the current study of the economic conditions of women employed in various occupations of unorganized sectors are as follows:-

1. To study and analysis the participation of women in unorganized sector.
2. To study the wages and standard of living of employed women in unorganized sector.
3. To study the economic conditions of women workers in unorganized sector.

Research Methodology

In order to accomplish the objectives of the proposed research, the study is based upon the collected data. This study is totally primary data based. The data is collected from respondent by using questionnaire through personal interview and direct inspection. Stratified multistage sampling design proposed to be adopted for section of working women in unorganized sector of Gorakhpur city for the assessment of their problems. Nagar Municipal Corporation cant and town are included in Gorakhpur town but formerly in Gorakhpur and for interview of working in unorganized sector the area of town Municipal Corporation has been selected. Out of 70 wards of Nagar Nigam 16 wards have been included by using random sampling. There are 6946 women employed in unorganized sector of Gorakhpur Nagar. 7 percent i.e. 400 women are sheeted for study. Out of 400, women related to Animal Husbandry and Poultry 68, Service 56, Product Manufacture 72, Labour 124, and from Retail Businessman women related 80.

Results and Discussion

Economic Condition of Employed Women :

Economic life of women is very important since other factors of a woman life are dependent upon its purity and prosperity and it also shapes their social life. The means of money earning should be genuine. Today women are constantly grappling with a flow of situations which is the result of industrialization. Women employed in internal sector are not satisfied with their achievements (remunerations). Though there recognition is base on their achievements, they are comfortable with their self satisfaction and want to be recognized and accepted on that basis.

In the women's economic life wages and money are not as important as the self satisfaction out of that earning. Most of the women are displeased even with good salaries, proposals and always look out to go in a different service though they get lower wages and status in them. The primary life of women is not dependent solely on their personal production and consumption; rather it is dependent on the economic life of the whole family. Economic values have a great significance in determining human behaviour and in personality development.

Economic insecurity, poverty, unemployment or unsuitable employment and going from one job to another not only make a woman insecure. Where the economic poverty is a permanent condition in a family, the sense of economic insecurity becomes deep seated in the inner most part of the consciousness prominently. Consequently the children of such families cannot build their confidence level and they cannot give their leadership in any work. Women working in unorganised sector are never good or nor can they even be good because the worries prevalent in their minds due to feeling of insecurity are magnified. Due to these worries they find their works more substantial than their capacities. In this condition women cannot adjust given circumstance properly and not in coco deuce with the time and situation.

Opportunities of employment, method of work, competition involved in getting employment, duration of work, economic support to the family in case of being unemployed and the type of economic help etc. more influential for the psychology of women. They are also influenced by other factors like expectation of family from employed women and their syndrome which are otherwise estimate of they are not working. Women identify themselves intrinsically with those works which are satisfying to them and therefore women do not feel weariness or frustration in doing such jobs, such work is castanet a good job or a good profession.

Women in Gorakhpur city employed in unorganised sector have many different occupations. Occupation of selected women has been shown in Table 1

It seems from Table 1 that select women employed in unorganised sector of Gorakhpur city perform as much as 18 types of job which have been divided in fine groups. 17 percent women are women engaged in Animal Husbandry and Poultry occupation group. In service occupation group 14.00 percent of women are employed wherein those who teach in private nursery schools and take tuitions and furnishing utensils at homes. In manufacturing occupation group there are 18.00 percent women employed. In labourers occupation group 31.00 percent women are employed. In retail business occupation group 20.00 percent women are involved.

Job Preference of Selected Women

The women told that they can be economically self dependent and satisfied only when they are able to grab jobs according to their abilities and capacities to work. They expressed their preference for a work which suits their aptitudes. They also expressed their desire that women should get reservation in some employment,

Table 1: Statement of Business/Occupation of Selected Women

S.No.	Occupation Group			
	Name of Occupation	No. of Women	Occupation included in Group	
			S.No. Name	No. of Women
1.	Animal Husbandry and Poultry	68(17.00)	1. Milk/Dairy Occupation	48 (12.00)
			2. Pig-caring	4 (1.00)
			3. Poultry	16 (4.00)
2.	Service	56(14.00)	1. Teacher in private primary school	16 (4.00)
			2. Furnishing utensils	40 (10.00)
3.	Material Manufacturing	72(18.00)	1. Manufacturing priors	12 (3.00)
			2. Pickers	8 (2.00)
			3. Embroidery, service, painting	36 (9.00)
			4. Preparing/basket/wearing boxed	8 (2.00)
			5. Making lay pots	8 (2.00)
4.	Labourer	124(31.00)	1. Working in House building	108 (27.00)
			2. In shops	16 (4.00)
5.	Retail Business	80(20.00)	1. Battle-leaves	8 (2.00)
			2. Fruits	8 (2.00)
			3. Vegetables	42(10.50)
			4. Cosmetics	8(2.00)
			5. Selling Fish	8(2.00)
			6. Grocery stores	6(1.50)
6.	Total	400(100)	18	400(100)

(Percentage are given in brackets)

Source: Compiled from Questionnaire.

and they should be helped in seeking job of their liking. Liking for job has been made clear in Table 2

It seen from Table 2 that business trade is the most preferable job for women 25.00 percent women prefer it as job. Police department services are the preferable job which has a share of 3.75 percent women only. 14.25 percent women like to do work in domestic jobs, 12.50 percent women have like to work as third and fourth class employees. 10.00 percent women like teaching job and 4.00 percent women like to work in administrative posts and 12.50 percent women have liked to do other works than above given.

Table 2: Job Preference of Selected Women

S. No.	Preference	No.	Percentage
1.	Teaching	32	8.00
2.	Administrative	16	4.00
3.	Third and Fourth Class Employee	50	12.50
4.	Women and Child Development Service	40	10.00
5.	Police Administration	15	3.75
6.	Health Service	40	10.00
7.	Business	100	25.00
8.	Domestic work	57	14.25
9.	Others	50	12.50
	Total	400	100

Source: Compiled from Questionnaire

Women Income and Changing Living Standard of Family :

An attempt was made to estimate the change in levels of family income of sample employed women in unorganised sector. The level of income of women depends upon the business or employment occupational group working hours and wages rates paid to them. Those women who are doing personal works in home have been kept in view while calculation the wages. The income received from their earning has been merged with the wages earned outside the home. It has been illustrated in Table 3.

It become clear from table-3 that the average of daily wages of all women working the city as Rs. 37.00 on the basis of occupation group average wages of women of animal husbandry and poultry is Rs. 36.00, in service occupation average remuneration of employed women is Rs. 32.00, in labourer occupation and material manufacturing occupation average daily remuneration is same Rs. 38.00.

In retail business group women earn Rs. 41.00 per day. It is also clear from table no. 6.5 that the monthly income of working women in different occupation is different. Average monthly income of women employed in animal husbandry and poultry occupation Rs. 1889, from service Rs. 929, from material manufacturing Rs. 1142, from labour occupation Rs. 1154 and from retail business Rs. 1281. The Average monthly income of

Table 3: Statement of Income of Employed Women in Unorganised Sector

S.No.	Occupational Group	Number of women employed	Daily Average Income of Women (In Rs.)	Monthly Income of the Women Total	Average
1.	Animal Husbandry and Poultry	68	36	94045	1089
2.	Service	56	32	52015	929
3.	Material Manufacturing	72	38	82262	1142
4.	Labourer	124	38	143125	1154
5.	Retail Business	80	41	99295	1281
	Total Average	400	37	450742	1119

Source : Compiled from Questionnaire.

Table 4: Statement of Increase in Family Income of Employed Women in Unorganised Sector

S. No.	Occupational Group	Number of Employed Women	Average Monthly Income (Excluded working women)(Rs.)	Average Monthly of Employed Women(Rs.)	Total Monthly Income(Rs.)	Increase in Income (Percent)
1.	Animal Husbandry and Poultry	68	5446	1089	6535	19.99
2.	Service	56	5600	929	6529	16.59
3.	Material Manufacturing	72	6300	1142	7442	18.13
4.	Labourer	124	3400	1154	4554	33.94
5.	Retail Business	80	4729	1281	6010	27.09
	Total	400	25475	5595	31070	-
	Average	-	5095	1119	6214	21.96

Source: Compiled from Questionnaire.

women employed in unorganised sector only Rs. 1127. Women engaged in unorganised sector earn money, which increase family income. An increase in the family income was observed in the case of all categories of sample women working in unorganised sector. It has been illustrated in Table 4.

It seen from Table 4 that women employed in unorganised sector increases the family income. In animal husbandry and poultry group the employed women increased in family income 19.99 percent. Women employed in service occupation increase in family income 16.13 percent, women employed in material manufacturing occupation increase family income 18.13 percent, the women employed as labourer increase family income 33.94 percent, the women employed in retail business increase family income 21.96 percent.

Women employed in unorganized sector increased their family income which leads to increase in standard of living. They increase their expenditure and saving also and they improve their life style and standard of living.

Saving and Consumption Pattern of Women Workers :

The level of living standard depends upon the level of income. As the level of income increases the consumption is also increases incensement in income not only affect the level of consumption but also affect the pattern of consumption. For this purpose we have attempted to estimated the average of annual expenditure on various item of consumer goods as well as services like education, health etc. The women employed in unorganised sector earn money; they increase expenditure, upgrade and upward change in quality of various items of consumption. Saving is also increased due to increase income. It has been illustrated in Table 5.

Table 5: Consumption Pattern of Women Workers

S. No.	Item	Before Worked in unorganised sector	After worked in unorganised sector	Increase expenditure
1.	Food	2531	3187	656
2.	Fuel	729	729	0
3.	Clothing	832	928	96
4.	Education and Health	332	332	0
5.	Expenditure on other items	281	486	105
6.	Saving	290	552	262
	Total Income	5095	6214	1119

Source: Compiled from Questionnaire.

It become clear from table -5 that if the women employed in unorganised sector increase their family income which leads to increase consumption and also change the pattern of consumption. Family of women employed in unorganised sector expanded Rs. 2531 on food it increase Rs. 656 on food after increasement on income due to women worked in unorganised sector, now total expenditure on food is Rs. 3187. There is no change in consumption of fuel, so expenditure change is also nil. In clothing expenditure is increased by Rs. 96, before women worked in unorganised sector Rs. 832 and after it increase up to 928. There is no change in expenditure in education and health. Expenditure in other item is Rs. 281 before women employed in unorganised sector and after when women employed in unorganised sector expenditure increase by Rs. 105 up to Rs. 486.Women employed in unorganised sector increase the family income which increases not only expenditure but saving also. Saving is also increase Rs. 290 to Rs. 552 total saving increase Rs. 262.

Conclusion

Women are important part of society. No society or country can develop without improving economic conditions of women. It is very unfortunate that the conditions of women today in our country are very deplorable in comparison to other countries, especially developed ones. It is necessary for development of women that they are provided equal opportunities to grow, but the experiences of our country makes it clear that the women have lesser opportunities of growth than men. Backwardness of women in educational sector not only deteriorates their social condition but also makes them weaker economically. On one hand women not working are fully dependent on the male income of the family, those who work cannot get proper wage for their work and are often victims of exploitation by their employers due to being less educated or uneducated on the other.

As per as the economic condition of women working unorganised sector in concerned, it becomes clear form various, studies than more often than not the family enjoys the ownership of women's incomes, especially their husbands. Probably are important reason of this phenomenon can be ascribed to our traditions and cultural heritage. Educational backwardness is another important reason working behind the pitiable economic condition of women in unorganised sectors. Their economic status is affected by their lack of skill, low standard of education and income. There are some suggestions for improvement in economic conditions of women employed in unorganised sector.

- Giving education and training to women so that they can exchange their

professional and technical knowledge of work.

- Employed women must be given help a counseling in selection of their occupation.
- Discrepancy /anomaly must be removed in the wages/ remunerations of employed women.
- Women must be level from double work and misconceptions of gender must be done along with.
- Sexual exploitation of women must be ended and legal protection and security arrangement must be complied with and implemented strictly.
- Working women must be given information about development programmes.
- Awareness should be generated among women about their rights.

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Effect of Nutrition Education on Rural Mothers Regarding Iron Deficiency Anaemia in Their Children

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Abstract

In rural area of Almora district in Uttarakhand state, most of the women are unaware of iron deficiency anemia, which is widespread problem of the whole world. They are ignorant of various measures required no improve the health and nutritional status of their children. In the present study, rural area of district Almora was selected for the purpose of investigation. Multistage random sampling technique was used for selecting the rural mothers. Total 248 rural mothers were selected for the purpose of investigation. Nutrition education was imparted for 6 months at weekly interval. During this period lectures, group discussions, posters, charts, demonstrations, flash cards, stories, calendars were used followed by individual contact to give nutrition education repeatedly and to explain each massage. Then again after six months nutrition education was imparted and data was collected by the investigator. Mean score knowledge of iron deficiency anaemia before and after nutrition, education to the rural mothers was 3.42 to 5.29. Significant positive changes were found in the knowledge regarding iron deficiency anaemia before and after nutrition education to the rural mothers. ($t=10.287$, $p<0.01$).

Key woards: widespread, investigation, demonstrations, knowledge, anaemia

Introduction

Children are the gift of God and are like a flower, who fill the surroundings with their aroma. Children find full expression of their growth potential where there are no constraints of social-economic and dietary nature. Ninety percent of Indian children are under weight for age and approximately half of them are anemic. Nutritional deficiencies are most serious and are commonly seen in children hence, the growth and development levels of children have been used to understand the nutritional status of the population. Life can not be sustained without adequate nourishment. The main caused behind the malnutrition especially in rural areas are inadequate health education of mothers, inadequate nutrition, poor environment, hygiene, large family size etc. Human behavior is subjected to change with environmental and motivational factors. It explores and adopts new ideas that suit to its need. This is the basis for providing nutrition education to the masses. Ignorance is one of the root causes of disease, which calls for nutrition education of people. Nutrition and health education have been an effective educational measure for including desirable behavioral changes for the ultimate improvement in the nutritional and health status of individuals. It moves the individual from lack of interest and ignorance to increasing appreciation, knowledge and finally leads to action. Nutrition and health education have been widely used in almost all parts of the world, both in developing and underdeveloped countries as a measure against both malnutrition and under nutrition. Nutrition and health education are inseparable and have long-term effects.

The most commonly used methods for educating rural mothers are posters, charts, demonstration, film, calendars, still picture, slides, radio and television. Nutrition education can be an effective way of combating anaemia and it can help mothers in proper selection of iron rich foods for their children. Anaemia is probably the most extensive nutrition deficiency disorder in India affecting 77 percent of preschool children. During critical school years, iron deficiency anaemia proceeds poorer attention span, memory, concentration and concept acquisition which leads to lowering educational attainments, reducing school enrolments and attendance in school children.

It is, therefore, important to impart nutrition education to parents so that they can effectively make use of relevant scientific knowledge to protect the lives and improve growth of their children.

Objectives

1. To assess the knowledge of rural mothers related to iron deficiency anaemia in children before imparting the nutrition education to the rural mother.
2. To educate the mothers about prevention of iron defi-

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ciency anaemia in their children.

3. To study the effectiveness of nutrition education on rural mothers regarding iron deficiency anaemia in their children.

Materials and Methods

Rural area of district Almora in Uttarakhand state was selected as the locate for the purpose of investigation. Multi random sampling technique was used for selecting the subjects. Total 248 rural mothers having children 3-6 years of age were selected. Interview schedule was used to collect the data. Schedule included general information about children and their family members such as name, age, sex, address, occupation, type of family religion, numbers of siblings, family income, source of drinking water etc and specific information about nutrition education related to the knowledge about the source of nutrition education, knowledge level about iron deficiency anaemia. Iron rich food sources and causes of iron deficiency anaemia. Data was collected from door to door and again the respondents were interviewed after 6 months collection of pre exposure data was done in August 2002. Then nutrition education was imparted for 6 months at weekly interval. During this period lectures, group discussions, posters, charts, demonstrations, flash cards, stories and calendars were used followed by individual contact to give education repeatedly and to explain each message. Then again after six months, nutrition education was imparted and data was collected by the investigator, again after exposure of nutrition education, data was collected on knowledge level of mothers regarding iron deficiency anaemia. Such data was collected with the help of same schedule which was used for the pre exposure of data collection, frequency, percentage, mean, standard deviation, correlation coefficient and test of significance (paired T test) was used draw valid conclusions.

Results and Discussion

General findings about the rural mothers and their family background are presented under the head "General profile". All the rural mothers belonged to Hindu religion about 66.94% of rural mothers belonged to nuclear families. Majority of rural mothers i.e. about 63.31% belonged to upper caste while 16.13% and 20.56% belonged to scheduled caste and backward caste, respectively.

Majority of the rural mothers (55.65%) were engaged in agriculture as main occupation while 29.43% rural mothers were involved in animal husbandry and agriculture. Only 2.42% rural mothers were educated up to graduation while 28.23% were illiterate and 28.23% had their education up to primary school. Majority of rural mothers (47.58%) belonged to medium size family i.e. having 5-10 members in their family while 33.47% rural mothers had less than 5 members in their family. Per capita income of most of the rural mothers (42.34%) ranged between Rs 250-500 per month.

Table 1: General profile of the rural mothers

S.No.	Information	Number	Percentage
1	Religion		
	Hindu	248	100
	Muslim	-	-
2	Family Type		
	Nuclear	166	66.94
	Joint	82	33.06
3	Caste		
	Upper caste	157	63.31
	Backward caste	51	20.56
	Scheduled caste	40	16.13
4	Occupation		
	Animal husbandry	13	5.24
	Agriculture	138	55.65
	Animal husbandry & agriculture	73	29.43
	Government Job	8	3.23
	House wives	16	6.45
5	Education level		
	Illiterate	70	28.23
	Primary	70	28.23
	Junior high school	47	18.94
	High school – intermediate	55	22.18
	Graduation	6	2.42
6	Family size		
	<5	83	33.47
	5-10	118	47.58
	>10	47	18.95
7	Percapita income of families (Rs/Months)		
	<250	13	5.24
	250-500	105	42.34
	500-750	84	33.87
	>750	46	18.55

Table 2: Percent distribution of rural mothers according to source of information regarding nutrition education.

S.No.	Source of Information	Number	Percentage
1	Nutrition education programme	-	-
2	Charts/Posters	42	16.93
3	Magazines/News paper	9	3.63
4	Radio/TV	82	33.06
5	By elderly members of the family	29	11.69
6	By doctors and nurses	16	6.45
7	None	70	28.22

Table 2 reveals that majority of rural mothers i.e. 33.06% gained nutrition education through radio/TV and

Table 3: Mean score of knowledge of iron deficiency anaemia before and after nutrition education to the rural mothers.

No. of mothers	Knowledge of iron deficiency anaemia						t	p
	Before Nutrition education		After Nutrition education		Change in knowledge			
	Mean	SD	Mean	SD	Mean	SD		
248	3.42	1.57	8.71	1.38	5.29	0.86	10.287	<0.01

16.93% by chart/Posters while 28.22% rural mothers had no source for nutrition education.

Table 3 shows the mean score knowledge regarding iron deficiency anaemia before nutrition education was 3.42, which was increased 8.71 after imparting nutrition education to the rural mothers. Significant changes were found in the knowledge regarding iron deficiency anaemia before and after nutrition education to the rural mothers ($t=10.287$, $p<0.01$).

Summary and Conclusion

A study was conducted on 248 rural mothers selected by multistage random sampling technique in the rural area of district Almora with the aim to know the effect of nutrition education on the knowledge of iron deficiency anemia to the rural mothers. Knowledge regarding iron deficiency anaemia was increased significantly after nutrition education to the rural mothers.

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Productivity and profitability of lentil (*Lens esculenta moench*) as influenced by fertility levels and Bio-fertilizers under Leucaena based agro-forestry system

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Abstract

*A field study was carried out during the rabi season of 2002-03 and 2003-04 at the research farm of Raja Balwant Singh College , Bichpuri, Agra (U.P). To assess the productivity and profitability of lentil (*Lens esculenta moench*) as affected by fertility levels and Bio-fertilizers under Leucaena based agro- forestry system. The maximum grain and biological yield ha^{-1} were produced by F_3(3 q ha^{-1} LLF+10 kg N + 40 kg P_2O_5 ha^{-1}) which was significantly superior to the remaining treatment, it was followed by F_4(3 q ha^{-1} LLF+25 q ha^{-1} FYM), F_1 (20kg N + 80 kg P_2O_5 ha^{-1}, F_2 (10kg N + 40 kg P_2O_5 ha^{-1}) over control (F_0) respectively. The grain and biological yield ha^{-1} were significantly higher in treatment B_3 than rest of the treatments during both the seasons. The net return and B:C ratio of lentil were significantly better in (F_3) by the application of 3 q ha^{-1} LLF+10 kg N + 40 kg P_2O_5 ha^{-1} . Similarly, all these economic characters were significantly increased owing to combined inoculation of Rhizobium + PSB over individual and no inoculations. The fodder and fuel wood production was higher in the treatment F_3 (3 q ha^{-1} LLF+10 kg N + 40 kg P_2O_5 ha^{-1}) over the rest of treatments. The treatment F_3 tended to be superior to the rest of the treatments under the test at all stages of crop growth in litter fall per tree during crop span in both the season.Cost of the cultivation, gross return, net return and B:C ratio was highest in treatment B_3 during both the year of field experimentation.*

Key words: Agro-forestry, Leucaena, Lentil, Fertility levels, Bio-fertilizers, Productivity and profitability.

Introduction

Agro-forestry is dynamic, ecologically based natural farm management system that along with agriculture and the integration of tree on farms, has many environmental benefits. It is a challenging task in this new millennium to bridge the wide gap that exists between demand and supply of food, fodder and fuel wood. Agro-forestry has much to in meting the demand of food, fodder, fuel wood, fiber and medicine. In recent years, efforts have been made to grow tree and crop together so as to get the advantage of their association for improve soil fertility, controlling erosion, maintaining physical properties, promote efficient nutrient cycling, leading to higher bio-mass productivity and sustainability. Leucaena *Leucocephala* being a tree with coppicing property, its cultivation, besides providing fodder, fuel wood and industrial wood also contribute to the improvement of soil fertility. It fixes about 80-120 kg N per year hectre (Sing and Pawar,1988) and 3.76 metric tones dry leaf matter per ha annually is produced which is rich in nutrients, gets decomposed easily in the soil and nurses the field crop to better yield.(Srivastava et al; 1989) and Torres(1983 b)

Lentil is an important pulse crop of winter season. It is mostly used as "dal" which contains 25% protein and 60% carbohydrates and also rich in calcium, iron and niacin. To sustain productivity of land and sustainability in productivity and quality of crop, judicious use of fertilizers and integration of organic matter and bio fertilizer and their scientific management is important. Therefore the present investigation was carried out to study and the productivity and profitability of lentil *(lens esculenta Moench)* as influenced by fertility levels and bio fertilizers under Leucaena based agro forestry system. The trees, therefore, arises to plan a system by which pulses fuel wood and fodder problem is solved by growing lentil with Leucaena tree under agro-forestry system.

Materials and Method

A field experiment was conducted for two consecutive winter season of 2002-03 and 2003-04 at the research farm of Raja Balwant Singh College, Bichpuri campus, Agra, UP, India. To study the productivity and profitability behavior of lentil (*Lens esculenta Moench*) as influenced by the fertility levels and bio-fertilizers under Leucaena based agro forestry system. Five fertility levels viz. control(F_0),20 kg N + 80 kg P_2O_5 ha^{-1} (F_1) ,10kg N +40 kg P_2O_5 ha^{-1} (F_2), 3 q ha^{-1} Leucaena litter fall + 10 kg N + 40 kg P_2O_5 ha^{-1}(F_3) and 3 q ha^{-1} LLF + 25 q ha^{-1} FYM (F_4) with four bio fertilizer viz. control (B_0) Rhizobium (B_1) Phosphate

solubilizing bacteria (PSB), (B_2) and Rhizobium + PSB, (B_3).Thus twenty treatments were taken in a randomized block design with three replications. As per the treatment, seed was treated with culture having Rhizobium leguminosaram bacteria and phosphate solubilizing bacteria (PSB) for the lentil just before sowing. The research site is situated at a height of 263 m above mean sea level, intersected by 27.2^0 N latitude and 77.9^0 longitude. The soils of the experimental area was sandy loam in nature having pH of 7.9, organic carbon 0.72% available N,P and K was 194.0, 17.2 and 276.0 kg ha $^{-1}$ respectively. The average rainfall of the area is 650 mm out of which more than 84% is received during the monsoon season (July – Sept.). Summer are very hot and windy with maximum temperature 48^0 C or oven hotter during the crop growth period varying from 37.7^0 C to 17.0^0 C minimum from 23.4^OC to 4.2^0C.

The plantation of Leucaena tree having a single row boundary of two year old tree, already existing 1 m X 5m distance and oriented in North-South direction. Leucaena tree were pruned in October during 2002-03 and 2003-04, coinciding with the sowing time of lentil. Seed of lentil variety DPL-62 at the rate of 50 kg ha^{-1} was sown by kudali at the distance of 25 cm in rows. The sowing of lentil was done on Nov.12 and Nov. 01 in the first and second year respectively. The crop was irrigated as per need and subsequent irrigations were provided to the crop. The following growth parameter of lentil crop viz. plant stand, plant height, no. of branches per plant and total dry matter per plant (g) and grain yield of lentil was recorded at harvesting time. The data were subjected to an analysis of the variance and test for the significance according to Fisher And Yates(1963).

Results and Discussion

Productivity (crop-lentil):

The yield increment due to F_3 (3q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1},F_4 (3 q ha^{-1} Leucaena litter fall +25 q ha^{-1} FYM), F_1 (20 kg N+80 kg P_2O_5 ha^{-1}) and F_2 (10kg N +40 kg P_2O_5 ha^{-1}) over the F_0 (control) in the first season were 79.34, 46.16, 35.71, and 28.97 percent and second season in the increment were 77.79, 44.58, 34.29, and 27.70 percent respectively. The variation in grain yield of lentil due to fertility levels treatment F_3 were showed significant superiority over F_4, F_1 , F_2, and F_0 on the whole, on mean bases the significant order of the treatment was found as $F_3 > F_4 > F_1 > F_2 > F_0$. The biological yield increment due to F_3 (3 q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1}, F_4 (3 q ha^{-1} Leucaena litter fall +25 q ha^{-1} FYM), F_1 (20 kg N + 80 kg P_2O_5 ha $^{-1}$) and F_2 (10kg N +40 kg P_2O_5 ha^{-1}) over the Fo (control) in the first season were 72.36, 44.85, 36.13 and 24.94 percent respectively. While in the second season the increment due to F_3, F_4, F_1 and F_2 over the F_0 control in ranged were 70.29, 43.04, 34.39, and 23.57 percent respectively. The biological yield (kg ha^{-1}) in both the seasons may arranged in the significant order $F_3 > F_4 > F_1 > F_2 > F_0$. Harvest Index of lentil crop due to fertility levels were also found to be significant on the mean basis. The grain yield increases due to B_3 (Rhizobium + PSB), B_1 (Rhizobium), and B_2 (PSB) over the control (B_0) in the first season were 25.14, 13.40, and 9.96 per cent while in the second season the grain yield increases were 30.02, 17.09, and 12.07 % respectively (Table 1). The biological yield increases due to B_3(Rhizobium + PSB), B_1 (Rhizobium), and B_2 (PSB) over the control (B_0) were 31.23, 16.41 and 9.78%

Table 1: Grain, Biological Yields and harvest Index by various treatment.

Treatments	Grain yield (Kg ha^{-1})			Biological yield (Kg ha^{-1})			Harvest Index		
	2002-03	2003-04	Mean	2002-03	2003-04	Mean	2002-03	2003-04	Mean
Fertility level									
F0	768.31	810.96	789.63	1784.11	1893.27	1838.69	43.06	92.82	42.94
F1	1042.67	1089.05	1065.86	2428.83	2544.45	2486.64	42.93	42.79	42.86
F2	990.92	1035.60	1013.26	2229.19	2339.68	2284.44	44.47	44.24	44.36
F3	1377.94	1441.83	1409.89	3075.24	3223.27	3149.26	44.89	44.69	44.79
F4	1123.02	1172.54	1147.78	2584.30	2708.21	2646.26	43.46	43.28	43.37
S.Em±	12.23	12.13	8.61	25.26	19.18	15.86	0.19	0.19	0.14
CD at S%	34.33	34.72	24.63	71.95	54.63	45.17	0.56	0.54	0.39
Bio-Fertilizer									
B0	945.86	960.65	953.26	2173.34	2222.59	2197.97	43.42	43.14	43.28
B1	1072.64	1124.90	1098.77	2450.90	2587.53	2519.22	43.59	43.39	43.49
B2	1040.09	1076.66	1058.38	2344.92	240.13	2392.53	44.42	44.03	44.23
B3	1183.68	1277.80	1230.74	2712.16	2916.86	2814.51	43.58	43.70	43.64
S.Em±	10.94	10.85	7.70	22.59	17.15	14.18	0.18	0.17	0.12
CD at 5%	31.25	31.06	22.03	64.34	48.85	40.39	0.501	0.49	0.35

F0=Control, F1=20kg N +80kg P_2O_5 ha^{-1}, F2 = 10kg N + 40kg P_2O_5 ha $^{-1}$, F3 = 3q ha $^{-1}$ LLF +10 kg N +40 kg P_2O_5 ha^{-1}, F4= 3 q ha $^{-1}$ LLF +25 q ha $^{-1}$ FYM; Bo=Control, B1= *Rizobium*, B2= PSB, B3= *Rhizobium* + PSB

Table 2: Economics of lentil cultivation in association with leucaena under different treatments

Treatments	Cost of cultivations(Rs. ha $^{-1}$)		Gross return (Rs. ha $^{-1}$)		Net return (Rs. ha^{-1})		Cost: Benefit ratio	
	2002-03	2003-04	2002-03	2003-04	2002-03	2003-04	2002-03	2003-04
Fertility levels:								
F0	10618.50	10618.50	20664.34	25950.13	10045.84	15331.63	0.95	1.44
F1	12810.50	13068.00	25756.45	32247.76	129.96	19179.26	1.01	1.47
F2	11714.50	11843.50	24557.36	30479.86	12842.86	18636.36	1.10	1.57
F3	11892.50	12021.50	30794.77	39501.53	18902.27	27480.03	1.59	2.29
F4	12354.50	12354.50	27444.01	33826.11	15089.51	21471.61	1.22	1.74
Bio-Fertilizer								
B0	11815.60	11918	23227.35	29209.24	11411.75	17290.44	0.97	1.45
B1	11878.10	11981.30	25744.68	32904.61	13866.58	20923.31	1.17	1.75
B2	11878.10	11981.30	25617.17	31807.63	13739.07	19826.33	1.16	1.66
B3	11940.60	12043.80	28786.14	35685.15	16845.54	23641.35	1.41	1.96

Table 3: Green leaf fodder and fuel wood Production (kg/ tree) as influenced by diff. treatment

Treatments	Green leaf production(kg/tree)		Fuel wood Production (kg/tree)	
	2002-03	2003-04	2002-03	2003-04
Fertility levels:				
F0	5.18	5.91	1.90	3.24
F1	5.67	6.72	2.08	3.68
F2	5.59	5.97	1.97	3.59
F3	5.60	7.28	2.08	4.13
F4	5.82	6.82	2.22	3.74
Bio-Fertilizer:				
B0	5.25	5.87	1.80	3.59
B1	5.58	6.81	1.93	3.69
B2	5.53	6.45	2.11	3.70
B3	5.92	7.03	2.36	3.73

respectively. In this regard the treatment for both seasons may be arranged in significant order of $B_3 > B_1 > B_2 > B_0$. Harvest index of lentil crop in first season data is quite apparent that treatment B_2(PSB) showed significant more than B_1 (Rhizobium) B_3 (Rhizobium + PSB) and B_0 (control) in second season all the bio fertilizer treatments in this regard may arranged in the merit order of $B_2 > B_3 > B_1 > B_0$ (Table 1).

Tree (Leucaena)

The variations in green leaf fodder production and fuel wood production due to different fertility levels were quite nominal in first year. However, the maximum green leaf fodder production (5.82 kg per tree) and fuel wood production (2.22 kg per tree) were recorded in treatment F_4 (3 q ha^{-1} Leucaena litter fall +25 q ha^{-1} FYM), and minimum 5.18 kg per treeleaf fodder and 1.90 kg per tree fuel production were recorded in control treatments. While in the second year variation in the green leaf fodder production and fuel wood production per tree due to fertility levels were found maximum in treatment F_3 followed by F_4, F_1, F_2 and Fo (control) (Table 3). The litter fall per tree increasing till 120 DAS of lentil crop irrespective of treatment effect in both the seasons, The treatment F_3(3q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1}) tended to be superior to the rest of the treatments under test.

The maximum green leaf fodder production (5.92 and 7.03 kg) and fuel wood production (2.36 and 3.73 kg) per tree were found in treatment B_3 (Rhizobium +PSB) followed by B_1 (Rhizobium), B_2 (PSB) and B_0 (control) in both the year. The variations in litter fall per tree due to bio- fertilizers were quite nominal at all stages of crop growth in both years of field experimentation (Table 4). Same report given by (*Chatterjee et al; 1990) and (Maity et al ; 1983)* . However treatment B_3 (Rhizobium +PSB) was found to be superior to the remaining treatments.

Economic implecations (Profitability)

The cost of cultivation was highest in the treatment F_1(20 kg N + 80 kg P_2O_5ha^{-1}) followed by F_4(3 q ha^{-1} Leucaena litter fall +25 q ha^{-1} FYM),F_3 (3q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1}, F_2 (10kg N +40 kg P_20_5 ha^{-1}) and F_0 (control) during both the years of field trial. The second part of cost of cultivation was also maximum in treatment B_3 (Rhizobium+PSB)as compared to rest of the bio-fertilizer treatment during both years (Table 2).

Net returns (Rs.18902.27 in 2002-03 and Rs.27480.83 in 2003-04) and gross returns (Rs.30794.77 in 2002-03 and Rs.39501.53 in 2003-04) per hectre were recorded considerably higher in treatment F_3 (3q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1}). The reason is quite apparent with the fact that net and gross returns were higher due to higher productivity in lentil and the less cost of cultivation under agro-forestry system. It is also evident from B:C ratio that the highest

Table 4: Litterfall per tree of leucaena (Mg) at successive stage of lentil crop growth as influenced by various treatment

Treatments	DAS(2002-2003)					DAS(2002-2003)				
	30	60	90	120	At harvest	30	60	90	120	At harvest
Fertility levels:										
F0	156.94	175.58	180.12	187.38	181.87	158.31	175.82	179.80	185.98	180.28
F1	160.69	180.61	189.88	197.16	192.54	161.12	181.02	188.18	196.41	190.22
F2	157.50	176.61	185.47	193.92	188.11	158.48	177.17	184.70	193.34	186.17
F3	161.99	184.25	197.10	209.64	204.22	162.73	184.32	195.50	206.84	206.61
F4	161.20	182.08	192.71	202.14	197.71	161.77	182.49	193.33	200.50	196.30
Bio-Fertilizer:										
B0	158.35	176.28	182.76	191.65	187.89	159.23	176.75	182.66	190.43	185.37
B1	160.24	181.22	191.42	200.07	195.61	160.60	181.08	189.46	198.49	192.97
B2	159.12	178.70	187.08	196.13	190.38	160.27	179.42	188.27	195.01	189.55
B3	160.96	183.10	194.96	204.02	197.68	161.83	183.40	192.82	202.53	195.78

B:C ratio was also calculated (1.59 in 2002-03 and 2.29 in 2003-04) in treatment F_3(3q ha^{-1} Leucaena litter fall+10kg N +40 kg P_2O_5 ha^{-1}). The net and gross returns and better B:C ratio were also recorded by Singh and Verma (2002) who reported that better B:C ratio was found with 12.25kg +30 kg P_2O_5 ha^{-1} + 5 q ha^{-1} poultry manure in lentil (Table 3).

Net and gross returns were highest in treatment B_3 (Rhizobium +PSB) during both the seasons. Cost of cultivation was also almost similar in all the treatments, but due to higher production of lentil the gross and net returns were also higher which are well reflected by B:C ratio being higher in treatment B_3 (Rhizobium +PSB) as compared to another bio-fertilizer treatments with other sources, Tomer et al, (1996) reported that among all the sources and levels of P_2O_5 the best combination was PSB + rock phosphate + Pyrite + 60 kg P_2O_5 gave higher yield and higher net returns (Table 3).

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Empowerment of women through SHGs in Kanpur Nagar

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Abstract

The paper examines the determinants of earnings of rural women under SHG scheme in the district Kanpur Nagar. Interview schedules were used for data collection from a randomly selected samples of 134 SHG members. Data was tabulated and analysed according to statistically. The findings showed majority of the respondents to be engaged in non-farm activities, which were largely traditional and less remunerative in nature. The main benefits of SHGs were increased participation in social service and organized action, having received new skills/training and better access to credit facilities.

Key words: determinants, schedules, traditional, organized

Introduction

The theory of underdevelopment views poverty as a product of the vicious circle of low per capita income, w savings, and consequently low capital formation and productivity, and so on. In rural areas, it arises, mainly from unemployment, under-employment and low earnings.

Poverty reduction requires active involvement of the government, together with substantial non-governmental effort, to tackle it on two fronts simultaneously, i.e., production and distribution and redistribution. Development of social infrastructure, like education, skill and trainings, is crucial to enable rural people to be gainfully employed, besides paying special attention to encourage self - employment on a large scale through provisions of micro-credit (Mishra & Puri 2002).

Women, who constitute slightly less than 50 per cent of the total population, are generally underemployed due to their limited command over resources and regulatory institutions. Particularly, rural women face greater problem than their urban counterparts with no source of livelihood other than agriculture. Hence, the government has been adopting various programmes for poverty alleviation of poor women inthe country. The introduction of Development of Women and Children in Rural Areas (DWCRA) was one such scheme. However, its several short - comings leading to its failure, paved way for the introduction of Self-Help Groups (SHGs) scheme, a sub-programme under Swarnjayanti Gram Swarozgar Yojana (SGSY). The SHGs scheme is specially aimed at increasing women's earnings and making them self confident. It has been a regular component of the Indian financial system since 1996.They are small informal and homogenous groups of not more than 20 members each.

Materials and Methods

Therefore, to visualize the empowerment of rural women through SHGs, a study was conducted in Kanpur Nagar. Multistage random sampling technique was used for the present study. At the first stage district Kanpur Nagar was selected purposively Kanpur Nagar was divided into ten block. At the second stage one block namely Kalyanpur was selected randomly. At the third stage four village namely Singhpur Kachhar, Hirdayapur, Gambeerpur and Vaintkunthpur were selected randomly from the block Kalyanpur. At the fourth stage total 134 SHG members were selected randomly to the selected villages. Interview schedule was used for the data collection. The methodology used by the study are simple average, ratios, percentages, standard deviation etc. The estimated ordinary least squares (OLS) monthly equation is of the form :

INCR = b0 + b1OCCP + b2AGER + b3EDCN + b4EXPN + b5SKIL + b6FTYP + b7ASST + b8LABS + b9HINC + b10YNGA + b11CRDT + b12MRKT + U

where,

INCR = monthly earning of the respondent,

OCCP = nature of occupation dummy, taking values 1 for non-farm and 0 for farm activities,

AGER = age of the respondent,

EDCN = education of the respondent in years,

EXPN = experience of the respondent in years,

SKIL = skill dummy, taking values 1 for skilled and 0 otherwise.

FTYP = family type dummy, taking values 1 for skilled and 0 otherwise,

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ASST = total asset value in Rs.
LABS = labour supply in hours per month,
HINC = husband's income per month,
YNGA = age of the youngest child,
CRDT = credit amount sanctioned in Rs.
MRKT = marketing dummy, taking values 1 for direct sales to consumers or own shop and 0 otherwise, and
U = Error term.

Results and Discussion

This section discusses the results of the analysis. Table 1 shows the mean and standard deviation of key variables. The mean age of the respondents was around 34 years and education less than middle school during the survey. Nearly 70 per cent of them came from joint family households and the rest from nuclear families. The average value of assets families. The average value of assets owned by them was worth Rs. 91,200. The average age of the youngest child, representing family constraint for women, was around seven years during the interview. The mean monthly income of the respondents' spouse amounted to Rs. 1308.

The mean work experience of the sample women was reported to be less than three years under the scheme, because it was introduced in UP only in April 1999 and the SHGs were sanctioned loans for activities after six months of proven thrift. About 55 per cent of them are engaged in non-farm activities. While the rest are involved in agricultural activities. Around 72 per cent of them had received vocational training under the scheme, and the average SHG credit sanctioned was Rs. 1,05,900. The mean monthly income reported by the sample respondents during the survey was Rs. 806. About 64 per cent of them sold their products directly to the consumers or through their own shop, while the rest chose other market channels. Further, their average labour supply per annum was 196 days.

Table 1 : Descriptive Statistics

Sl. No.	Variable	Mean	S.D.
1.	INCR	806.00	615.90
2.	OCCP	0.55	0.50
3.	AGER	34.38	7.09
4.	EDCN	7.29	3.92
5.	EXPN	2.45	3.61
6.	SKIL	0.72	0.45
7.	FTYP	0.07	0.26
8.	HINC	1308.00	804.00
9.	YNGA	6.75	4.03
10.	CRDT	105900.00	102000.00
11.	MRKT	0.64	0.48
12.	ASST	91200.00	98710.00
13.	LABS	196.20	79.53

Table 2 furnishes information on the nature of employment undertaken. Of the 134 sample SHG respondents contacted during the survey, 105 had commenced production activities, while 29 were yet to start it. Among those who had commenced it, majority (61) are engaged in non-agricultural activities, while the rest (44) are involved in agricultural activities. Thus, majority of them prefer the more regular employment providing farm and non - farm activities. The former include agricultural activities, like dairying, floriculture, banana cultivation and poultry, which were preferred to the seasonal ones, like dairying, floriculture, banana cultivation and poultry. Meanwhile, the non-agricultural activities comprise own shops, tailoring and embroidery, food item processing, hotels, bakery, carpentry, pottery, laundry, agarbathi making, beauty parlour, basket weaving, cobber, stationeries shop, cycle store and other petty shops. However, it may be observed that the non-farm activities chosen are mainly traditional and less remunerative in nature.

Table 2 : Nature of activity

Sl. No.	Details	No.	%
A.	Agriculture Activities	(44)	(42.0)
(i)	Dairying	34	32.00
(ii)	Floriculture	6	6.00
(iii)	Banana cultivation	4	4.00
(iv)	Poultry farming	1	1.00
B.	Non-Agricultural Activities	(61)	(58)
(i)	Food and beverages	14	13.00
(ii)	Manufacturing	12	11.00
(iii)	Own shop	22	21.00
(iv)	Service	13	12.00
Total (A - B)		105	100.00
C.	Activity not started	39	
Grand Total		134	

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Housing management practices adopted in different categories of members and non-members families of dairy cooperative in Jaipur district of Rajasthan

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Abstract

Major farmers of members and non-member families housed their animal near dwelling. Landless category kept their animals inside dwelling due to more affection with their animals in both member's non-members. Kutcha floor in animals shed was prominent maintained by 88.83 per cent and 96.76% However, higher percentage of member families had brick plus mud floor. Majority (74.71%) of families in members had east-west orientation of the shed while in case of non-members majority (56.67%) had north-south orientation. Majority (65.83 per cent) of member families provided floor space as per recommendation whereas in case of non-members majority (79.71%) of families provided either more or less floor space in comparison to recommendation. Ventilation in animal shed was optimum in majority (79.71%) of members families, while 35.0% non-members families had optimum ventilation. It was concluded that 53.83% member families used either G.I sheet or asbestos sheet as roof material while majority (63.33%) non-members families used thatched material for roof. Landless families in both members and non-members were using thatched material for construction of roof of animal shed due to poor economic condition in comparison to other categories. Majority (54.17%) of member families had one side open shed. While in case of non-member majority of household had closed shed for their animals. The membership of dairy co-operative had significant association with all the housing parameters selected for the study i.e. place of keeping animals, type of floor, orientation, floor space available, ventilation in the shed, roof material used, and type of housing animals. Knuckling method of milking was more popular and adopted by 87.50 per cent and 95.0 per cent respondents in members' and non-members families respectively. Majority (55.83%) members. families maintained optimum interval while majority (62.50%) on non-members families was not maintaining the optimum interval between two milking majority of members, (85.83%) and non-member (94.71%) farmer's milking to their animals at same place, where animals were kept. Significantly higher percentage of members (14.16) households milked to their animals at separate dry place in comparison to non-members (5.83%). Teat plus udder were washed by majority (65.83%) of members' families and about more than half (53.33%) non-members families. Membership of dairy co-operatives and significant association with all the parameters identified under milking management practices for the study.

Key words: affection, co-operative, association, asbestos, families

Introduction

The India is predominantly an agrarian economy with more than 75% 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).

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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).

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 rRajasthan. 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, and chi-squire was calculated for interpretation of data.

Results and discussions

Hosing management Practices:

Place of keeping animals.

The place of keeping / housed to the animals by members and non-members families presented in the table-1.In case of member's families 60.83% farmers kept their animals near dwelling whereas 20.0 and 19.17% respondents kept in side dwelling and separate from dwelling, respectively. It was found that in different categories of members 65.0% landless farmers kept their animals inside dwelling while 60.71 and 72.73 percent marginal and small farmers housed near dwelling and 21.78% marginal and 18.18 percent small farmers housed their animals separate from dwelling. It indicates that majority of landless families kept their animals in side dwelling due to more affection with milch animals whereas majority of marginal and small farmers kept near dwelling. In case of non-members nearly 45.83, 37.50 and 16.67% of selected respondents housed their animals near dwelling, inside dwelling and separate from dwelling, respectively. Category wise analysis indicates that 79.17% landless farmers kept inside dwelling while 40.39 and 60.0% marginal and small farmers housed to their animals near dwelling.

It can be concluded that majority of selected respondents housed their animals near dwelling by members as well as by non-members families. The membership had significant ($P<0.05$) effect on place where animals were housed. These findings are approximately similar to Bhardwaj et al. (2003) reported that 58 and 52% farmers of co-operative and non-cooperative villages were found to keep their buffaloes near dwelling. Ray et al. (2007) observed that majority of the sheds was situated near to the family house (68 %).

Type of floor in the shed:

Type of floor is very important components for achieving clean milk production. In case of members the overall average katcha floor and brick plus mud floor in the animals shed were maintained by 88.33 and 11.67 percent, respectively. In different categories 100.0, 89.29 and 83.72% landless, marginal and small farmers had katcha floor in the shed. In case of non-members overall average 96.67 percent respondents had katcha floor and only 3.33 percent had brick plus mud floor. Even not a single respondent had cemented and brick plus cement floor in cattle shed in both members and non-members.

It can be concluded that katcha floor were prominent, maintained by majority of the respondents in members and non-members families. The reason for adopting the katcha floor in the shed were, farmers believed that on such type of floor animals feel more comfort than other type of floors as stated by members and non-members farmers. It can also be concluded that significantly higher percentage of member families had brick floor in the shed as compare to

Table 1 : Housing Management Practices adopted in different categories of Members and Non-Member's families

S.N	Particulars	Members				Non-members				Chi-square on overall basis
		Landles	Marginal	Small	Overall	Landless	Marginal	Small	Overall	
1	Place of keeping animals									
i	Inside dwelling	65.0	12.50	9.09	20.0	79.17	32.23	17.65	37.50	7.60*
ii	Near dwelling	35.0	60.71	72.73	60.83	20.83	40.39	58.82	45.83	
iii	Separate from dwelling	-	21.78	18.18	19.17	-	19.35	16.67	16.67	
2	Type of floor									
i	Katcha	100	89.29	81.82	88.83	100	95.16	97.06	96.67	5.02*
ii	Cement	-	-	-	-	-	-	-	-	
iii	Brick+ Mud	-	10.71	18.18	11.67	-	4.84	2.94	3.83	
3	Orientation of animal shed									
i	North-south	35.0	25.0	22.73	25.83	70.83	62.90	34.29	56.67	19.62**
ii	East-west	65.0	70.0	77.27	74.17	29.17	37.10	64.71	43.43	
4	Floor space available									
i	As per recommendation	55.0	66.07	70.45	65.83	8.33	29.03	35.29	26.67	36.66**
ii	Less than recommendation	25.0	7.14	6.82	10.0	79.17	22.58	26.47	35.0	
iii	Morethan recommendation	20.0	26.79	22.73	24.17	12.50	48.39	38.24	38.33	
5	Ventilation in the shed									
i	Low	20.0	8.93	6.82	10.0	54.13	41.94	52.94	47.50	43.10**
ii	Optimum	65.0	80.36	84.09	79.17	29.17	35.48	38.24	35.0	
iii	Over	15.0	10.71	9.09	10.83	16.67	22.58	8.82	17.50	
6	Roof material used									
i	Thatched	70.0	51.79	29.55	46.67	87.50	59.68	52.94	63.33	7.54*
ii	G.I. Sheet	20.0	28.57	50.0	35.0	12.50	32.26	44.18	31.67	
iii	Asbestos sheet	10.0	19.64	20.45	18.33	-	8.06	2.94	5.0	
7	Type of housing animals									
i	Closed	35.0	32.14	29.55	31.67	58.33	41.94	47.06	46.67	9.74**
ii	Open side open	60.0	57.14	54.17	54.17	25.00	30.65	32.35	30.0	
iii	Three side open	5.0	10.72	14.16	14.16	16.67	27.41	20.59	23.33	

* (P<0.05) **(P<0.01)

non-members families. The membership of dairy co-operative societies show significant (P<0.05) effect on type of floor in the animal shed. These findings are in conformity with the earlier findings Dhiman (1988), Dhiman et al. (1990) reported that the percentage of respondents who used mud floors (83.75 and 71.25) in adopted and non-adopted village. Malik and Nagpaul (1998) found that 53.89 percent respondents had mud floor in the buffalo shed. Singh and Singh (2000) observed that 100 percent in Bhiwani zone and 81.0 percent in Hisar zone having katcha floor. Bhardwaj (2003) observed that regarding floor condition in animal house majority of respondents (58 percent) were having katcha floor in both the categories. Garg et al (2005) found that majority of the sheds (70.93 percent) had kacha flooring. Singh et al (2007) observed katcha floor had by 100 percent respondents.

Orientation of animal shed:

Table-reveals that in case of members 74.17 and 25.83 percent respondents had east- west (E-W) and north- south (N-S) orientation of the animals house. Category wise analysis shows that 65.0, 75.0 and 77.27 percent landless, marginal and small farmers had east-west orientation by member's families. It indicates that majority of respondents of all categories had desired direction of the shed. In case of non-members east-west and north- south orientation had by 43.43 and 56.67 percent farms, respectively. In different categories 70.83, 62.90 and 34.29 percent landless, marginal and small farmers had north-south direction of animal shed.

It can be concluded that majority (74.17 %) of families in members had east –west direction of the shed whereas in case of non-members majority (56.67%) had north –south orientation of animal shed. The membership of dairy co-operatives had significant (P<0.01) effect on orientation of animal shed.

Floor space available:

As table- reveals that in case of members families 65.83 percent respondents provided floor space as per recommendation, while 24.17 and 10.0 percent provided more than recommendation and less than recommendation, respectively. Category wise analysis indicates that 70.45 percent small families, 66.07 percent marginal and 55.0% landless families provide floor space as per recommendation.

Table further shows that in case of non-members 26.67, 35.0 and 38.33% of selected respondents provided floor space as per recommendation, more than recommendation and less than recommendation,

respectively. In different categories 79.17% landless families provided less space whereas 48.39 and 38.24 percent marginal and small families provide floor space more than recommendation.

It can be concluded that majority of member families provided floor space as per recommendation while in case of non members majority of families provide either more or less floor space in comparison to recommendation .The membership of dairy co-operatives significantly (P< 0.01) effect to the floor space available to milch animals.

Ventilation in the animal shed:

The table- reveals that in case of members 79.17 percent sheds had optimum ventilation whereas 10.83 percent and 10.0 percent shed had over and low ventilation , respectively. In case of non-members families 47.50, 35.0 and 17.50 percent shed had low, optimum and over ventilation, respectively.

It can be concluded that majority (79.17 percent) sheds in member families had optimum ventilation where as in case of non-members families only 35.0 percent shed had optimum ventilation . The membership show significant (P<0.01) effect on ventilation in the shed of the animals.

Materials used for roof of animal shed:

Type of material used by members and non-members families as roof material were analyzed and presented in Table 1

Table reveals that various roofing material were used included G.I sheet, asbestos sheet and thatched materials by selected respondents.. It was observed that overall average 46.67, 35.0 and 18.33 percent farmers were using thatched, G. I sheet and asbestos sheet, as roof material, respectively. Categorywise indicates that 70.0 and 51.79 percent landless and marginal farmers were used thatched material for roof where as 50.0 percent small farmers were used coggurated G.I sheet for roof of animal shed. It indicates that majority of landless and marginal farmer were using thatched material for construction of roof of shed.Table further reveals that overall 63.33, 31.67 and 5.0 percent respondents were used thatched, G.I sheets and asbestos sheet, respectively in case of non-members. In different categories it indicates that 87.50,59.68 and 52.94 percent landless ,marginal and small farmers were used thatched material for roof. It shows that thatched materials were used by majority of landless, marginal and small farmers.

It can be concluded that higher percentage of non-members farmers were used thatched material for made of roof of animals shed in comparison to members families. It can also be concluded that higher percentage members were used either G.I sheet or asbestos sheet as roof material. The membership show significant (P<0.05) effect on material used for construction of shed for the animals.

Type of house for animals:

Type of house used for animals by the members and non-members families of the study area presented in the table-1 .The perusal of the results reveals that overall 31.67 percent respondents had completely close shed , 54.17 percent had one side open shed and 14.16 percent had three side open shed in case of members .In different categories 60.0, 57.14 and 47.73 percent landless, marginal and small families had one side open shed, respectively. Table further indicates that in case of non-members 46.67, 30.0 and 23.33 percent farmers had closed shed, one side open shed and three side open shed, respectively. It was also found that 58.33, 41.94 and 47.06 percent landless, small and marginal farmers had closed shed for their animals.

It can be concluded that majority of the respondents in case of members had one side open shed while in case non-members majority of household had closed shed for their animals. The membership of dairy co-operatives show significant effect (P<0.01) on type of house used for animals.

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Impact of diversified agriculture on income and employment of farmers in Mau district of Uttar Pradesh

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Abstract

The study was aimed to asses the effect of diversification in agriculture on income and employment of the farmers of Mau district in Uttar Pradesh. Primary data were collected by surveying 100 respondents. Technical efficiency was estimated through tabular method using percentage of total as basis. the results indicates that incomes of diversified and non-diversified farmers from agriculture were Rs. 120528/- (72.86percent) and Rs.34076.79/- (52.36percent), respectively. Income from other than agricultural sources were Rs. 44900/-(27.14percent) and Rs. 31000/- (47.64percent) for diversified and for non-diversified farmers, respectively. There was 348 mandays (54.12 percent) employment from agriculture to diversified farmers as against 147.5 mandays (39.60percent) employment to non-diversified farmers. The diversified farmers have employment of 294.50 (45.88percent) mandays from non-agricultural activities in comparison to 225.00(60.40 percent) mandays employment by non-diversified farmers from other than agricultural activities.

Key words: Diversified, Non-diversified, Mandays, income and Employment.

Introduction

It is often said that India is a rich cuntry inhabited by poors. This necessarily indicates paradoxical situation of abudant natural resources and poverty-ridden people in public domain. In order to fulfill unlimited human necessities within limited resources, it is imperative to find out ways and means for most effective and optimum utilization of available resources .Uttar Pradesh being the most popular state of India, is facing with several resource related constraints such as fragmented and small land holdings,non availability of irrigation water, inadequate input supply in time and financial hard ship with the farming community. Since crop production is an enterprise often fails to provide livelihood supporting food and earnings and returns are season specific, adoption of other farming related enterprises seems to hold promise for better utilization of available resources and generating more employment opportunities for rural youth. Keeping in view the above problem Govt. of India and World Bank has launched a programme namely "Diversification in agriculture". In addition to cultivation of traditional crops for example wheat, rice, gram etc.to fulfill fundamental necessities, diversified farming envisages to adopt dairy, hatchery, sericulture, viniculture and other related activities that utilize available resources more efficiently and gives extra income. It means with the help of diversification farmers can opt for many enterprises at their own farms for livelihood and optimum use of resources.

The present study was taken up to asses the impact of diversified agriculture on income and employment of farmers in Mau district of Uttar Pradesh.

Methodology

The present study pertains to pardaha block of Mau district of Azamgarh region of Uttar Pradesh. The Azamgarh region is particularly less progressive and backward with exceedingly less productivity, low income and employment. Studies conducted pertaining to this aspect found to be scarce in the area. Therefore, selection of the area was made to asses the additional income and employment generation through adoption of diversification in farming by the farmers of the selected area. Thus pardaha block of Mau district was selected purposively. The 10 villages of pardha block were selected randomly. 100 cases from selected villages were selected mainly the medium and large formers were considered for present study. The selected 100 cases were categorized in to diversified and non diversified farms. The number of diversified farm was 37 and the number of non-diversified farm was 63. These farmers were again categorized to medium and large formers.

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The number of cases in large and medium farm size came to 16 and 17 respectively in case of diversified farmers. While the number of cases in large and medium farms came to 28 and 35 respectively in case of non diversified farmers. Survey method was used for collection of data .The study was based on primary data, the data were collected from the selected farmers by the personal interview method with the help of pre-prepared schedules and questionnaires.

Resuts and Discussion

Income level of different groups of farmers have indicated in Table 1, revealed that the diversified farmers have 72.86 and 27.14 percent income from agricultural and other than agricultural sources respectively. Agricultural resources contributed 12.41,28.12,17.13 and 15.20 percent of income from food grains, vegetables, dairy and fishery, respectively. Other than agricultural sources, business and services, contributed 16.56percent and 10.58percent of income, respectively. Non diversified farmers have 52.36percent and 47.64percent income from agricultural and other than agricultural resources, respectively. Among agricultural sources 26.60percent and 25.74percent of income was obtained from food grains and vegetable crops respectively. Where as contribution from other than agricultural sources were 38.42percent and 9.22 percent from business and services, respectively.

Level of employment for different groups of farmers indicated in Table 2, revealed that the diversified farmers have 54.12percent and 45.84percent employment from agricultural and other than agricultural sources, respectively. Agricultural resources viz food grains, vegetables, dairy and fishery, provided 13.93, 11.59, 15.56 and 13.07percent employment, respectively. Non-agricultural sources, business and services, provided 18.59 and 27.24percent employment, respectively. Non

Table 1 : Level of income among farmers in Mau District

(in Rupees)

Sl. No. Particular	Diversifie farmers			Non-diversified farmers		
	Large farmer	Medium farmer	Average	Large farmer	Medium farmer	Average
A. Income from agriculture	124450(71.34)	116606(74.55)	120528(72.86)	54260.71(81.89)	13892.86(21.74)	34076.79(52.36)
1. Crop (food grain)	21437(12.29)	19603(12.53)	20520(12.41)	30875(46.60)	3750(5.87)	17312.50(26.60)
2. Vegetabels crops	51313(29.49)	41723(26.68)	46518(28.12)	23385.71(35.37)	10142.86(15.87)	16764.29(25.74)
3. Dairy	31308(17.95)	25375(16.22)	28341.50(17.13)	-	-	-
4. Fisheries	20392(11.69)	29905(19.12)	25148.50(15.20)	-	-	-
B. Income from other than agriculture 31000(47.64)		50000(28.66)	29800(25.45)	44900(27.14)	12000(18.11)	50000(78.26)
1. Business	35000(20.06)	19800(12.66)	27400(16.56)	-	50000(78.26)	25000(38.42)
2. Service	15000(8.60)	20000(12.79)	17500(10.58)	12000(18.11)	-	6000(9.22)
Total	**174450(100)**	**156406(100)**	**165428(100)**	**66260.71(100)**	**63892.86(100)**	**65076.79(100)**

Note: figures in parentheses indicate percentage of total

Table 2 : Level of employment among farmers in Mau District

(in Mandays)

Sl. No. Particular	Diversifie farmers			Non-diversified farmers		
	Large farmer	Medium farmer	Average	Large farmer	Medium farmer	Average
A. Employment from agriculture	327.00(51.09)	369.00(57.21)	348.00(54.12)	160.00(51.61)	135.00(31.03)	147.50(39.60)
1. Crop (food grain)	87.00(13.59)	92.00(14.26)	89.50(13.93)	105.00(33.87)	90.00(20.69)	97.50(26.70)
2. Vegetabels crops	68.00(10.63)	81.00(12.56)	74.50(11.59)	55.00(17.74)	45.00(10.34)	50.00(13.42)
3. Dairy	94.00(14.69)	106.00(16.43)	100.00(15.56)	-	-	-
4. Fisheries	78.00(12.19)	90.00(13.95)	84.00(13.07)	-	-	-
B. Income from other than agriculture	313.00(48.91)	276.00(42.79)	294.50(45.48)	150.00(48.39)	300.00(68.79)	225.00(60.40)
1. Business	163.00(25.47)	76.00(11.78)	119.50(18.59)	60.00(19.35)	230.00(82.87)	145.00(38.93)
2. Service	150.00(23.44)	200.00(31.01)	175.00(27.24)	90.00(29.03)	70.00(16.06)	80.00(21.47)
Total	**640.00(100)**	**645.00(100)**	**642.50(100)**	**310.00(100)**	**435.00(100)**	**372.50(100)**

Note: figures in parentheses indicate percentage of total

diversified farmers could get 39.60 and 60.40percent employment from agricultural and other than agricultural sources respectively. Agricultural resources brought about 26.70 and 13.42percent employment from food grains and vegetable crops, respectively. Other than agricultural resources had 38.93 and 21.47percent employment from business and services, respectively.

It can be seen from the above discussion that income and employment for both groups of farmers were found same but inverse relationship between the agricultural and non-agricultural activities was discernible.

Recommendations

The following recommendation comes out from the undertaken study:

1. Diversification helps in increasing the farm income and employment because farmers are exposed to alternative opportunities through maximized returns from their investments in farm sector.
2. Diversification helps in minimization of the risk and uncertainty of farmers.
3. Diversification helps in increase the availability of (not only in season) family labour and hired labour employment.
4. Diversification helps in use of products and by-products on the farms.
5. Diversification helps in optimum use of resources.

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Structure and growth of television in Uttar Pradesh

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Abstract

The study was conducted in Doordarshan Kendra Lucknow of Uttar Pradesh to investigate the structure and growth of television with special focus on farm telecast in Uttar Pradesh. The findings revealed that a tremendous growth of television in Uttar Pradesh was recorded. The growth of transmitters was phenomenal after that reaching as all time high. In rural area, the number of television households has increased whereas in case of urban household the growth per cent has been dropping constantly. The decreasing trend of percentage time devoted to different farm telecasts. Doordarshan Kendra, Lucknow used to telecast maximum programmes on education and development followed by informative, entertainment and infotainment. As time passed, the pattern was changed. In present time there were maximum telecasts on entertainment programmes followed by informative, education and development and infotainment. Maximum number of telecasts were on agriculture which had decreased. This, however, is not a positive trend. The decreased could be due to the fact that many more programmes in development which were non-agriculture in nature got the higher priority.

Key words: Television, Infotainment, Entertainment, Priority

Introduction

Consumption of mass media has to be regarded as one of the indices of development. The present age has been rightly termed as an "information age" people want adequate and authentic information as early as possible. The mass media namely, newspaper, radio and television try satisfy this important need of the people craving for information. Of these mass media, television is the most exciting means of communication ever device by man. New television development, provided a need for constant broadcasting. This need promoted the growth of television stations all over the world. With the constant supply of televisions signals, demand for television sets increased at a surprising rate.

Television that was once a luxury to the rich now becoming common in all levels of society. This was the first stage of television bringing outside events into the living rooms of people all over the world. Today over one billion homes have televisions has been an amazing process.

Doordarshan has three-tier primary programme service i.e. at national, regional and at local level. In the national programmes the focus is on the events and issues of interest to the entire nation. These programmes include news, current affairs, science, cultural programmes, serials music, dance and movies. The regional programmes originated from the state capitals and relay by all transmitters in the respective state in the language and dialects of that particular region. The local programmes are area specific and cover local issues featuring of local people.

Indian television has grown into one of the largest network in the world. Doordarshan network consists of 64 Doordarshan Kendras/Production Centres, 24 Regional News Units, 126 Doordarshan Maintenance Centres, 1399 transmitters (202 High Power Transmitters, 828 Low Power Transmitters, 351 Very Low Power Transmitters and 18 Transposers) and 30 Channels and DTH Service. It cover 79.40% of area and 91.40% of the population. The number of TV households is estimated to be 87.3 million; most of these are in metropolion cities and towns.

Jin DalYong (2007) argues that global television system has dramatically changed during the past two decades. The number of television sets has increased, and the number of TV channels has soared as television industries have been privatized and commercialized. New broadcasting systems such as cable and satellite broadcasting industries have also become part of everyday life around the world.

In this information age, television has become popular of its tremendous and audible appeal. It has ability to convey life and events in action to develop a profound influence upon the viewers. It provides viewers with realistic experiences, which capture their attention and motivate them in proper direction. Considering above facts in view the study was undertaken with specific objective to ascertain the structure and growth of television with special focus on farm telecast in Uttar Pradesh.

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Methodology

The present study was undertaken to ascertain the structure and growth of television with special focus on farm telecast in Uttar Pradesh. For this purpose the researcher had collected secondary data since inception of television from 1st January 2008 to 31st December 2008. The researcher has personally consulted Doordarshan officials and collected various available documents which were used for the study. For analyzing the growth of television, the growth percent was calculated with the help of using following formula.

$$Growth\,percent = \frac{Difference\,between\,two\,successive\,years\,data}{Data\,of\,previous\,years}$$

Results and Discussion

Area and population

It is evident from table 1 that a tremendous growth of television in Uttar Pradesh was recorded. It covered 90.5% of area in 2008 which was only 20.7% in 1983 and the population of 96.4 per cent in 2008 which was earlier 30.6 per cent in 1983. This is a position trend and a lot of impact of television has been recorded because of this ascending growth. A highest growth per cent has been observed in terms of area as well as population between the year 1993 to 1998 in the state.

Table 1 : Area and population covered by Doordarshan Kendra, Lucknow.

S. No.	Year	Area		Population	
		Percent	%Growth	Percent	%Growth
1.	1983	20.7	-	30.6	-
2.	1988	23.7	12.66	34.5	11.30
3.	1993	28.4	16.55	42.1	18.05
4.	1998	57.8	50.86	79.6	47.11
5.	2003	73.2	21.04	90.1	11.65
6.	2008	90.5	19.12	96.4	6.53

Growth of TV transmitters

The data in the table 2 shows the growth of television transmitters in Uttar Pradesh. It shows that it took 13 years to establish 18 transmitters in the state (1975-1988). The growth of transmitters was phenomenal after that reaching as all time high of 85 in year 2008. This shows the state was really committed to make TV available to maximum people.

The table 3 clearly indicates that in rural area, the number of television households has increased at a constant rate of 10.00 per cent (approx.) in every 5 years whereas in case of urban household the growth per cent has been dropping constantly. The growth per cent was dropped in urban area because of getting saturated.

Table further reveals that there was a tremendous growth in television households which becomes more than doubled in last decade.

Table 2 : Growth of TV transmitters in Uttar Pradesh

S. No.	Year	Transmitters (No.)				Total
		HPTs	LPTs	VLPTs	Transponders	
1.	1975	1	-	-	-	1
2.	1983	1	2	-	-	3
3.	1988	3	13	1	1	18
4.	1993	7	28	2	1	38
5.	1998	12	47	3	1	63
6.	2003	14	60	4	-	78
7.	2008	16	65	4	-	85

Table 4 : Duration of transmissions for farm telecast under Doordarshan Kendra, Lucknow.

S. No.	Year	Total time duration (min./week)	Average duration (minutes/week)	Duration for farm telecast	
				Minutes	Percent
1	1988	459	66	330	71.89
2	1993	1132	162	285	25.18
3	1998	1312	187	282	21.49
4	2003	1542	220	203	13.16
5	2008	1738	248	157	9.03

Duration of transmission

Table 4 indicates the decreasing trend of percentage time devoted to different farm telecasts under Lucknow Doordarshan Kendra. The table reveals that the maximum time i.e. 71.89% (330 minutes out of 459 minutes/ week) was devoted for farm telecast in the year 1988. Since then the total percentage has decreased from 25.18% in 1993, 21.49% in 1998, 13.16% in 2003 which was now only 9.03 per cent in the year 2008.

Programme composition

Table 5 indicates that Doordarshan Kendra, Lucknow used to telecast maximum programmes i.e. 71.97% on education and development followed by informative (14.69%), entertainment (8.06%) and infotainment (5.28%) in the year 1988. As time passed, the pattern was changed. In 2008 there were maximum telecasts on entertainment programmes (36.79 %)

Table: 3 : Growth of television households in Uttar Pradesh (Figure in 000's)

S.No.	House holds	Year 1988	1993	% Growth	1998	% Growth	2003	% Growth	2008	% Growth
1.	Urban	1237	1949	36.53	2945	33.82	3932	25.10	4368	9.98
2.	Rural	921	1126	18.21	1578	28.64	2540	37.87	4816	47.26
	Total	2158	3075	29.82	4523	32.01	6472	30.11	9184	29.53

Table: 5 : Composition of different telecasts under Doordarshan Kendra, Lucknow (in minutes)

S.No.	Year	Programme Category				Total
		Informative	Education and Development	Entertainment	Infotainment	
1.	1988	3507(14.69)	17178(71.97)	1923(8.06)	1259(5.28)	23867(100)
2.	1993	17973(30.53)	24743(42.02)	12316(20.92)	3846(6.53)	58868(100)
3.	1998	16543(24.25)	25208(36.95)	22318(32.72)	4149(6.08)	68218(100)
4.	2003	21174(26.40)	20367(25.40)	28805(35.92)	9849(12.28)	80195(100)
5.	2008	24660(27.29)	18720(20.72)	33240(36.79)	13740(15.20)	90360(100)

Note: The value in parenthesis indicates percentage.

Table: 6 : Composition of various educational and developmental programmes under Doordarshan Kendra, Lucknow. (in minutes)

S. No.	Name of Programmes	Year				
		1988	1993	1998	2003	2008
1.	Quize/Brain storming	-	371(1.50)	416(1.65)	2097(10.30)	1907(10.19)
2.	Children programme	2291(13.34)	2235(9.03)	2074(8.23)	1238(6.08)	1493(7.98)
3.	Women's programme	2078(12.10)	2556(10.33)	2537(10.06)	2452(12.04)	1689(9.02)
4.	Agricultural programme	10896(63.43)	14823(59.91)	14645(58.10)	10548(51.79)	8182(43.71)
5.	Youth Programme	839(4.88)	1516(6.13)	2262(8.97)	628(3.08)	1136(6.07)
6.	Industrial workers	-	-	760(3.02)	-	-
7.	Adult education	-	1004(4.06)	-	153(0.75)	379(2.02)
8.	Health and family welfare	1074(6.25)	2238(9.04)	2514(9.97)	3251(15.96)	3934(21.01)
	Total	17178(100)	24743(100)	25208(100)	20367(100)	18720(100)

Note: The value in parenthesis indicates percentage.

followed by informative (27.29%), education and development (20.72%) and infotainment (15.20%). There was a good increase in the per cent telecast from 8.06 to 36.79 for entertainment programmes in the same year.

The main purpose of introducing television was first to educate, then to inform and last to entertain the people. At the time of its inception the television in Uttar Pradesh had it's main focus on regional programmes specially education and development programmes followed by informative and entertainment programmes respectively. Trends have, however, reversed now, education and development has taken a back seat whereas information and entertainment are still dominating.

Table 6 shows that maximum number of telecasts i.e. 63.43 per cent were on agriculture in 1988 followed by 59.91, 58.10 and 51.79% in 1993, 1998 and 2003 respectively which had decreased up to 43.71% in 2008. This, however, is not a positive trend.

The decreased could be due to the fact that many more programmes in development which were non-agriculture in nature got the higher priority. The number of private and government sponsored programme development companies increased in order to fill the vacuum provided by the increase in the number of cable networks. Executives were also turning to data obtained from audience researches, which showed that the entertainment fare was the most popular and Doordarshan had to compete with other satellite networks which were primarily entertainment based.

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Yield Gap Analysis and Economics of Chilli Cultivation through Front Line Demonstration

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Abstract

The front line demonstrations were conducted on farmers field of Seoni district of Madhya Pradesh from 2008-09 to 2010-11(three consecutive years) at four adopted villages under real farming situations. Prevailing farmer's practices were treated as control for comparison with recommended practice. The result of Front Line Demonstration conducted by Krishi Vigyan Kendra in chilli crop shows a greater impact on farmers face due to significant increase in yield over local check. The extension gap ranged between 35 to 41 q/ha whereas the trend of technology gap ranged between 87 to 90 q/ha, the benefit cost ratio was recorded to be higher 1.73 to 2.13 under demonstration, while it was 1.12 to 1.30 under control plots.

Key words: Chilli, Front Line Demonstration, Yield, Economics, B: C Ratio

Introduction

Available agricultural technology does not serve its purpose till it reaches and adopted by its ultimate users, the farmers. Technology transfer refers to the spread of new ideas from originating sources to ultimate users (Prasad *et al*. 1987).Chilli is one of the most important cash crop supporting the livelihood and improving the economic life of the farmers in Madhya Pradesh. It is used both as immature green and matured red fruit. Generally matured ripe fruits are used as spice. India produced 1.33 million tonnes of chilli from an area of 0.808 million hectares with an average productivity of (dry fruits) 1.5 tones/ha (Rao and Joseph, 2008)

In Seoni district of Madhya Pradesh the poor productivity is mostly due to imbalanced use of fertilizers and indiscriminate use of plant protection measures for control of thrips, mite and PLCV disease. There is ample scope for further improvement of production and productivity of chilli for raising the income level of the farming community of the district. Further; the resource poor farmers are very reluctant towards proper scientific management of the crop. But still a good area (2010 ha) is under cultivation of chilli with the available low cost technologies therefore it is possible to bridge the yield gap and increase the existing production level upto certain extent.

Methodology

The study was carried out by JNKVV,Krishi Vigyan Kendra Seoni, during Kharif season from 2008-09 to 2010-11 (Three consecutive years) at the farmers field of four adopted villages namely Katalbodi,Semariya ,Bamhodi and Khairi of Seoni district. During these three years of study, an area of 10.4 ha was covered under front line demonstration with active participation of 34 farmers. Before conducting FLDs a list of farmers was prepared from group meetings and specific skill training was imparted to the selected farmers regarding different aspects of cultivation .The difference between the demonstration package and existing farmer's practices are mentioned in Table 1.

In demonstration plots, use of quality seeds of improved variety, raised bed transplanting and timely weeding as well as balanced fertilization were emphasized. The traditional practices were maintained in case of local checks. The data on output were collected from both FLD plots as well as control plots and finally the extension gap, technology gap, technology index, economics of demonstration along with the benefit cost ratio were worked out. To estimate the technology gap, extension gap and technology index following formula have been used

$$\text{Technology Index} = \frac{(Pi - Di)}{Pi} \times 100$$

Where

Pi = Potential yield of ith crop

Di = Demonstration yield of ith crop

Results and Discussion

A perusal of data (Table 2) indicates that the yield of chilli increased successively over the years in demonstration plots. The green fruit yield ranged from 110 to 113 q/ha in the three consecutive years. The increase in percentage of yield ranged between 46.05 to 56.94 during three years of the study. The result speaks of the positive effects of FLD over the existing practices towards enhancing the yield of Chilli in Seoni district of Madhya Pradesh with its positive effect on yield attributes. The extension gap showed an increasing trend. The extension gap ranging between 35 to 41 q/ha during the period of study emphasizes the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide

Table 1: Comparison between demonstration package and existing farmer's practices under Chilli FLD

Particulars	Chilli	
	Demonstration Package	Farmers Practice
Farming situation	Irrigated, Upland	Irrigated, Upland
Variety	KA-2	Pusa Jwala
Time of transplanting	15-20 August	10-15 September
Method of transplanting	Raised bed	Flat bed
Seed rate	300 g/ha	500 g/ha
Fertilizer dose	100:50:80	40:30:30
Seedling treatment	Before transplanting seedling root dip in imidacloprid 4ml/10 litre of water for 30 minutes	Nil
Plant protection	Need based application of Imidacloprid 0.3 ml/litre before flowering and wettable sulpher 2.5 g/litre to protect the crop against PLCV and mite	Nil
Weed management	Pendimethalin (Stomp) 1.25 kg as pre- emergence followed by one hand weeding about 35 -40 days after transplanting.	One hand weeding at 30 days after transplanting

Table 2: Productivity, Technology gap, Extension gap and Technology index in Chilli (cv KA-2) Under FLDs

Year	Area (ha)	No. of farmers	Green fruit yield (q/ha)			(%) increase over control	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Potential	Demonstration	Control				
2008-09	2.0	8	200	110.00	69.0	59.42	90	41	45.00
2009-10	3.4	12	200	113.00	72.0	56.94	87	41	43.50
2010-11	3.0	14	200	111.00	76.0	46.05	89	35	44.50

Table 3: Economics of Front line demonstration of Chilli

Year	Yield (q/ha)		Cost of Cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
	Demon-stration	Control	Demon-stration	Control	Demon-stration	Control	Demon-stration	Control	Demon-stration	Control
2008-09	110.00	69.0	40206	29190	110000	62100	69794	32910	1.73	1.12
2009-10	113.00	72.0	41705	32010	124300	72000	82595	39990	1.98	1.24
2010-11	111.00	76.0	42464	32970	133200	76000	90736	43030	2.13	1.30

extension gap.

The trend of technology gap ranging between 87 to 90 q/ha reflected the farmers cooperation in carrying out such demonstration with encouraging results in subsequent years .The technology gap observed may be attributed to the dissimilarity in soil fertility status and weather condition.

The technology index showed the feasibility of the evolved technology at the farmer's field. The lower the value of technology index, the more is the feasibility of the technology. As such, the reduction in technology index from 45.00% during 2008-09 to 43.50% during 2009-10 exhibited the feasibility of the demonstrated technology in this region.

Economic indicators i.e,cost of cultivation ,gross return ,net returns and B:C ratio of Front Line Demonstration are presented in Table-3 .The data revealed that, the net return from the demonstration were substantially higher than control plots .Benefit :Cost ratio was recorded to be higher under demonstration against control during all the years of study.

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Assessment of Knowledge Level of the Viewers Farm Telecast

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Abstract

The present study was carried out during the year 2004-05 in Allahabad district of Uttar Pradesh. To know knowledge level of the viewers of farm telecast. Maximum (44.00%) farm viewers had fair knowledge about farm telecast with respect to recommended practices of wheat cultivation, 34.00% farm viewers were having good knowledge about telecast with respect to recommended practices of wheat cultivation and the remaining 22.00% farm viewers had poor knowledge about farm telecast with respect to recommended practices of wheat cultivation. The calculated chi - square values (23.916, 21.369, 48.029, 16.276 and 19.462) higher than the table value of chi - square (5.991) at 2 degree of freedom and at 5% level of significance which is significant of education, back ward castes, small land holding size, high level of media exposure respectively. Significance association with the knowledge of the farmers about the recommended practices of wheat cultivation and the calculated chi - square value (3.937) of high level of income was lower than the table value of chi - square which is non significant at 2 degree of freedom and at 5% level of significance, but association with the knowledge of the farmers about the recommended practices of wheat cultivation. Based on the findings the research hypothesis accepted and the null hypothesis (thus higher the above socio economic profile lower is the knowledge level) is rejected.

Key words:, The viewers farm telecast, knowledge level, with their socio- economic relationship.

Introduction

In India mass communication plays an important role in creating people's awareness about national policies and programmes by providing information and education besides healthy entertainment. The present agricultural strategy in India calls for a speedy dissemination of agricultural information and technical knowledge to the farming community. Agriculture is the main occupation of majority of Indian population. More then 72% of the population is engaged directly or indirectly in agriculture. Nearly 22.50% of the national income is generated from agriculture sectors therefore, in order to develop national economy, it is essential to develop agriculture. Keeping in this view our aims were:

i. To assess the knowledge level of the viewer farm telecast.
ii. To study the association with the knowledge of their socio- economic profile.

Methodology

The study was conducted in Allahabad district of Uttar Pradesh during the year 2004-05. In this district Chaka block was purposively selected for the study. This block consists of 49 villages, out of which 10 villages were selected randomly. In each village 10 farmers were selected purposively, who were having their own television sets and viewing the Krishi Darshan programme telecast. Thus the total sample size was of 100 respondents. The data were collected through personal interview with the help of structural scheduled. The data were analyzed statistically, find out the percentage and chi-square values.

Results and Discussion

The data presented in Table 1, indicated that majority of the farm viewers (44%) had fair knowledge about farm telecast regarding wheat crop, followed by 34% having good knowledge about farm telecast with respect to wheat crop and the remaining 22% respondents had poor knowledge about farm telecast regarding wheat crop.

Table 1: Distribution of respondents according to their knowledge of farm telecast regarding wheat crop

S. No.	Level of knowledge	Score Range	Frequency	Percentage
1.	Poor	0 – 17	22	22
2.	Fair	18 – 35	44	44
3.	Good	36 – 52	34	34
	Total		100	100

It is evident in Table 2, that majority of the farm viewers (70%) were in the old age group (above 45 years) out of which 30% respondents had good level of knowledge, 20% had Fair and 20% had poor level of knowledge. 28% of the respondents were in the middle age group (25–45 years) out of which 3 per cent had good knowledge, 23% had fair knowledge and 2% had poor knowledge about improved practices of wheat crop. In the young age group (below 25 years) 1%

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respondents had fair and 1 per cent had good knowledge.

Table 2: Association between knowledge of viewers and their age regarding the recommended practices of wheat crop cultivation.

S. No.	Age group	Level of knowledge Poor	Fair	Good	Total
1.	Young (Below 25 years)	-	1	1	2
2.	Middle (25 – 45 years)	2	23	3	28
3.	Old (Above 45 years)	20	20	30	70
	Total	22	44	34	100

$c^2 = 23.916$ c^2 (tab.) at 5% at 2 d. f.= 5.991.

The data presented in Table 2, indicates that the majority of respondents 44% were having fair knowledge about improved practices of wheat crop, followed by 34% respondents were having good knowledge and the remaining 22% respondents had poor knowledge about improved practices of wheat crop. Panday (1993), reported that majority of farm telecast viewers were 22-41 years of age group and mane et. al. (1992) reported that there was positive association between age and viewing of the respondents.

It is clear from the Table 3, shows that majority of the farm viewers (41%) were having medium level of education, followed by low (30%) and high (29%) level of education respectively. Majority of respondents (44%) had fair level of knowledge followed by 34 per cent and 22% with good and poor level of knowledge respectively.

Table 3: Association between knowledge of viewers and their educational level regarding the recommended practices of wheat crop cultivation.

S. No.	Level of education	Score range	Level of knowledge Poor	Fair	Good	Total
1.	Low	0 – 2	14	10	6	30
2.	Medium	2 – 4	6	15	20	41
3.	High	5 – 6	2	19	8	29
	Total		22	44	34	100

$c^2 = 21.369$ c^2 (tab.) at 5% at 2 d. f.= 5.991

In the low education level 14% respondents had poor level of knowledge, followed by 10% with fair and 6% with good knowledge level. In the medium level of education 20% had good level of knowledge, followed by 15% with fair and 6% with poor level of knowledge. Among the respondents with high level of education 19% had fair level of knowledge, followed by 8 and 2% with good and poor level of knowledge respectively. Out of the 22% responds with poor knowledge level 14% had low education level, followed by 6 and 2% with medium and high level of education respectively. Among the 44% respondents having fair knowledge level 10, 15 and 19% had low, medium and high level of education respectively. In the good knowledge level having 34% respondents, 6, 20 and 8% had low, medium and high level of education respectively. Ingle et. al. (1992) reported that there was no. significant association between education and attitude towards farm telecast.

Table 4: Association between caste of viewers with their knowledge level regarding the recommended practices of wheat crop cultivation.

S. No.	Caste	Level of knowledge Poor	Fair	Good	Total
1.	Scheduled Castes	10	-	-	10
2.	Backward Castes	6	20	26	52
3.	General Castes	6	24	8	38
	Total	22	44	34	100

$c^2 = 48.029$ c^2 (tab.) at 5% at 2 d. f. = 5.991

The data given in Table 4, that majority of the farm viewers (52%) were from backward castes, followed by General (38%) and Scheduled Castes (10%). Majority of respondents (44%) had fair level of knowledge, followed by 34 and 22% with good and poor level of knowledge respectively.

In the Scheduled castes, all the respondents (10%) had poor level of knowledge. Amongst the Backward castes, 26% had good level of knowledge, followed by 20% with fair and the remainder 6% with poor level of knowledge. Amongst the respondents from general castes 24% had fair level of knowledge, followed by 8 and 6% with good and poor level of knowledge respectively.

Out of the 22% respondents with poor knowledge level 10% were from Scheduled castes, followed by 6 and 6% from backward and general castes respectively. Among the 44% respondents having fair knowledge level 24 and 20% were from general and backward castes respectively. In the good knowledge level having 34% respondents, 26 and 8% were from backward and general castes respectively.

The observation recorded in Table 5, that majority of the farm viewers (55%) had small land holding, followed by Medium and large (35%) and marginal land holding (10%). Majority of respondents (44%) had fair level of knowledge, followed by 34 and 22% with good and poor level of knowledge respectively.

Table 5: Association between size of land holding of viewers and their knowledge level Regarding the recommended practices of wheat crop.

S. No.	Category of land holding	Size of land holding	Level of knowledge Poor	Fair	Good	Total
1.	Marginal	Below 1 ha	1	8	1	10
2.	Small	2 – 4 ha	12	16	27	55
3.	Medium & Large	Above 4 ha	9	20	6	35
	Total		22	44	34	100

$c^2 = 16.276$ c^2 (tab.) at 5% at 2 d. f. = 5.991

In marginal land holding 8% respondents had fair level of knowledge, followed by 1% each with good and

poor level of knowledge. Amongst respondents with small land holding 27% had good level of knowledge, followed by 16% with fair and 12% with poor level of knowledge. Amongst the respondents with medium and large land holding, 20% had fair level of knowledge, followed by 9 and 6% with poor and good level of knowledge respectively.

Out of the 22% respondents with poor knowledge level, 12% had small land holding, followed by 9 and 1% with medium and large and marginal land holding respectively. Among the 44% respondents having fair knowledge level, 20, 16 and 8% were with Large/ medium, small and marginal land holding respectively. In the good knowledge level having 34% respondents, 27, 6 and 1% were with small, large/medium and marginal land holding respectively.

It is evident from the Table 6, that majority of (57%) the farm viewers were from high income level, followed by medium (33%) and low (10%) income group. Majority of respondents (44%) had fair level of knowledge, followed by 34% and 22% with good and poor level of knowledge respectively.

Table 6: Association between annual income of viewers and their knowledge regarding the recommended practices of wheat crop

S. No.	Level of Income	Annual Income	Level of knowledge Poor	Fair	Good	Total
1.	Low	Up to Rs. 15,000	3	6	1	10
2.	Medium	Rs.15,000–30,000	7	16	10	33
3.	High	Above Rs. 30,000	12	22	23	57
	Total		22	44	34	100

$c^2 = 3.937$ c^2 (tab.) at 5% at 2 d. f. = 5.991

In low income level, 6% respondents had fair level of knowledge, followed by 3% and 1% with poor and good level of knowledge. Amongst respondents with medium income level 16% had fair level of knowledge, followed by 10% with Good and 7% with poor knowledge level. Amongst the respondents with high income level 23% had good level of knowledge, followed by 22 and 12% with fair and poor level of knowledge respectively.

Out of the 22% respondents with poor knowledge level, 12% had high income level, followed by 7 and 3% with medium and low income level respectively. Among the 44% respondents having fair knowledge level, 22, 16 and 6% were with High, medium and low income level respectively. In the good knowledge level having 34% respondents, 23, 10 and 1% were with high, medium and low income level respectively.

The data presented in Table 7, reveals that majority of the farm viewers (62%) had high level of mass media exposure, followed by low 20% and medium 18% level of mass media exposure. Majority of respondents (44%) had fair level of knowledge, followed by 34 and 22% with good and poor level of knowledge respectively. Similar findings were reported by Borkar (1984), about the television viewers. Nayak et. al. (1993), reported that 74% respondents devote more time for telecast of agricultural programmes.

Table 7: Association between knowledge of viewers and their mass media exposure Regarding the improved practices of wheat crop

S. No.	Level of mass media exposure	Score range	Level of knowledge Poor	Fair	Good	Total
1.	Low	0 – 1	10	8	2	20
2.	Medium	2 – 3	3	12	3	18
3.	High	4 – 5	9	24	29	62
	Total		22	44	34	100

$c^2 = 19.462$ c^2 (tab.) at 5% at 2 d. f. = 5.991

In low mass media exposure level 10% respondents had poor level of knowledge, followed by 8 and 2 per cent with fair and good level of knowledge, respectively. Amongst respondents with medium level of mass media exposure 12% had fair level of knowledge, followed by 3% each with poor and good knowledge level. Amongst the respondents with high mass media exposure level 29% had good level of knowledge, followed by 24 and 9% with fair and poor level of knowledge respectively.

Out of the 22% respondents with poor knowledge level, 10% had low mass media exposure, followed by 3 and 9% with medium and high level of mass media exposure respectively. Among the 44% respondents having fair knowledge level, 24, 12 and 8% were with high, medium and low mass media exposure respectively. In the good knowledge level having 34% respondents, 29, 3 and 2% were with high, medium and low mass media exposure respectively. Singh (1986), reported that the respondents of 'farm telecast viewers' group had more knowledge then the none viewers.

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To study the effect of integrted plant nutrient supply on different phenological parameters of urdbean

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Abstract

*A field experiment was conducted to know response of IPNS on yield attributes of URD viz., In urd, the plant height, number of branches/plant and dry matter production increased significantly with increase in the age of the crop during both the years, while the number of trifoliate leaves/ plant increase from branching to the flowering stage and thereafter, declined at podding stage of the crop. Above parameters were recorded highest in T_3 (FYM + Chem.) followed by T_8 (*Azoto + Rhizobium + *PSB + FYM + Chem.) and T_7 (*Azoto + Rhizobium + *PSB + Chem.). Yield attributes of urd viz., number of pods/plant, number of grains/pod and 1000-grain weight on an average ranged from 29.9 to 38.4; 5.6 to 8.0 and 34.1 to 37.6 g, respectively. The substitution of N & P by FYM or Azotobacter + Rhizobium + PSB or* Azotobacter + Rhizobium + *PSB + FYM along with chemical fertilizers registered statistically similar values of these parameters in both the years of study.*

Key words: IPNS, chemical fertilizers, bio-fertilizers, urd.

Introduction

Urd bean [*Vigna mungo* (L.) is one of the most important pulse crops. It has the potentiality to contribute on a large scale to the pulse production in India. Urdbean being a short statured legume crop with short duration and fast growing in nature, can find place in many intercropping systems (Sharma *et al.*, 1988). Globally, India is the largest producer of pulses (15.23 million tonnes), however, its productivity is only 673 kg ha^{-1}. The per capita consumption of pulses in India decreased from 69 g day^{-1} during 1961 to 36 g day^{-1} as on now. This is due to poor growth rate in production of pulses compared with the population growth. With an estimate, India needs 29.30 million tonnes of pulses by 2020 with a productivity of 1,172 kg ha^{-1} (Ali and Agrawal, 2004). This target can be achieved either by bringing more are a under pulses or by enhancing the productivity per unit area and/or combination of both. Pandey *et al.* (1999) observed that crop residue incorporation is one of the important constituents to increase the efficacy of applied fertilizers. Thus, for higher productivity and improvement in soil fertility for longer period, integrated plant nutrient management system (IPNS) has become important. The principal aim of IPNS is efficient and judicious use of all the major sources of plant nutrients in a integrated manure, so as to get maximum economic yield without any deleterious effects on physico-chemical and biological properties of the soil.

Materials and Methods

A field experiment was conducted during the kharif season at the Agricultural Research Farm of Amar Singh (P.G.) College, Lakhaoti (Bulandshahar). The Research Farm is situated about 15 km away from Bulandshahr on Bulandshahr-Garh road. Bulandshahr located in western Uttar Pradesh is the most fertile and suitable belt of Doab of Ganga and Yamuna for cereals and vegetables. It lies between 28^0 N latitude and 77' E longitude at an elevation of about 201.48 m above mean sea level. The average annual rainfall of this region is 703.75 mm about 88% of which is received from June to September and the remaining (20%) during October to March. May and June are the hottest months of the year and maximum temperature ranges between 43-45^0C while January is the coldest month with minimum temperature ranging between 3-6^0C. Treatments description are $T_{1:}$ Recommended dose of NPK (120: 60:40), T_2 : Fertilizer dose based on soil test value, T_3 : 10 tonnes ha^{-1} FYM + Rest through chemical fertilizers, T_4 : Azotobacter + 75% N and full dose of P & K through chemical fertilizers, T_5 : Rhizobium + 50% P and full dose of N & K through chemical fertilizers, T_6 : PSM (Phosphorus solubilizing bacteria) + 75% P and full dose of N & K through chemical fertilizers, T_7 : *Azotobacter* + *Rhizobium* + PSB + 75%N, 25% P and 100% K through chemical fertilizers, T_8 : *Azotobacter* + *Rhizobium* + PSB + 10 t ha^{-1} FYM and 33% N, no P and K through chemical fertilizers, T_9 : 2 t ha^{-1} Vermicompost + 75% Recommended dose of NPK. Fertilizer application Urea (46% N), DAP (48% P) and MOP (60% KCl) were used as a source of nitrogen,

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phosphorus and potassium respectively, in the form of chemical fertilizers. FYM was used as a source of nitrogen, phosphorus, potassium and mirco-elements also in the form of organic manure. The microbial culture of *Azotobacter (A. Chroococcum)*, PSB *(Bacillius* and *Pseudomonas*) & *Rhizobium* were used as bio-fertilizers.

Plant height

Height of plant was measured from ground surface to the base of optical leaf and mean value was reported.

Number of trifoliate leaves

The numbers of fully developed green leaves having three leaflets were counted and reported as number of trifoliate leaves per plant.

Number of branches per plant

Branches having at least two fully developed trifoliate leaves were considered for recording the number of branches per plant.

Dry matter accumulation

Dry matter accumulation of whole plant was recorded from two-plant samples taken from the respective plots. The sampling was done close to the ground surface at different stages i.e. branching, flowering and podding. Two randomly selected plants from each net plot were chopped into small pieces and kept for sun drying for 2-5 days. After sun drying, sample was kept in oven at 65±5°C temperature till constant weight.

Post harvest studies

Number of pods per plant

Five plants were taken randomly from each net plot and the number of pods per plant was counted and average number of pods per plant was reported.

Number of grains per pod

Number of grain per pod was recorded form five randomly selected pods taken from each net plot. The average number of grains per pod was calculated by dividing the total number of grains by number of plant(s).

Test weight

Thousand grains from the produce of each net plot were counted and weighed and then finally reported as test weight.

Grain yield per hectare

Grain yield obtained from net plot was weighted and after conversion in to q ha^{-1} grain yield was reported.

The data was tabulated and processed to suit for computerization and analysis of variance, by method as given by Snedecor and Cochran (1984).

Result and Discussion

Plant height

In all the treatments plant height increased uniformly with the advancement of crop age from branching up to the podding stage during both the years of study and in their average values (Table 1). It was also observed that highest plant height was recorded at branching stage in T_3, at flowering as well as at podding in T_8 (on the basis of two years mean value).The plant height varied significantly due to various IPNS treatments at all the growth stages in both the years of investigation and in their average mean also. At branching stage T_{3-} (FYM + Chemical fertilizer) recorded significantly higher plant height (35.36, 38.21 and 36.84 cm) than other treatments during both year and in average values, respectively. The minimum plant height of 24.87 cm in average value was however obtained in treatment T_9 (Vermicompost + Chemical fertilizer). At flowering stage, T_8- (*Azoto* + *Rhizobium* + PSB + FYM + Chemical fertilizer) exhibited maximum plant height (127.88 cm in 2004 and 130.05 cm in 2nd year) being closely followed by integrated use of FYM + Chemical

Table 1: Plant height and total number of leaves per plant of intercropped URD at different growth stages as influenced by integrated plant nutrient supply

Treat-ments	Plant Height (cm)									Total no of trifoliate leaves/ plant								
	I Yr			II Yr			Mean			I Yr			II Yr			Mean		
	B	F	P	B	F	P	B	F	P	B	F	P	B	F	P	B	F	P
T_1	25.3	105.2	123.5	26.4	106.4	125.7	25.8	105.8	124.6	14.7	24.8	10.4	14.8	24.8	10.6	14.7	24.8	10.5
T_2	26.0	104.5	123.4	28.1	105.7	126.4	27.1	105.1	124.9	14.7	25.0	10.6	14.9	25.8	10.4	14.8	25.4	10.5
T_3	35.5	124.9	132.8	38.2	126.0	135.5	36.8	125.5	135.1	15.5	28.3	13.2	15.9	29.1	13.6	15.7	28.7	13.4
T_4	25.7	102.9	119.0	26.8	104.1	120.9	26.2	103.5	119.9	13.9	24.8	10.9	14.3	24.8	11.0	14.1	24.8	11.0
T_5	26.1	98.9	109.9	27.3	100.1	111.7	26.7	99.6	110.8	13.0	23.4	9.2	13.2	23.9	9.7	13.1	23.7	9.5
T_6	25.3	95.9	107.9	26.4	97.0	109.6	25.8	96.5	108.8	13.5	24.4	10.7	14.0	24.7	10.9	13.7	24.5	10.8
T_7	28.0	126.9	134.9	29.2	128.0	136.7	28.6	127.5	135.8	15.0	28.4	14.9	15.9	28.9	15.0	15.5	28.6	15.0
T_8	28.5	127.9	134.4	30.9	130.0	137.9	29.7	129.0	136.1	16.0	30.0	15.4	16.1	30.8	15.5	16.1	30.4	15.5
T_9	24.3	66.1	86.1	25.4	67.3	88.0	24.9	66.7	87.1	13.3	23.6	10.8	13.3	23.9	10.8	13.3	23.8	10.8
S.Em.±	0.6	5.7	3.8	1.0	7.9	5.7	0.3	0.2	0.3	1.0	0.8	0.4	0.6	0.8	0.2	0.1	0.2	0.1
CD (0.05)	1.8	17.3	11.4	3.0	23.6	17.1	1.1	0.6	1.0	2.9	2.4	1.2	1.9	2.3	0.6	0.4	0.5	0.3

Growth Stages: B- Branching, F- flowering, P- Podding

fertilizer (T_3) during 2004 and *Azoto* + *Rhizobium* + PSB + Chem. (T_7) in 2005 and in their average values also but showed significantly superior to rest of the treatments under study. At podding stage integrated use of either FYM + Chem. (T_3) (134.14 cm in average values), *Azoto* + *Rhizobium* + PSB + FYM + Chem. (T_8) or *Azoto* + *Rhizobium* + PSB + Chem. (T_7) recorded statistically similar plant height but were found significantly better than rest of the treatments during both the years of experimentation and in their average values.

Total number of trifoliate leaves/ plant

It was noted that the number of trifoliate leaves/ plant increased from branching to the flowering stages and then declined at podding stage of the crop (Table 1).

There were significant differences in total number of trifoliate leaves/ plant due to various IPNS treatments at different growth stages of urd during both the years and in average values also.

At branching stage, integrated use of *Rhizobium* + Chem. (T_5); PSB + Chem. (T_6) and Vermicompost + Chem. (T_9) showed significantly inferior with respect to number of trifoliate leaves per plant than either recommended T_8 (Azoto + Rhizo + PSB + FYM + Chemical fertilizer) during both the years and in their average values also. T_8 recorded maximum 16.06 numbers of leaves/ plant in average values. While at flowering and podding stages, T_8 showed significantly higher number of trifoliate leaves/plant over rest of the treatments in both the years and in average values. Significantly higher plant height, total number of trifoliate leaves/plant, number of branches/plant, dry matter accumulation by urd were associated with treatments T_3 followed by T_8 at all the growth stages of urd in both the years. These results are in close conformity with the results obtained by Mortensson (1994), Reddy *et al.* (2000) and Ibyabijen *et al.* (1996).

Number of branches/plant

In general, number of branches/plant increased with increase in crop age from branching to the podding stage (Table 2). Number of branches/ plant differed significantly due to IPNS treatments in both years and in average values. At branching and flowering stages, T_8 (3.16 at branching and 6.61 at flowering) registered significantly more number of branches/ plant than rest of the treatments in both the years and average values. At podding stage, the number of branches produced under T_8, T_3, T_7 were found to be statistically similar and showed significantly superior to rest of the treatments during both the years but in their average values T_8 (7.63) showed significantly higher number of branches/ plant over rest of the treatments and minimum value (5.79) was associated with treatment T_9 (Vermicompost + Chemical fertilizer).

Dry matter production

The dry matter production increased with increase in crop age from branching to podding stage. Dry matter production of urd varied significantly due to various IPNS treatments in both the years (Table 2). At branching and flowering stages supplementation N & P by FYM, *Azotobacter, Rhizobium* of their combinations along with chemical fertilizers showed statistically similar dry matter production and these treatments were found significantly superior to rest of the treatments in both the years and in average values. Maximum dry matter production of 2.84, 39.95 and 56.66 g/plant at branching, flowering and podding stage, respectively was noticed under T_8. While minimum values (1.84, 31.30 and 40.85 g/plant) were associated with T_9 and T_5. Use of *Azoto*

Table 2: Number of branches / plant at different growth stages and dry matter production of inter crop URD as influenced by integrated plant nutrient supply

Treat-ments	No. of branches/plant									Dry matter production (g/plant)								
	I Yr			II Yr			Mean			I Yr			II Yr			Mean		
	B	F	P	B	F	P	B	F	P	B	F	P	B	F	P	B	F	P
T_1	1.96	5.16	5.93	2.03	4.59	6.79	2.00	4.88	6.36	2.03	35.66	44.32	2.17	35.24	44.11	2.10	35.45	44.22
T_2	1.99	5.36	6.09	2.16	4.96	7.29	2.08	5.16	6.69	1.99	35.99	44.96	2.09	37.34	46.04	2.04	36.67	45.50
T_3	2.63	5.49	6.93	2.79	5.96	7.53	2.71	5.73	7.23	2.40	37.72	45.49	2.59	37.84	45.84	2.50	37.78	45.67
T_4	2.23	5.08	6.53	2.49	5.53	6.26	2.36	5.31	6.40	2.26	36.19	47.06	2.37	35.57	47.04	2.32	35.88	47.05
T_5	1.63	4.53	5.99	1.83	3.59	5.89	1.73	4.06	5.94	1.86	30.46	41.16	2.27	32.14	42.87	2.07	31.30	42.02
T_6	1.79	5.19	6.26	1.99	4.66	6.16	1.89	4.93	6.21	1.96	31.46	45.46	1.97	32.59	45.44	1.97	32.03	45.45
T_7	2.76	5.69	6.86	2.83	5.46	7.13	2.80	5.58	7.00	2.68	37.89	54.49	2.67	38.44	55.91	2.68	38.17	55.20
T_8	3.16	6.13	7.36	3.16	7.09	7.89	3.16	6.61	7.63	2.86	39.96	56.56	2.81	39.94	56.54	2.84	39.95	56.55
T_9	1.70	3.99	5.49	1.99	4.06	6.09	1.85	4.03	5.79	1.80	32.66	40.12	1.87	33.04	41.57	1.84	32.85	40.85
S.Em.±	0.10	0.13	0.11	0.08	0.18	0.19	0.05	0.30	0.24	0.25	1.04	1.76	0.23	1.05	1.76	0.07	0.39	0.38
CD(0.05)	0.32	0.39	0.34	0.25	0.54	0.58	0.15	0.99	0.79	0.75	3.11	5.29	0.69	3.16	5.30	0.22	1.29	1.24

Growth Stages: B- Branching, F- flowering, P- Podding

Table 3 : Effect of integrated plant nutrient supply on yield attributes of Urd

Treatment	No. of pods/ plant			No. of grains/pod			1000-grain weight (g)			Grain yield (q/ha)		
	I Y	II Yr	Mean	I Yr	IIYr	Mean	IYr	IIYr	Mean	I Yr	IIYr	Mean
T_1	34.56	35.62	35.09	6.15	6.18	6.17	35.03	35.03	35.03	5.84	6.38	6.11
T_2	35.92	35.72	35.82	5.98	6.28	6.13	34.20	36.13	35.17	6.13	6.49	6.31
T_3	36.19	36.46	36.33	6.85	6.85	6.85	36.73	36.90	36.82	6.75	7.07	6.91
T_4	33.22	33.76	33.49	6.11	6.31	6.21	34.77	35.40	35.09	6.53	6.75	6.64
T_5	29.49	30.36	29.93	5.51	5.78	5.65	33.84	34.40	34.12	5.59	6.05	5.82
T_6	30.46	33.22	31.84	6.15	6.35	6.25	35.20	35.50	35.35	6.54	6.59	6.57
T_7	36.69	37.99	37.34	6.95	7.15	7.05	36.97	37.70	37.34	7.76	7.88	7.82
T_8	37.36	39.36	38.36	8.01	8.05	8.03	37.20	37.93	37.57	8.27	7.48	7.88
T_9	32.22	33.02	32.62	5.55	6.05	5.80	34.80	34.67	34.74	5.65	7.03	6.34
S.Em.±	1.57	0.75	0.44	0.32	0.25	0.08	1.01	1.05	0.30	0.11	0.16	0.28
CD (0.05)	4.71	2.25	1.45	0.97	0.775	0.25	3.08	3.15	0.98	0.35	0.50	0.91

+ *Rhizobium* + PSB + chemical fertilizer with or without FYM (T_7 and T_8) showed similar dry matter production but were found significantly better than rest of the treatments during both the years and in average values.

Growth Stages: B- Branching, F- flowering, P- Podding

Variations in performance of urd grown with different IPNS treatments can be explained on the basis of crop growth and yield attributes, for which a good supply of carbohydrates is required which in turn is dependent on vigour of the plant developed through the vegetative phase and nutrient supply. It was observed that FYM + Chem. fertilizer (T_3) as well as *Azotobacter* + *Rhizobium* + PSB + FYM + Chem. (T_8) resulted in higher plant height, total number of trifoliate leaves/plant, number of branches/plant and dry matter accumulation which subsequently increased the number of branches, number of pods per plant, number of grains/pod and 1000 grain weight significantly over the control leading to higher urd grain yield. Das and Mathur (1980), Rathore *et al.* (1980), Singh *et al.* (1994), Abbas *et al.* (1995), Pandey *et al.* (1998) and Singh and Rai (2004) also reported similar findings.

Yield attributes

Number of pods/ plant

The number of pod/ plant varied significantly due to various treatments during both the years and in average values. Substitution of N & P by FYM, or *Azotobacter* + *Rhizobium* + PSB or *Azotobacter* + *Rhizobium* + PSB + FYM along with chemical fertilizer showed statistically similar number of pods/ plant in both the years of investigation as well as in average values. These treatments were found to be significantly better than other remaining treatments. The minimum number of pods/ plant were 29.49 in 1st year and 30.36 in 2nd year observed in T_5 (Rhizo + Chemical fertilizer) where a part of chemical fertilizer was substituted by *Rhizobium*. T_8 recorded maximum (37.36 and 39.36 number of pods/plant) during both the year, respectively.

Number of grains/ pod

Perusal of data in Table 3 revealed that T_8 showed significantly higher number of grains/ pod than rest of the treatments during both the years (8.01 in 2004 and 8.05 in 2005) and (8.03) in average values. On the other hand, the minimum number of grains/ pod were observed under T_5 treated plot (5.51 in 2004, 5.78 in 2005 and 5.65 in average value).

1000- grain weight

The 1000 grain weight obtained in 2005 (35.96 g) was more as compared to 2004 (35.42 g).Variations in 1000 grain weight due to various IPNS treatments were found to be significant during both the years as well as in average values. However, it was noticed from average values that the 1000 grain weight was highest (37.57 g) in T_8 (Azoto + Rhizo + PSB + FYM + Chemical fertilizer) and minimum (34.12 g) in T_5 (Rhizo + Chemical fertilizer).

Grain yield

Variation in grain yield due to IPNS treatments was found to be significant during both the years as well as in their average value. During 1st year, treatment T_8 registered significantly higher grain yield (8.27 q ha^{-1}) than rest of the treatments while the yield values obtained with T_7 was found higher (7.88 q ha^{-1}) in 2nd year which was statistically *at par* with T_8, while significantly superior to other treatments. In case of average values maximum grain yield was recorded in T_8 (7.88 q ha^{-1}) while it was *at par* with T_7 (Azotobactor + Rhizo + PSB + Chemical fertilizer) but significantly superior to other treatments. Yield attributes of urd viz., number of pods per plant, number of grains/pod, 1000 grain weight were remarkably higher under treatments where substitution of N and P by FYM, or *Azotobacter* + *Rhizobium* + PSB or *Azotobacter* + *Rhizobium* +

PSB + FYM along with chemical fertilizers were made (Table 3). Similar observations were also reported earlier by Patil *et al.* (1992).

Higher values of yield attributes might be due to the fact that FYM acting as slow releasing source of N, is expected to be more closely matched with the supply and demand of N by urd and this could reduce N losses (Becker *et al.,* 1994).

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Gender issues in indigenous technical knowledge

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Abstract

For successful generation and dissemination of sustainable agricultural technologies, analysis and validation of ITKs and their blending with modern technologies is a matter of great concern. Understanding gender concerns in the study of ITK is of further importance in view of changing roles of extension education in sustainable agricultural development.

Key words: dissemination, technologies, extension education

ITK and sustainable development

There is a need to search for the unifying concept of sustainability and sustainable development. If sustainability and sustainable development are to escape becoming empty buzzwords, careful thought must be given to clarify their exact meaning or alternative meaning, so that they are useful as a touchstone for sound policy making.

Beginning of formal agricultural research and extension systems in the country aimed at exploiting indigenous or traditional technologies. Even with in traditional systems, gaps existed between 'good' and 'bad' farmers and practices. Both research and extension systems sought to exploit the good practice.

These technologies have five major characteristics. First, they have low capital intensity, whatever capital is built up (like bunds, terraces, wells) are labour-intensive. They focus on improving quality of management (operations) and materials (seeds, land, tools etc.). In capital-starved surplus -labour, traditional agricultural system, this meshes ideally with relative factor scarcities. Second, since these are usually environment-friendly, these are sustainable. There are rice fields in the Indo-gangetic plains which have been in cultivation for centuries and produced stable outputs. Third, these are generally very location and site-specific. That is why these are rarely noticed by outsiders in a macro-oriented information system. Fourth, over time, these diffuse over small, homogenous zones or sub-zones, mainly by farmer--to-farmer interaction. Since farmers as a group have a very low propensity for mobility, the diffusion area is further constrained. It is left to the few adventurous and pilgrimage-prone farmers, to collect varieties and ideas during their long journeys. And finally, indigenous innovations generally generate only small increments in output. Usually, they relate to one or two practices and not the whole package. This micro-orientation implies that the grainaries only from small interaction effects. Thus, during the first half of this century when there was practically no external source for technological change, agricultural output grew only at less than 0.1 per cent per annum, and that too primarily on account of systematic expansion of labour and land. Therefore, in sustainable agricultural development the ITKs assume a place of significant importance.

Woman and sustainable development

It is impossible for India to march through the 2151 century if we deprive her girls and mothers the right to be free from poverty, hunger, ignorance and disease. For those among us who believe that development is 'people-centered', young girls or women are indeed the future. Young women of the nineties are the mother of both men and women of the next century. If we are serious about growth, sustainability and solidarity, we ought to take an integrated approach which considers the 'external' as well as 'internal' well being of women to improve the quality of life as a first step towards a better society and a much more effective development.

To concentrate on women is, in fact, the best investment we can make to avoid the disappointments of the past. There is direct link between development and the role and place of women as co-architects of development. Women have been seen as lacking in ability, fit only for certain traditional tasks, and as such, their own confidence in themselves and in their abilities has shrunk greatly. This further reinforces the prevalent attitudes. This has led to diminished performance and consequent decline in productivity. Hence, development is fragile, limited and incomplete. Thus we need to start from the base, from the grassroots, with the young girls and women who will carry the seeds of change, who will mother future generation and come out of this vicious

cycle. They have to be supported and guided in the path of empowerment. Women need support, counseling and training in order to become empowered. An empowering culture is especially useful for development of women in rural areas. Even though legally women have been given the power to decision making in the government, by reserving 33 per cent seats in Panchayats, they are really lacking in leadership qualities.

The empowerment approach of the nineties has indeed brought in a breath of fresh air. This approach of development challenges both local and global patriarchal structures. A recent development is the transition from Women in Development to Gender and Development. This represents a transition to' not only to integrate women in development' but look for the potential in development initiatives to transform unequal social/ gender relations and to empower women. Training programmes within the World Bank and FAO have begun in 'gender literacy' which includes gender analysis and gender planning.

Neglect of women's creativity

Review of Indian literature shows that the needs and problems of women in agriculture have been largely ignored; that technology is not gender neutral and that technology is embedded in social relations with an intimate two-way link between them. One general conclusion is that, even in those areas where new agricultural technology has been adopted, the economic position of wage labourers, specifically of female labourers has not improved. Their wage level is much less than that of males.

There has been a gender bias in agricultural technology research. For example, improvements have been made mainly on the tools used by males (plough, seed-drill etc.) while little attention has been paid to the tools employed by women (such as hoe, sickle).

Studies show how women have been creative in using traditional symbols such as conch shells, drums etc., in mobilizing people for collective action. This has been highlighted dramatically in recent anti-liquor movement in Andhra Pradesh.

There has been thus a serious gender gap in our extension services. As we know, many times, the priorities of men and women become very different. For example in Chamoli and Garhwal area, while men supported a scheme to establish a potato seed farm involving the cutting down of large forest areas, the women opposed it as they saw the forest as the main source of fodder, fuel and water.

Although women have been suppressed socially in various ways, they have been associated with agriculture right from its invention. They are the initiators of agriculture. Women have been particularly active in protection of environment and sustainable agriculture. The women belonging particularly to hill and tribal areas and S.C., S.T. and deprived communities contribute significantly to agricultural production and income to the families.

Women have deep knowledge and understanding about each individual animal's behaviour i.e. feeding preferences, temperament, production characteristics and the like.

In tribal areas women are found to collect creepers like Tinosperma, leaves of trees like Alengium, flowers and seeds of Mahuva trees for feeding animals. On analysis the tree leaves were found to be rich in protein. Flowers of Mahuva tree are known to be rich in energy. In north Gujrat, with dominant pastoralist population, the women of pastoralist families were found to be well aware of useful tree species like Prosopis cineraria, Acacia species, Ziziphus species and small shrubs like Lana. Both in tribal areas as well as in semi-arid parts of North Gujrat, women have identified tree species whose pods and seeds can be fed to the animals with benefit.

Finally, all the traditional technologies are not necessarily gender neutral. Patriarchy and clear-cut gender and caste inequalities operate within traditional.

It is the women who are responsible for the day to day back-breaking jobs like cleaning sheds, cleaning animals, cutting and fetching fodder, feeding animals, fetching water, milking, etc. They have absolutely no say in money matters. They are also not involved in decisions regarding sales of animals/animal products, purchase of animals, purchase of commercial feeds and medicines, taking animals to the veterinarian, etc. All these are done by men.

However, in many communities, it is a taboo for woman to have access to knowledge on medicinal plants to treat human beings and animals. They believe that the strength of the medicine is diminished in the hands of women.

Gender issues in ITK

ITK is 'gendered' because men and women usually have different and often complementary economically productive roles, different resource base and face different sets of social constraints. There are at least four main types of gender differences in local knowledge systems:

- women and men having different knowledge about similar things;
- having knowledge of different things; having different ways of organizing knowledge and
- having different ways of preserving and transmitting knowledge.

Some aspects of ITK may have complementary male and female components. Both must be understood to comprehend particular aspects of agricultural

production.

Specific knowledge is possessed only by one gender or age set. This pertains to the cultural roles of one gender and often may not be available to the other. Further, in some societies specific bodies of knowledge are held only by particular office holders.

Although other bodies of knowledge are common to both genders, specific research is required to ascertain that. What is clear is that significant bodies of local knowledge are overlooked when research focuses on just male heads of households.

Understanding the ITKs

Knowledge is a fundamental component of indigenous culture and must be considered in terms of both its sacred and secular dimensions. Knowledge is not considered independently from its products and expressions, or from actions. These all form part of closely integrated cultural systems. The physical products and expressions of indigenous cultures are intimately connected to the knowledge from which they derive or with which they are associated. Indigenous people are custodians and stewards of their land and environments and in some sense are entrusted to care for these through successive generations. Systems of knowledge and their role in the conservation of the environment are vital to ensuring the continuity of indigenous cultures by maintaining cultural diversity; recognition and protection of indigenous knowledge can also benefit environmental conservation and sustainable management.

Characteristics of indegenous knowledge system

(1) Indigenous knowledge is inherited over generations and evolved continuously in dealing with the situations and problems.

(2) Indigenous knowledge is dynamic in nature. It is the knowledge for survival vis-à-vis accumulation. As the inherited and locally evolved knowledge keeps on interacting with the outside knowledge the evolution becomes continuous. Thus knowledge generation, transfer and processing are integral parts of the evolution of indigenous knowledge system.

(3) IKS is unique to a culture, region and group, and the accumulation and processing of IKS is directly proportional to the diversity of the agro-ecology and socio-economic conditions. Thus the diversity of the agro-ecology and socio-economy is the basis of IKS.

(4) Though the IKS is a complex whole embedded in the culture and way of life, it could be broken down into different types of knowledge system, such as natural and physical environment, cognitive and ideational environment, and social environment. However, it is very important to relate all these strands of knowledge to understand the rationality of local knowledge system.

(5) People differ in their ability with respect to local knowledge, implying to their age, gender, and occupational roles, etc. implying the presence of different source for different types of knowledge, for the purpose of documenting and analyzing the knowledge.

(6) It has been argued that it is very important to understand the agro-ecological and socio-economic interactions to know the context for the evolution of certain local practices. Thus, ecological mapping and agro-ecosystem analysis etc., are of great value in studying the local practices.

Methods of documentation and analysis of IKS

Broadly, four types of data collection methods emerged from one hundred and twenty two papers received from scholars of the international community at the workshop on "sustainability through farmer involvement in technology generation and diffusion", in February, 1990, organized by the Indian Society of Agronomy, New Delhi. The four methods of data collection were, (1) Survey method, (2) Continuous interaction under programme of on-farm experimentation, (3) rapid rural appraisal, (4) Anthropological methods.

Some of the studies depended upon the data collected by an on-form research group through the rapid rural appraisal (RRA) technique using a key informant panel. The anthropological method involved an in-depth investigation of the social, cultural and related aspects of the traditional practices. Most of the research papers received were one village studies (or involved a small set of villages and undertook the following types of documentation.

Types of documentation

(1) Documenting mainly a large variety of practices without scientific validation.

(2) Documenting some of the prevalent practices and comparing them with recommended practices.

(3) Documenting the practices/details of experimentation on a specific aspect (e.g. soil and water conversion).

(4) Documenting the practices evolved to mitigate specific problems of farming or for sheer survival under conditions of ecological and economic stress.

(5) Documenting a variety of practices in their socio-cultural and ecological context.

(6) Documenting practices which evolved in response to a specific external intervention.

Some methods which emerge as recommendations from the group in the ILEIA workshop on "Participatory Technology Development" were as follows:

(i) Four stage case studies using the conflictive-interactive-iterative method: a method which is apt to de-mystify expert knowledge.

(ii) Documentation of oral histories.

(iii) The Delphi method

(iv) Mapping : Ecological mapping, agronomic mapping and mapping of seasonal, spatial and sectoral diversity of homesteads or watersheds.(Mapping can be done by different persons like farmers and extension workers or the researcher himself).

(v) Manual discriminant analysis where each practice is compared and contrasted, based on the response of the farmers individually and in groups.

(vi) Analysis of decision tree for local population.

(vii) Use of traditional leaders and craftsmen/women as resource persons.

(viii) Linguistic and historical analysis concepts, vocabulary and key words.

(ix) Ethnobotany.

(x) Critical incident analysis such as the identification of farmers' seed exchange and in-village experimentation.

(xi) Competitions in local newspapers in which, for example, school children are encouraged to record local technologies or solutions to problems.

(xii) Workshops with field level extension workers and/or farmers.

There are wide ranges of RRA techniques comprising agro-ecosystem analysis which also could be used for studying indigenous knowledge systems.

However, the present paper draws heavily on the three new methods of studying indigenous technical knowledge through which the information was gathered and analyzed successfully.

a) Farming Systems

The study of farming systems of the location is of paramount importance without which it would be difficult to interpret the information gathered through different methods. Farming system consists of different sub-systems like cropping system and animal husbandry system, etc. It is important to study the food chain, and input-output-process relations of different sub-systems as influenced by socio-economic and ecological factors, life age, genders, seasonality, moisture status, soil fertility etc.

(b) Interviews

Interviews have to be exploratory and participatory in nature, and to explore it has to be interactive and iterative too. Often the interviewer has to track down the vantage point of the respondents to have maximum possible information and to know how farmers perceive and analyze some of their own practices.

The study of indigenous knowledge should go beyond participant observation to participant analysis which is possible only through interviews. Interviews provide for the interaction of knowledge of four types of people involved in the whole process : (1) the farmer himself who is the ultimate and first hand source of local knowledge, (2) the local extension workers who has the immediate advantage of understanding and analyzing both informal and formal knowledge of studying IKS systematically by the virtue of his training, and (3) the scientist who could be of use in analyzing agro-ecological variables causing the evolution of indigenous practices.

The Efficiency

All the four sources for collection of information and analysis of local knowledge differ (in the table below the arrow the arrow pointing to the high level) at the least on five characteristics (i) local orientation (ii) scientist orientation (iii) degree of interaction formal and informal knowledge (iv) wholistic analysis, and (v) specialist analysis etc. The ability to provide and analyze information in terms of quantity and accuracy also varies with age, gender, occupational experience, etc. Thus, it demands that the researcher be careful in being selective and or collective while collecting and analyzing the information.

Further subdivisions comprised categories in which different soils were grouped and those soils were eventually divided into types based on their dominant property or context. Thus, contrary to the observation of Kervin and Sikana (1990), farmers here classified the land and soil systems on the basis of hierarchy. Farmers also classified the soils on several planes helping them to arrive at a detailed picture of the properties of a particular soil in a locality.

Group interviews are better than individual interviews with farmers. Farmer; are far more enthusiastic and flowing in their talk in groups than in a situation question answer between a researcher and a farmer. Tape-recorder very useful and often essential to avoid the problems of ' down, and interrupting the flow of discussion. However before starting the interview, one should inform them and acquainted with the curious object, which could otherwise distract attention. After the interview is over, the recorder tape co be played back if they wished to hear what they spoke as part of the interview.

Integrating ITK with scientific knowledge

The knowledge systems of farmers are highly dynamic and co-evolve as their circumstances change. Farmers constantly learn and unlearn and unlearn choosing the appropriate knowledge in their struggle for a sustainable livelihood. While scientists often rely on averages, the knowledge of local people is more dynamic and up-to--date, continually revised as conditions change. Integration of ITK with the scientific knowledge system is vital for sustainable intensification of agriculture. Available resistance for pests and diseases of the local germ-plasm can be effectively integrated into the improved varieties through bio-technology. Similarly, the

efficacy and efficiency of locally available treatments can be improved significantly through modem science. Scientific procedures can identify the active ingredients and could come up with appropriate recommendations in terms of effective application rates.

For prioritization of ITKs, the methods used in the project were explained by the facilitators, including the parameters and weighted scores to quantify the importance of ITKs as below:

S. No.	Parameter	Weighted score (wi)
1.	Severity of problem	20
2.	Prevention of maximum losses	18
3.	Innovativeness	16
4.	Easy to handle	14
5.	Availability of related inputs	11
6.	Extent of use	08
7.	Indigenous knowledge base	06
8.	Rationality	04
9.	Eco-friendliness	02
10.	Cost-effectiveness	01
	Total	**100**

For calculating the overall importance index (I), the following formula was used:

$$I = \frac{S wi Xi}{S Wi}$$

Where, Xi is the score out of 10 on each parameter.

By this method, the ITKs may be classified according to their importance into four categories as shown below:

Below 2.50	- Not important
Between 2.51 to 5.00	- Less important
Between 5.01 to 7.50	- Important
Above 7.50	- Most important

Earlier, the participants in their group exercises identified 40 ITKs in the Day 2 of the training programme. Copies of the 40 ITKs were provided to each participant and they were asked to study carefully and classify in different thematic areas. Following this, the participants were made into four groups and they were asked to prioritize the ITKs using the scoring system as mentioned above. After the completion of group exercises, the groups presented the scores on the flip chart. These were discussed in-depth, with particular reference to the parameters and revisions were made in the scoring, wherever required. The participants were also asked to identify the themes and sub-themes of those 40 ITKs and present on flip charts.

The gender issues in ITK were discussed in an interactive mode so that the participants first learn the activities which are performed by men and women in agricultural operations. The methodology of activity analysis particularly for the farm women by using PRA tools was explained by the facilitators. Examples of activity analyses done earlier were presented and discussed.

The facilitators brought out that by and large seed selection, procurement and storage are done by farm women. Other activities, viz., control of diseases in crops and animals and poultry birds are also done by women but vary according to the farming situations and socio-cultural conditions. The experiences of the participants were also shared related to identification of the areas of activities which are performed by men and women.

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Effect of nitrogen, sulphur and boron on seed yield and quality parameters of linseed (*Linum usitatissimum* L.)

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Abstract

A field experiment was carried out at R.B.S. College, Agricultural Research Farm Bichpuri, Agra during winter seasons of 2002-03 and 2003-04 on a sandy loam soil to study the effect of nitrogen, sulphur and boron on linseed (Linum usitatisimum *L.) crop. The levels of N, S and B were 0, 30, 60 and 90 ; 0, 15, 30 and 45 ; 0 and 1.0 kg ha^{-1}, respectively. N application increased seed yield (1516.28 kg ha^{-1}) significantly with every increase in the level of nitrogen up to 60 kg N ha^{-1}. The highest seed yield was obtained at 45 kg S ha^{-1} but this was found statistically superior over 0 and 15 kg S ha^{-1}. The significantly higher seed yield was recorded with 1.0 kg Boron ha^{-1} over control. The application of N decreased oil content but application of S increased oil content of the linseed in both the years. Boron application had no significant effect on oil content. Protein content in seed increased significantly with every increase in the level of nitrogen, sulphur and Boron up to 90 kg N, 45 kg S and 1.0 kg B ha^{-1}, while N application decreased the iodine value of oil, whereas S application increased the iodine value of oil significantly over control. Application of Boron had no significant effect on iodine value*

Key words: Seed yield, Nitrogen, sulphur, Boron

Introduction

Average production of linseed (*Linum usitatissimum* L.) in India is about 858 kg/ha. Its cultivation under rainfed condition with low use of fertilizers is the main cause of low yield. Among Rabi oilseeds, linseed is next to rapeseed mustard in area and production. It is an industrially important oilseed crop with over 3.5 m.ha. of land under its cultivation. Linseed oil is used for edible purpose and in the preparation of various oils and paints. Low acid and iodine values determine the quality of oil and the same could be improved by Sulphur and Boron application. Linseed oil has been used from centuries as drying oil and has got number of industrial uses such as in the preparation of paints, varnish, oil, cloth, linoleum pad and printing ink etc.

In recent years, in addition to major secondary and micro nutrients have also assumed practical significance. Out of these, the deficiency of S and Zn are already recognized, whereas Mg, Fe and B are gaining importance in large area (Tandon, 1995). Therefore, keeping its importance in view, a study on effects of N, S and B on seed yield and quality parameters of linseed.

Materials and Methods

Field experiment was conducted during Rabi 2002-03 and 2003-04 with linseed crop (Cv. Subhra) at R.B.S. College Agricultural Research Farm, Bichpuri, Agra (U.P.). The experimental soil was sandy loam (Typic ustochrept) containing organic carbon 0.38%, available N 189.7, P_2O_5 29.40, K_2O 313.00 and S 14.65 kg/ha. The oil content in seed was determined by Soxhlet extraction method. Iodine value were determined with the help of method suggest by (A.O.A.C., 1960).

Application rates of N, S and B (kg/ha) were 0, 30, 60 and 90; 0, 15, 30 and 45; and 0 and 1.0, respectively, which were supplied through Urea, elemental sulphur and borax (11% boron) While S and B and half of N were applied before sowing and remaining nitrogen was top dressed after first irrigation. All the treatments received a uniform dose of 40 kg P_2O_5 and 20 kg K_2O ha^{-1} through triple super phosphate and muriate of potash, respectively.

Experiment was conducted in split split plot design with four replications keeping nitrogen levels in main plots, level of sulphur in sub plots and level of boron in ultimate plots.

Results and Discussion

Seed yield:

Significantly higher seed yield (1516.28 kg ha^{-1}) was recorded with the application of 60 kg N ha^{-1} over control and 30 kg N ha^{-1}. The increases in seed yield at 60 kg N ha^{-1} were 42.67% and 10.87% over control and 30 kg N ha^{-1} respectively (Table 1). Mander *et al.* (2002) have also observed similar results. The highest seed yield (1433.76 kg ha^{-1}) was obtained at 45 kg S ha^{-}

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Table 1: Seed yield and quality parameters of linseed as affected by various treatments.

Treatments	Seed yield (kg/ha)			Oil content (%)		Protein content (%)		Iodine value	
	2002-03	2003-04	Pooled	2002-03	2003-04	2002-03	2003-04	2002-03	2003-04
N_0	1011.19	1114.32	1062.76	38.23	38.54	17.18	18.77	169.95	170.78
N_{30}	1315.23	1419.92	1367.58	37.89	38.20	18.58	20.30	169.30	170.31
N_{60}	1464.41	1508.16	1516.28	37.51	37.83	20.33	22.22	168.33	169.42
N_{90}	1517.33	1622.48	1569.90	37.15	37.46	21.67	23.68	160.20	161.22
CD at 5%	67.48	67.13	67.29	NS	NS	0.27	0.31	2.92	2.96
So	1240.03	1345.03	1292.53	36.85	37.17	18.98	20.73	164.25	165.30
S_{15}	1322.96	1426.39	1374.67	37.35	37.67	19.25	21.03	167.14	168.16
S_{30}	1363.28	1467.81	1415.54	37.97	38.28	19.56	21.38	167.83	168.86
S_{45}	1381.89	1485.64	1433.76	38.60	38.91	19.97	21.82	168.37	169.40
CD at 5%	48.91	50.62	49.74	NS	NS	0.22	0.24	2.18	2.70
B_0	1287.06	1395.42	1341.24	37.67	37.99	19.40	21.19	166.81	167.88
$S_{1.0}$	1367.02	1467.02	1417.02	37.72	38.02	19.48	21.29	166.98	167.98
CD at 5%	30.19	30.18	30.29	NS	NS	0.06	0.06	NS	NS

^{1} but this was found statistically at par with 30 kg S ha^{-1} and superior over control and 15 kg S ha^{-1}. Kulhare *et al*. (1996) also observed increase in seed yield due to sulphur application. Boron @ of 1.0 kg ha^{-1}also gave significantly higher seed yield over control. Chitdeshwari and Poongathi (2003) also observed increased in seed yield due boron application.

Seed quality:

Oil content:- Nitrogen application decrease oil content in linseed (Table 1). Oil content was tended to decrease with increasing level of nitrogen up to 90 kg ha^{-1}. Mangatram *et al*. (2003) also observed decrease in oil content due to nitrogen application. Application of sulphur increased significantly oil content in seed with every increased in the level of sulphur up to 45 kg ha^{-1}. Datta and Patra (2005) have also observed similar results. Application of Boron had no significant effect on oil content.

Protein content:

Protein content in seed increased significantly with every increase in level of nitrogen up to 90 kg ha^{-1}. The same trend was found by Mangatram *et al*. (2003). Significantly higher protein content in seeds was recorded with application of 45 kg S ha^{-1} over all other doses of sulphur (0, 15, and 30 kg S ha^{-1}). Venkatesh *et al*. (2002) also observed increase in protein content due to sulphur application. Boron application @ 1.0 kg ha^{-1} gave significantly higher protein content in seed over control. In the present study the enhancement of seed protein due to boron supply may be cause of accelarated protein synthesis in seed.

Iodine Value:

Iodine value decreased with increasing levels of N (Table 1). The significantly lower iodine value of oil was noted in 90 kg N ha^{-1} as compared to all other levels of nitrogen. Iodine value of oil increased significantly with the application of sulphur over its no application (control). Application of boron no significant effect on iodine value of oil.

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Major constraints in marigold cultivation and their remedies

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Abstract

A survey was conducted in year 2008 in the distt. Muzaffarnagar on Marigold cultivation to know major constraints faced by Marigold growers in cultivation and marketing of marigold. It was found that the availability of quality seeds, lack of technical information about varieties and their adoptability in the area, lack of agronomical practices and postharvest management, lack of proper storage facilities of planting material, value addition, grading and packing of flowers. Marketing of flowers is a major problem faced by growers. Creating awareness among marigold growers, special technical training programmes, exposure visits of technical institute, identification of suitable varieties suited to the agro ecological situation of the area, preparation of leaflet in Hindi language, seed production in government and farmers field, conducted demonstrations of farmers field, training of farmers in cultural practices and post harvest management of flowers, exposure visit of the growers and professionals to the places where crops are being grown on commercial scale,. Interaction of the farmers with traders and for buy back arrangement, formation of the farmers's club and linkages with bank for credit facilities etc.

Key words: Constraints, Management, Programmes, Demonstrations, Farmers's

Introduction

Marigold is the main crop grown for cut flowers. Cut flowers are used in Garland making, religious practices, interior decoration and also for dying. Demand for Marigold flowers remains round the year and is increasing day by day. Marigold crop give good income in short period. It can be grown three times a year as Rainy crop, winter crop and summer crop. Nursery sowing for rainy season crop is sown in the month of June and transplanted in July, winter season nursery is sown in the month of September and transplanted in the month of October and for summer crop, nursery is sown in February and transplanted in March. The rainy season crop gives more flowers in comparison to summer crop, but due to lack of proper Post harvest Management, growers are unable to get good prices/income. The production of marigold crop is very low, some times crop become damaged due to insect and diseases infection. Marigold growers face various problems time to time. Present investigation was conducted to study "Major Constraints in Marigold Cultivation and their remedies" under western plain zone of U.P. conditions.

Materials and Methods

Present study was carried out by survey and personal interviews of Marigold growers of the Distt. Muzaffarnagar in 2007-08. Muzaffarnagar distt. comprises of fourteen blocks. In which four blocks were selected on the basis of floriculture, especially marigold growing areas i.e. Block Baghra, Thanabhawan, Jansath, Kandhla. First of all a comprehensive list of 40 farmers from four villages (one village for each block i.e. Titawi, Babri, Meerapur and Bharsi respectively). Total 40 farmers from all four villages were selected to study the Major Constraints. The data was collected through personal interview with the help of structural schedule.

Results and Discussions

Different activities discussed by the marigold grower through personal interview. The detail is given in Table No. 1. The data revealed that the there are many constraints faced by grower are given below :

a. About Seed: It is found at the field that only 15% farmers used the quality seed and 85% farmer used the local seed. Due to non availability of quality seed the production and productivity of marigold flowers goes down. The non availability of quality seed problem faced by 85% farmers.
b. Hybrids/newly varieties : About newly varieties/ hybrids seed the Table 1 revealed that only 30% grower is aware and used newly varieties and seventy per cent not used the Hybrids/newly varieties seed. it is also main constraint faced by growers.

Production Techniques

a. Seed Treatments: The table 1 revealed that in available of quality fungicide and un awareness about seed treatment 92.5 per cent growers not treated their seed before sowing at the time of nursery preparation. Many times damping-off of diseases damaged the nursery.Only 7.5% farmers treatment their seed before sowing.

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Table 1: Different activities discussed by the marigold grower

S.No.	Major Constraints	No. of Farmers Interviewed	Availability No.	Availability %age	Non-Availability Gap	Non-Availability %age
1.	Quality seed availability	40	6	15	34	85
2.	Newly varieties availability	40	12	30	28	70
3.	Production Techniques					
	Seed treatment material (Fungicides	40	3	7.5	3	92.5
	Quality Planting Material	40	12	30	28	70
	Balance Fertilizer	40	8	20	32	80
	Pitching.	40	4	10	36	90
4.	Plant Protection	40	6	15	34	85
5.	Post Harvest Losses					
	Grading	40	4	10	36	90
	Packing	40	8	20	32	80
6.	Value Additions	40	2	5	38	95

b. Nursery Management : The table 1 revealed that only 30% grower sown their nursery on the raised bed and used fungicide for seed treatment and 70% farmer sown the nursery on the plain field. In lack of technical knowledge they get poor yield due to poor quality nursery.

c. Balanced Fertilizers :The table 1 revealed that at the time of transplanting 80% farmer do not use the balanced fertilizers on the soil testing base. The maximum farmer use nitrogenous and phosphatic fertilizer 80% farmers not use the potassic fertilizer. Due to used of maximum nitrogenous fertilizer many diseases and insects damages their crop and productivity become very low.

d. Pitching : Pitching is very important practices in marigold cultivation towards the increasing the production. Table 1 shows that 90% farmers not doing the pitching in marigold cultivation, so that production become low.

e. Plant Protection : Table 1 shows that 85% farmers not aware about insect and disease management of marigold. Some time whole crop become damaged by Powdery Mildrew and other insects.

Post Harvesting Management

1. Grading of Flower : The marketing prices depend upon the quality of flower but table 1 revealed that only 10 per cent grower done grading and 90 percent not done. So that they get low prices of their products.
2. Packing : To send the flowers in the marketing proper packing is compulsory, but table 1 revealed that only 20 percent grower done proper packing and 80 per cent not done proper packing, so that post harvest loses increased and income of farmer decreased.

Value Addition : To increase the income of farmers there is a big scope of value addition, but only 5 percent of grower aware from value addition and 95 percent farmers are unaware. So that they could not get the good income from marigold cultivation.

Remdies

The major constraints of marigold grower can be solved by the below suggestions :

1. Awareness Camp - To solve the problems of marigold grower the awareness camp should be organized three times in a year.
2. Technical Training Programme - The Technical Training should be provides to the Marigold growers through Special Technical Programme about the production techniques before the growing season.
3. Demonstration on the Farmer's Field :
   To promote the growers and increasing the productivity of marigold the demonstration on many aspects like introduction of newly varieties, Fertilizer Management, Insect & Disease Management should be organized at farmers field and field days should be organized.
4. ExposureVisits - Special exposure visit at marigold growers should be organized Interstate (SAU and KVK) and out of state IARI and IIHR.
5. Seed Production Programme - To increasing the availability of quality seed to growers timely. The seed programme promoted in SAU, KVK & Government Institute and distribute to the farmers.
6. Marketing : To provide the good income to grower the Marigold Grower Association should be made and they involve in the flowers marketing.
7. Value Addition : For future scope of marigold cultivation the value addition training should be provided to the growers.

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Factors Affecting Adoption of Different Brands of Fertilizers by Farmers

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Abstract

Use of fertilizers is an important determinant of agricultural development in area. Several factors may affect the adoption of fertilizers by farmers. Therefore, this study was undertaken to study the adoption and use of different brands of fertilizers by farmers of different farm sizes and factors influencing their choice. The study was conducted in Sikandra Rao and Akrabad blocks of Aligarh district. A total of 240 respondents were personally interviews using a pre-tested schedule. The findings revaluated that in terms of adoption of fertilizers (Urea) brands, 'medium' and 'large' size farmers gave top priority to 'SRIRAM UREA' while small farmers preferred 'CHAND CHHAP UREA' at the top. Farmers use a wide range of considerations in choosing and adoption a particular brand of fertilizer and considerations and preference of small, medium and large farmers for adopting fertilizers were different

Key words: Fertilizer; Agricultural development

Introduction

Fertilizers have played an important role in increasing the agricultural production in the country. The domestic production of chemical fertilizers increased from a modest volume of 0.04 million tones in 1951-52 to over 15.5 million tones in nutrient terms (N+P) in 2005-06 during the same period, the overall consumption of fertilizers in nutrient terms (NPK) increased from 0.07 million tones to 20.3 million tone in 2005-06 availability, adequacy and use of fertilizers are the important determinant of agricultural development in an area. Keeping the above into view, this study was undertaken with the following specific objective.

To study the adoption and use of different brands of fertilizers by farmers of different farm sizes and factors influencing their choice.

Methodology

This study was conducted in Sikandra Rao and Akrabad blocks of Aligarh district. Two villages were randomly selected from each block. A total of 240 respondents were selected amongst the three categories viz. small, medium and large size of farmers the data were collected with the help of a pre-tested schedule by personal interview method. The data collected were analyzed with the help of non-parametric statistical tools.

Results and discussion

Priority order for adoption of popular brands of fertilizers :

The data (table 1) revealed that in terms of adoption of fertilizer (Urea) brands, 'medium' and 'large' size farmers gave top priority to 'SRIRAM UREA' while small farmers preferred ' CHAND CHHAP UREA' at the top. The three major brands of urea which found place in the first three preferences of all categories of farmers were : SRIRAM, CHAND CHHAP and IFFCO.

The farmers were asked about the considerations based on which they chose a particular brand of fertilizer, the data revealed (Table 2) that in case of small farmers, five major considerations of the farmers for adopting a particular brand in their preferential order were; fully quantity guarantee, timely supply, availability in open market. 'meeting full demand' and 'freshness of material. Other considerations in order o their preferences were; 'economic cost'. 'Better packing'. 'Credit support' and backing up by technical support.

On the basis of over all assessment of the preferred considerations, the five major brands of urea, in case of small farmers, which emerged as top ranking

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Table 1: Priority order of adoption of different fertilizer brands (In case of Urea)

S. No.	Fertilizer brands	Small		Medium		Large	
		MPS Index	Rank Order	MPS Index	Rank Order	MPS Index	Rank Order
1.	Chand Chhap	68.14	I	61.48	II	58.81	IV
2.	Ujawla	47.11	IX	46.52	IX	40.00	IX
3.	Kribhco	55.10	IV	54.07	V	61.93	III
4.	Iffco	59.56	III	60.74	III	63.11	VIII
5.	Kisan	48.44	VIII	50.22	VIII	46.22	VIII
6.	Indogulf	52.00	VII	52.33	VII	55.41	VII
7.	Sardar	53.33	VI	57.93	IV	53.48	VI
8.	Sri Ram	62.81	II	63.11	I	64.44	I
9.	Narmada	53.48	V	53.67	VI	56.59	V

Table 2: Considerations for the adoption of different brands (In case of small farmers)

S. No.	Name of fertilizer brands	Consideration Codes									Total % Score	Rank Order
		A	B	C	D	E	F	G	H	I		
1.	Chand	00	78	10	72	55	28	24	32	04	303	I
2.	Ujwala	54	56	08	75	45	36	21	48	02	345	VII
3.	Kribhco	80	56	70	24	25	26	27	28	10	346	VI
4.	Iffco	80	48	70	24	30	28	24	26	11	341	VIII
5.	Kisan	45	72	21	60	50	36	21	44	01	350	IV
6.	Indogulf	63	72	02	54	40	36	27	40	04	338	IX
7.	Sardar	63	64	02	60	45	40	33	40	01	348	V
8.	Sriram	90	80	14	66	45	28	24	36	-	383	II
9.	Narmada	72	56	14	54	50	36	27	42	-	351	III
	Total	547	582	211	489	385	294	228	336	33	3223	
	Rank Order	**II**	**I**	**VIII**	**III**	**IV**	**VI**	**VII**	**V**	**IX**	-	

Table 3: Considerations for the adoption of different brands (In case of medium farmers)

S. No.	Name of fertilizer brands	Consideration Codes									Total % Score	Rank Order
		A	B	C	D	E	F	G	H	I		
1.	Chand	80	64	02	72	55	40	27	32	01	373	III
2.	Ujwala	36	56	03	60	50	36	30	48	05	324	VIII
3.	Kribhco	80	64	63	30	32	32	27	28	08	364	VI
4.	Iffco	80	56	70	36	35	36	27	26	07	373	IV
5.	Kisan	54	64	01	60	45	36	27	44	08	339	VII
6.	Indogulf	72	32	02	60	40	40	27	40	10	323	IX
7.	Sardar	63	80	04	48	50	44	30	40	06	365	V
8.	Sriram	80	70	25	60	55	44	27	36	03	400	I
9.	Narmada	80	75	13	66	56	40	24	42	02	398	II
	Total	625	561	183	492	418	348	246	336	50	3259	
	Rank Order	I	II	VIII	III	IV	V	VII	VI	IX	-	

Table 4: Considerations for the adoption of different brands (In case of large farmers)

S. No.	Name of fertilizer brands	Consideration Codes A	B	C	D	E	F	G	H	I	Total % Score	Rank Order
1.	Chand	80	96	10	60	45	40	27	30	06	394	III
2.	Ujwala	36	56	03	60	50	32	33	50	04	324	IX
3.	Kribhco	75	72	77	36	30	24	27	34	07	382	II
4.	Iffco	78	80	63	42	35	28	27	38	05	396	I
5.	Kisan	45	64	02	60	45	36	30	48	02	332	VIII
6.	Indogulf	63	80	05	54	40	44	30	30	05	351	VII
7.	Sardar	73	80	08	48	45	40	27	42	00	363	V
8.	Sriram	81	75	04	60	50	48	24	30	03	375	IV
9.	Narmada	72	64	01	66	50	40	30	36	02	361	VI
	Total	603	667	173	486	390	332	255	338	34	3283	
	Rank Order	II	I	VIII	III	IV	V	VII	VI	IX	-	

Codes :

A : Full quantity guarantee
B : Timely Supply
C: Credit support
D: Available in open market
E : Full demand met
F: Economic cost
G: Better packing
H: Fresh store
I : Technical support or literature

choices in order of their references were; CHAND CHHAP. SRI RAM, IFFCO UREA, KRIBHCO UREA and NARMADA.

The considerations influencing the option of medium size farmers in relation to the adoption of different brands of urea fertilizer according to the priority-wise preference were ' full quantity guaranteed' and 'timely supply' (Table 3). Other major considerations mentioned by the farmers in order of their preference were; 'availability in open market.' 'adequate supply to meet full demand', 'economic cost and 'freshness of the stock'. Followed by such considerations as 'better packing' credit and technical support., based on these considerations, the major brands of urea, in case of medium farmers which emerged as top ranking choices in order of their preferences were; SRIRAM, CHAND CHHAP, IFFCO, SARDAR and KRIBHCO.

The response of large farmers regarding their preferences for different brands of urea and the factor influencing are given in table 4. It revealed that 'timely supply' followed by, guarantee for full quantity' was the major considerations for adopting a particular brand of fertilizer. Other considerations worth mentioning were; availability in open market 'full demand met', 'economic cost' better packing quality' and 'freshness of the stock' Accordingly, the highly preferred brands in case of large farmers were ; SRIRAM, IFFCO, KRIBHCO, CHAND CHHAP, NARMADA.

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